

Formal and Real Authority in Organizations: An Empirical Assessment*

Feng Li

University of Michigan
feng@umich.edu

Michael Minnis

University of Michigan
minnis@umich.edu

Venky Nagar

University of Michigan
venky@umich.edu

Madhav Rajan

Stanford University
mrajan@stanford.edu

September 2009

* We thank seminar participants at London Business School, University of Michigan, University of Southern California, and the Third Interdisciplinary Accounting Conference in Copenhagen for many valuable comments.

Formal and Real Authority in Organizations: An Empirical Assessment

Abstract

Theories of the firm such as Aghion and Tirole (1997) distinguish *formal* authority from *real* authority: a manager could be formally responsible for a decision, but in reality may acquiesce to her better-informed subordinate. These models, as well as organizational theorists (e.g., Simon 1997), suggest that employee communication patterns during critical decision-making reveal most clearly the underlying patterns of real authority. We propose the extent to which CEOs communicate in the high-stakes setting of earnings conference calls as a measure of their real authority over top management. Using a large database of firm conference call transcripts, we find that our real authority measure is distinct from formal authority measures of CEOs, and is significantly associated with theoretically predicted organizational factors. CEOs with real authority also receive higher wages. Real authority is thus a distinct and *measurable* organizational feature.

Formal and Real Authority in Organizations: An Empirical Assessment

Heather Bellini (UBS Analyst): Hi, good morning, everybody. I just wanted to ask a question, Steve. Typically, revenue synergies in software deals have been elusive, at least that's what us and the industry would at least remember. Can you talk with us a little bit about the revenue synergies you would expect, why you would expect to get them, and over what time frame we could expect to see them, have this play out? Thank you.

Steve Ballmer (Microsoft CEO): Yes. I am going to let Kevin [Johnson - President, Platform and Services Division] take this.

Microsoft Corporation conference call on February 1, 2008.¹

1. Introduction

Economic theory defines property rights as formal control over assets in unforeseen circumstances. However, recent studies recognize that an individual with formal control may not be able to exercise this right because she does not have the necessary information to make the optimal decision. She may try to gain this information from another individual who has it, or might acquiesce to this other informed individual, ceding him *real* authority over the asset. This interplay of formal and real authority among individuals, and the underlying patterns of information communication, has received extensive attention in recent analytical theories of the firm.² This study conducts one of the first systematic *empirical* tests of such theories.

To measure authority, prior empirical analyses have typically relied on organizational charts (org-charts), surveys, job titles, or statements of job responsibilities.³ However, in their canonical study of real authority, Aghion and Tirole (1997) note that these measures of delegation,

¹ Source: <http://www.microsoft.com/presspass/press/2008/feb08/02-01Transcript.msp>.

² Examples of papers in this area are Bolton and Dewatripont (1994), Aghion and Tirole (1997), Bolton and Scharfstein (1998), Baker, Gibbons and Murphy (1999), Garicano (2000), Dessein (2002), Dewatripont and Tirole (2005), Mookherjee (2006), Van den Steen (2007), and Ferreira and Sah (2009).

³ See, for example, Baker, Gibbs, and Holmstrom (1994), Baiman, Larcker, and Rajan (1995), Baker and Holmstrom (1995), Nagar (2002), Aggarwal and Samwick (2003), Moers (2006), and Ortega (2009).

decentralization, and management responsibilities are measures of “formal authority.” The measures do not account for the fact the person making the true decision could be someone else: a person with “real authority.” Complex management decisions require subjective soft knowledge (Petersen and Rajan 1994; Stein 2002; Petersen 2004; Tetlock et al. 2008), and the person who possesses this knowledge is the person with real authority. This person gains real authority because subjective knowledge is not easily communicated and transferred through the management chain, resulting in the individual with formal authority in many cases simply “rubber-stamping” this person’s decision. Aghion and Tirole (1997) derive several testable predictions about real authority and how it differs from formal authority, and then reveal a critical obstacle: “The key issue is, of course, the *measurement* of real authority” (p. 26, emphasis theirs).

Aghion and Tirole’s (1997) concern is a substantive one: while org-charts, titles, and formal job responsibilities are easily measured, it is difficult for an outside researcher to extract the identities of the employees who possess subjective knowledge and, hence, real authority. The amorphous nature of subjective knowledge and the subliminal power connotation of real authority make these concepts elusive to objective surveys; respondents along the management hierarchy may give conflicting answers on who has the real authority (Bertrand and Mullainathan 2001). This paper is an attempt to overcome such obstacles in the measurement of real authority.

To do so, we observe that theories of the firm themselves suggest the solution – communication patterns among employees. The analytical research investigating organization design and delegation (see footnote 2) consistently models scenarios in which an informed subordinate may communicate information to an uninformed superior and thus influence the final decision; i.e., communication patterns during high-stakes decision-making reveal patterns of

real authority in the organization. The psychosocial organization theories Aghion and Tirole (1997) use to motivate their study make the same point as well. These theories argue that while formal hierarchies exist as explicitly planned structures, patterns of real authority are only visible through information communication patterns in meetings, as those with real authority successfully influence the decision outcome (Simon 1997, Ch. VII and VIII). Critical internal management meetings therefore suggest themselves as the ideal data source for identifying real authority.

Since strategic internal management meetings are necessarily confidential, we focus on a publicly available communication setting that carries equal importance, namely earnings conference calls. Most publicly traded firms host earnings conference calls each quarter during which management describe the performance and strategy of the firm and field a spontaneous question and answer session with analysts. This meeting offers a critical window for analysts and investors to observe and update their views of the management team and its handling of the firm (Kimbrough 2005).⁴ The high financial stakes carried by these meetings have been documented at length. Stock prices respond to a variety of cues, ranging from tangible information (Bushee et al. 2003) to the vocal inflections and tone reflexively affected by executives when talking (Mayew and Venkatachalam 2008). As a result management is under significant pressure to perform credibly, and firms approach this event with great care (see Figure 1).⁵

We propose that the extent to which the Chief Executive Officer (CEO) speaks in these conference calls is a proxy for the extent to which he or she possesses real authority. Our assumption is that, unlike hard formal information, it is difficult to prime a responder about

⁴An AIMR (Association for Investment Management & Research) survey found that 95 percent of analysts and investors view the conference call as the most important form of technology-aided communications between management of public companies and the investment community (Stewart 2002).

⁵ Attempts to shortcut this interaction can lead to clear analyst dissatisfaction as evidenced by the case of Cisco Systems, which was recently criticized for hosting a conference call with an overly “scripted feel” (Vance 2009).

subjective knowledge adequately in advance of a Q&A session, especially to a deeply informed audience. As in critical meetings, letting the person with the relevant subjective knowledge speak is a natural strategy and inspires confidence (Tracy 2009). In earnings conference calls, such a strategy maximally showcases the management team's credibility and control over firm operations (see the Microsoft quote above and the case study in Appendix A). To the extent the speaker is indeed the possessor of subjective knowledge, he or she by definition has real authority.

We obtain machine readable texts of 17,419 conference calls from 2003-2007 and measure the amount of communication conducted by the CEO relative to others in top management.⁶ We hypothesize and find that our measure of the CEO's real authority is related to its theoretically predicted determinants. Specifically, we predict and find that the CEO has more real authority when the non-CEO management team has weaker monetary incentives, the urgency of decision-making is lower, the tasks considered are more important, the expertise required is less technical or innovative, and the span of the CEO's control is smaller. Furthermore, we find that these results obtain after controlling for measures of the CEO's formal authority and CEO's individual characteristics such as ownership, tenure, prestige, and overconfidence. Real authority thus appears to be a distinct organizational feature.

Our predictions above are joint tests of our assertion that conference calls can measure real authority and of the theories of real authority. We therefore provide additional economic evidence on the validity of our measure of real authority. Under the assumption that well-functioning labor markets reward real authority (Rosen 1982), we conduct a joint test of labor market efficiency and our measure of authority. We show that wages are an increasing function of

⁶ The conference call has an introductory management preamble followed by a question and answer session. In the body of the paper we distinguish between the management's initial preamble and the subsequent spontaneous answers.

real authority, in that our measure of CEO real authority is positively associated with the wages of the CEO relative to top management, after accounting for a rich set of controls.

Our results on the link between real authority and compensation also speak to a different class of models of the firm, namely those based on tournament theory. A key prediction of this theory is discrete jumps in pay as an employee wins the current job “tournament” and is promoted to the next level. While the empirical literature on tournaments finds wage differences across successive job-levels, it turns out that promotions are *not* the main cause. For example, Baker and Holmstrom (1995, p. 257) report that the wage differential between adjacent levels ranges from 18% to 47%, but promotions themselves only yield a wage premium of 7%. Gibbons and Waldman (1999) explain this pattern with an adverse selection model where the employer continuously learns more about the employee’s human capital and adjusts her responsibilities and wages accordingly even within the same job title. This is precisely our finding on the linkage between real authority and compensation.

Section 2 describes the theory, the measure of real authority, and our hypotheses. Section 3 describes our data and variable measurement, and provides a discussion of the descriptive statistics. Section 4 discusses the results, which Section 5 supplements with robustness analyses. Section 6 concludes.

2. Hypothesis Development

Modern analytical studies of the firm, such as Aghion and Tirole (1997) and the papers listed in footnote 2, revolve around three key concepts: 1) subjective knowledge that is distributed differentially across individuals in an organization and is costly to transfer; 2) formal lines of

authority; and 3) communication processes through which individuals attempt to influence the decision of those with formal authority. The three concepts are interlinked: for example, if every individual's knowledge can be transferred and interpreted by others costlessly, i.e., the only organizational challenge is to induce that individual to communicate, patterns of authority are vacuous (Mookherjee 2006, p. 369).

We frame our hypotheses in the context of the real authority of the CEO relative to top management. Broadly speaking, papers such as Aghion and Tirole (1997) and Baker, Gibbons and Murphy (1999) model a manager with the formal authority as the principal (in our case the CEO) and a subordinate with the subjective knowledge as the agent (in our case the remaining management team). In these models, the agents propose projects which the principal must accept or reject. The principal cannot interact with all the company's stakeholders personally; as a result much subjective knowledge about the projects resides with her subordinates. The uninformed principal must then decide to invest resources in becoming informed. This is costly, however, in that time and expense are required to gain this information. Further, the potential for an informed principal to overrule the subordinate may reduce the subordinate's initiative to search for projects *ex ante*. Considering these costs, it is at times optimal for the principal to acquiesce to the agent's decision expertise. The extent to which the principal does so is the measure of the agent's real authority.⁷

⁷ Despite their broader similarities, there are significant differences across the model setups. For example, Aghion and Tirole (1997) argue that a principal can delegate formal authority to an agent, while Baker, Gibbons and Murphy (1999) argue that "decision rights in organizations are not contractible" and, therefore, "formal authority only resides at the top" of the organization (abstract). However, Baker, Gibbons and Murphy (1999) do suggest that "informal delegation" and "informal authority" exist within organizations. In their view, informal delegation arises when an informed principal effectively promises not to overturn the decisions of the subordinate, whereas informal authority arises when an uninformed principal "rubber-stamps" the subordinate's decisions. This notion of informal authority is similar in spirit to Aghion and Tirole's (1997) real authority and results in similar predictions.

These theoretical analyses generate a rich set of equilibrium results, some of which are tied to specific modeling assumptions and others that are more broadly valid. We cull these results to generate a set of hypotheses that are a) broadly consistent with these models, and b) empirically testable. Specifically, following Aghion and Tirole (1997), we predict a negative association between the extent of real authority retained by the principal and the incentives of the agents, the decision urgency of the projects, the importance of the task considered, the technical competency required, and the span of control of the principal. Likewise, Baker, Gibbons and Murphy (1999) suggest that the principal will cede real authority on projects in which the subordinate has particular expertise, when the outcome is inconsequential for the principal, or if a decision is needed quickly.⁸ We discuss each of these factors in turn and then state our main hypothesis.

Incentives: Aghion and Tirole (1997) note that higher monetary incentives for the agent may have two complementary effects on the agent's real authority: 1) it will increase the probability that the agent will recommend a good project, and 2) it will decrease the need for monitoring by the principal and hence the probability that the principal will overrule the project proposal. These incentives align the agent's interests with those of the principal, reducing control costs. If the agent's monetary incentives are high, the principal is less likely to retain real authority.

Decision Urgency: Another factor affecting the principal's real authority is the time it takes for the agent to effectively communicate information to the principal (a form of high knowledge transfer costs). The benefits to the principal of maintaining real power over the decision may be more than offset by the crucial time lost in the communication and decision process.

⁸ Baker, Gibbons and Murphy (1999) present these as potential scenarios in which informal authority may arise. They also formally derive sufficient conditions under which informal authority is feasible and efficient. In the equilibrium of this supergame, the uninformed principal never overturns the proposal of the agent and thus cedes informal (or real) authority to the agent; in turn, the agent only proposes projects with high expected outcomes for the principal (i.e., does not abuse the informal authority).

Task Importance: Ceding real authority to the agent creates control costs: the agent can make suboptimal decisions from the perspective of the principal. When the suboptimal decision may result in a sufficiently large negative outcome (i.e., control costs are high), the principal has much to lose by ceding real authority. Therefore, the principal will be relatively more willing to imbue the agent with real authority on projects of less significance to the principal.

Technical Competency: The principal simply may not have the technical competence or experience to fully understand the nature of the projects proposed by the manager. Instead, the principal may be selected for her ability to effectively impact the marginal productivities of the employees throughout the organization (Rosen 1982) – i.e., manage people and processes. The principal thus may have lower real authority in firms which require a high level of technical expertise (e.g., scientific innovation).

Span of Control: A principal with broad control over productive labor is likely overburdened with project proposals from subordinates. Increasing numbers of project proposals by subordinates increases the knowledge transfer costs from the subordinates to the principal. With each marginal project proposal, the average time spent on each project proposal decreases, resulting in the CEO being less informed about each project, on average. Therefore, increases in span of control magnify the information asymmetry (i.e., increase knowledge transfer costs) between the principal and the agent, thus endowing the agent with more real authority.

Drawing on our measure of CEO communication as the proxy for her real authority, we combine the above predictions into our first hypothesis:

- H1: The real authority of the CEO is lower in firms with higher monetary incentives for subordinates, higher decision-making urgency, lower shareholder communication importance, higher technical complexity, and greater span of control.**

An alternative explanation to H1 is that we are observing variations, not in real authority, but in *formal* authority. A talented subordinate who wants to rise through the ranks may not be content with verbal CEO promises to acquiesce to the subordinate's knowledge and authority. He may want to see definitive formal limits on CEO power, which ultimately seeps into conference call patterns. Likewise, a "hands on" CEO may wish to sidestep internal top management dissent and challenges to her decisions, and seek authority over top management through formal means. We therefore seek to control for measures of formal authority in testing H1. To do so, we measure the CEO's formal authority through job title concentration, including the CEO's position on the board and founder status.⁹

In addition, CEOs derive power from sources such as ownership and prestige (Finkelstein 1992, p. 510). A CEO can also acquire power through psychological and sociological means. People tend to defer to psychological traits such as confidence, and recent literature has paid much attention to CEO overconfidence and its impact on corporate decisions (e.g., Malmendier and Tate 2005). Likewise, a CEO with a long tenure may know the sociological innards of the organization well enough to get what she wants. We include these attributes in the development of our second hypothesis to incorporate the possibility that other forms of CEO authority may be associated with a CEO's *real* authority.¹⁰ We now formally propose our second hypothesis:

H1a: Hypothesis H1 holds after controlling for measures of the CEO's formal authority and CEO individual characteristics.

⁹ We typically do not have access to specific CEO employment contracts wherein the scope of formal authority is delineated in writing.

¹⁰ In a perfect labor market, CEO characteristics should match perfectly with firm characteristics and there would be little reason to expect any variation in the former after controlling for the latter. However, CEO characteristics empirically have a significant incremental effect on firm performance (Bertrand and Schoar 2003).

Hypotheses H1 and H1a are *joint* tests of the analytical theories of real authority and our assertion that the communication patterns of conference calls can capture real authority. To further establish the validity of our measure of real authority, we turn to joint tests involving the CEO labor markets and our measure of the CEO's real authority.

Efficient labor markets should reward authority within an organization (Rosen 1982). This equilibrium is an outcome of a matching process of talent and responsibility. Those with more responsibility (or authority) have an impact on productive resources below them in the hierarchical chain and, therefore, require more talent given the multiplicative impact of their decision and actions. Therefore, we predict that the CEO's compensation relative to top management will increase with her real authority.¹¹ Formally stated:

H2: The compensation of the CEO is increasing in the CEO's level of real authority.

Our tests thus far have focused on the CEO who is the leader of the firm's management group. However, the predictions of formal authority and wage theories apply not just to the principal decision maker, but also to the subordinate agent. If the principal has ceded more real authority to the agent, the agent's pay relative to the principal's pay should be commensurately higher. A key subordinate who reports to the CEO and plays an important role in the earnings conference call is the CFO. As a test of the models' subordinate-related perspective, we propose our final hypothesis:

H2a: The compensation of the CFO relative to the CEO is increasing in the CFO's proportion of communication on earnings conference calls relative to the CEO.

¹¹ Note that our tests measure relative compensation (though we examine the level of CEO compensation as well). We cannot test if the management team as whole is overpaid or underpaid relative to their marginal product.

3. Data and Variable Definitions

Our study uses data from multiple sources. We obtain conference call data from transcripts compiled by ThomsonReuters, firm financial and compensation data from Compustat's Xpressfeed and ExecuComp databases, respectively, stock return data from CRSP, and board of directors and governance data from RiskMetrics (formerly IRRC).¹² Appendix B provides descriptions and definitions for all variables used in our analysis. We discuss the variables below, with particular focus on the conference call data as this is the unique contribution of our study.

3.1 CEO's Real Authority Measure

Our measure of the CEO's real authority is the extent to which the CEO participates in earnings conference calls. Because the variable has not been used in previous studies, we describe our process for measuring real authority in detail. We obtained over 129,000 conference call transcripts compiled from January 2001 to September 2008 by ThomsonReuters. As indicated in Table 1, which reports our conference call selection process, we discard conference calls that have foreign text or are not related to earnings.¹³ Earnings conference calls have the advantage in our setting in that they generally follow a consistent format across firms: an opening dialogue by company executives followed by a question and answer session between analysts and company executives. Non-earnings related conference calls which we eliminate are generally presentations made at conferences or are conference calls for special events, such as mergers and acquisitions. We eliminate these transcripts to control for special one-time items and to ensure a consistent

¹² We use company founding year data from Boyan Jovanovic's website: <http://www.nyu.edu/econ/user/jovanovi/>.

¹³ Our FORTRAN code is not able to process transcripts which include foreign characters. These firms would likely have been removed from the sample because of missing compensation data anyway.

format for the transcript.¹⁴ In addition, we note that transcripts in the initial years of the database (2001-2002) are inconsistently formatted, so we eliminate these as well. Finally, because we require compensation data for our analysis, the most significant single reason for eliminating conference calls from the sample is the lack of ExecuComp data. From the original sample of conference calls, we ultimately use the data from 17,419 transcripts.

For each conference call, we use FORTRAN code to parse the text and identify the date of the call, the name and ticker symbol of the firm, and whether the call related to an earnings report.¹⁵ In addition, each time a person spoke during a conference call, the transcript reports the name and title of the individual who spoke.¹⁶ We then determine the amount of speech (both the number of times that a person spoke as well as the number of characters spoken) for each individual on the conference call by title. Our primary measure of real authority is the amount of text spoken by the CEO as a percentage of text spoken by all company personnel on the conference call.

Our coding procedure eliminates any transcripts from the sample for which we cannot identify at least one speaker during the conference call. We could not identify speakers in the transcripts for at least three reasons: 1) the transcript explicitly stated that a speaker was unidentified; 2) our code was unable to properly parse the name and title for at least one speaker

¹⁴ In untabulated results, our findings are robust to including all non-earnings conference calls.

¹⁵ We received the transcripts in XML (Extensible Markup Language) formatting. XML provides “tags” to identify elements of the transcript. In particular, we used XML tags to identify the company name, date of the conference call, type of conference call (e.g., earnings, conference presentation, etc.) and company ticker symbol. The main body of the conference call text did not contain XML tags and was effectively a plain text document.

¹⁶ While the transcript reports the title of the individual speaking, there is by no means a consistent set of titles across all firms. We identified over 16,000 unique titles for individuals who spoke at least once on the conference calls. Because it is important to our study that the executive positions are identified correctly, we manually examined each of the titles and grouped the more than 16,000 unique titles into one of nine major title groupings: CEO, CFO, Operations, Functions, Investor Relations, Other, Analyst, Operator, and Unknown. As the CEO and CFO conduct a majority of the conference call, we focus our reported statistics on these two roles.

(or the title that was parsed was insufficient to identify the individual’s position); or, 3) analysts were not labeled with an “Analyst” title and, therefore, we could not identify them as such.¹⁷ As these reasons for omitting conference call observations are not systematically related to our analysis, our results should be unbiased, but may have reduced power.¹⁸

The conference calls are typically quarterly events; however, all other variables that we use in this study are measured on an annual basis. We therefore convert the conference call data to annual observations by averaging across all conference calls for a firm within a fiscal year.¹⁹ After this procedure, there are 6,862 firm-year conference call observations. We further eliminate firm-year observations with insufficient data from all other data sources.²⁰ Finally, the unit of observation in this study is a firm-level basis (rather than firm-year); therefore we average the annual observations for all variables within a firm to derive 1,376 firm observations.²¹ Ultimately,

¹⁷ In the conference calls which were parsed properly, analysts were identified in the transcript by their name, firm name and the title of “Analyst.” However, conference call transcripts also identified analysts by their name and firm name only, omitting the title of “Analyst.” Therefore, when the transcript was parsed, the title variable was missing and we were unable to identify the position of the individual without examining each transcript manually.

¹⁸ In untabulated results, our findings are robust to including conference calls that were dropped because an individual was unidentified (we made the assumption that the unidentified speaker was a non-CEO company employee).

¹⁹ To be precise, we calculate the percentage of talking conducted by the CEO for each conference call within a year and average this value across all valid conference calls in our sample for that year. We assign any conference call occurring after the third month of the fiscal year through the third month of the following year to that fiscal year – i.e., we assume that the conference calls occur with up to a three month lag following the quarter close. Bowen, Davis, and Matsumoto (2002) find that 75% of the conference calls in their large sample occur in the 9 day window surrounding the quarterly earnings announcement. Even after applying our filtering procedures, some firms still had more than 4 earnings conference calls in a given year. The reason for this is that when an acquisition takes place, the historical transcript of the acquired firm is identified by the ticker symbol of the acquiring firm. Therefore, acquiring firms’ *Percentage CEO Text* variable may include data from acquired firms’ transcripts. We attempt to mitigate this noise by eliminating any conference calls that occur in the same month for the same firm. In addition, as a robustness check, we eliminate firm-years with more than 4 earnings conference calls and our findings are virtually identical.

²⁰ We matched each conference call to an ExecuComp firm based on the ticker symbol as reported in the conference call transcript. This approach matched approximately 1,500 firms. We were also able to match approximately 200 additional firms by hand. Subsequently, the firms were matched to Compustat (*gvkey*), CRSP (CRSP-Compustat link) and RiskMetrics (*Cusip*) datasets. However, we were unable to find a match for all firms in each of these datasets, resulting in the elimination of some firm-years as detailed in Table 1.

²¹ By averaging all variables across time for a firm, we are effectively using the “between” estimator. We take this approach primarily because all variables have a high degree of persistence for a firm across years – i.e., these are firm characteristics that persist over time and the main variation of interest is the heterogeneity between firms (therefore,

we reduce the sample further to 1,147 firm observations after we require each firm to have a minimum of 2 years of data.

3.2 Conference Call Descriptive Statistics

Table 2 reports the descriptive statistics for the 17,419 conference calls that we parsed without issues. We present the data for all conference calls in Panel A, by year in Panel B, and by Fama-French 12-industry grouping in Panel C. Several statistics are worth noting. First, the variables appear to be well-centered – the mean and median are similar in magnitude across the variables. Figure 2a presents the distribution of the amount of text spoken by all company personnel during the conference calls. The distribution is similar to a normal distribution with the exception of a few outliers to the extreme right. Figure 2b presents the distribution of the amount of speaking by the CEO as a percent of total company personnel speech. This distribution (which by definition is distributed between 0 and 1, inclusive) has fatter tails than the normal distribution and also has a mass point at zero. CEOs are not present (i.e., do not speak) for approximately 9% of the conference calls in our sample. A second item worth noting is the significant role that the CFO plays in the conference calls. In fact, while the CEO is not present on 9% of the conference calls, the CFO is not present on only 7% of the conference calls.

In Panel B we present the conference call statistics by year. The first item to note is the distribution of our sample across years. Our sample is skewed toward more recent years for three potential reasons: 1) the number of conference calls has increased over this time period; 2) ThomsonReuters collected more conference calls in more recent years; and 3) the formatting of

firm fixed effects regressions are not appropriate). Using annual observations and estimating clustered standard errors at the firm level is an alternative to our approach. See Section 5 for our robustness tests.

the transcripts was more consistent in later years, allowing our code to more effectively parse the text without error. A second observation is that the length of the conference call has increased monotonically over the time period, while the number of analyst questions has remained fairly constant. A final item to note in Panel B is that the role of the CEO has also increased over the years. The percentage of CEO text rose from 45% in 2003 to 50% in 2007. Most of this increase in the mean likely comes from a higher rate of presence by the CEOs on the conference calls. In untabulated results, we find that the percentage of conference calls attended by the CEO increased from 86% in 2003 to 93% in 2007.

Panel C reports the conference call statistics by industry. Two items are worth noting from this table. First, there is significant variation across industry type for not only the length of the conference call, but also the extent to which the CEO participates on average. For example, Utilities industries have both the least amount of text spoken by company personnel and the least amount of participation by the CEOs. In contrast, the Health industries have the longest conference calls on average while CEOs play the most dominant role in the Manufacturing industries. Second, the distribution of conference calls in our sample is concentrated in five industry classes, consistent with the distribution of firms in the ExecuComp dataset.

3.3 CEO's Formal Authority Measures

Formal authority resides with the individual who has the express *right* to make a decision. Ideally, this measure would be constructed from the details of the compensation contract where contingencies are expressly spelled out. However, outside researchers are typically not privy to contract details beyond financial report disclosures. As a result, prior studies on CEO's formal

authority (e.g., Adams et al. 2005) have developed their own proxies; we borrow three of these measures. Our first measure of formal authority is an indicator variable for a company founder CEO. We find that just over 12% of the CEOs in our sample also founded the company. The second measure is an indicator variable for title concentration. A CEO who is the Chair of the Board of Directors as well as the President of the company likely has more formal authority to make decisions.²² 50% of the CEOs in our sample have concentrated titles.²³ Our third measure is an indicator variable for the CEO as the only insider on the Board of Directors. Similar to the title concentration argument, if a CEO is the only executive with formal ties to the Board, she likely has higher levels of authority over the other executives. Table 3 reports that approximately 60% of the CEOs are the only insiders on the Board.²⁴

3.4 CEO Characteristic Measures

As we discussed in Section 2, CEOs may derive power from various sources other than formal channels. These include ownership of the firm, tenure, prestige and overconfidence. We discuss our proxies for each of these constructs in this section.

We calculate CEO ownership as the total number of shares owned by the CEO divided by the total number of shares outstanding for the firm. CEOs in our sample own approximately 1.7% of their firms on average, while the median is only 0.3%. Tenure is measured as the number

²² In addition, we count a CEO who is not President as having title concentration if there is no other person with the title President or Chief Operating Officer reporting to her (see Adams et al. 2005).

²³ We also considered a variable for CEO duality; however, this variable is highly correlated with the CEO title concentration variable (which is a subset of CEO duality), and so we selected only one of these variables.

²⁴ As an external validity check, we cross-check the magnitudes of our descriptive statistics in Table 3 with prior studies, and find them comparable. Details of the comparisons are excluded from the paper for brevity, but are available from the authors.

of years the CEO has been in office. We find that the average (median) CEO tenure is approximately 8 (6) years.

Prestige is more difficult to quantify. We proxy for this construct using Fortune magazine's annual survey of the America's Most Admired Companies. Fortune conducts this survey on an annual basis by surveying management of Fortune 1000 companies to rank their peer firms on eight dimensions, including quality of management.²⁵ While the ranking is particular to a *firm*, we suggest that the CEOs of the companies that are ranked highly gain prestige. We operationalize this measure by creating a dummy variable indicating that the firm is one of the top 5 firms in its industry in the survey.²⁶

Finally, we consider CEO overconfidence. Malmendier and Tate (2005) designate CEOs whose wealth is overexposed to the idiosyncratic risk of their firms as overconfident. Using proprietary data, they create measures of overconfidence based on the extent to which CEOs wait to exercise their options or excessively accumulate stock. Because this proprietary data does not apply to our sample, we proxy for the extent to which CEOs wait to exercise their options using end of year holdings of exercisable options which remain unexercised, scaled by the sum of the value of unexercised exercisable options, unexercisable options and shares of stock. This results in a percentage of value of the CEO's holdings that are held in unexercised exercisable options. On average, 29% of the total value of the CEO's holdings is held in unexercised exercisable options.

²⁵ The other dimensions include innovation, people management, use of corporate assets, social responsibility, financial soundness, long-term investment, and quality of products or services.

²⁶ One potential issue with this measure is that Fortune only considers the largest 1,000 companies by sales and, within this group of firms, only considers firms that are among the ten largest within their industry. While our sample includes these firms, it also includes other firms that were not eligible for the survey. Therefore, this measure is biased towards larger firms.

3.5 Determinants of the CEO's Real Authority

We now discuss the proxies for the determinants of real authority listed in Section 2.1. It is important to note that these determinants are fundamentally theoretical constructs lacking clear and obvious empirical counterparts. Our empirical representations, determined by plausibility and feasibility considerations, are as follows:

Incentives: Recognizing that agent incentives can take many forms, we use the extent to which the wealth of the four highest paid executives other than the CEO is sensitive to a change in the firm's stock price.²⁷

Decision Urgency: We conjecture that managers in highly competitive industries need to respond quickly to competitor actions. We use the degree of product market competition as our proxy for urgent decision-making. To do so, we calculate the Herfindahl index based on firm sales for each 4-digit SIC industry within the entire Compustat Xpressfeed universe. Because this measure may be a noisy proxy for our underlying construct and because we only want to capture those industries that are highly competitive, we create an indicator variable that is set to 1 only if a firm's industry is in the top decile of the Herfindahl index across all industries. Table 3 reveals that approximately 39% of our sample firms are in a highly competitive industry.²⁸

Task importance: The conference call itself is an important task for top management, for it is an important source of information for capital providers. However, the conference call setting

²⁷ More precisely, we measure the extent to which the executives' *firm-based* wealth as reported in proxy statements is sensitive to the change in stock price, as we cannot measure other outside wealth of the executives. We calculate these sensitivities for stock and options separately. For stock, the sensitivity of the executive's wealth to price changes is simply dependent upon the number of shares held by the executive. The sensitivity of the value of the option portfolio to a change in firm stock price is dependent upon the number of shares underlying the options and the "delta" of the options (Core and Guay 2002). See Appendix B for the method we used to estimate this variable.

²⁸ Considering that only firms within the top decile of 4-digit SIC industries received an indicator value of "1", 39% may seem to be a high number. However, by construct of the Herfindahl index variable, those industries in the top decile generally include a higher number of firms, while industries in the lower deciles include relatively fewer firms.

may be less relevant for firms in highly regulated industries such as utilities and telecommunications. These industries are scrutinized by federal, state and local regulators, whose substitute monitoring and information collection role could diminish the benefit of the conference calls to capital providers. In such settings, the CEO may leave the conference call activities to lower-level management. Therefore, our proxy for low task importance is an indicator variable representing if the firm is in a Fama-French “Utilities” or “Telecom” industry.

Technical Competency: We use firm research and development (R&D) intensity to capture the notion of technical competency. Table 3 reports that our sample firms spend 4% of sales on R&D activities on average.²⁹

Span of Control: We proxy for the span of control and CEO overload using the natural log of the number of employees in the firm – as the CEO’s breadth over production labor increases, she has less real authority as a result of overload. The average firm has approximately 22,000 employees, while the median has approximately 6,000.³⁰

3.6 Firm Characteristics and Controls

We include a full battery of control variables that prior literature has associated with CEO authority, compensation and firm performance (e.g., Bebchuk, Cremers and Peyer 2008; Chhaochharia and Grinstein 2009). We use board size (number of directors) and percentage of inside directors (employees, former employees or relatives of employees) as Board structure variables. The average board in our sample has 9.4 directors. We also include the G Index

²⁹ If the R&D variable in Compustat has a missing value, we re-code the value to zero. Approximately 43% of our sample reports missing values for R&D and, including the missing values, approximately 55% reports zero R&D expenditures. These results are similar to the findings of Coles et al. (2008).

³⁰ We also examined the ratio of employees-to-sales; our results are unchanged if we use this alternative measure.

developed by Gompers, Ishii and Metrick (2003) as a measure of corporate governance. Finally, we include control variables for firm size, growth, profitability, and volatility.

3.7 Compensation Measures

Our first measure of compensation is the total compensation of the CEO divided by the total compensation of the CEO and the four highest paid executives other than the CEO. By scaling CEO compensation by the top five executives' compensation, we are attempting to control for unobservable factors of the wage function that are firm specific.³¹ We find that the CEO receives 38% of the compensation that is paid to the top five executives, similar to the amount reported in Bebchuk et al. (2008). Our second measure of compensation is the natural log of total CEO compensation.

4. Results

4.1 Correlations

Table 4 provides the Pearson correlations for the measures of the CEO's real authority, formal authority and characteristic variables. First note the high correlation between *Percentage CEO Text*, our main measure of CEO real authority, and *Percentage CEO Number* – there is little difference between the amount of text spoken and the number of times that the CEO speaks. In addition, our percentage text real authority measure is negatively correlated with equity incentives for other management, and with product market competition, regulation, and employee base.

³¹ Bebchuk et al. (2008) use this compensation variable as a proxy for “CEO Centrality,” or the “relative importance of the CEO within the top executive team in terms of ability, contribution, or power” (abstract). In contrast, we simply view this variable as a scaled version of CEO compensation which controls for unobservable wage factors and can partially be explained by the extent of CEO delegation.

This indicates, at least at the univariate level, that the predictions of analytical models of real authority have some support in the data.

The second observation to note in Table 4 is that that our CEO real authority measure is not strongly related to formal measures of CEO authority; the correlation with *CEO Only Insider* is the only statistically significant association. This provides initial evidence that we are measuring a construct distinct from formal authority.

4.2 Multivariate Results on CEO's Real Authority

Table 5 provides multivariate tests of hypotheses H1 and H1a. In models (1) - (5) we test each determinant variable separately and generally find evidence consistent with our prediction H1.³² The CEO's proportion of communication is negatively associated with non-CEO incentives, decision urgency, task irrelevance and technical knowledge. In model (5) we find a negative but insignificant coefficient on $LN(Employees)$. We then include all determinant variables jointly in model (6) and find that all coefficients have signs in the predicted direction and are all statistically significant except for decision urgency. In model (7) we test H1a by also including our variables for CEO formal authority, *CEO Ownership*, *CEO Tenure*, *Prestige*, and *Overconfidence*. Our results continue to hold. We also note the economic significance of our results. A standard deviation increase in *Non-CEO Equity Sensitivity*, *R&D/Sales*, or $LN(Employees)$ results in a 0.9, 1.9, and 2.6

³² Note that, because many of the variables that proxy for the determinants of the CEO's real authority are features of particular industries (e.g., high research and development intensive industries, such as pharmaceuticals), we do not include industry fixed effects in the regressions in which the CEO's level of real authority is the dependent variable. We are not interested solely in *within industry* variation, which would be the result if industry fixed effects were included, but variation *across all* firms. However, we adjust the standard errors for within-industry correlation by estimating clustered standard errors for each 3-digit SIC code.

percentage point decrease in *Percentage CEO Text*, respectively. These results provide some of the *first* significant evidence supporting the predictions of real authority models.

We also consider our alternative measure of the CEO's real authority – the percentage of the *number* of times the CEO speaks relative to other executives. Conference calls start with an initial prepared remark by management which, though scripted, creates an initial impression on the audience and sets the stage for the rest of the call.³³ Nonetheless, we downplay the initial preamble by using the number of times that the CEO speaks during the conference call rather than the amount of text. All of our results (untabulated) are robust to the use of this measure.

In contrast to the univariate correlations of Table 4, the results in Table 5 also indicate that real authority is significantly related to formal authority. We further investigate formal authority in Table 6 by replicating the regressions from Table 5 with formal authority as the dependent variable. Unlike our results in Table 5, which indicate a consistently negative relation between CEO real authority and its predicted determinants, Table 6 reveals that the same does not obtain for measures of the CEO's formal authority. In each specification, at most one coefficient is significantly negative, and in two of the specifications, one determinant variable has a significantly positive coefficient. We conclude that real authority, while related to formal authority, is a distinct organizational feature.

4.3 CEO's Real Authority and CEO Compensation

Hypothesis H2 predicts a positive relation between CEO wages and real authority. We regress CEO wages on our proxy of CEO real authority and various controls for the wage

³³ For example, witness how audience members in university lectures form strong impressions even when they cannot interrogate the speaker.

function.³⁴ We consider both scaled (by the total wages of the top 5 executives) and unscaled (natural log of) total CEO wages.³⁵ Table 7 presents the results of our analysis. As an initial assessment, in the first regression, we only include our real authority measure and firm characteristic controls and find that the coefficient on CEO real authority is strongly significantly positive; that is, compensation is an increasing function of real authority. In model (2), we include variables for the CEO's formal authority and characteristics and find that the magnitude and significance of the coefficient on the CEO real authority measure changes little. Results using $LN(Compensation)$ for the CEO, rather than the ratio of top executive compensation, in model (3) are similar. Real authority is thus related to wages as predicted by hypothesis H2.³⁶

Table 7 also allows us to compare the magnitude of the impact of real versus formal authority and other firm characteristics on wages. Using model (2) we calculate the impact on the portion of compensation paid to the CEO of a one standard deviation change in various independent variables. A standard deviation increase in the CEO's real authority is associated with an increase in the relative portion of compensation paid to the CEO of 1.6 percentage points (or about a 4 percent increase relative to the mean value of 38%). This is similar in magnitude to a one standard deviation increase in firm size, which has an approximate impact of 1.6 percentage points. By comparison, an increase in CEO's formal authority (which is measured using indicator variables, so the increase here is simply the value of the coefficient) is associated with an increase in the CEO's compensation portion of 2.0 and 3.0 percentage points for *CEO Title Concentration* and

³⁴ We also include industry fixed effects, defining the industry at the 2-digit SIC code level, for the compensation related regressions.

³⁵ Inferences are similar using cash compensation (salary and bonus) only.

³⁶ The association between CEO compensation and CEO formal authority measures in Table 7 is similar to that found in prior studies (e.g., Bebchuk, Cremers and Peyer 2008). Our findings are also robust to the inclusion of squared ownership and tenure terms, as done in prior studies.

CEO Only Insider, respectively. Thus, the wage implications of real authority appear to be economically significant as the wage implications of formal authority.

4.4 The Subordinate Perspective: The CFO

Table 7, models (4) and (5), test the contention in hypothesis H2a that the CFO's compensation relative to that of the CEO should increase in the CFO's relative real authority.³⁷ As the hypothesis specifically speaks to the agent's relationship to the principal, in column (4) we consider the compensation and text spoken for the CEO and CFO only. As predicted, we find that the CFO's compensation is positively associated with the CFO's real authority.³⁸ As an additional check, the compensation and percentage CFO text variables in column (5) are measured consistently with the CEO compensation model in columns (1) and (2) by including all executives in the calculation of the measure. The results continue to hold. Hence our evidence suggests that theories of real authority are valid from both a principal's and an agent's perspective.

5. Additional Analyses and Robustness Checks

We next consider a variety of robustness tests of our findings. For brevity, we do not tabulate the results but they are available from the authors upon request. First, we examine the effect of the CFO on our CEO text variable. In earnings conference calls, the CFO's portion of communication is substantial because financial results are typically reviewed and discussed. As a

³⁷ Note that we include variables for the CFO's ownership and presence on the Board of Directors, but do not include other variables that are included for the CEO either because of a substantial reduction of data (e.g., date of employment is frequently missing resulting in a substantial reduction in the *Tenure* observations) or because the variable is not relevant for the CFO (e.g., *Title Concentration* and *Only Insider*).

³⁸ Specifically, the compensation measure (*CFO to CEO Compensation*) is calculated as the CFO's compensation divided by the sum of the CFO's and CEO's compensation. The *Percentage CFO-CEO Text* variable is calculated similarly as the amount of text spoken by the CFO divided by the sum of the text spoken by the CFO and CEO.

result, a portion of the variation in the CEO communication patterns driven by the CFO may not indicate differences in authority, but rather may reflect the importance of financial communication. We therefore consider an alternative calculation of our measure of the percentage of CEO communication in which we remove the CFO from the denominator.³⁹ Using this measure, the CEO speaks about 70% of the time. We re-execute model (7) from Table 5, and find that our inferences remain unchanged.

Next, we relax our requirement that each firm has at least 2 annual observations and examine the potential influence of outliers. The unit of observation for our study is the firm-level and because we average the variables across all available years for a particular firm, we do not winsorize the data, allowing, instead, the averaging process to ameliorate extreme observations. We reconsider this issue by eliminating observations with the most significant influence on the coefficient estimates.⁴⁰ After relaxing the 2 year minimum restriction and eliminating outlier observations, the sample size increases to 1,223. Once again, our inferences are similar to those of Table 5 except for the coefficient on *Non-CEO Equity Sensitivity* which is now insignificant at the 10% level. However, this loss of significance is not robust; using $LN(Sales)$ instead of $LN(Assets)$ as a proxy for firm size, we recover the significance of this variable. Overall, therefore, the theoretically motivated determinants of real authority are empirically robust.⁴¹

³⁹ Specifically, the alternative measure is the amount of text spoken by the CEO divided by the total amount of text spoken by company personnel other than the CFO. Note that 2 observations were dropped because the CFO conducted 100% of the communication on the conference calls.

⁴⁰ Specifically, we calculate Cook's distance statistic (Cook 1977) and identify and eliminate two observations with much higher values of this statistic compared to the remaining observations.

⁴¹ As an additional robustness check on the span of control, we also include the number of business segments reported by the company as a control variable in the main model of Table 5. This variable may create empirical issues in that firms may strategically choose the number and type of segments to report and the reporting choice is likely not consistent across firms (Berger and Hann 2003); however, the coefficient on $LN(Employees)$ remains significantly negative after inclusion of the number of business segments.

6. Conclusion

Theory is presently far ahead of empirics in the analysis of key organizational design features such as real authority. Aghion and Tirole (1997) implicate measurement difficulties as the prime reason for this gap. Soft concepts such as real authority, influence and subjective knowledge manifest themselves in human interpersonal interactions, an activity that traditionally has been studied in small experimental laboratory settings and not large-sample archival settings. Recent advances in media and computing technology, however, have put forth vast quantities of visual, audio, and textual information on the Internet, opening up new methodologies and measurement techniques for large-scale capture of human interpersonal interaction. We exploit these technologies to conduct one of the first large-scale cross-sectional empirical tests of analytical organizational theories of real authority.

Specifically, we use earnings conference calls to systematically investigate real authority in a sample of approximately 1,000 organizations. Because these theories view communication patterns as the key reflectors of real authority patterns in an organization, we use measures of the text spoken by the CEO during these conference calls relative to other members of the top management as a proxy for the real authority of the CEO over top management, and show that these measures are associated with various firm characteristics predicted by analytical models of real authority.

Our study, which represents a first step in the empirical tests of real authority models, takes a “steady-state” view of the firm. That is, we examine if real authority models can explain the medium-run cross-sectional variation in organizational arrangements in our sample. We do not examine any within-sample variation: i.e., are there subsets of firms whose structures deviate

significantly from theory? Why do these firms deviate and what are the consequences? A particularly interesting subset consists of organizations that experience an imminent survival shock. The organization's first line of defense is typically not remapping formal lines, but immediately vesting real authority in appropriate individuals. For example, when President John F. Kennedy was suddenly thrust into the Cuban Missile Crisis in 1962, the recorded minutes of the Executive Committee for the National Security Council meetings indicate that communication patterns and the resulting distribution of real authority among the council members only partly conformed to pre-existing formal hierarchies (Neustadt and May 1988). Likewise, in the current financial crisis, one of the most powerful positions in the Treasury is the chief investment officer for the Troubled Asset Relief Program, although formally this job title is subordinate to an assistant secretary of the Treasury (Solomon 2009). Extending our steady state analysis to specific situations such as crises would be an important advance in our understanding of real authority.

References

- Adams, R., H. Almeida, and D. Ferreira. 2005. Powerful CEOs and Their Impact on Corporate Performance. *The Review of Financial Studies* 18(4): 1403-1432.
- Aggarwal, R. and A. Samwick. 2003. Performance Incentives within Firms: The Effect of Managerial Responsibility. *The Journal of Finance* 63(4): 1613-1649.
- Aghion, P. and J. Tirole. 1997. Formal and Real Authority in Organizations. *Journal of Political Economy* 105(1): 1-29.
- Baiman, S., D. Larcker, and M. Rajan. 1995. Organizational Design for Business Units. *Journal of Accounting Research* 33(2): 205-229.
- Baker, G., R. Gibbons and K. Murphy. 1999. Informal Authority in Organizations. *Journal of Law, Economics, and Organization* 15(1): 56-73.
- Baker, G., M. Gibbs, and B. Holmstrom. 1994. The Wage Policy of a Firm. *The Quarterly Journal of Economics* 109(4): 921-955.
- Baker, G. and B. Holmstrom. 1995. Internal Labor Markets: Too Many Theories, Too Few Facts. *The American Economic Review* 85(2): 255-259.
- Bebchuk, L., M. Cremers, and U. Peyer. 2008. CEO Centrality. Working paper. Harvard Law School.
- Berger, P. and R. Hann. 2003. The Impact of SFAS No. 131 on Information and Monitoring. *Journal of Accounting Research* 41(2): 163-223.
- Bertrand, M. and S. Mullainathan. 2001. Do People Mean What They Say? Implications for Subjective Survey Data. *The American Economic Review* 91(2): 67-72.
- Bertrand, M. and A. Schoar. 2003. Managing with Style: The Effect of Managers on Firm Policies. *Quarterly Journal of Economics* 118(4): 1169-1208.
- Bolton, P. and M. Dewatripont. 1994. The Firm as a Communication Network. *The Quarterly Journal of Economics* 109(4): 809-839.
- Bolton, P. and D. Scharfstein. 1998. Corporate Finance, the Theory of the Firm, and Organizations. *The Journal of Economic Perspectives* 12(4): 95-114.
- Bushee, B., D. Matsumoto, and G. Miller. 2003. Open Versus Closed Conference Calls: The Determinants and Effects of Broadening Access to Disclosure. *Journal of Accounting and Economics* 34(1-3): 149-180.

- Chhaochharia, V. and Y. Grinstein. 2009. CEO Compensation and Board Structure. *The Journal of Finance*, forthcoming.
- Coles, J., N. Daniel, and L. Naveen. 2008. Boards: Does One Size Fit All? *Journal of Financial Economics* 87(2): 329-356.
- Cook, R. 1977. Detection of Influential Observation in Linear Regression. *Technometrics* 19(1): 15-18.
- Core, J. and W. Guay. 2002. Estimating the Value of Employee Stock Option Portfolios and Their Sensitivities to Price and Volatility. *Journal of Accounting Research* 40(3): 613-630.
- Dessein, W. 2002. Authority and Communication in Organizations. *Review of Economic Studies* 69(3): 811-838.
- Dewatripont, M. and J. Tirole. 2005. Modes of Communication. *Journal of Political Economy* 113(6): 1217-1238.
- Ferreira, D. and R. Sah. 2009. Who Gets to the Top? Generalists Versus Specialists in Organizations. Working paper, London School of Economics and University of Chicago.
- Finkelstein, S. 1992. Power in Top Management Teams: Dimensions, Measurement, and Validation. *Academy of Management Journal* 35(3): 505-538.
- Garicano, L. 2000. Hierarchies and the Organization of Knowledge in Production. *Journal of Political Economy* 108(5): 874-904.
- Gibbons, R. and M. Waldman. 1999. A Theory of Wage and Promotion Dynamics Inside Firms. *The Quarterly Journal of Economics* 114(4): 1321-1358.
- Gompers, P., J. Ishii, and A. Metrick. 2003. Corporate Governance and Equity Prices. *The Quarterly Journal of Economics* 118(1): 107-155.
- Kimbrough, M. 2005. The Effect of Conference Calls on Analyst and Market Underreaction to Earnings Announcements. *The Accounting Review* 80(1): 189-219.
- Lashinsky, A. 2009. The Axman Comes to Google. http://money.cnn.com/2009/03/17/technology/lashinsky_google.fortune/index.htm
- Malmendier, U. and G. Tate. 2005. CEO Overconfidence and Corporate Investment. *The Journal of Finance* 60(6): 2661-2700.

- Mayew, W. and M. Venkatachalam. 2008. The Power of Voice: Managerial Affective States and Future Firm Performance. Working paper. Duke University.
- Moers, F. 2006. Performance Measure Properties and Delegation. *The Accounting Review* 81(4): 897-924.
- Mookherjee, D. 2006. Decentralization, Hierarchies, and Incentives: A Mechanism Design Perspective. *Journal of Economic Literature* 44(2): 367-390.
- Nagar, V. 2002. Delegation and Incentive Compensation. *The Accounting Review* 77(2): 379-395.
- Neustadt, R., and E. May. 1988. *Thinking in Time: The Uses of History for Decision Makers*. New York, NY: The Free Press.
- Ortega, J. 2009. Employee Discretion and Performance Pay. *The Accounting Review* 84(2): 589-612.
- Petersen, M. 2004. Information: Hard and Soft. Working paper. Northwestern University and National Bureau of Economic Research.
- Petersen, M. and R. Rajan. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. *The Journal of Finance* 49(1): 3-37.
- Rosen, S. 1982. Authority, Control and the Distribution of Earnings. *The Bell Journal of Economics* 13(2): 311-323.
- Simon, H. 1997. *Administrative Behavior*. 4th Ed. The Free Press. New York, NY.
- Solomon, D. 2009. Bailout Man Turns the Screws. *The Wall Street Journal*. April 7, 2009: A1.
- Stein, J. 2002. Information Production and Capital Allocation: Decentralized versus Hierarchical Firms. *The Journal of Finance* 57(5): 1891-1921.
- Stewart, N., Ed. 2002. *IR Guides Book*. Brimsdown, UK: The Magazine Printing Company.
- Tetlock, P., M. Saar-Tsechansky, and S. Macskassy. 2008. More Than Words: Quantifying Language to Measure Firms' Fundamentals. *The Journal of Finance* 63(3): 1437-1467.
- Tracy, J. 2009. Ace your earnings calls. *Investor Relations Newsletter* September: 11-13.
- Van den Steen, E. 2007. Interpersonal Authority in a Theory of the Firm. Working paper 4667-07. MIT Sloan School of Management.
- Vance, A. 2009. Cisco Preens on TelePresence. *The New York Times*, as quoted from: <http://bits.blogs.nytimes.com/2009/03/16/cisco-preens-on-telepresence/>, March 16, 2009.

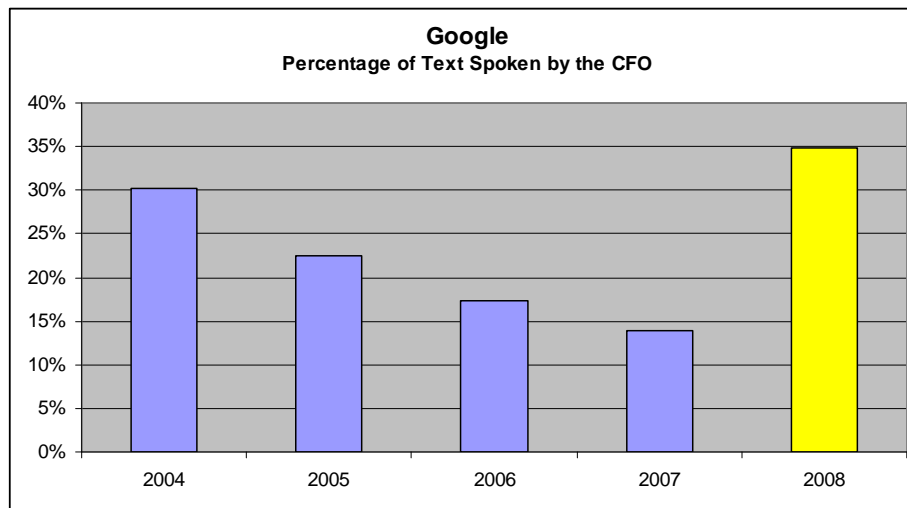
Appendix A: Google, Inc. Example

We provide a brief example to highlight the manner in which our measure may be effective in capturing the notion of real authority.* On August 1, 2008, Google, Inc. hired a new Chief Financial Officer from outside the company, Patrick Pichette. Prior to arriving at Google, Mr. Pichette was the top operations executive at Canada's largest phone company. He was brought into Google to specifically ensure that the company maintained efficient operations and, according to Google's CEO Eric Schmidt, to review internal business plans "systematically, business after business." Lashinsky (2009) documents the following changes at Google since Mr. Pichette joined the company:

Since he started as CFO on Aug. 1, Google has shut down numerous projects, facilities, and perks, from the seemingly trivial - an unneeded gourmet cafe at its headquarters, the annual companywide ski trip - to the significant. The latter includes the termination of a major effort called Lively, a virtual-environment product that mimicked Second Life, and the shuttering of a failed acquisition, dMarc Broadcasting, through which Google had attempted to broker radio advertising. In January, Google publicized its first layoffs, the termination of 100 recruiters made redundant because the company has dramatically reined in its hiring.

While Lashinsky (2009) also indicates that the aforementioned actions at Google may have occurred with an alternative CFO, given management's comments and Mr. Pichette's background, it appears that he has begun to have a significant impact on Google's investment decisions.

Mr. Pichette has certainly made an impact on the conference calls. The chart below presents the percentage of speaking by Google's CFO.[^] The 2008 4th Quarter conference call was the first earnings conference call in which Mr. Pichette spoke. During this conference call he spoke more text (35%) and more times (66%) than any other executive. In reading the transcript of the conference call, we noted that Mr. Pichette had significant control over the dialogue, even at one point "delegating" a response to the CEO, Eric Schmidt. While this example is only anecdotal, it provides an illustration of why we suggest that there is a link between speaking on the conference calls and real decisions made within the company.



* The source of information for this illustration is from Google, Inc.'s corporate website (www.google.com/corporate) and Lashinsky (2009), an article posted to the CNN Money website http://money.cnn.com/2009/03/17/technology/lashinsky_google.fortune/index.htm.

[^] Mr. Pichette started at Google on August 1, 2008. Upon review of the 3rd Quarter 2008 conference call, Mr. Pichette did not speak. Because our dataset is missing a few non-4th quarter conference calls for Google during these years and to mitigate any seasonality concerns, we present 4th quarter conference calls only (which typically occur in January the following year). However, the conference calls which are not included in the graph have the same downward trend prior to Mr. Pichette's arrival at Google.

Appendix B: Variable Definitions

This appendix describes the data source and measurement of each variable used in our study. All data is for the years 2003 – 2007. We collect conference call data from earnings conference call transcripts compiled by ThomsonReuters. The data for all remaining variables is sourced from Compustat, ExecuComp, CRSP, and RiskMetrics (formerly IRRC) datasets. We average the annual observations of each variable for a given firm across all available years within our timeframe. Therefore, the unit of observation for each variable is the firm level, rather than the firm-year level.

(i = firm; m = month; y_i = first year for firm i in the annual sample; Y_i = last year for firm i in the annual sample; t, t', t'' = year counters; $M_{i,t}$ = last month in fiscal year t for firm i ; T_i = total number of years for firm i in the annual sample; j = executive; $J_{k,i,t}$ = total number of company executives on conference call k for firm i in year t ; k = conference call; $K_{i,t}$ = total number of conference calls for firm i in year t)

Variable	Description	Formula
<i>CEO's Real Authority</i>		
Percentage CEO (CFO) Text Percentage CEO Number	The ratio of the number of characters spoken by the CEO (CFO) during the conference call to the number of characters spoken by all company executives during the conference call. This variable was created by parsing the text of earnings conference call transcripts acquired from ThomsonReuters. See Table 1 for a description of the conference call selection process. We create an annualized version of this variable by averaging the data across all conference calls within a fiscal year (we assume that conference calls that occur up to 3 months after the fiscal year-end are associated with earnings for that year). <i>Percentage CEO Number</i> uses the same formula as <i>Percentage CEO Text</i> except the number of times that the CEO and all executives speak is substituted for the number of characters spoken.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left[\frac{1}{K_{i,t}} \sum_{k=1}^{K_{i,t}} \left(\frac{\text{Characters_Spoken}_{CEO(CFO),k,i,t}}{\sum_{j=1}^{J_{k,i,t}} \text{Characters_Spoken}_{j,k,i,t}} \right) \right]$
<i>CEO's Formal Authority</i>		
CEO Founder	This is a dummy variable = 1 if the CEO was a company founder; and 0 otherwise. To determine if the CEO was a company founder, we first established the date in which the CEO joined the company by using the earlier of the <i>becameceo</i> and <i>joined_co</i> variables from ExecuComp. We then established the year in which the company was founded by using the firm age data from Jovanovic's website: http://www.nyu.edu/econ/user/jovanovi/ . This data provides the founding year, incorporation year and exchange listing year for approximately 7,700 firms. Because the founding year data is frequently missing, to establish the first year for the firm, we first use the founding year, then the incorporation year and finally the listing year. We then compare this founding year to the year that the CEO	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} \text{CEO_Founder}_{i,t}$

	joined the company. If the difference between these years is less than 2, we then set the <i>CEO Founder</i> variable = 1. As the founding year (instead the incorporation or listing year) is not used for all firms, the <i>CEO Founder</i> variable may be overstated. On the other hand, if a founding year was missing, then we assumed that the CEO was not a founder to avoid dropping observations. This may potentially understate this variable.	
CEO Title Concentration	This is a dummy variable = 1 if the CEO is the Chair of the Board and the President (or the CEO is the Chair of the Board and no other executive is the President or COO); and 0 otherwise. To determine the titles of the executives, we use the RiskMetrics database. This database contains all company directors and identifies their position within the company if the director is also an employee. Specifically, RiskMetrics has dummy variables identifying the <i>chairman</i> , <i>president</i> , and <i>coo</i> . If the CEO is also identified as the Chairman and President, or is identified as the Chairman and no other director is identified as the President, then <i>CEO Title Concentration</i> = 1; and is 0 otherwise. Using RiskMetrics may overstate this variable somewhat in the case in which a company has a President, but the President is not also a director.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} CEO_Title_Concentration_{i,t}$
CEO Only Insider	This is a dummy variable = 1 if the CEO is the only company employee on the Board of Directors; 0 otherwise. The RiskMetrics database classifies all directors as employee (E), linked (L) or independent (I). This variable is coded as 1 if the CEO is the only employee (E) listed on the Board according to RiskMetrics.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} CEO_Only_Insider_{i,t}$

Determinants of CEO's Real Authority

Non-CEO Equity Sensitivity	This variable measures the sensitivity of the wealth of the top 4 non-CEO executives to a 1% change in stock price. We measure this variable as the sum of total shares held (<i>shrown_excl_opts</i>), total unexercised unexercisable options (<i>opt_unex_unexer_num</i>) and total unexercised exercisable options (<i>opt_unex_exer_num</i>) for all 4 top executives—excluding the CEO—times the fiscal year-end stock price divided by 100. Before summing the number of shares and options, we multiply the options holdings by the estimated delta of the options. This is necessary because options portfolio values are less sensitive to changes in stock price than stock portfolios. We calculate the delta using the Black-Scholes model. This model requires the following inputs (our assumptions in parentheses): dividend yield (3-year average yield prior to year of observation), expected volatility (see <i>Return Volatility</i> variable definition), number of years until option	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} \left[\frac{\left(\sum_{j=1}^4 (Shares_{j,i,t} + (Delta_{i,t} * Options_{j,i,t})) \right) * \frac{Price_{i,t}}{100}}{1000} \right]$
----------------------------	--	---

	maturity (assumed 5 years for all options), current stock price (<i>prcc_f</i> from Compustat), strike price (assumed to be the price needed to derive the intrinsic value reported in ExecuComp), and risk-free rate (assumed the risk-free rate reported in ExecuComp). Note that some prior studies have calculated separate deltas for newly granted options and all other options; however, starting with fiscal year 2006, ExecuComp no longer reports the expiration date of the newly granted options, requiring us to make a similar set of assumptions for new and old options so we aggregated all options. We recoded any missing ExecuComp variables to zero if missing. Shares are reported in \$M, so we divide by 1,000 to report the sensitivity in \$MM.	
Product Market Competition	This is a measure of the competitiveness within an industry, as proxied by firm concentration. For each year and 4 digit SIC in Compustat, we calculate the Herfindahl index based on the sales for each firm in the industry. The Herfindahl index is calculated as the sum of the squared market shares of each firm within the 4 digit SIC. For each year, we then create deciles of the industry Herfindahl indices. The Product Market Competition variable is a dummy variable = 1 if the industry is in the lowest (most competitive) decile; and zero otherwise.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} Herfindahl_Decile_Dummy_{i,t}$
Regulated Industry	This is a dummy variable = 1 if the firm is in a Utilities or Telecom industry (as defined by the Fama-French 12 industry segmentation).	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} Utilities_Industry_Dummy_{i,t}$
R&D/Sales	Research and development expenses (Compustat data item <i>xrd</i>) divided by sales (Compustat data item <i>sale</i>). We re-code missing values of R&D to zero to avoid significant observation losses.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{R \& D_{i,t}}{Sales_{i,t}} \right)$
LN(Employees)	The natural log of (1 + the total number of employees of the firm); the number of employees is taken from Compustat data item <i>emp</i> and is reported in thousands.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} LN(1 + Total_Employees_{i,t})$
CEO Characteristics		
CEO (CFO) Ownership	This is the percentage of outstanding company shares owned by the CEO (CFO). We use the <i>shrown_excl_opts</i> variable in ExecuComp to identify the number of shares held by the CEO (CFO) and the variable <i>shrsout</i> to identify the total number of shares outstanding for the firm. This variable may contain noise because the measurement of <i>shrsout</i> is at the end of the fiscal year, whereas <i>shrown_excl_opts</i> may be measured at a date after the fiscal year and before the proxy statement date.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{shrown_excl_opts_{CEO(CFO),i,t}}{shrsout_{i,t}} \right)$

CEO Tenure	This is the number of years the CEO has been in office. We subtract the <i>becameceo</i> variable in ExecuComp from the <i>year</i> variable and add 1 (to count the first year in office as 1).	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} (year_{i,t} - becameceo_{i,t} + 1)$
Prestige	This is a dummy variable = 1 if the firm is listed as one of the top 5 companies in its industry of Fortune Magazine's annual America's Most Admired Companies survey.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} Top_5_Company_{i,t}$
Overconfidence	This measures the extent to which the CEO holds unexercised exercisable options. It is measured as the intrinsic value of the unexercised exercisable options (<i>opt_unex_exer_est_val</i> in ExecuComp) divided by the value of the total holdings of the CEO, which is the sum of the value of unexercised exercisable options, unexercisable options (<i>opt_unex_unex_est_val</i>), and shares of stock (<i>shown_excl_opts*prcc_f</i>). All values of options and the amount of stock holdings are from the ExecuComp database and the share price is from Compustat.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{opt_unex_exer_est_val_{CEO,i,t}}{value_of_holdings_{CEO,i,t}} \right)$
Firm Characteristics and Controls		
Board Size	This is the number of directors on the Board of Directors. We count the number of directors listed in the RiskMetrics database for the measurement of this variable.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} Number_of_Directors_{i,t}$
Percentage Insiders	This is the percentage of insiders on the Board of Directors. The RiskMetrics database classifies all directors as employee (E), linked (L) and independent (I). The linked directors include former employees and family members. We count any director that is an employee (E) or linked (L) as an insider.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{Number_of_Insiders_{i,t}}{Number_of_Directors_{i,t}} \right)$
LN(Assets)	The natural log of total company assets (Compustat Fundamentals Annual dataset item <i>at</i> reported in \$MM).	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} LN(Total_Assets_{i,t})$
Growth	The year-over-year percentage sales growth using the firm's net sales (Compustat data item <i>sale</i>).	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}} \right)$
ROA	Return on Assets as measured by Income Before Extraordinary Items (Compustat data item <i>ib</i>) divided by year-end assets (Compustat data item <i>at</i>).	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{Inc_Before_Extraordinary_Items_{i,t}}{Total_Assets_{i,t}} \right)$
Returns	Annual returns for the fiscal year calculated by compounding the monthly returns from the CRSP monthly data file (variable <i>ret</i> in the CRSP file).	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left[\left(\prod_{m=1}^{12} (ret_{i,m,t} + 1) \right) - 1 \right]$

ROA Volatility	The standard deviation of annual ROA (as defined above) for the 5 year window from $t-4$ to t .	$= \frac{100}{T_i \sqrt{5}} \sum_{t=y_i}^{Y_i} \left[\sqrt{\sum_{t'=t-4}^t \left(ROA_{i,t'} - \frac{\sum_{t'=t-4}^t ROA_{i,t'}}{5} \right)^2} \right]$
Return Volatility	The standard deviation of log monthly returns for the 60 month window starting 59 months before the last month (M_t) of the fiscal year. We only require a minimum of at least 12 months starting 11 months before window from $m-11$ to m to be included.	$= \frac{100\sqrt{12}}{T_i \sqrt{5}} \sum_{t=y_i}^{Y_i} \left[\sqrt{\sum_{m=M_{i,t}-59}^{M_{i,t}} \left(LN(ret_{i,m} + 1) - \frac{\sum_{m'=M_{i,t}-59}^{M_{i,t}} LN(ret_{i,m'} + 1)}{60} \right)^2} \right]$
G Index	The Gompers, Ishii and Metrick (2003) Governance Index provided by the RiskMetrics database. This is a composite measure of 24 charter provisions. Because this measure is not updated annually, for any year of missing data, we use the previous year's value.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} G_Index_{i,t}$
CFO on Board of Directors	This is a dummy variable = 1 if the CFO is on the Board of Directors; 0 otherwise according to the RiskMetrics dataset.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} CFO_on_Board_Dummy_{i,t}$
Compensation Measures		
CEO (CFO) to Top 5 Compensation	The ratio of total CEO (CFO) compensation to the top 4 highest paid executives plus the CEO (CFO). Total compensation is defined as the <i>tdc1</i> variable from ExecuComp.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{tdc1_{CEO(CFO),i,t}}{\sum_{j=1}^5 tdc1_{j,i,t}} \right)$
LN(CEO Compensation)	Natural log of CEO total compensation. Total compensation includes salary, bonus, other annual compensation, restricted stock grants, long-term incentive program payouts, and value of option grants (as determined by the Black-Scholes formula) as reported by ExecuComp's <i>tdc1</i> variable (reported in \$M). 1 is added to the <i>tdc1</i> value prior to taking the natural log of the variable.	$= \frac{1}{T_i} \sum_{t=y_i}^{Y_i} LN(tdc1_{CEO,i,t} + 1)$
CFO to CEO Compensation	The ratio of total CFO compensation to the sum of CFO and CEO total compensation. Total compensation is defined as the <i>tdc1</i> variable from ExecuComp.	$= \frac{100}{T_i} \sum_{t=y_i}^{Y_i} \left(\frac{tdc1_{CFO,i,t}}{tdc1_{CFO,i,t} + tdc1_{CEO,i,t}} \right)$

Figure 1: Sample Timeline for Management's Preparation for Earnings Conference Calls
 (Source: Corporate Executive Board IRO Survey, July 2009)

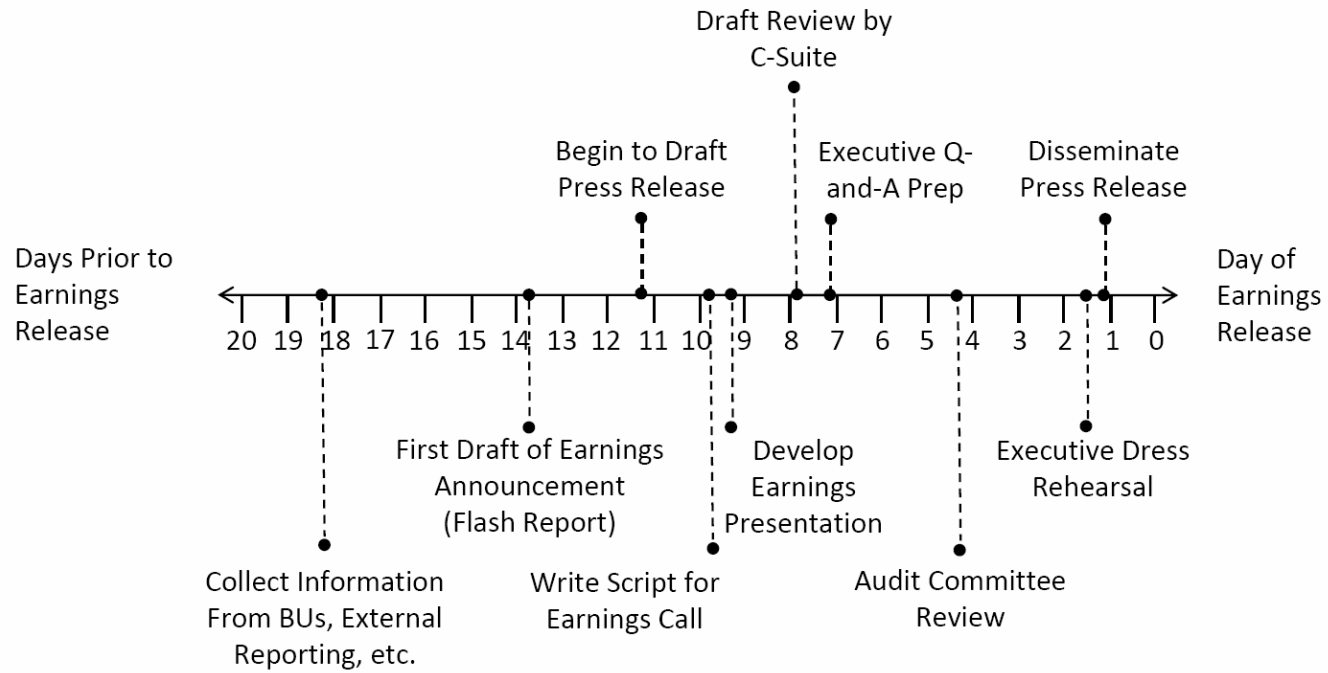
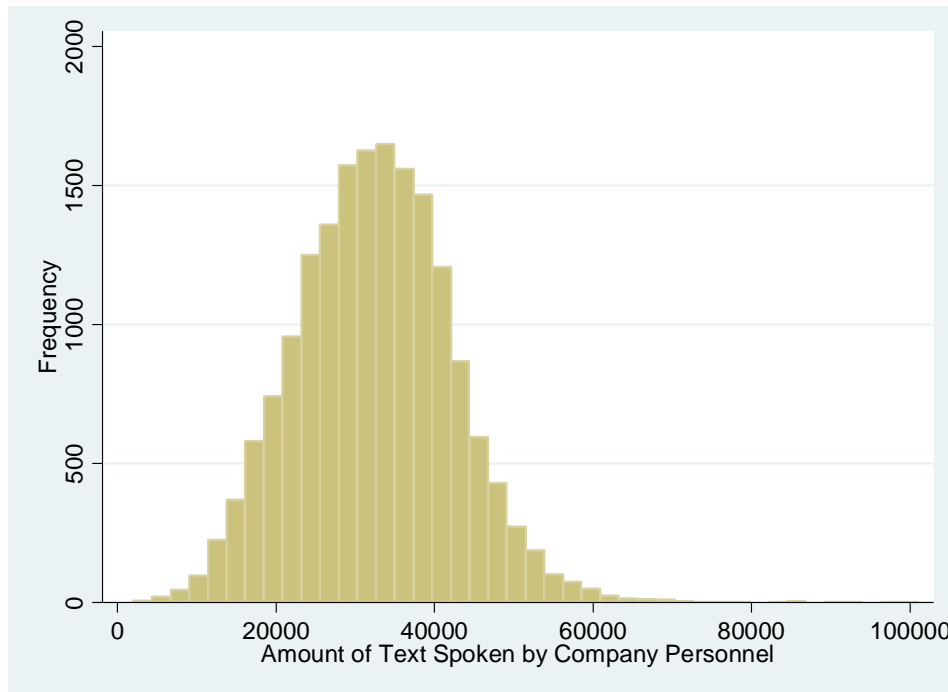
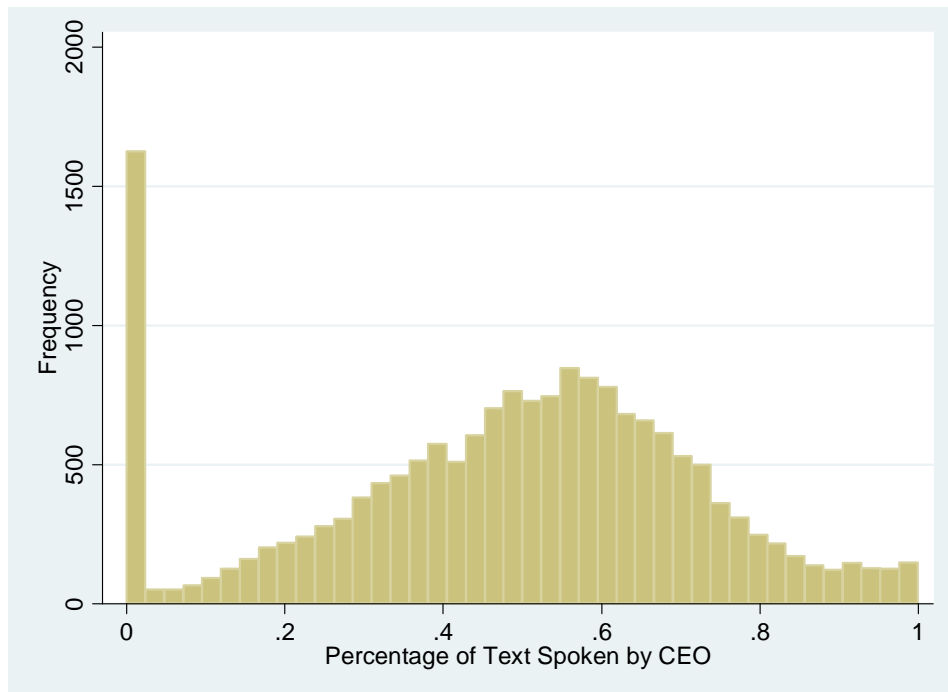


Figure 2a: Distribution of Conference Call Length



This figure shows the distribution of the number of characters spoken by company personnel during the 17,419 earnings conference calls in our sample. Table 2 reports the descriptive statistics.

Figure 2b: Distribution of the Percentage of CEO Text



This figure shows the distribution of the amount of text spoken by the CEO as a percent of total company personnel speech during the 17,419 earnings conference calls in our sample. During approximately 9% of the conference calls the CEO was not present (or at least did not make any comments). Table 2 reports the descriptive statistics.

TABLE 1: Conference Call Selection

Number of transcripts received from ThomsonReuters (January 2001 - September 2008)	129,924
Transcripts which contain foreign characters	(23,981)
Not "Earnings" related	(24,840)
Do not have both a presentation section and a Q&A section	(4,185)
Not an ExecuComp firm	(44,235)
Unable to identify at least one speaker on the conference call	(10,705)
More than 1 CEO or CFO in the conference call identified	(642)
More than 1 conference call in a month	(493)
Keep only years 2003 - 2007	(3,424)
Eligible conference calls	<u>17,419</u>
Data for conference calls occurring the same fiscal year are averaged within the year resulting in the following number of firm-years	6,862
Insufficient data in Compustat, CRSP, ExecuComp or RiskMetrics	(2,433)
Eligible firm-years	<u>4,429</u>
All variables are averaged across time within each firm to derive the following number of firm observations	<u>1,376</u>
Require a minimum of 2 annual observations per firm	<u>1,147</u>

We received 129,924 individual conference call transcript files from ThomsonReuters. We then parsed these text files to determine the amount of text spoken by each individual. We only kept conference calls which indicated that they were related to earnings (as indicated in the header of the text file). Additional conference calls were eliminated because of formatting issues with the text file or lack of data availability as described in this table. The conference calls are generally held on a quarterly basis; however, because all other data used in our study is on an annual basis, we average the conference call data within a year for a given firm. We then create a firm level observation by averaging all annual values for a firm across all years of data available. Finally, we require a minimum of 2 annual observations to be included in the sample, reducing the number of firm observations to 1,147.

TABLE 2: Conference Call Descriptive Statistics - Summary statistics for the 17,419 earnings conference calls that were selected as described in Table 1.**Panel A: All conference calls**

Variable	Mean	Median	Standard Deviation	Minimum	Maximum	N
Length of Text	32,484	32,409	9,866	1,998	100,986	17,419
Number of Comments	49	46	23	1	223	17,419
Analyst Questions	42	40	21	0	203	17,419
Percentage CEO Text	48%	51%	24%	0%	100%	17,419
Percentage CFO Text	33%	32%	20%	0%	100%	17,419
Percentage CEO Comments	49%	52%	25%	0%	100%	17,419
Percentage CFO Comments	32%	30%	22%	0%	100%	17,419

Panel B: By year

Year	Length of Text	Number of Comments	Analyst Questions	Percentage Text		Percentage Number		N	%
				CEO	CFO	CEO	CFO		
2003	30,529	47	42	45%	33%	46%	32%	1,835	10.5%
2004	31,570	49	42	47%	33%	47%	33%	3,097	17.8%
2005	32,744	50	43	47%	33%	48%	33%	3,718	21.3%
2006	32,967	49	41	49%	32%	50%	32%	4,105	23.6%
2007	33,229	49	42	50%	32%	51%	31%	4,664	26.8%

Panel C: By industry

Industry	Length of Text	Number of Comments	Analyst Questions	Percentage Text		Percentage Number		N	%
				CEO	CFO	CEO	CFO		
Non Durable Consumer Goods	33,578	51	44	47%	32%	47%	32%	903	5.2%
Durable Consumer Goods	33,053	56	48	50%	33%	49%	33%	436	2.5%
Manufacturing	30,949	53	47	54%	32%	54%	31%	2,271	13.0%
Energy	30,970	52	47	50%	19%	51%	17%	683	3.9%
Chemicals	33,781	54	48	50%	31%	53%	29%	495	2.8%
Business Equipment	32,923	47	40	52%	33%	53%	32%	3,620	20.8%
Telecom	33,799	35	28	40%	35%	40%	33%	387	2.2%
Utilities	27,442	44	38	36%	42%	37%	41%	781	4.5%
Shops	33,411	50	42	46%	34%	47%	34%	2,106	12.1%
Health	34,326	48	40	44%	32%	45%	31%	1,203	6.9%
Money	31,898	47	40	43%	34%	43%	34%	2,420	13.9%
Other	33,306	51	43	50%	33%	50%	33%	2,114	12.1%

Length of Text = the total number of characters (i.e., letters) spoken by a company employee during the conference call; *Number of Comments* = the total number of times that a company employee spoke during the conference call; *Analyst Questions* = the number of times that an analyst spoke; *Percentage CEO (CFO) Text* = the total number of characters spoken by the CEO (CFO) divided by the *Length of Text*; *Percentage CEO (CFO) Number* = the total number of times that the CEO (CFO) spoke divided by *Number of Comments*. *N* is the number of observations and *%* is the percentage of the sample by category.

TABLE 3: Descriptive Statistics - Summary statistics for variables used in all analyses. The variable values have been averaged across all years for each firm, making firm level the unit of observation. Lag correlation is the Pearson correlation between the variable and its one year lag value for the pooled sample prior to averaging values across firm-years.

<u>Variable</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>Minimum</u>	<u>Maximum</u>	<u>N</u>	<u>Lag Correlation</u>
<i>CEO's Real Authority</i>							
Percentage CEO Text	47.4%	48.9%	20.2%	0.0%	99.7%	1,147	0.77
<i>Determinants of CEO's Real Authority</i>							
Non-CEO Equity Sensitivity	0.95	0.31	6.76	0.00	222.88	1,147	0.90
Product Market Competition	0.39	0.00	0.46	0.00	1.00	1,147	0.90
Regulated Industry	0.07	0.00	0.26	0.00	1.00	1,147	1.00
R&D/Sales	0.04	0.00	0.10	0.00	1.33	1,147	0.87
LN(Employees)	2.18	1.98	1.27	0.01	7.28	1,143	0.99
<i>CEO's Formal Authority</i>							
CEO Founder	0.12	0.00	0.31	0.00	1.00	1,147	0.92
CEO Title Concentration	0.50	0.50	0.42	0.00	1.00	1,147	0.68
CEO Only Insider	0.60	0.75	0.42	0.00	1.00	1,147	0.73
<i>CEO Characteristics</i>							
CEO Ownership	1.7%	0.3%	4.3%	0.0%	49.9%	1,147	0.61
CEO Tenure	8.06	6.00	6.54	1.33	44.00	1,122	0.85
Prestige	0.18	0.00	0.33	0.00	1.00	1,147	0.73
Overconfidence	29.0%	26.3%	22.5%	0.0%	97.0%	1,147	0.70
<i>Firm characteristics and Controls</i>							
Board Size	9.42	9.20	2.29	4.67	22.60	1,147	0.89
Percentage Insiders	27.6%	26.1%	12.6%	6.2%	100.0%	1,147	0.79
LN(Assets)	7.96	7.77	1.66	3.61	14.23	1,147	0.99
Growth	13.1%	10.4%	13.9%	-27.2%	195.6%	1,147	0.29
ROA	4.9%	4.6%	6.8%	-92.6%	39.9%	1,147	0.62
Returns	18.8%	16.3%	20.5%	-42.2%	145.1%	1,147	(0.01)
ROA Volatility	4.2%	2.2%	7.9%	0.1%	137.4%	1,147	0.88
Return Volatility	39.4%	34.6%	17.6%	12.5%	121.6%	1,147	0.78
G Index	9.49	9.00	2.50	2.00	18.00	1,111	0.98
<i>Compensation Measures</i>							
CEO to Top 5 Compensation	38.3%	38.5%	9.1%	0.0%	77.7%	1,147	0.40
LN(CEO Compensation)	8.13	8.13	0.96	0.00	10.82	1,147	0.73
CFO to CEO Compensation	29.1%	27.9%	9.7%	4.0%	100.0%	1,127	0.38
CFO to Top 5 Compensation	14.9%	14.5%	4.3%	3.2%	37.7%	1,127	0.29

The number of observations varies based on data availability. See Appendix B for variable definitions.

TABLE 4: Pearson Correlations - Correlations between the CEO's real authority (*Percentage CEO Text* and *Percentage CEO Number*) and determinants of the CEO's real authority, CEO characteristics, firm size, and CEO compensation.

N = 1,143

	Percentage CEO Text	Percentage CEO Number	Non-CEO Equity Sensitivity	Product Market Competition	Regulated Industry	R&D/Sales	LN(Employees)	CEO Founder	CEO Title Concentration	CEO Only Insider	CEO Ownership	LN(Assets)
Percentage CEO Number	0.93											
Non-CEO Equity Sensitivity	(0.10)	(0.10)										
Product Market Competition	(0.12)	(0.12)	0.04									
Regulated Industry	(0.14)	(0.15)	(0.02)	0.26								
R&D/Sales	(0.01)	0.00	0.03	0.12	(0.12)							
LN(Employees)	(0.24)	(0.25)	0.11	(0.15)	(0.05)	(0.24)						
CEO Founder	(0.03)	(0.02)	(0.01)	0.04	(0.07)	0.00	(0.08)					
CEO Title Concentration	0.05	0.05	(0.07)	0.03	0.06	(0.03)	0.10	0.02				
CEO Only Insider	0.10	0.12	(0.10)	0.00	0.11	0.06	(0.05)	(0.17)	0.38			
CEO Ownership	0.01	0.02	0.04	(0.00)	(0.07)	(0.02)	(0.08)	0.30	0.04	(0.14)		
LN(Assets)	(0.32)	(0.33)	0.14	0.16	0.18	(0.20)	0.62	(0.07)	0.10	(0.07)	(0.16)	
CEO to Top 5 Compensation	0.15	0.13	(0.12)	0.02	0.02	(0.10)	0.10	(0.08)	0.22	0.22	(0.18)	0.12

See Appendix B for variable definitions. **Bold** indicates significance at the two-tailed 5% level.

Table 5: Determinants of the CEO's Real Authority - *Percentage CEO Text* regressed on determinants of the CEO's real authority, characteristics and firm controls.

		Dependent variable: Percentage CEO Text						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
		<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>
Independent variables								
<i>Determinants of CEO's Real Authority</i>								
Non-CEO Equity Sensitivity		(0.181) ***					(0.163) ***	(0.133) ***
		(6.89)					(5.75)	(5.82)
Product Market Competition			(2.892) *				(2.197)	(2.102)
			(1.67)				(1.30)	(1.18)
Regulated Industry				(8.585) ***			(9.698) ***	(10.740) ***
				(4.67)			(4.74)	(4.67)
R&D/Sales					(17.280) *		(19.830) **	(19.320) *
					(1.85)		(2.11)	(1.89)
LN(Employees)						(1.147)	(2.188) **	(2.061) **
						(1.37)	(2.54)	(2.33)
<i>CEO's Formal Authority</i>								
CEO Founder								(0.234)
								(0.09)
CEO Title Concentration								3.626 **
								2.24
CEO Only Insider								2.487 *
								1.66
<i>CEO Characteristics</i>								
CEO Ownership								(0.029)
								(0.15)
CEO Tenure								(0.297) **
								(2.39)
Prestige								(3.353)
								(1.59)
Overconfidence								0.019
								0.68

(Continued)

Table 5 (Continued)

Firm Characteristics and Controls

Board Size	(0.764) ** (2.21)	(0.752) ** (2.06)	(0.734) ** (2.12)	(0.764) ** (2.19)	(0.690) ** (1.97)	(0.709) * (1.94)	(0.507) (1.40)
Percentage Insiders	(0.018) (0.33)	(0.025) (0.44)	(0.034) (0.63)	(0.030) (0.54)	(0.029) (0.52)	(0.044) (0.83)	0.078 1.43
LN(Assets)	(3.338) *** (6.56)	(3.349) *** (6.46)	(3.390) *** (6.47)	(3.518) *** (6.86)	(3.005) *** (4.39)	(2.156) *** (2.69)	(2.109) *** (2.59)
Growth	0.009 0.25	0.012 0.32	(0.003) (0.08)	0.025 0.65	(0.007) (0.19)	(0.003) (0.08)	(0.003) (0.07)
ROA	(0.029) (0.37)	(0.061) (0.83)	(0.091) (1.29)	(0.082) (1.00)	(0.014) (0.19)	(0.066) (0.85)	(0.020) (0.26)
Returns	0.023 0.76	0.024 0.78	0.033 1.08	0.017 0.55	0.021 0.68	0.012 0.39	0.014 0.46
ROA Volatility	(0.011) (0.20)	(0.014) (0.26)	(0.008) (0.14)	0.036 0.72	(0.016) (0.29)	0.048 0.96	0.041 0.79
Return Volatility	(0.048) (1.10)	(0.053) (1.24)	(0.076) * (1.93)	(0.029) (0.65)	(0.045) (0.99)	(0.033) (0.79)	(0.034) (0.76)
G Index	0.480 * 1.92	0.454 * 1.81	0.520 ** 2.13	0.464 * 1.84	0.553 ** 2.24	0.548 ** 2.34	0.390 1.63
Intercept	78.670 *** 11.88	80.320 *** 12.27	80.710 *** 12.54	80.350 *** 11.80	77.330 *** 10.93	75.700 *** 11.07	70.390 *** 9.74
Industry (2-digit SIC)							
Fixed Effects?	N	N	N	N	N	N	N
Adj. R ²	9.9%	10.0%	10.7%	10.0%	10.1%	12.5%	14.1%
N	1,111	1,111	1,111	1,111	1,107	1,107	1,085

See Appendix B for variable definitions. Reported below the coefficients are heteroskedasticity consistent t-statistics, corrected for correlation across observations within an industry (3-digit SIC). *, **, *** indicate significance at the two-tailed 10%, 5% and 1% levels, respectively.

Table 6: Analysis of the CEO's Formal Authority - Measures of the CEO's formal authority regressed on determinants of the CEO's real authority, characteristics and firm controls.

	Dependent variables: Measures of Formal Authority		
	CEO Founder*100 (1) Coef. <i>t-stat</i>	CEO Title Concentration*100 (2) Coef. <i>t-stat</i>	CEO Only Insider*100 (3) Coef. <i>t-stat</i>
<i>Independent variables</i>			
<i>Determinants of CEO's Real Authority</i>			
Non-CEO Equity Sensitivity <i>(Incentive effects)</i>	(0.011) (0.22)	(0.386) ** (2.09)	(0.382) ** (2.27)
Product Market Competition <i>(Urgency effects)</i>	1.367 0.63	0.994 0.35	(0.407) (0.18)
Regulated Industry <i>(Task importance effects)</i>	(6.650) ** (2.36)	5.701 1.17	15.010 *** 3.26
R&D/Sales <i>(Expertise effects)</i>	(10.780) (0.71)	(2.404) (0.18)	6.398 0.45
LN(Employees) <i>(Span of control effects)</i>	(1.232) (1.03)	3.251 * 1.93	1.560 1.29
<i>CEO Characteristics</i>			
CEO Ownership	0.455 1.34	0.584 1.60	0.069 0.25
CEO Tenure	1.906 *** 10.89	1.368 *** 7.50	(0.507) *** (2.77)
Prestige	(5.085) * (1.72)	(3.264) (0.82)	(2.116) (0.45)
Overconfidence	(0.039) (1.01)	0.089 * 1.67	0.033 0.74

(Continued)

Table 6, (Continued)

Firm Characteristics and Controls

Board Size	(0.681) (1.18)	(2.613) *** (2.96)	(4.071) *** (5.50)
Percentage Insiders	0.214 *** 3.26	(0.975) *** (9.04)	(1.566) *** (16.07)
LN(Assets)	2.441 ** 2.11	2.577 * 1.77	(1.431) (1.24)
Growth	(0.012) (0.21)	0.134 1.63	(0.107) (1.33)
ROA	(0.183) (1.42)	(0.612) *** (3.15)	(0.418) *** (2.66)
Returns	0.045 1.12	0.045 0.75	0.054 0.82
ROA Volatility	(0.070) (0.66)	(0.261) ** (2.12)	0.093 0.94
Return Volatility	0.103 1.34	(0.030) (0.27)	(0.016) (0.23)
G Index	(0.011) (0.03)	1.593 *** 3.49	0.770 1.63
Intercept	(21.880) ** (2.43)	47.750 *** 3.22	147.200 *** 14.04
Industry (2-digit SIC)			
Fixed Effects?	N	N	N
Adj. R ²	23.9%	15.2%	28.6%
N	1,085	1,085	1,085

The dependent variables were multiplied by 100 to ease readability of the coefficient estimates. Reported below the coefficients are heteroskedasticity consistent t-statistics, corrected for correlation across observations within an industry (3-digit SIC). *, **, *** indicate significance at the two-tailed 10%, 5% and 1% levels, respectively.

Table 7: Compensation Regressions - Measures of CEO (CFO) compensation regressed on the CEO's (CFO's) real authority, characteristics and firm controls.

	Dependent variables: Measures of CEO and CFO Compensation				
	CEO			CFO	
	CEO to Top 5 Compensation	CEO to Top 5 Compensation	LN(CEO Compensation)	CFO to CEO Compensation	CFO to Top 5 Compensation
	(1)	(2)	(3)	(4)	(5)
	Coef.	Coef.	Coef.	Coef.	Coef.
<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	
<i>Independent variables</i>					
<i>Measures of Real Authority</i>					
Percentage CEO Text/100	8.687 *** 5.05	7.754 *** 4.37	0.355 *** 2.75		
Percentage CFO-CEO Text/100 [#]				4.296 ** 2.53	
Percentage CFO Text/100 [#]					1.459 * 1.77
<i>CEO's Formal Authority</i>					
CEO Founder		(0.300) (0.26)	0.032 0.48	(0.505) (0.43)	(0.719) (1.21)
CEO Title Concentration		2.027 *** 2.84	0.083 * 1.84	(1.538) * (1.76)	(0.212) (0.48)
CEO Only Insider		2.962 *** 3.22	0.081 1.63	(0.267) (0.31)	0.818 ** 2.00
<i>CEO Characteristics</i>					
CEO Ownership		(0.315) *** (2.58)	(0.029) ** (2.09)	0.226 1.48	(0.023) (0.52)
CEO Tenure		0.125 * 1.89	0.008 * 1.67	(0.038) (0.49)	0.025 0.66
Prestige		(1.349) (1.42)	0.017 0.20	1.685 1.52	0.336 0.74
Overconfidence		0.012 1.09	0.002 ** 2.36	(0.017) (1.34)	0.002 0.31
<i>CFO Characteristics</i>					
CFO Ownership				3.563 ** 2.46	3.146 *** 4.22
CFO on Board of Directors				3.076 ** 2.14	2.841 *** 3.62

(Continued)

Table 7, (Continued)

Firm Characteristics and Controls

Board Size	(0.274) (1.52)	(0.075) (0.38)	0.022 1.24	0.067 0.36	0.102 1.22
Percentage Insiders	(0.098) *** (4.59)	(0.022) (0.88)	(0.005) *** (2.85)	0.039 1.35	0.024 * 1.68
LN(Assets)	0.931 *** 3.31	0.967 *** 3.12	0.439 *** 17.27	(0.955) *** (3.17)	(0.461) *** (3.80)
Growth	(0.041) ** (2.05)	(0.044) ** (2.17)	0.002 1.62	0.048 * 1.77	(0.003) (0.23)
ROA	0.087 * 1.77	0.108 ** 2.10	0.020 *** 7.67	(0.103) ** (2.33)	(0.012) (0.43)
Returns	0.029 ** 1.98	0.021 1.46	0.002 1.25	0.007 0.44	0.008 1.29
ROA Volatility	0.037 ** 2.03	0.047 ** 2.21	0.007 * 1.91	(0.074) * (1.75)	(0.030) (1.10)
Return Volatility	(0.040) * (1.67)	(0.040) * (1.75)	0.004 *** 2.58	0.047 ** 2.53	0.010 1.14
G Index	0.272 ** 2.26	0.192 1.58	0.013 1.47	(0.177) (1.56)	(0.030) (0.65)
Industry (2-digit SIC)					
Fixed Effects?	Y	Y	Y	Y	Y
Adj. R ²	15.4%	19.3%	59.9%	13.6%	10.7%
N	1,111	1,088	1,088	1,069	1,070

Percentage CFO-CEO Text is the amount of text spoken by the CFO divided by the sum of the amount of text spoken by the CFO and CEO. *Percentage CFO Text* is computed analogously to *Percentage CEO Text* wherein the denominator includes all executives on the conference call. We have one fewer observation using *Percentage CFO-CEO Text* because neither executive was present for one firm.

The CEO and CFO measures of real authority are divided by 100 to ease readability of the coefficient estimates. See Appendix B for variable definitions. Reported below the coefficients are heteroskedasticity consistent t-statistics, corrected for correlation across observations within an industry (3-digit SIC). *, **, *** indicate significance at the two-tailed 10%, 5% and 1% levels, respectively.