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Are overconfident CEOs better leaders? Evidence from stakeholder commitments

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Abstract

We find evidence that the leadership of overconfident CEOs induces stakeholders (i.e. suppliers) to take actions that contribute to the leader's vision. By being intentionally over-exposed to the idiosyncratic risk of their firms, overconfident CEOs exhibit a strong belief in their firms' prospects. This belief attracts suppliers and induces more commitment including greater relationship-specific investment and higher relationship durability. Our evidence suggests that overconfident CEOs achieve these stakeholder commitments through their leadership actions rather than their verbal statements.

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Abstract

We find evidence that the leadership of overconfident CEOs induces stakeholders (i.e. suppliers) to take actions that contribute to the leader's vision. By being intentionally over-exposed to the idiosyncratic risk of their firms, overconfident CEOs exhibit a strong belief in their firms' prospects. This belief attracts suppliers and induces more commitment including greater relationship-specific investment and higher relationship durability. Our evidence suggests that overconfident CEOs achieve these stakeholder commitments through their leadership actions rather than their verbal statements.

"I told people you weren't betting on a device. You were betting on Steve Jobs."

~ Randall Stephenson (AT&T CEO)

Managerial overconfidence can significantly affect corporate activities and outcomes. Studies show that overconfident CEOs destroy firm value by over–investing, making costly merger and acquisition decisions, and employing loose accounting practices.[1] Yet, some of the most successful leaders, such as Jack Welch of General Electric and Steve Jobs of Apple Inc., displayed managerial overconfidence during their tenure as CEO. Recent studies have uncovered important benefits to employing overconfident CEOs such as higher R&D productivity and innovation output (Galasso and Simcoe, 2011, Hirshleifer, Low, and Teoh, 2012). We add to this growing literature by asking: Are overconfident CEOs better leaders?

Our definition of leadership follows Hermalin (1998), where a leader's actions motivate key stakeholders, such as suppliers, to exert greater effort. Leadership is distinct from formal authority because stakeholders' actions are voluntary. In this context, suppliers choose to invest in relationship-specific assets and to sell their products to customers. To motivate stakeholder actions, a leader must have strong self–belief and belief in the firm's prospects under her leadership. Recent psychology studies show that overconfident people are more respected and influential, and that their peers view overconfidence as a proxy for competence (e.g., Anderson, Brion, Moore, and Kennedy, 2012; Kennedy, Anderson, and Moore, 2013). These psychological underpinnings motivate our hypothesis that the leadership of overconfident CEOs may attract greater stakeholder commitments.

Short of conducting interviews or running experiments, leadership and influence are typically unobservable and difficult to quantify and measure. Instead, we test our *leadership* hypothesis by focusing on the observable actions of one important class of firm stakeholders – suppliers. This is an ideal test setting because their voluntary cooperation

[1] For example, see Malmendier and Tate (2005, 2008), Billet and Qian (2008), Kolasinski and Li (2013), Schrand and Zechman (2012), Ahmed and Duellman (2013), Banerjee, Humphrey-Jenner, Nanda, and Tham (2015).

represents a significant leadership outcome, particularly when stakeholder effort and commitment are critical to a firm's success. From the stakeholder's view, such commitment and effort require costly investments that have low value outside of the relationship. A classic example are the steel dies used to form the body of a car model, which have low outside practical value (Klein, Crawford, and Alchian, 1978). Therefore, stakeholders will only commit effort and develop specialized investment if they strongly believe in the leadership of the firm's CEO.

The success of the original iPhone is a recent example of the importance of stakeholder commitment. AT&T (then Cingular) helped Apple Inc. to secretly develop the iPhone and made heavy concessions to become the exclusive iPhone carrier in the U.S. market, effectively tying their fate to the iPhone's future prospects.[2] This example shows the close interdependency between a firm's success and the commitments made by a firm's stakeholders towards product design and quality. More notably, the decision of Randall Stephenson, the CEO of AT&T, to commit relationship-specific investment to Apple Inc. was not motivated by the prospect of the iPhone per se, but by his belief in the leadership of Steve Jobs, then the CEO of Apple Inc. This is the essence of Randall Stephenson's statement: "*I told people you weren't betting on a device. You were betting on Steve Jobs.*"

Following extant literature, we measure CEO overconfidence using vested in-the-money stock options of CEOs in the ExecuComp database.[3] While holding vested in-the-money stock options may under-diversify the CEO's wealth (Hall and Murphy, 2002), it may also provide the benefit of significant leadership for at least three reasons. First, having "skin in the game" conveys the CEO's strong belief in the firm's prospects because the CEO's human capital is already tied to the firm. Second, it demonstrates a willingness to lead by example. Hermalin (1998) argues that leading by example may be a credible form of leadership and cites historical examples including Dr. Martin Luther King, Jr. marching at the head of civil rights marches. Third, holding vested-in-the-money options reflects a commitment to exert costly effort (Gervais, Heaton, and Odean, 2011).

[2] "*Life After the iPhone: How AT&T's Bet on Apple Mobilized the Company*" *Forbes* Jan 21, 2013.
[3] For example, see: Campbell et al. (2011), Malmendier, Tate, and Yan (2011), Hirshleifer, Low, and Teoh (2012), Banerjee, Humphrey-Jenner, and Nanda (2015).

Our evidence suggests that overconfident CEOs raise the likelihood of initiating a new dependent supplier network as well as expanding the existing dependent supplier network.[4] For example, the findings indicate that overconfident CEOs increase the probability of adding a dependent supplier by +1.2%. This is economically large given that only 7.2% of firm-year observations in our sample experience an increase in dependent suppliers. These findings are consistent with the view that overconfident CEOs are able to influence important suppliers to commit to their leadership vision.

A concern with this interpretation is the possibility of an omitted variable simultaneously inspiring the CEO to hold vested-in-the-money options and inducing growth in the firm's supplier network. We address this issue by estimating conditional logit regressions that include firm strata (i.e. fixed effects) to capture unobserved firm heterogeneity and industry-year strata to capture industry growth cycles. In these tests, we exploit the timing of the vested-in-the-money option to examine whether stakeholders are influenced by the CEO's actions. While overconfidence is considered a permanent trait, its revelation can represent leadership action. We also employ an overconfidence measure that requires active managerial choice rather than inaction or inertia (Kolasinski and Li, 2013). This measure also addresses the possibility that overconfidence reflects insider information. This approach yields similar results, suggesting that industry growth cycles, unobserved firm heterogeneity, and insider information are unlikely driving our findings.

To sharpen our analysis, we focus on firms where stakeholder commitment is particularly valuable. For instance, specialized inputs, such as the components of an iPhone, require customized supplier investment compared to commoditized inputs for commercial retailers. Suppliers of relationship-specific inputs may be reluctant to develop customized products due to costly initial investment and low ex-post re-deployability of the inputs if the relationship terminates (Titman, 1984). Relationship-specific investment creates value because it improves productivity (Dyer and Nobeoka, 2000), enhances core

[4] We follow SFAS 14 in classifying dependent suppliers as firms that generate at least 10 percent of revenues from a customer firm. Sample firms that are not reported as customers in this dataset are assumed to have no dependent suppliers. Section 3.2 provides details on our customer-supplier dataset.

competency (Parmigiani, 2007), and stimulates inter-project spillovers (Kang et. al., 2009). We hypothesize that the leadership of overconfident CEOs is particularly important in this scenario because suppliers will only commit relationship-specific investment if they have strong conviction in the leadership of their customer firm's CEO.

We test this prediction by examining durable manufacturing firms because this sector produces unique products that require greater relationship-specific inputs from suppliers (Titman and Wessels, 1988; Banerjee, Dasgupta, and Kim, 2008). Consistent with this hypothesis, our results are pronounced in the durable manufacturing sector. The results are also stronger for firms in high 'contract intensity' industries where 'contract intensity' represents the depth of relationship-specific investment between supplier and customer industries (Nunn, 2007).[5] These results support the view that CEO overconfidence is particularly important in influencing supplier commitment when greater relationship-specific investment is necessary.

We also find direct evidence of relationship-specific investment in two additional tests. We use the supplier's R&D intensity as a proxy for the general production of asset-specific outputs following Kale and Shahrur (2007) and Raman and Shahrur (2008). The evidence suggests that the presence of an overconfident CEO raises suppliers' R&D intensity. The effects are stronger for smaller suppliers who typically have less bargaining power over their customer. This evidence is consistent with the view that overconfident CEOs are able to provide better leadership to smaller suppliers who typically require more assurances. Fee, Hadlock, and Thomas (2006) propose that the depth of supply chain commitment should be borne out in the duration of a customer-supplier relationship. We implement an Andersen-Gill extension of the Cox proportional-hazard model to analyze the durability of customer-supplier relationships. We find that supplier relationships with customer firms face lower termination risk when the customer CEO is overconfident. Together, this set of findings suggests that overconfident CEOs influence the actions of their key suppliers.

[5] Contract intensity is measured as the proportion of inputs in an industry that are neither bought nor sold on an exchange nor reference-priced (Nunn, 2007).

While our set of findings provide support for the *leadership* hypothesis, our evidence is potentially consistent with a 'dark-side' view of overconfidence – CEOs may overpay to acquire these commitments. In this scenario, the leadership outcomes we document may lower profitability and destroy firm value. However, additional tests reveal no support for this view. Instead, the evidence suggests that firms led by overconfident CEOs have higher future gross profitability, lower input costs, and generate higher risk-adjusted returns relative to their competitors. This is consistent with a bright-side view that overconfident CEOs enhance firm value.

A natural question is whether the manner through which leadership is expressed is important in our setting. As previously argued, options holdings (i.e. "skin in the game") conveys a strong personal belief of the CEO in her own leadership abilities. Alternatively, CEO overconfidence can be measured from communications during media appearances, which may also potentially influence stakeholders. Using a media-based measure of CEO overconfidence (Banerjee, Humphrey-Jenner, and Nanda, 2015), we find that suppliers tend to respond to the CEO's actions rather than their verbal statements.[6] These findings suggest that, in our setting, suppliers are not necessarily swayed by cheap talk. Rather, they require the CEO to lead by example (i.e. actions) before making their costly commitments.

An alternative interpretation of our findings is that stakeholder commitments result from the tendency of overconfident CEOs to over-invest, engage in M&A activities, and pursue innovation projects (e.g., Malmendier and Tate, 2005, 2008; Galasso and Simcoe, 2011; Hirshleifer, Low, and Teoh, 2012). These types of corporate activities may mechanically attract new suppliers. However, it is not clear that simply increasing corporate activities is sufficient to induce costly relationship-specific investment (RSI) unless the supplier is convinced that the leadership of the CEO will deliver long-term

[6] If the interests of both parties are perfectly aligned, verbal communication (cheap talk) are sufficient to induce commitments from stakeholders since stakeholders deduce that the CEO has no incentives to lie (see Farrell and Rabin, 1996). On the other hand, stakeholders will not believe in the CEO's words if both parties face diametrically opposite interests and the CEO has no incentive to speak the truth. Between the extremes, cheap talk may convey various amounts of information. In our context, stakeholders may discount words over actions due to imperfectly-aligned interests since relationship-specific investments are costly and concerns over asymmetric bargaining power and holdup remain.

value. Notably, our results are most pronounced for RSI-intensive firms/industries and robust after controlling for M&A activities. In a similar vein, while the results are consistent with an innovation channel, innovation is inherently risky. Stakeholders must be convinced to take these risks and follow the CEO's vision.

Lastly, we address the selective disclosure issue of the customer-supplier dataset. In June 1997, SFAS 131 was issued which requires firms to disclose sales to each material customer, but not the identity of the customer. Even prior to its issuance, Ellis, Fee, and Thomas (2012) find selective disclosure of customer identities by firms. To the extent that suppliers that commit greater RSIs for their customers are more likely to disclose the identities of their customers and also take stronger cues from the overconfidence of their customer firms' CEOs, this would favor us towards finding our results. However, Ellis, Fee, and Thomas (2012) find the opposite selective disclosure inclination – suppliers with greater proprietary costs are less inclined to disclose their customers' identities due to product market competition. This finding works against our results.

1 Literature Review and Contribution

Recent studies explore the economics of leadership and how leadership can affect firm outcomes. Hermalin (1998) and Komai, Stegeman, and Hermalin (2007) show that by setting an example, managers may signal private information, motivating subordinates to work harder. Almazan, Chen, and Titman (2013) show that "top-down" capital allocation may optimally create higher levels of investment expenditure to motivate effort from employees.

Our key contribution is to provide empirical evidence supporting theories on leadership by examining stakeholder actions. Our evidence suggests that stakeholders are more committed when the firm's CEO is overconfident. The finding on supplier commitment emphasizes that CEO leadership reaches beyond the boundaries of the firm to include outside stakeholders, particularly for firms in industries that are reliant on relationship-specific investment.

Our findings are also consistent with the view that overconfidence is a useful leadership trait. In experimental settings, studies show that overconfident people are more respected and influential, and are viewed as more competent (Anderson, Brion, Moore, and Kennedy, 2012; Kennedy, Anderson, and Moore, 2013). Our empirical setting finds support for this idea. In addition, we compare the *display* of overconfidence using "skin in the game" actions (i.e., the CEO's willingness to hold vested in-the-money options) and conversations with the media. The evidence indicates that suppliers are more likely to respond to "skin in the game" actions rather than positive words in media appearances.

A large literature shows that overconfident CEOs have a significant impact on firm outcomes. An open question is why boards appoint overconfident CEOs (Goel and Thakor, 2008; Gervais, Heaton, and Odean, 2011) when evidence suggests that CEO overconfidence causes over–investing, costly mergers and acquisitions, and loose accounting practices.[7] However, recent studies find a 'bright side' of CEO overconfidence. Overconfident CEOs generate higher R&D productivity and innovative output (Galasso and Simcoe, 2011; Hirshleifer, Low, and Teoh, 2012). Our evidence is also consistent with a 'bright side' of CEO overconfidence in that the leadership of overconfident CEOs induce valuable relationship-specific investment from key stakeholders and improve firm value.[8] Our finding also contributes to a broad literature on the determinants of customer-supplier relationship by showing that leadership actions affect the supply chain.

2 Sample Selection and Data

We start with firms in the Execucomp database with available CEO stock option data. Following the standard literature, we remove utilities (SIC: 4000 – 4999) and financial firms (SIC: 6000 – 6999). Next, we identify customer and supplier pairs from the business

[7] See: Malmendier and Tate (2005, 2008), Billet and Qian (2008); Kolasinski and Li (2013), Schrand and Zechman (2012), Ahmed and Duellman (2013), Banerjee, Humphrey-Jenner, Nanda, and Tham (2015).

[8] Relationship-specific investment (RSI) improves productivity (Dyer and Nobeoka, 2000), enhances core competency (Parmigiani, 2007), and stimulates inter-project spillovers (Kang et. al., 2009). Dyer and Nobeoka (2000) find that Toyota's ability to effectively create and manage network-level knowledge-sharing processes with her suppliers explains partially the relative productivity advantages enjoyed by Toyota and her suppliers. Kang et al. (2009) indicates that RSI can create extra economic value through inter-project spillovers with the same contracting partner and finds empirical support using Taiwanese suppliers of original equipment manufacturers.

segment files of Compustat.[9] Principal customer names are manually matched to Compustat GVKEYs following the approach in Fee, Hadlock, and Thomas (2006).[10] Inverting this dataset provides a list of firms that report the identities of their dependent suppliers.

We identify whether our sample of Execucomp firms is reported as customers by firms in the customer-supplier dataset. *Increase* (*Decrease*) *in Number of Suppliers* is an indicator equal to 1 if the year-on-year change in *Number of Suppliers* is positive (negative), and 0 otherwise. *Start of Supplier Network* equals to 1 if a firm has at least one dependent supplier in year t and none in year t-1, and equals to 0 otherwise. *End of Supplier Network* is defined symmetrically. When *Start of Supplier Network* and *End of Supplier Network* both equate to 0, then we keep the previous value of the measure. *Number of Suppliers* is the number of dependent suppliers in the firm's network.

Financial variables and stock return data are obtained from Compustat and CRSP. We collect insider trades from Thomson Insider, and acquisition data from SDC Platinum. Our sample period starts from 1993 and ends in 2011, which is the last year that we have information on customer-supplier pairs. Using these databases, we construct the following variables: *firm size*, *leverage*, *return on assets* (ROA), *ROA Volatility*, s*ales growth, market-to-book ratio, capital expenditure, R&D*, *cash*, *past stock return*, *CEO tenure*, and *acquisitions*. The Appendix provides full variable construction details. We have 1,921 unique firms from 1993 to 2011, totaling a panel of 14,745 firm-year observations.

2.1 Measures of CEO Overconfidence

Our primary measure of CEO overconfidence is a stock option-based measure, which is motivated from Malmendier and Tate (2005). Since our data on CEO stock options is

[9] In accordance with SFAS 14, public firms are required to disclose sales to their principal customers, defined as customers that contribute to at least 10 percent of the total revenue of the firm or if sales to a customer are material to the business of the firm.

[10] For customer names that are abbreviated, we hand-match and use industry affiliations to determine whether the customer is in Compustat. For the remaining unmatched customers, we check their corporate websites in the Directory of Corporate Affiliation (DCA) database to determine if the customer is a subsidiary of a listed firm. If so, we assign the customer to its parent's GVKEY. To ensure accuracy, we discard any customer name that cannot be unambiguously matched to a GVKEY.

from Execucomp, we compute the average moneyness of the CEO's option holdings annually following the approach in Campbell et al. (2011), Malmendier, Tate, and Yan (2011), Hirshleifer, Low, and Teoh (2012), and Banerjee, Humphrey-Jenner, and Nanda (2015). From Execucomp, we obtain the number and value of the CEO's vested stock options to construct *CEO Overconfidence* as the ratio of average value per option to average strike price, where the average value per option is the total value of the CEO's option holdings (Execucomp: opt unex exer val) scaled by the number of such options (Execucomp: opt unex exer num). The average strike price is the firm's stock price at the end of the fiscal year (CRSP: prcc f) less the average value per option. We define *Holder 67* as an indicator that equal to 1 if the *CEO Overconfidence* measure is at least 67% in-the-money on at least two occasions in the past five years (e.g., Malmendier and Tate, 2005; Banerjee, Humphrey-Jenner, and Nanda, 2015).

We create two indicator variables to capture when overconfidence is revealed. *CEO Overconfidence Up* is an indicator equal to 1 when *CEO Overconfidence* is in the top quartile in year t but not so in year t-1, and 0 otherwise. *CEO Overconfidence Down* is an indicator equal to 1 when *CEO Overconfidence* is in the top quartile in year t-1, but not at year t. These variables capture the timing of overconfident CEO actions so we can precisely link this to stakeholder actions.

Since unexercised options represents a non-action, it may reflect inattention or inertia rather than overconfidence. We estimate Kolasinski and Li (2013)'s measure of overconfidence that sidesteps this issue. This measure tracks the CEO's unprofitable insider purchases of firm stock which captures trading action rather than inaction or inattention. *Overconfidence Trade* is an indicator equal to 1 if the CEO purchases shares over the next 2 years that experience negative buy-and-hold returns benchmarked against the Fama-French size-decile portfolio. To capture the timing of when overconfidence is revealed, we construct an indicator variable, *Overconfidence Trade Up*, equal to 1 if *Overconfidence Trade* is unity in year t but not in year t-1, and zero otherwise.

We also use a media-based measure of overconfidence following Banerjee, Humphery-Jenner, and Nanda (2015). The measure is based on keyword search for references to

confidence and non-confidence[11] in the Factiva database for articles referring to the CEOs in The New York Times, Business Week, Financial Times, The Economist, Forbes Magazine, Fortune Magazine, and The Wall Street Journal. *CEO Media Positivity* is an indicator equal to 1 in the year if the number of 'confident' articles exceeds the number of 'non-confident' articles, and zero otherwise. Missing *CEO Media Positivity* values are set to zero.

2.2 Measuring Supplier Commitment

Following Kale and Shahrur (2007) and Raman and Shahrur (2008), we use suppliers' R&D expenditure as a proxy for relationship-specific investment (RSI) by the supplier at each supplier-customer pair level, we calculate the proportion of a supplier's R&D expenditures attributable to a customer based on the fraction of the supplier's sales sold to the customer. Specifically, we define *Supplier R&D Intensity* as the product of supplier's R&D expenditure and fraction of sales to the customer, normalized by the total assets of the supplier. The normalization allows for comparability across suppliers of different sizes.

The leadership of an overconfident CEO may induce supplier commitment by encouraging within-relationship cooperation and the easing of contractual frictions. Following Fee, Hadlock, and Thomas (2006), we examine the durability of customer-supplier relationships. Using survival analysis, we use the Andersen-Gill extension of the Cox model the termination of the relationship at a given point in time. The definitions of relationship status and econometric considerations are discussed in Section 3.3.2.

2.3 Summary Statistics

Panel A of Table 1 shows that 53.3% of our customer-years are helmed by *Holder 67* CEOs. In contrast, revelations of substantial change in CEO overconfidence (*CEO Overconfidence Up*) are only found in 6.8% of sample observations. Out of all customer-supplier relationships, 57% of them are led by overconfident customer CEOs at least once during the life of the relationship. Departures of dependent suppliers (mean=7.5%) are similar to arrivals of dependent suppliers (mean=7.2%). Terminations and initiations of

[11] References to confidence are *overconfident*, *overconfidence*, *optimistic*, and *optimism*. References to non-confidence are *reliable*, *cautious*, *conservative*, *practical*, *frugal*, and *steady*.

supplier networks are rarer events, occurring in 3.5% and 3.3% of the sample observations, respectively.

[Insert Table 1]

Panel B of Table 1 partitions the sample firms into two groups - firms with and without dependent suppliers (i.e. standalone firms). Relative to the average standalone firm, the average firm with suppliers is significantly larger (by about 6 times), has higher valuation by the market-to-book ratio (3.82 vs 3.05), higher ROA (6.6% vs 5.0%), lower volatility in ROA (4.6% vs 5.5%), makes more capital expenditure (7.1% vs 6.5%) and has higher R&D intensity (4.8% vs 4.2%). Relative to the average standalone firm, the average firm with suppliers has higher leverage (24.6% vs 21.9%) and lower cash levels (9.8% vs 12.7%). The CEO of the average firm with suppliers has also a higher confidence level (i.e. greater vested in-the-money option holdings). Stock performance between the 2 types of firms are not statistically different.

3 Overconfident CEOs and Leadership Outcomes

In this section, we test our main hypothesis which we call the *leadership hypothesis* that overconfident CEOs induce leadership outcomes. In our context, leadership outcomes are voluntary rather than delegated actions from formal authority. We assess the *leadership hypothesis* using the following tests. We examine the effect of overconfident CEOs on the probability of attracting dependent suppliers or initiating supplier networks. Next, we examine whether overconfident CEOs gain greater suppliers commitments by 1) analyzing in industries that are particularly reliant on stakeholder investment, 2) measuring suppliers' relationship-specific investment, and 3) quantifying the durability of the relationship. Finally, we examine the possibility that these leadership outcomes destroy firm value.

3.1 Do Overconfident CEOs Attract Suppliers?

We begin by examining the effect of overconfident CEOs on the firm's supplier network. Suppliers represent a key leadership outcome because they are vital to firm success and

cooperate voluntarily to provide inputs to the customer. We estimate a logistic regression model using equation (1):

$$Supplier\ Increase_{i,t-1,t} = a + \beta_1 CEO\ Overconfidence\ Measure + \beta_2 \varphi_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Suppliers Increase is an indicator equal to one if the firm experiences an increase in the number of suppliers from year *t*-1 to *t*, and zero otherwise. The indicator variable allows an intuitive economic interpretation, although the results are also similar using an OLS model with the *number of suppliers*.[12] We estimate this model using various *CEO Overconfidence* measures, described in details in Section 2 and the Appendix. φ represents a vector of control variables associated with supplier networks. The baseline regression specification includes year fixed effects to proxy for macro-economic trends and industry fixed effects to capture differences across industries following the approach in Malmendier, Tate, and Yan (2011). We cluster standard errors at the firm level. We expect $\beta_1 > 0$ if CEO overconfidence attracts suppliers.

[Insert Table 2]

The evidence suggests that suppliers respond strongly to the presence of an overconfident CEO. Column (1) of Panel A in Table 2 presents the result from a univariate logit model. With *Holder 67* at *t*-1 as the CEO overconfidence measure, the coefficient estimate is positive and statically significant, indicating that a firm is more likely to attract additional suppliers when the CEO is overconfident. Economically, *Holder 67* has a marginal effect of +1.2% on the likelihood of the firm experiencing an expansion of its supplier network. This represents an 18% increase over the sample frequency of supplier network expansions of 7.2%.

The results are similar with the inclusion of firm characteristics in column (2). The coefficient estimate on *Holder 67* remains positive and statically significant. The regressions include recent stock returns and an acquisition indicator as controls since *Holder 67* may be related to recent stock performance and acquisition activity. The control variables indicate that customer firms are more likely to add suppliers when they have

[12] These results are available upon request.

higher sales growth, higher R&D, lower leverage, and fewer existing suppliers. These patterns accord with the evidence in Banerjee, Dasgupta, and Kim (2008). Customer firms also have more suppliers when the customer reports missing R&D. This is an interesting finding because it is consistent with the view that firms that do not report R&D have innovation activity (Koh and Reeb, 2015).

We create a sharper test of the *leadership hypothesis* by examining the timing of supplier actions. This test is important for two reasons. First, a direct corollary of the *leadership hypothesis* is that supplier actions should occur during periods when the CEO provides greater leadership. To measure the timing of leadership, we use the *CEO Overconfidence Up* measure which is an indicator equal to 1 when *CEO Overconfidence* is in the top quartile in year t but not so in year t-1.

Second, this test may help address plausible alternative explanations. For example, underlying industry shocks may simulatenously increase demand and motivate overconfident CEOs to provide leadership. To capture time-varying industry-wide changes, we include industry-year fixed effects based on two-digit SIC codes. However, fixed effects can cause an incidental parameters problem in logit models. Therefore, we adopt a conditional logit model that stratifies observations along the industry-year dimension, sidestepping the incidental parameters problem. Inevitably, this causes fluctuations in sample size across different model specifications because we require variation within each stratum.[13]

The conditional logit estimates suggest that suppliers react during times of leadership action. Column (3) shows that the coefficient estimate on *CEO Overconfidence Up* is positive and significant at the 1 percent statistical level. Standard errors are clustered at the industry strata because clustering must be on a greater dimension than the industry-year stratum. Because the model includes industry-year strata, the results suggest that it is unlikely that industry shocks are the omitted variables that drive our main results. The

[13] For example, when the stratification is industry fixed effects, the conditional logit model constrains the coefficient estimates to be equivalent across regressions in all industries. If a certain stratum experiences no variation in the dependent variable, all observations in that stratum are eliminated. This condition will result in variation in sample sizes across different specifications.

evidence also suggests that the timing of leadership is important – suppliers are more likely to come onboard during times when the CEO provides leadership.

Another concern is unobserved underlying firm heterogeneity. Our baseline regressions partially address time-varying firm shocks with the inclusion of recent stock performance, sales growth, and growth prospects (i.e., market-to-book ratio). However, the possibility of an omitted unobservable underlying variable will always linger. Researchers traditionally address this issue by incorporating firm fixed effects, but the low within-firm variation in *Holder 67* makes this approach infeasible. We propose a plausible approach to rule-out unobserved firm heterogeneity and sharpen the tests of the *leadership hypothesis*. Since the *CEO Overconfidence Up* measure captures the initial timing of the CEO's leadership action, it is possible to estimate a conditional logit model with firm strata because there is sufficient within variation.

The evidence suggests that our results are unlikely explained by unobserved firm heterogeneity. Column (4) shows that the coefficient estimate on *CEO Overconfidence Up* remains positive and significant with the inclusion of firm strata. This suggests that the link between overconfident CEO's and suppliers' actions is not due to unobserved firm heterogeneity. The inclusion of firm characteristics in the regression makes time-varying firm shocks an unlikely explanation for this relation. The evidence is consistent with the view that 1) suppliers are more likely to come onboard when the CEO provides leadership, and 2) unobserved firm heterogeneity is not behind our findings.

3.1.1 Alternative Measures of CEO Overconfidence

While the *Holder 67* measure of overconfidence allows for convenient econometric interpretation, our findings are potentially sensitive to the construction of the *Holder 67* measure. Or, economically, suppliers may react to the degree of CEO leadership represented in the CEO's option holdings. Therefore, we re-estimate the conditional logit model using the continuous measure of *CEO Overconfidence* similar to the approach developed in Campbell et al. (2011), Malmendier, Tate, and Yan (2011), and Hirshleifer, Low, and Teoh (2012).

The evidence suggests that the results are not sensitive to the indicator measure of in-the-money option holdings. Column (1) of Panel B shows that the coefficient estimate on *CEO Overconfidence* is positive and significant with the inclusion of firm strata. The result also implies that the degree of CEO option holdings affects the probability of gaining a dependent supplier.

A related concern with option holdings-based measures is that excess holdings of in-the-money options may reflect inaction or inertia rather than overconfidence or leadership. Because the measure relies on inactivity rather than activity, it may represent procrastination or inattention on the part of the CEO. We tackle this issue by following the approach in Kolasinski and Li (2013) to create a measure of CEO overconfidence based on action/activity. Using CEO insider transactions, we create an *Overconfidence Trade Up* measure which captures instances of overconfident CEO trading activity (See Section 2/Appendix for full details).

The evidence supports the view that our earlier findings are not a result of CEO inaction or inattention. Using a conditional logit model with firm strata, we find that the coefficient estimate on *Overconfidence Trade Up* is positive and significant. This suggests that firms are likely to attract more suppliers during times when the CEO engages in overconfident insider transactions. It also demonstrates that our results are not sensitive to the measurement of CEO overconfidence as proposed in the extant literature.

3.1.2 Do Suppliers Respond to the Withdrawal of Leadership?

Our tests until this point focus on positive leadership outcomes as measured by an expansion in the dependent supplier network. A direct corollary of the *leadership hypothesis* is that supplier should also react when the CEO withdraws leadership. Examining the withdrawal of leadership may provide a more powerful test if there are lingering concerns regarding construction of the overconfidence measures.

We measure withdrawal of leadership using the *CEO Overconfidence Down* measure, which is the analog of the *CEO Overconfidence Up* measure. To implement this test, we estimate the same industry-year strata conditional logit model as in Panel A, column (3), but replace the dependent variable with *Supplier Decrease*, which is an indicator equal to

1 if the firm experiences a decrease in the number of suppliers from year *t*-1 to *t*, and 0 otherwise.

The evidence suggests that suppliers respond strongly to the withdrawal of leadership by customer CEO. Column (3) of Panel B shows that the coefficient estimate on *CEO Overconfidence Down* is positive and statically significant. This implies that a firm is more likely to *lose* dependent suppliers when an overconfident CEO withdrawals leadership. Because the specification includes industry-year strata, it is unlikely that these results are due to industry shocks. Column (4) shows that the results are similar with the inclusion of firm strata, suggesting that unobserved firm heterogeneity is not likely behind our findings.

3.1.3 Additional Test: Initiation of Supplier Network

As a sharper test of the *leadership hypothesis*, we examine the boundary scenario where firms attract their first dependent supplier. This helps to address a potential econometric issue that supplier relationships tend to be persistent. For example, Fee, Hadlock, and Thomas (2006) estimate a 76% probability that a customer-supplier relationship continues in the subsequent year.[14] The pattern is similar in our sample, with 75% of customer-supplier relationships continuing into the next year.

To examine the initiation of a supplier network, we estimate our earlier analysis using *Start of Supplier Network* as the dependent variable. *Start of Supplier Network* is an indicator equal to one if a firm adds at least one dependent supplier in year *t*, but had no dependent supplier in year *t*–1. Table 3 presents the results of the regression analysis which follows the same specifications as before.

[Insert Table 3]

The evidence suggests that overconfident CEOs strongly affects the initiations of supplier networks. Column (1) shows that *Holder 67* is positively associated with *Start of Supplier Network* in a logistic regression with year dummies and industry dummies.

[14] Holding control variables at their sample means in a logistic regression, Fee, Hadlock, and Thomas (2006) estimates that the probability of a relationship termination is about 24%.

Evaluated at the mean of the other independent variables, *Holder 67* has a marginal effect of +0.8% on the likelihood of the firm experiencing a supplier network initiation. This represents a 24% increase over the sample frequency of supplier initiation of 3.3%. The results are similar with the inclusion of firm characteristics in Column (2). The economic effect remains relatively large.

Next, we examine whether the timing of leadership relates to the initiation of a supplier network. To ensure that industry shocks are not driving both leadership and initiation of supplier networks, we estimate a conditional logit model with industry-year stratification. Using the *CEO Overconfidence Up* measure, column (3) shows that customers attract their first set of suppliers when the CEO provides strong leadership. This also suggests that our findings are not likely due to industry shocks. Column (4) shows that coefficient estimate on *CEO Overconfidence Up* remains positive and significant with the inclusion of firm strata. This indicates that unobserved firm heterogeneity is unlikely behind our findings. Overall, the evidence is consistent with the view that 1) suppliers are more likely to come onboard when the CEO provides leadership, and 2) our results are not due to the persistence in customer-supplier relationships.

The overall findings in Section 3.1 provide strong support for the *leadership hypothesis*. The results indicate that CEO overconfidence has strong effects on the expansions and initiations of firms' supplier networks. In particular, we find that the timing of leadership is important as supplier actions occur during times when the overconfident CEO provides the most leadership. Our results are also robust to various measures of CEO overconfidence and the use of industry-year and firm stratification in conditional logit models.

3.2 Importance of Overconfident CEOs in Industries Requiring Intensive Relationship Specific Investment

Certain businesses are particularly reliant upon suppliers to deliver customized inputs necessary for their final product. Consider for example the number of unique, customized parts in an iPhone. The customization of specialized inputs is commonly referred to as

relationship-specific investment (RSI). Given the value of supplier relationships in these industries, we examine whether overconfident CEOs are particularly important in attracting suppliers. Firms in durable goods manufacturing industries (i.e. durable sector) produce more unique products that can only be sold to few customers (e.g., Titman, 1984; Titman and Wessels, 1988). To the extent that firms in durable sector require greater customization in inputs from suppliers, CEO leadership may be particularly important in order to attract valuable suppliers onboard the firm and to induce greater supplier RSI.

We narrow our focus to only firms in manufacturing industries and separately analyze the durable sector and non-durable manufacturing sector. We employ the same empirical tests used in Tables 2 and 3 for both expansion and initiation of a supplier network.

[Insert Table 4]

Panel A of Table 4 reports the results from logit regressions using the *Holder 67* measure of CEO overconfidence. As before, we include industry dummies and year dummies following Malmendier, Tate, and Yan (2011) and cluster standard errors by firm. The regressions include the full set of control variables as in Tables 2 and 3 but are suppressed to conserve space. Column (1) presents results from the durable sector sample, while Column (2) presents results from the non-durable sector.

The evidence suggests that the leadership of overconfident CEOs is more valuable for the expansion of a supplier network in durable relative to non-durable industries. The coefficient estimate on *Holder 67* is positive and significant at the 10% level in durable sector, while it is negative and insignificant in the non-durable sector shown in column (2). We also find similar patterns for the initiation of a supplier network. Column (3) shows that in the durable sector, the coefficient estimate on *Holder 67* is positive and significant at the 10% significance level indicating that overconfident CEOs are more likely to initiate a supplier network. Column (4) shows that there is no relation in the non-durable sector. This evidence is consistent with the view that leadership by overconfident CEOs is particularly important when leadership outcomes are particularly valuable.

This analysis has generally weaker statistical power due to smaller sub-samples and the broad classification of durable/non-durable manufacturing sectors. To estimate a sharper test, we examine the timing of supplier actions using the *CEO Overconfidence Up* measure. As before, this measure allows for the estimation of the conditional logit model to capture unobserved industry shocks and firm heterogeneity.

Panel B reports a stronger link in the durable sector between overconfident CEOs and supplier networks using the conditional logit model. Column (1) shows that the coefficient estimate on *CEO Overconfidence Up* is positive and significant at the 1% level in durable sector, while it is insignificant in the non-durable sector shown in column (2). Also, columns (3) show a strong association in the durable sector between overconfident CEOs and the initiation of a supplier network, but not for the non-durable sector. We present firm strata specifications to capture unobserved firm heterogeneity although the patterns are similar when including industry-year strata to account for industry shocks.

The evidence is consistent with the view that the leadership of overconfident CEOs is more important when relationship-specific investment is particularly valuable to firm success. However, as previously noted, durable manufacturing is a broad classification. To more precisely evaluate the importance of RSI, we classify firms based on a measure of "contract intensity" within each industry. Contract intensity refers to the proportion of inputs in an industry that are neither bought nor sold on an exchange nor reference-priced (Nunn, 2007). Therefore, industries with higher contract intensity have more customized goods. To keep the analysis comparable to the durable/non-durable analysis above, we split firms into two groups based on the median contract intensity industry. We present results using both the *Holder 67* and *CEO Overconfidence Up* measures of CEO overconfidence.

The evidence suggests that the leadership of overconfident CEOs is particularly valuable in industries with high contract intensity. Panel C presents the results using *Holder 67*. Column (1) indicates that in industries with high contract intensity, the coefficient estimate on *Holder 67* is positive and significant at the 10% level. This suggests that overconfident CEOs are associated with larger supplier networks in high contract

intensity industries. We find no significant association among firms in low contract intensity industries. The results are statistically stronger when examining supplier network initiation. Column (3) shows that in high contract intensity industries, overconfident CEOs are more likely to initiate supplier networks, while no such relation exists in low contract intensity industries (Column 4).

The results are also similar using the *CEO Overconfidence Up* measure of CEO overconfidence. Panel D shows the coefficient estimates are positive and significant on *CEO Overconfidence Up* in high contract intensity industries (Columns (1) and (3)), but not in low contract intensity industries.

Collectively, our evidence indicates that in industries that require relationship-specific inputs, leadership in the form CEO overconfidence is particularly important to the growth of supplier networks. In these industries, the cost of supplier commitment tends to be higher and contracting imperfections are likely to be more salient. Therefore, leadership may be particularly important. Our evidence in this section supports this view.

3.3 Do Overconfident CEOs Attract Greater Supplier Commitments?

The previous section examines the *leadership hypothesis* by exploiting industry variation in the degree of relationship-specific investment (RSI). Supplier relationships in these industries are on average more valuable because these inputs are costlier to develop and more difficult to re-deploy if the relationship terminates. RSI is also associated with value creation as it improves productivity (Dyer and Nobeoka, 2000), enhances core competency (Parmigiani, 2007), and stimulates inter-project spillovers (Kang, Mahoney, and Tan, 2009). Therefore, gaining voluntary cooperation in these industries suggests that suppliers believe in the leadership of the customer firm's CEO.

In this section, we search for more direct evidence of RSI at the individual customer-supplier level. There are two compelling reasons for this analysis. First, focusing on customer-supplier relationships allows for a direct test of RSI commitments. Second, analyzing each customer-supplier relationship helps to attribute the variation among

individual suppliers for each customer. By examining the relative size between the customer and supplier, we can understand issues surrounding bargaining power.

The challenge is that the nature of RSI is difficult to quantify. Therefore, we use two proxies for relationship-specific investment motivated from the existing literature: 1) *Supplier R&D Intensity* which captures the amount of research and development at the supplier firm (Kale and Shahrur, 2007; Raman and Shahrur, 2008) and 2) *Relationship Durability* which captures the likelihood of relationship termination at a given point in time (Fee, Hadlock, and Thomas, 2006).

3.3.1 Supplier Commitments: R&D Intensity

A proxy for a supplier's relationship-specific investment is the amount of research and development activity (Kale and Shahrur, 2007; Raman and Shahrur, 2008). This captures the general production of asset-specific or non-commoditized outputs. To tie R&D activity to the customer-supplier relationship, we implement the following procedure. First, we scale the supplier's R&D activity by its sales relationship with the customer.[15] To allow for comparability across suppliers of different size, we normalize by total assets and apply the natural logarithm transformation to minimize the influence of outliers.[16] We call this measure *Supplier R&D Intensity*. Since the measure is continuous, we estimate an OLS regression using equation (2).

$$Supplier\ R\ \&\ D\ Intensity_{i,t} = a + \beta_1 Holder67_{t-1} + \beta_2 \varphi_{i,t-1} + \beta_3 \gamma_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

[Insert Table 5]

φ represents a vector of supplier control variables while γ represents a vector of customer control variables. The regression specification includes industry fixed effects to capture differences in R&D activity across industries and time fixed effects to capture macro-economic trends. We cluster standard errors by customer-year because each customer may have multiple suppliers in a given year. The regressions include customer

[15] For example, if a firm has \$100 in R&D activity and 40% of its sales are to a single customer, then we attribute \$100*0.4=\$40 to this particular relationship.

[16] Our results are both qualitatively and quantitatively similar using the raw values and are available upon request.

characteristics and supplier characteristics that are potentially associated with R&D activity. We expect $\beta_1 > 0$ if CEO overconfidence attracts suppliers.

Table 5 presents the results. The evidence suggests that suppliers to customer firms with overconfident CEO produce greater *R&D intensity*. Column (1) shows that β_1 is positive and significant with the inclusion of customer firm characteristics. β_1 is also positive and significant after including a full set of supplier firm characteristics in Column (2), suggesting that supplier characteristics are not driving our findings. Together, the evidence is consistent with the view that CEOs attract greater supplier commitments.

From this customer-supplier pair setting, we can explore the influence of relative size between customers and suppliers to provide evidence on the leadership channel of overconfident CEOs. Typically, when suppliers are smaller than their major customers, they tend to have less bargaining power in the supply chain relationship. While locking in a larger supplier may secure revenues, smaller suppliers run the risk of ex-post hold-up problems due to their relatively weaker bargaining positions. Therefore, smaller suppliers may require additional assurances, in particular when relationship specific investments are required. The leadership of overconfident CEOs may provide one such channel. By holding in-the-money options, the overconfident CEO may be less likely to hold-up the smaller supplier because delays along the supply-chain may significantly affect the CEO's personal wealth.

To test this hypothesis, we classify suppliers by their asset sizes relative to their customers. A supplier is classified as *small* (*big*) if the *Supplier-Customer Size Ratio* is lower (higher) than the SIC 2-digit industry median value. The evidence presented in column (3) suggests that overconfident CEOs strongly affect supplier R&D intensity among smaller suppliers, but have little impact among large suppliers as seen in Column (4). This evidence is consistent with the view that the leadership of overconfident CEOs may convince smaller suppliers to make relationship-specific investments when there are potentially bargaining power issues at hand.

3.3.2 Supplier Commitments: Relationship Durability

Another dimension of supplier commitment is the durability of the customer-supplier relationship. Fee, Hadlock, and Thomas (2006) propose that the durability of customer-supplier relationship relates to contractual frictions which may arise from RSI-related issues or hold-up problems. If the leadership of overconfident CEOs helps to alleviates frictions, we expect that these relationships are less likely to terminate, *ceteris paribus*.

To model the durability of customer-supplier relationships, we use survival analysis to estimate a hazard function. Specifically, we estimate the probability that a customer-supplier relationship terminates within a time interval conditional on the survival of the relationship up till the beginning of that interval. However, standard hazard function are not appropriate in our setting because a customer-supplier relationship may terminate then restart in the future.[17] It is also not statistically appropriate to model multiple terminations of a single relationship as separate observations since terminations within a customer-supplier pair may be correlated. In light of these constraints, we employ the Andersen-Gill extension of the standard Cox model (Andersen and Gill, 1982). Like the Cox model, the Andersen-Gill extension adjusts for censoring in the data but it provides two important advantages. First, it can accommodate recurrent terminations in customer-supplier relationships. Second, it can generalize to hazard non-proportionality which we exploit to check the assumption of hazard proportionality, a hallmark of the standard Cox model.

To study the association between customer CEO leadership and relationship durability, we define *Holder 67 Relationship* equal to 1 if a *Holder 67* customer CEO is present between the start and termination of the relationship, and 0 otherwise. *Holder 67 Relationship* is re-computed for relationships with subsequent restarts and terminations. All other independent variables are based on relationship and firm characteristics in the first year of the customer-supplier relationship. Our definition of customer-supplier

[17] The information between the restart and the subsequent termination is not admissible in a standard Cox model. A potential workaround is to perform survival analysis till the occurrence of the first termination and discard all subsequent information. However, this solution entails a suboptimal use of our data because more than 25% of unique customer-supplier pairs have a terminate-restart characteristic.

relationship length follows Fee, Hadlock, and Thomas (2006) closely. The start of a relationship is defined to be the first year in which both customer and supplier are linked in the Compustat business segment file. We follow the relationship till the year in which the link is broken (termination year). If both firms are present in Compustat in the termination year, we determine that the customer-supplier relationship is terminated. If at least one of the firms disappear from Compustat in the termination year, we accord the relationship with a *right-censored* status because we cannot determine if a relationship is terminated mutually. Since our sample period ends in 2012, we also classify all surviving relationships in 2012 as being *right*-censored. Furthermore, as it may take at least 2 years for a customer CEO to be classified as a *Holder 67* CEO, we only include relationships that begin on or after 1995.

[Insert Table 6]

Table 6 presents the results as hazard ratios, which represents the ratio of hazard rates corresponding to two levels of the variable.[18] For example, a hazard ratio above unity (below unity) implies that the variable increases (decreases) the chance of relationship termination at that point in time.

The evidence suggests that overconfident CEOs have longer supplier relationships on average. Column (1) shows that the hazard of a relationship termination is about 10.8% lower in a *Holder 67 Relationship* relative to a *Non-Holder 67 Relationship* and is highly statistically significant. In Column (2), the *Holder 67 Relationship* continues to be associated with lower hazards of relationship termination with the inclusion of supplier and customer control variables which we suppress to conserve space. In this specification, the hazard of a relationship termination is about 19.5% lower in a *Holder 67 Relationship* relative to a *Non-Holder 67 Relationship*. Column (3) shows the results are also unchanged after including *Beginning Size Ratio*, *Beginning Supplier R&D Intensity,* and *Beginning Sales Dependency.* The customer-supplier relationship is less likely to terminate when the

[18] Likewise, the hazard ratio of a continuous variable represents the ratio of hazard rates corresponding to a unit-change in the said variable.

supplier has high initial *beginning sales dependency.* This is economically sensible as more dependent suppliers are more reliant on their major customer.

Next, we verify that the assumption of hazard proportionality holds in the model. Recall that hazards of relationship termination are interpreted at every point in time but the model only yields a single estimated coefficient per independent variable. This observation encapsulates the hazard proportionality implied in the standard Cox model which assumes that hazard ratios are constant through time. The Andersen-Gill extension relaxes this assumption by making it possible to include interaction terms between independent variables and time, also widely known as time-varying covariates. The interaction terms allow the effect of their corresponding independent variables to change with time elapsed in the relationship. Therefore, we test whether these interaction terms are not statistically significant.

The evidence confirms that hazard proportionality is not violated in our model. We add interaction terms of all independent variables with time in Column (4). *Holder 67 Relationship* continues to predict a lower hazard of relationship termination (-29.2%) but the effect of its interaction with time is not statistically distinguishable from zero. This result both confirms our findings in the previous columns and verifies that the assumption of hazard proportionality is upheld in our model. In Column (5), we restrict our sample to customer-supplier relationships without any restarts (i.e. only 1 termination) and find that our conclusions on *Holder 67 Relationship* remain unchanged.

3.4 Do Supplier Commitments Represent a 'Dark-side' of CEO Overconfidence?

The results in this section support a 'bright-side' view that the leadership of overconfident CEOs creates valuable supplier relationships along various dimensions. However, if overconfident CEOs are over-optimistic and overpay for these supplier commitments, these 'achievements' may ultimately hurt the company's bottom line and sacrifice firm value. This would represent a 'dark-side' view of CEO overconfidence.

We create two tests to examine the possibility that overconfident CEOs overpay for their supplier commitments. First, we examine *input costs* and *markup percentage* to test whether overconfident CEOs overpay their suppliers. These measures capture gross profitability and buying power (Fee and Thomas, 2004). Firms that overpay suppliers tend to exhibit weak buying power and low profitability. Second, we examine stock returns to directly measure value effects. The 'dark-side' view would imply that these supplier commitments come at a significant cost, destroying firm value and producing poor stock performance.

3.4.1 Input Costs and Gross Profitability

Following Thomas and Fee (2004), we measure buying power using *input costs* defined as the cost of goods sold (COGS) divided by total sales. All else equal, firms that overpay suppliers tend to have weak buying power and pay higher *input costs*. We also use a related measure – *markup percentage* – defined as total sales minus cost of goods sold (COGS) divided by COGS. If overconfident CEOs overpay for supplier commitments, this decreases the markup of their final products, all else equal. We test whether overconfident CEOs overpay for their supplier commitments by estimating OLS regressions following equation (3).

$$Margin_{i,t} = \alpha + \beta_1 Holder67_{t-1} + \beta_2 \varphi_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

where *Margin* represents either *Input Costs* or *Markup Percentage* defined above. φ represents a vector of control variables. In all specifications, we include industry-year fixed effects to capture cross-sectional variation in *Input Costs* or *Markup Percentage* across industries. Since we are interested in examining the possibility of overpaying suppliers, we only consider observations with at least one supplier in each of both year t and year t-1. After applying this constraint, our subsample comprises 422 unique firms from the years 1994 to 2011, yielding a panel of 2,244 firm-years across 29 2-digit SIC industries.

[Insert Table 7]

The results in Table 7 are inconsistent with the 'dark-side' view. Column (1) shows that the coefficient estimate on *Holder 67* is negative and statistically significant,

indicating that *Input Costs* are *lower* for firms with overconfident CEOs. This results suggests that overconfident CEOs tend to have *greater* bargaining power. While it may be impossible to objectively quantify 'overpayment' - particularly if inputs are asset-specific - the evidence suggests that operating profitability is at least not compromised. A firm led by an overconfident CEO has a -2.3% lower *Input Costs* relative to the sample mean. Column (2) shows that our conclusions are unchanged using *Markup Percentage*. Controlling for input costs, firms led by overconfident CEOs command higher prices for their products. Economically, *Holder67* is associated with a +16.2% higher *Markup Percentage* relative to the sample mean.[19]

In sum, the evidence is inconsistent with the view that supplier commitments elicited by overconfident CEOs destroy firm value. While we cannot definitively rule out overpayment for supplier commitments, the evidence generally points in the opposite direction. Firms led by overconfident CEOs tend to have *greater* buying power and gross profitability, as measured by *Input Costs* and *Markup Percentage*. These findings tend to support the 'bright-side' view that overconfident CEOs generate valuable leadership outcomes.

3.4.2 Stock Performance of Firms with Dependent Suppliers

In our second test, we directly examine value effects of CEO leadership in firms with dependent suppliers using stock returns. If overconfident CEOs secure supplier commitments at great costs, this is likely to generate poor future stock performance. On the other hand, we expect equity outperformance if the leadership outcomes of overconfident CEOs are value-creating. Therefore, we test the opposing 'dark-side' and 'bright-side' predictions by forming portfolios and tracking stock performance using the following procedure.

We restrict our sample to observations with at least one disclosed supplier at the fiscal year end. We allocate firms into either the *Holder67* (*Non-Holder67*) portfolio if the

[19] The sample means referred in Columns (1) and (2) are computed only among firms with at least one supplier in the current year and at least one supplier in the previous year. Due to this constraint, the sample size in Table 7 is smaller than that in Table 2.

CEO is (is not) overconfident at the fiscal year end. The firm stays in the portfolio for the next 12 months. We calculate the average returns of the stocks in the two portfolios each month and benchmark them against the Fama-French 5 factors and the momentum factor.

[Insert Figure 1]

Figure 1 presents the results. The evidence strongly supports the 'bright-side' *leadership* hypothesis. Panel A presents the average monthly alphas of the *Holder67* portfolio, *Non-Holder67* portfolio, and the difference in returns between the two portfolios. The *Holder67* portfolio yields a statistically significant monthly alpha of 0.38%, while the alpha of the *Non-Holder67* portfolio is not statistically significant. The long-short portfolio yields a statistically significant monthly alpha of 0.27%. Our results are also similar using characteristics-adjusted returns (DGTW), and are available upon request.

We also present the factor loadings of the *Holder67*, *Non-Holder67*, and the long-short portfolio in Panel B. Notably, firms helmed by both overconfident and non-overconfident CEOs have similar loadings on SMB, suggesting that they are similar in size. However, the factor loading on HML is negative for firms led by overconfident CEOs and positive for their counterparts. This suggests that stocks in the *Non-Holder67* portfolio tend to be value firms. These firms also tend to be more conservative in their corporate investment activities as they have a positive and significant loadings on CMA. We note that firms in the *Holder67* portfolio are not necessarily aggressive in their investment activities as the factor loading on CMA is close to zero (0.029).

Panel C examines manufacturing firms in the *durable/non-durable* industries. Within this subsample, only firms in the *durable* industries generate significant alphas. The *Holder67* portfolio yields an alpha of 0.58% while the *Non-Holder67* portfolio is not statistically significant. In the *non-durable* industries, the alphas in the two portfolios are positive but not statistically distinguishable from zero. Similarly, we also find that the outperformance of the *Holder67* portfolio is more pronounced in the *high-RSI* industries than in the *low-RSI* industries, although the differences are not significant. The patterns

in Panels C and D are consistent with our findings in Table 4 that the influence of CEO leadership on supplier actions is stronger in industries where RSI is more valuable.

Overall, the evidence from our stock performance analysis is not consistent with the 'dark-side' view that overconfident CEOs overpay for their supplier commitments. Instead, the positive stock performance supports the *leadership* hypothesis. Among firms with dependent suppliers, the market reacts favorably to those led by overconfident CEOs. This suggests that these leadership outcomes are value-enhancing.

4 Additional Test and Discussion

In this section, we provide additional evidence in support of the *leadership* hypothesis. We examine whether suppliers are sensitive to the manner with which CEOs express overconfidence. We also discuss alternative explanations for our findings.

4.1 Does the Manner of Leadership Matter?

As previously discussed, overconfident behavior of CEOs provides leadership through three potential channels: 1) communicating a strong belief in the firm's prospects, 2) setting an example, and 3) displaying commitment. However, there are other ways that overconfident CEOs can demonstrate leadership.

One notable manner are positive public statements to the news media. Such verbal communication can also provide leadership, particularly when the interests of both parties are perfectly aligned (e.g., Farrell and Rabin, 1996). In this scenario, words are sufficient to induce commitments from stakeholders since stakeholders deduce that the CEO has no incentives to lie. Following Banerjee, Humphrey-Jenner, and Nanda (2015), we use a news-based measure of CEO overconfidence – *CEO Media Positivity* based on the relative frequency of confident articles to non-confident articles describing the CEO. Since this measure is independent of the CEOs' option exercise behavior, it captures CEO overconfidence that is exuded through verbal communication.

[Insert Table 8]

We examine the effect of *CEO Media Positivity* on expansion of supplier networks in Table 8. In Column (1), we find that while the association between *CEO Media Positivity* and *Supplier Increase* is positive, it is not statistically significant. We pit *Holder 67* against *CEO Media Positivity* in Column (2) in a horse-race regression. Though both variables predict *Supplier Increase* positively, only *Holder 67* is statistically significant. Next, we partition firms based on their membership in the durable and non-durable manufacturing sectors (Titman and Wessels, 1988), and perform a split-sample analysis. Consistent with our prior findings in Table 4, *Holder 67* predicts expansions of supplier networks only among firms in the durable manufacturing sectors. On both sides of the split-sample analysis, *CEO Media Positivity* is not a statistically significant predictor of *Supplier Increase*. Overall, our findings are consistent with the notion that stakeholders are more likely to be influenced by CEO leadership that is exuded by costly option-exercise behavior but not verbal media statements.

4.2 Alternative Explanation: Corporate Activity

An alternative interpretation of our findings is that stakeholder commitments result from the tendency of overconfident CEOs to over-invest, engage in M&A activities, and pursue innovation projects (Malmendier and Tate, 2005, 2008; Galasso and Simcoe, 2011; Hirshleifer, Low, and Teoh, 2012). These types of corporate activities may mechanically attract new suppliers, possibly explaining our findings. For example, an increase in acquisition activity may attract more suppliers in the next period.

While increasing corporate activities may increase the number of suppliers, it is not clear that such actions are sufficient to induce costly relationship-specific investment (RSI). Suppliers who produce such goods must be convinced that the leadership of the CEO will deliver long-term value. Notably, our results are most pronounced for RSI-intensive firms/industries. Second, our results are robust after controlling for M&A activities. Third, while the results are consistent with an innovation channel, innovation is inherently risky. Stakeholders must be convinced to take these risks and follow the CEO's vision. Overall, it seems unlikely that heighted corporate activity can fully explain our findings.

4.3 Do CEOs take cues from suppliers?

An alternative explanation is that our results may be due to a reverse causality explanation where the CEO take cues from suppliers' actions. In this scenario, suppliers cause the CEO of the customer firm to become overconfident. We find this explanation unlikely for two reasons. First, in our customer-supplier sample, customer are significantly larger than suppliers. Thus, it is less likely that customer CEOs are influenced by suppliers' actions. Second, while it is certainly possible that suppliers deliver the vision to a customer, it would make more economic sense that the vision originates from the customer CEO who subsequently finds suppliers to support the vision. It is after the vision is established that the customers and suppliers may share ideas along the supply-chain (e.g., Chu, Tian, and Wang, 2015). Our evidence also supports this idea.

5 Conclusion

CEOs are hired for their vision and leadership talent. Yet, leadership has many dimensions and definitions, which makes this ability difficult to define and systematically analyze. We hypothesize that corporate boards hire overconfident CEOs because they are better leaders. Our study provides a tractable empirical setting where supplier commitments represent valuable leadership outcomes. Leadership is distinct from formal authority because stakeholders' actions are voluntary.

Our evidence suggests that overconfident CEOs are better able to attract suppliers to commit to the CEO's vision. Overconfident CEOs attract supplier relationships, particularly when such relationship are valuable, such as in durable goods manufacturing industries and high relationship-specificity industries. Suppliers also more likely to provide relationship-specific products to suppliers when the supplier CEO is overconfident.

Overall, our results reveal a bright side of CEO overconfidence. This provides a potential explanation for why boards appoint overconfident CEOs. While overconfidence is often perceived as a negative trait, future research may explore additional positive dimensions of CEO overconfidence.

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Appendix I. Variable Definitions

CEO Overconfidence $_{t}$	Average value of the CEO's options scaled by the average strike price. The numerator is the value of the CEO's vested and unexercised options (EXECUCOMP: OPT UNEX EXER VAL) scaled by the number of such options (EXECUCOMP: OPT UNEX EXER NUM). The denominator is the difference between the firm's stock price at the end of the fiscal year (CRSP: PRCC F) and the numerator. Source: Campbell et al. (2011), Malmendier, Tate, and Yan (2011), Hirshleifer et al. (2012), Execucomp, CRSP
CEO Overconfidence Up $_{t-1, t}$	Variable equates to unity if CEO Overconfidence in year t is in the top quartile of the sample and if CEO Overconfidence in the year t-1 is not in the top quartile of the sample, and equates to 0 otherwise. Source: Execucomp, CRSP
Overconfidence Trade $_{t}$	Dummy variable that equates to unity in year t if the CEO's purchases over the next 2 years have negative 180-day BHARs on average, and equates to zero otherwise. Source: Kolasinski & Li (2013)
Overconfidence Trade Up $_{t-1, t}$	Dummy variable that equates to unity if OC Trade (see above) is zero in year t-1 and is unity in year t, and equates to zero otherwise. Source: Kolasinski & Li (2013), Thomson Reuters Insiders
Holder 67 $_{t-1}$	Variable equates to unity if a CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. Variable switches from zero to unity from the first such instance. Source: Execucomp, CRSP
Holder 67 Relationship $_{s, i}$	For a given customer-supplier relationship, variable equates to unity if a Holder 67 customer CEO is incumbent in any year between the start (inclusive) and end (exclusive) of the relationship, and equates to zero otherwise. Source: Execucomp, CRSP, Compustat
CEO Media Positivity $_{t}$	Dummy variable that equates to unity if the number of articles containing references to confidence is more than the number of articles containing references to non-confidence during the year, and equates to zero otherwise (Banerjee, Humphrey-Jenner, and Nanda, 2015). Source: Banerjee, Humphrey-Jenner, and Nanda (2015)
Industry Relationship-Specificity $_{j}$	Proportion of inputs used in I-O industry that are neither sold on organized exchanges nor reference-priced. Readers may refer to Nunn (2007) for more details. Source: Nunn (2007)
CEO Stock Ownership $_{t-1, t}$	CEO's percentage share ownership in year t-1. Source: Execucomp
Total Assets $_{t-1}$	Total Assets of firm. Source: Compustat
Leverage $_{t-1}$	Sum of long-term debt and short-term debt, scaled by total assets. Source: Compustat
Market-to-Book Ratio $_{t-1}$	Ratio of market value of equity to book value of equity. Source: Compustat
Return on Assets $_{t-1}$	Ratio of net income to assets. Source: Compustat
Sales Growth $_{t-1}$	Difference between sales in year (t-1) and year (t-2), scaled by sales in year (t-2). Source: Compustat
Capital Expenditure $_{t-1}$	Capital expenditure of firm, scaled by total assets. Source: Compustat
R&D $_{t-1}$	R&D expenses of customer firm, scaled by total assets. Missing R&D expenses are set to zero. Source: Compustat
Missing R&D $_{t-1}$	Dummy variable that equates to unity if R&D expenses are missing in the Compustat database, and equates to 0 otherwise. Source: Compustat
CEO Tenure $_{t-1}$	If the date of appointment as CEO is available in Execucomp, variable equates to the number of years elapsed since the appointment date. Otherwise, variable equates to the number of years elapsed since the earliest date where the CEO first appears in the database. Source: Execucomp

Appendix I. (Continued)

2-Year Stock Returns $_{t-2,\, t-1}$	Buy-and-hold returns of firm stock from beginning of year (t-2) to end of fiscal year (t-1). Source: CRSP
ROA Volatility $_{t-3,\, t-1}$	3-year standard deviation of ROA from year (t-3) to year (t-1). Source: Compustat
Cash $_{t-1}$	Cash holdings of firm, scaled by total assets. Source: Compustat
Acquisitions $_{t-1,\, t}$	Variable equates to unity if the firm performs at least 1 acquisition within the (t-1, t) window, and equates to zero otherwise. Source: SDC Platinum
Suppliers Increase $_{t-1,\, t}$	Variable equates to unity if the number of dependent suppliers in year (t) is higher than the number of dependent suppliers in year (t-1), and equates to 0 otherwise. Source: Compustat
Suppliers Decrease $_{t-1,\, t}$	Variable equates to unity if the number of dependent suppliers in year (t) is lower than the number of dependent suppliers in year (t-1), and equates to 0 otherwise. Source: Compustat
Start of Supplier Network $_{t-1,\, t}$	Variable equates to unity if firm has at least one dependent supplier in year (t) and has no dependent supplier in year (t-1), and equates to 0 otherwise. Source: Compustat
End of Supplier Network $_{t-1,\, t}$	Variable equates to unity if firm has no dependent supplier in year (t) and has at least one dependent supplier in year (t-1), and equates to 0 otherwise. Source: Compustat
Supplier Sales Dependency $_{s,\, i,\, t}$	For each supplier-customer pair in a year, supplier sales dependency is defined as the ratio of supplier-customer sales to total supplier sales. Source: Compustat
Supplier R&D Intensity $_{s,\, i,\, t}$	For each supplier-customer pair in a year, we first compute the supplier's R&D activity that is attributable to the customer by multiplying supplier's R&D expenses by Supplier Sales Dependency (see above for definition). Thereafter, we normalize the resulting value by the total assets of the supplier. To facilitate presentation, values are inflated by a factor of 1000. Source: Compustat
Durable Firm $_{j}$	Industries whose SIC codes are between 3400 and 3999. Source: Titman and Wessels (1988)
Non-Durable Firm $_{j}$	Industries whose SIC codes are between 2000 and 3399. Source: Titman and Wessels (1988)
High RSI $_{j}$	Industries whose Industry Relationship-Specificity values are higher than the sample median. Source: Nunn (2007)
Low RSI $_{j}$	Industries whose Industry Relationship-Specificity values are lower than the sample median. Source: Nunn (2007)
Input Costs $_{t}$	Ratio of cost of goods sold to total sales. Source: Compustat
Markup Percentage $_{t}$	Ratio of the difference between total sales and cost of goods sold to cost of goods sold. Source: Compustat
Supplier-Customer Size Ratio $_{s,\, i,\, t}$	For each customer-supplier pair in a year, Supplier-Customer Size Ratio is computed as the ratio of total assets of the supplier to that of the customer. Supplier-Customer Size Ratio is defined to be small (big) if it is lower (higher) than the SIC 2-digit industry median value. Source: Compustat

Figure 1.

Figure 1 reports monthly alphas of portfolios of firms led by overconfident/ non-overconfident CEOs. Our sample is restricted to observations with at least one supplier in each of both year t and year t-1. We allocate each firm to the *Holder67* (*Non-Holder67*) portfolio if the CEO is (is not) identified as *Holder67* at the end of its fiscal year. The firm remains in the portfolio over the next 12 months. We calculate average return of the stocks each portfolio and benchmark against the Fama-French 5 factors and the momentum factor. *Holder67* is a dummy variable which equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder67* switches from zero to unity from the first such instance.

Panel A presents the monthly alphas of the *Holder67* portfolio, the *Non-Holder67* portfolio, and the long-short portfolio. Panel B presents the loadings and standard errors of each portfolio on the 6 risk factors. Panel C repeats the above analysis separately for firms in the *durable*/*non-durable* industries. Following Titman and Wessels (1988), *durable* industries have SIC codes 3400-3999 and *non-durable* industries have SIC codes 2000-3399. Panel D separates firms by their membership in *high-RSI*/*low-RSI* industries. We determine industry-level relationship specificity according to the year 1997 contract intensity variable from Nunn (2007). An industry is classified as *high* (*low*)-*RSI* if its industry contract intensity is above (below) the sample median. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Panel A. Portfolio Monthly Alphas for Firms Led by Overconfident/Non-Overconfident CEOs

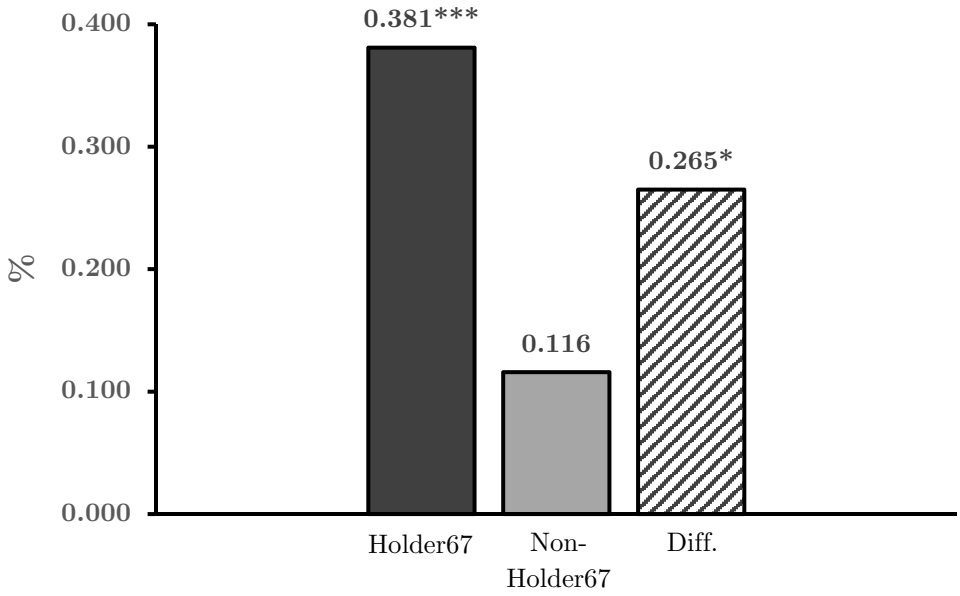

Figure 1. (Continued)

Panel B. Portfolio Loadings on Fama-French 5 Factors + Momentum Factor

	(1)	(2)	(3)
Portfolio	Holder67	Non-Holder67	Difference
α	0.381***	0.116	0.265*
	(0.127)	(0.120)	(0.146)
MKT – RF	1.091***	1.076***	0.015
	(0.032)	(0.031)	(0.037)
SMB	0.469***	0.468***	0.000
	(0.046)	(0.043)	(0.053)
HML	-0.107	0.125**	-0.232***
	(0.065)	(0.062)	(0.075)
RMW	0.155**	0.236***	-0.082
	(0.063)	(0.060)	(0.073)
CMA	0.029	0.157**	-0.128
	(0.076)	(0.072)	(0.087)
MOM	-0.232***	-0.260***	0.028
	(0.024)	(0.023)	(0.028)
Months	234	234	234
R-squared	0.909	0.906	0.294

Panel C. Durable/ Non-Durable Industries Portfolio Monthly Alphas

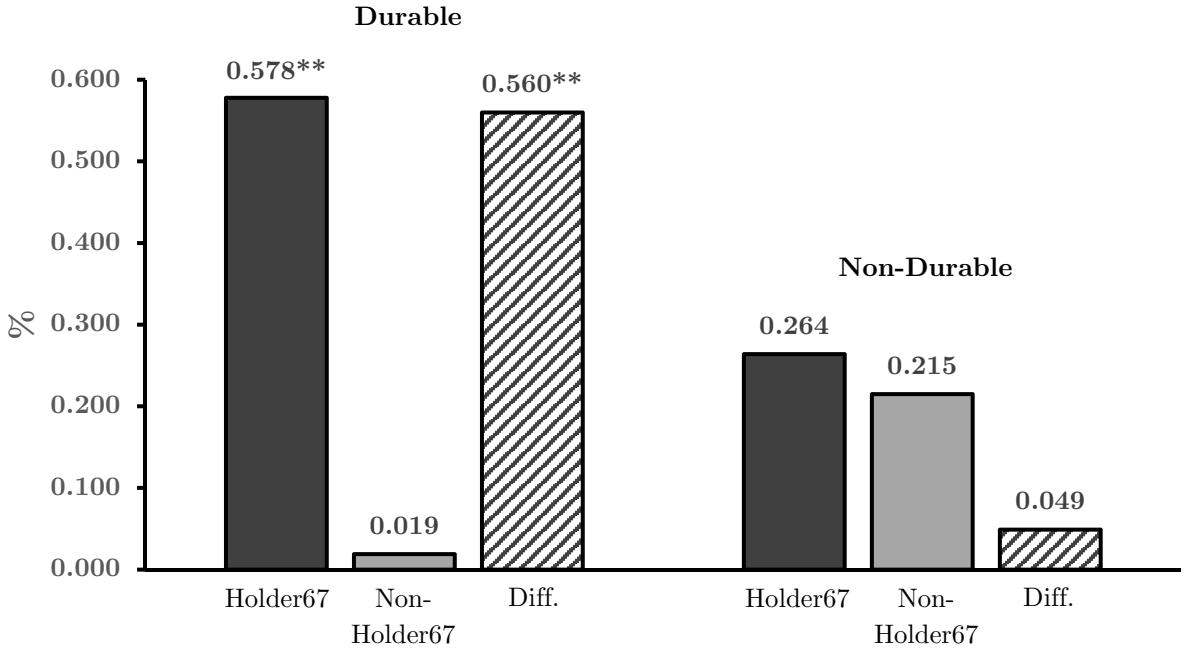

Figure 1. (Continued)

Panel D. High/ Low-RSI Industries Portfolio Monthly Alphas

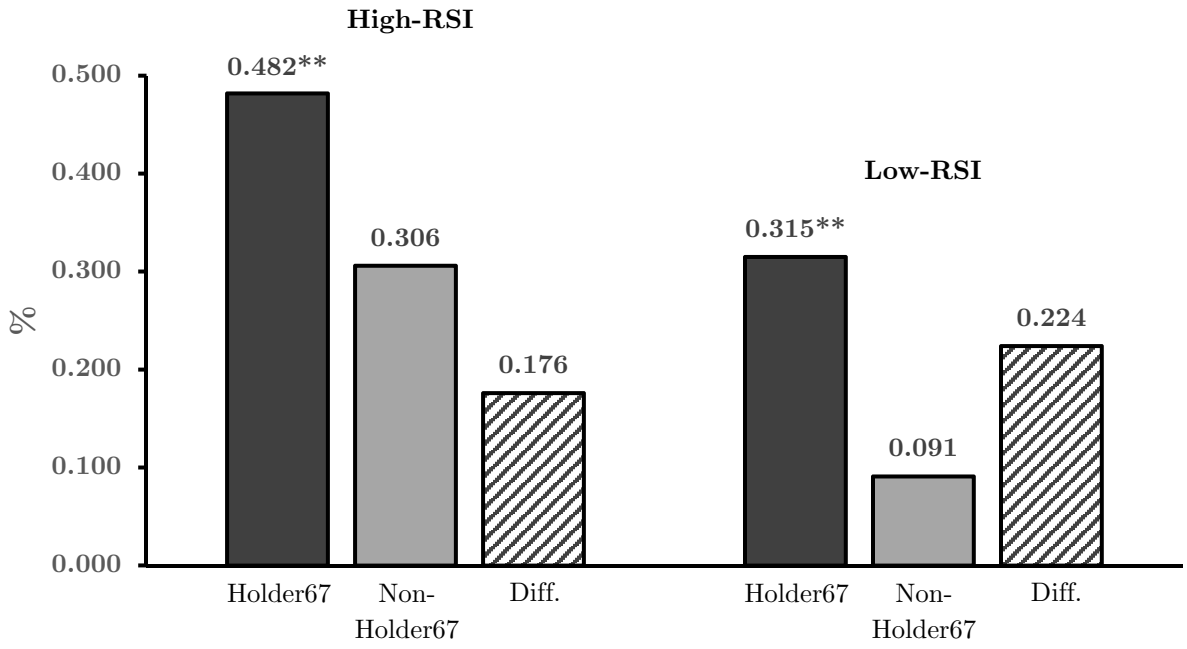

Table 1.
Descriptive Statistics

Panel A reports the summary statistics of the sample used in our baseline regression in Column (2) of Table 2 Panel A. Financial variables are winsorized at the 1st and 99th percentiles to reduce the influence of outliers.

Panel A. Summary Statistics for Sample Firms

	N	Mean	S.D.	P10	P25	P50	P75	P90
Holder 67	14745	0.533	0.499	0	0	1	1	1
CEO Overconfidence	14745	0.321	0.262	0	0.075	0.289	0.516	0.703
CEO Overconfidence Up	14179	0.068	0.253	0	0	0	0	0
Holder 67 Relationship	4974	0.570	0.495	0	0	1	1	1
CEO Media Positivity	7923	0.810	0.392	0	1	1	1	1
CEO Stock Ownership	14745	2.021	4.917	0	0	0.21	1.35	5.63
Total Assets	14745	4088	8760	190	408	1066	3225	10219
Leverage	14745	0.224	0.201	0	0.050	0.202	0.335	0.464
Market-to-Book Ratio	14745	3.204	2.904	1.075	1.580	2.365	3.703	5.947
Return on Assets	14745	0.053	0.108	-0.052	0.019	0.062	0.105	0.158
Sales Growth	14745	0.124	0.269	-0.123	0.001	0.087	0.198	0.387
Capital Expenditure	14745	0.066	0.068	0.013	0.025	0.045	0.081	0.138
R&D[20]	14745	0.043	0.068	0	0	0.010	0.062	0.134
Missing R&D Indicator	14745	0.420	0.494	0	0	0	1	1
Cash	14745	0.121	0.144	0.009	0.024	0.070	0.164	0.298
ROA Volatility	14745	0.054	0.069	0.007	0.014	0.030	0.064	0.125
CEO Tenure	14745	1.751	0.855	0.693	1.099	1.792	2.398	2.833
2-Year Stock Returns	14745	0.373	1.279	-0.474	-0.186	0.164	0.605	1.236
Acquisitions	14745	0.355	0.478	0	0	0	1	1
Durable Indicator	14745	0.336	0.472	0	0	0	1	1
Non-Durable Indicator	14745	0.270	0.444	0	0	0	1	1
Industry Relationship-Specificity	8360	0.643	0.225	0.311	0.503	0.694	0.826	0.931
Customer-Supplier Size Ratio	12002	0.081	0.386	0.001	0.002	0.008	0.039	0.146
High C-S Size Ratio	12002	0.487	0.500	0	0	0	1	1
High-RSI Indicator	8360	0.531	0.499	0	0	1	1	1
Suppliers Increase	14745	0.072	0.258	0	0	0	0	0
Suppliers Decrease	14745	0.075	0.264	0	0	0	0	0
Start of Supplier Network	14745	0.033	0.180	0	0	0	0	0
End of Supplier Network	14745	0.035	0.183	0	0	0	0	0
Input Costs	2244	0.606	0.218	0.269	0.451	0.657	0.769	0.865
Markup Percentage	2244	1.093	1.481	0.155	0.300	0.522	1.219	2.723
Supplier R&D Intensity	12002	23.213	48.114	0.654	2.083	7.652	21.417	52.577

[20] Missing values of *R&D* are assigned to be zero. Reported statistics exclude missing *R&D* values.

Table 1 (Continued)

In Panel B, we compare the variable means of firm-year observations with (Customer) and without (Non-Customer) dependent suppliers. The following statistics are drawn from the sample used in the baseline regression in Column (2) of Table 2 Panel A. ***, **, * represent statistical significance of differences in means at the 1%, 5% and 10% levels respectively.

Panel B. Comparison between Customer and Non-Customer Observations

	Customer		**Non-Customer**		
	N	**Mean**	**N**	**Mean**	**Difference**
Holder 67	2904	0.545	11841	0.531	0.014
CEO Overconfidence	2904	0.343	11841	0.315	0.028***
CEO Overconfidence Up	2804	0.065	11375	0.069	-0.004
CEO Stock Ownership	2904	1.123	11841	2.241	-1.118***
Total Assets	2904	12394	11841	2051	10343***
Leverage	2904	0.246	11841	0.219	0.026***
Market-to-Book Ratio	2904	3.824	11841	3.052	0.771***
Return on Assets	2904	0.066	11841	0.050	0.015***
Sales Growth	2904	0.132	11841	0.121	0.010**
Capital Expenditure	2904	0.071	11841	0.065	0.006***
R&D	2904	0.048	11841	0.042	0.006***
CEO Tenure	2904	0.930	11841	0.959	-0.028***
Cash	2904	0.098	11841	0.127	-0.029***
ROA Volatility	2904	0.046	11841	0.055	-0.009***
2-Year Stock Returns	2904	0.407	11841	0.365	0.042

Table 2.
The Effect of CEO Overconfidence on the Increase/Decrease in Suppliers

This table presents results from logit and conditional logit regressions. In Panel A, the dependent variable is *Suppliers Increase*. *Supplier Increase* is a dummy variable that equates to unity if a firm has more dependent suppliers in year t than it has in t-1, and equates to zero otherwise. Dependent suppliers are defined according to SFAS 14. The key independent variables are *CEO Overconfidence Up* and *Holder 67*. *CEO Overconfidence* is per-option value of CEO's vested and unexercised options scaled by average strike price (Campbell et al., 2011; Malmendier, Tate, and Yan, 2011; Hirshleifer, Low, and Teoh, 2012). *CEO Overconfidence Up* is a dummy variable that equates to unity if the continuous *CEO Overconfidence* in year t is in the top quartile of the sample and *CEO Overconfidence* in t-1 is not in the top quartile of the sample, and equates to zero otherwise. *Holder 67* is a dummy variable which equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. Columns (1) and (2) present results from a logit model while Columns (3) and (4) present results from a conditional logit model. In Panel B, we add *Suppliers Decrease* as a dependent variable. *Suppliers Decrease* is defined symmetrically to *Suppliers Increase* (see above). Apart from *CEO Overconfidence* and *CEO Overconfidence Up*, we add *Overconfidence Trade Up* and *CEO Overconfidence Down* as key independent variables. Following Kolasinski and Li (2013), *OC Trade* is a dummy variable that equates to unity in year t if the CEO's purchases over the next 2 years have negative 180-day BHARs on average, and equates to zero otherwise. BHARs are benchmarked against returns of Fama-French size-decile portfolios, and equates to zero otherwise. *Overconfidence Trade Up* is an indicator that switches on if *OC Trade Up* is zero in year t-1 and is unity in year t. *CEO Overconfidence Down* is defined symmetrically to *CEO Overconfidence* Up. Variables definitions are in Appendix 1. Robust standard errors are reported in parentheses. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 2. (Continued)
Panel A. Baseline Specifications of Supplier Commitment

	(1) LOGIT: Suppliers Increase	(2) LOGIT: Suppliers Increase	(3) C-LOGIT: Suppliers Increase	(4) C-LOGIT: Suppliers Increase
Holder 67 $_{t-1}$	0.261***	0.165**		
	(0.085)	(0.080)		
CEO Overconfidence Up $_{t-1, t}$			0.517***	0.367***
			(0.113)	(0.121)
CEO Stock Ownership $_{t-1, t}$		-0.006	-0.008	0.004
		(0.010)	(0.011)	(0.013)
Log (Total Assets $_{t-1}$)		0.799***	0.811***	-0.107
		(0.034)	(0.042)	(0.066)
Leverage $_{t-1}$		-0.389*	-0.397*	0.050
		(0.209)	(0.231)	(0.304)
Market-to-Book Ratio $_{t-1}$		0.042***	0.041**	0.014
		(0.014)	(0.016)	(0.009)
Return on Assets $_{t-1}$		0.251	0.445	0.683
		(0.433)	(0.386)	(0.621)
Sales Growth $_{t-2, t-1}$		0.314**	0.403***	0.388**
		(0.148)	(0.140)	(0.188)
Capital Expenditure $_{t-1}$		1.164*	1.009	1.806**
		(0.658)	(0.951)	(0.731)
R&D $_{t-1}$		5.052***	4.908***	3.948***
		(0.747)	(0.627)	(0.808)
Missing R&D $_{t-1}$		0.229	0.202	0.354
		(0.152)	(0.145)	(0.609)
Log (1 + CEO Tenure $_{t-1}$)		-0.025	0.017	0.001
		(0.109)	(0.107)	(0.107)
Cash $_{t-1}$		0.257	0.264	-0.693
		(0.329)	(0.339)	(0.443)
ROA Volatility $_{t-3, t-1}$		0.914	0.915*	0.401
		(0.676)	(0.501)	(0.603)
Log (2-Year Stock Returns $_{t-2, t-1}$)		-0.025	-0.014	0.028
		(0.075)	(0.101)	(0.100)
Acquisitions $_{t-1, t}$		0.013	0.006	-0.055
		(0.078)	(0.083)	(0.087)
Num. Suppliers $_{t-1}$		-0.015**	-0.016**	-0.126***
		(0.006)	(0.007)	(0.031)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	Yes	No	No
Observations	14,745	14,745	11,040	5,285
Pseudo R-squared	0.071	0.206	0.188	0.034
Industry-year strata	No	No	Yes	No
Firm strata	No	No	No	Yes
Firm cluster	Yes	Yes	No	No
Industry cluster	No	No	Yes	Yes

Table 2. (Continued)
Panel B. Alternative Specifications of Supplier Commitment

	(1) C-LOGIT: Suppliers Increase	(2) C-LOGIT: Suppliers Increase[#]	(3) C-LOGIT: Suppliers Decrease	(4) C-LOGIT: Suppliers Decrease
CEO Overconfidence $_{t-1}$	0.908***			
	(0.199)			
Overconfidence Trade Up $_{t-1, t}$		0.199**		
		(0.099)		
CEO Overconfidence Up $_{t-1, t}$			0.155	0.092
			(0.129)	(0.127)
CEO Overconfidence Down $_{t-1, t}$			0.401**	0.303**
			(0.169)	(0.144)
CEO Stock Ownership $_{t-1, t}$	-0.002	0.007	-0.026***	-0.014
	(0.012)	(0.010)	(0.008)	(0.018)
Log (Total Assets $_{t-1}$)	-0.111*	-0.154**	0.705***	0.273***
	(0.066)	(0.067)	(0.108)	(0.092)
Leverage $_{t-1}$	0.204	0.131	-0.232	0.424
	(0.249)	(0.289)	(0.211)	(0.395)
Market-to-Book Ratio $_{t-1}$	-0.007	0.017	0.025**	-0.000
	(0.010)	(0.011)	(0.011)	(0.021)
Return on Assets $_{t-1}$	0.497	0.718*	-0.660	-1.113**
	(0.461)	(0.418)	(0.408)	(0.491)
Sales Growth $_{t-2, t-1}$	0.358**	0.435**	-0.682***	-0.412*
	(0.156)	(0.180)	(0.134)	(0.229)
Capital Expenditure $_{t-1}$	1.102	1.241**	1.478*	0.199
	(0.722)	(0.618)	(0.836)	(1.038)
R&D $_{t-1}$	3.203***	2.655***	5.044***	0.564
	(0.751)	(0.775)	(0.666)	(1.601)
Missing R&D $_{t-1}$	0.188	0.344	0.146	-0.056
	(0.594)	(0.624)	(0.176)	(0.367)
Log (1 + CEO Tenure $_{t-1}$)	-0.063	0.003	0.151	0.081
	(0.087)	(0.086)	(0.126)	(0.158)
Cash $_{t-1}$	-0.497	-0.569	-0.062	-0.171
	(0.397)	(0.353)	(0.370)	(0.640)
ROA Volatility $_{t-3, t-1}$	0.402	0.012	-0.340	-1.942***
	(0.583)	(0.498)	(0.788)	(0.452)
Log (2-Year Stock Returns $_{t-2, t-1}$)	-0.133	-0.063	-0.103	0.092
	(0.097)	(0.082)	(0.092)	(0.101)
Acquisitions $_{t-1, t}$	-0.091	-0.074	0.052	-0.095
	(0.080)	(0.088)	(0.077)	(0.061)
Num. Suppliers $_{t-1}$	-0.131***	-0.127***	0.055	0.548***
	(0.031)	(0.030)	(0.068)	(0.174)
Observations	5,575	5,629	11,684	5,583
Pseudo R-squared	0.035	0.029	0.213	0.130
Firm strata	Yes	Yes	No	Yes
Industry-year strata	No	No	Yes	No
Industry cluster	Yes	Yes	Yes	Yes

[#]Sample begins from year 1996 (inclusive) onwards because the sample is substantially smaller prior to 1996.

Table 3.
The Effect of CEO Overconfidence on the Start/End of Supplier Network

This table presents results from logit and conditional logit regressions. The dependent variable is *Start of Supplier Network*. *Start of Supplier Network* is a dummy variable that equates to unity when the firm has at least one dependent supplier in year t and none in t-1, and equates to zero otherwise. Dependent suppliers are defined according to SFAS 14. The key independent variables are *CEO Overconfidence Up* and *Holder 67*. *CEO Overconfidence* is per-option value of CEO's vested and unexercised options scaled by average strike price (Campbell et al., 2011; Malmendier, Tate, and Yan, 2011; Hirshleifer, Low, and Teoh, 2012). *CEO Overconfidence Up* is a dummy variable that equates to unity if the continuous *CEO Overconfidence* in year t is in the top quartile of the sample and *CEO Overconfidence* in t-1 is not in the top quartile of the sample, and equates to zero otherwise. *Holder 67* is a dummy variable which equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. Columns (1) and (2) present results from a logit model while Columns (3) and (4) present results from a conditional logit model. Variable definitions are in Appendix 1. Robust standard errors are reported in parentheses. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 3. (Continued)

	(1) LOGIT: Start Supp. Network	(2) LOGIT: Start Supp. Network	(3) C-LOGIT: Start Supp. Network	(4) C-LOGIT: Start Supp. Network
Holder 67 $_{t-1}$	0.241**	0.178*		
	(0.096)	(0.106)		
CEO Overconfidence Up $_{t-1, t}$			0.436***	0.305**
			(0.128)	(0.149)
CEO Stock Ownership $_{t-1, t}$		-0.018	-0.017	0.004
		(0.013)	(0.013)	(0.015)
Log (Total Assets $_{t-1}$)		0.318***	0.328***	-0.235***
		(0.036)	(0.046)	(0.085)
Leverage $_{t-1}$		0.075	0.143	0.163
		(0.255)	(0.319)	(0.333)
Market-to-Book Ratio $_{t-1}$		0.024	0.015	0.027*
		(0.018)	(0.020)	(0.016)
Return on Assets $_{t-1}$		0.109	0.532	0.367
		(0.522)	(0.423)	(0.629)
Sales Growth $_{t-2, t-1}$		0.428**	0.494**	0.550**
		(0.173)	(0.206)	(0.254)
Capital Expenditure $_{t-1}$		-0.362	-0.327	-0.799
		(0.797)	(1.666)	(1.267)
R&D $_{t-1}$		3.224***	3.182***	2.449***
		(0.908)	(0.589)	(0.872)
Missing R&D $_{t-1}$		-0.037	-0.059	0.565
		(0.169)	(0.176)	(0.517)
Log (1 + CEO Tenure $_{t-1}$)		0.007	0.097	0.145
		(0.136)	(0.172)	(0.160)
Cash $_{t-1}$		-0.187	-0.257	-0.503
		(0.387)	(0.344)	(0.663)
ROA Volatility $_{t-3, t-1}$		0.366	0.534	-1.036
		(0.855)	(0.565)	(0.828)
Log (2-Year Stock Returns $_{t-2, t-1}$)		-0.018	-0.038	-0.027
		(0.090)	(0.110)	(0.083)
Acquisitions $_{t-1, t}$		-0.014	-0.006	-0.123
		(0.100)	(0.096)	(0.104)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	Yes	No	No
Observations	14,731	14,731	9,054	4,040
Pseudo R-squared	0.027	0.056	0.045	0.017
Industry-year strata	No	No	Yes	No
Firm strata	No	No	No	Yes
Firm cluster	Yes	Yes	No	No
Industry cluster	No	No	Yes	Yes

Table 4.
The Effect of CEO Overconfidence on Suppliers in Industries with High Relationship-Specific Investment

This table presents results from conditional logit regressions. The dependent variables are *Suppliers Increase* and *Start of Supplier Network*. *Suppliers Increase* is a dummy variable that equates to unity if a firm has more dependent suppliers in year t than it has in t-1, and equates to zero otherwise. *Start of Supplier Network* is a dummy variable that equates to unity when the firm has at least one dependent supplier in year t and none in t-1, and equates to zero otherwise. The key independent variable in Panel A and Panel C is *Holder 67*. *Holder 67* is a dummy variable that equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. The key independent variable in Panel B and Panel D is *CEO Overconfidence Up*. *CEO Overconfidence* is per-option value of CEO's vested and unexercised options scaled by average strike price (Campbell et al., 2011; Malmendier, Tate, and Yan, 2011; Hirshleifer, Low, and Teoh, 2012). *CEO Overconfidence Up* indicator is a dummy variable that equates to unity if the continuous *CEO Overconfidence* measure in year t is in the top quartile of the sample and *CEO Overconfidence* in t-1 is not in the top quartile of the sample, and equates to zero otherwise. In Panel A and Panel B, we split the manufacturing firms into (i) durable (SIC 3400-3999), and (ii) non-durable (SIC 2000-3399) manufacturing industry types following Titman and Wessels (1988). In Panel C and Panel D, we split the manufacturing firms by industry-level relationship-specificity according to the year 1997 contract intensity variable from Nunn (2007). An industry is classified as High (Low) RSI if its industry contract intensity is above (below) the sample median. Variable definitions are in Appendix 1. Robust standard errors are reported in parentheses. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 4. (Continued)

Panel A. Durable/Non-Durable Manufacturing Industries Subsample Analysis

	(1) LOGIT: Suppliers Increase	(2) LOGIT: Suppliers Increase	(3) LOGIT: Start Supp. Network	(4) LOGIT: Start Supp. Network
Industry Type	Durable	Non-Durable	Durable	Non-Durable
Holder 67 $_{t-1}$	0.225*	-0.011	0.308*	-0.055
	(0.136)	(0.171)	(0.187)	(0.224)
Control variables	Yes	Yes	Yes	Yes
Observations	4,946	4,037	4,946	4,037
Pseudo R-squared	0.219	0.241	0.069	0.073
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Firm cluster	Yes	Yes	Yes	Yes

Panel B. Durable/Non-Durable Manufacturing Industries Subsample Analysis

	(1) C-LOGIT: Suppliers Increase	(2) C-LOGIT: Suppliers Increase	(3) C-LOGIT: Start Supp. Network	(4) C-LOGIT: Start Supp. Network
Industry Type	Durable	Non-Durable	Durable	Non-Durable
CEO Overconfidence Up $_{t-1,\,t}$	0.559***	0.249	0.564***	-0.207
	(0.210)	(0.271)	(0.149)	(0.249)
Control variables	Yes	Yes	Yes	Yes
Observations	1,771	1,411	1,372	1,032
Pseudo R-squared	0.042	0.070	0.026	0.028
Firm strata	Yes	Yes	Yes	Yes
Industry cluster	Yes	Yes	Yes	Yes

Table 4. (Continued)

Panel C. High/Low RSI Manufacturing Industries Subsample Analysis

	(1) LOGIT: Suppliers Increase	(2) LOGIT: Suppliers Increase	(3) LOGIT: Start Supp. Network	(4) LOGIT: Start Supp. Network
Relationship Specificity	High	Low	High	Low
Holder 67 $_{t-1}$	0.299*	0.060	0.458**	0.046
	(0.164)	(0.176)	(0.219)	(0.233)
Control variables	Yes	Yes	Yes	Yes
Observations	4,472	4,057	4,472	4,057
Pseudo R-squared	0.210	0.251	0.083	0.070
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Firm cluster	Yes	Yes	Yes	Yes

Panel D. High/Low RSI Manufacturing Industries Subsample Analysis

	(1) C-LOGIT: Suppliers Increase	(2) C-LOGIT: Suppliers Increase	(3) C-LOGIT: Start Supp. Network	(4) C-LOGIT: Start Supp. Network
Relationship Specificity	High	Low	High	Low
CEO Overconfidence Up $_{t-1,\,t}$	0.340**	0.382	0.464***	0.040
	(0.140)	(0.358)	(0.096)	(0.334)
Control variables	Yes	Yes	Yes	Yes
Observations	1,583	1,221	1,231	939
Pseudo R-squared	0.045	0.073	0.027	0.028
Firm strata	Yes	Yes	Yes	Yes
Industry cluster	Yes	Yes	Yes	Yes

Table 5.
The Effect of CEO Overconfidence on Relationship Specific Investment

This table presents results from OLS regressions. The unit of observation in this table is a customer-supplier pair in a year. The dependent variable in Panel A is *Supplier R&D Intensity*. For each observation, we compute the value of R&D activity of the supplier that is attributable to the customer by multiplying the R&D expenses of the supplier by *Supplier Sales Dependency*. *Supplier Sales Dependency* is defined as the ratio of supplier-to-customer pair sales to total supplier sales. Subsequently, we compute *Supplier R&D Intensity* by normalizing the above by total assets of the supplier since larger suppliers may have a greater capacity to commit more resources towards R&D activities. Finally, values of *Supplier R&D Intensity* are inflated by a factor of 1000. We apply the logarithmic transformation to *Supplier R&D Intensity* in the regressions. The key independent variable in this table is *Holder 67*. *Holder 67* is a dummy variable that equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. In Columns (3) and (4), we split the sample by the *Supplier-Customer Size Ratio*. For each customer-supplier pair in a year, *Supplier-Customer Size Ratio* is computed as the ratio of total assets of the supplier to that of the customer. Therefore, smaller values of *Supplier-Customer Size Ratio* imply that the supplier is smaller than the customer. *Supplier-Customer Size Ratio* is defined to be small (big) if it is lower (higher) than the SIC 2-digit industry median value. Variable definitions are in Appendix 1. Robust standard errors are reported in parentheses. Where multiple fixed effects are deployed, singleton observations are eliminated from the sample. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 5. (Continued)

	(1) OLS: Supp. R&D Intensity	(2) OLS: Supp. R&D Intensity	(3) OLS: Supp. R&D Intensity	(4) OLS: Supp. R&D Intensity
Supplier-Customer Size Ratio	All	All	Small	Big
Holder 67 $_{t-1}$	0.110***	0.071*	0.148***	-0.014
	(0.042)	(0.039)	(0.046)	(0.048)
Customer Control Variables				
Stock Ownership $_{t-1}$	0.110***	0.071*	0.148***	-0.014
	(0.042)	(0.039)	(0.046)	(0.048)
Log (Market Cap $_{t-1}$)	0.022***	0.021***	0.035***	0.017**
	(0.008)	(0.007)	(0.011)	(0.008)
Leverage $_{t-1}$	0.007	0.055***	0.059**	-0.021
	(0.020)	(0.018)	(0.026)	(0.025)
M/B Ratio $_{t-1}$	-0.547***	-0.419***	-0.460***	-0.575***
	(0.135)	(0.125)	(0.160)	(0.168)
Return on Assets $_{t-1}$	0.007	-0.000	-0.004	0.014
	(0.008)	(0.007)	(0.009)	(0.009)
Sales Growth $_{t-2,\ t-1}$	0.254	0.283	0.542	0.314
	(0.360)	(0.338)	(0.429)	(0.419)
Capital Expenditure $_{t-1}$	0.263**	0.254**	0.133	0.299**
	(0.115)	(0.106)	(0.140)	(0.120)
R&D $_{t-1}$	-1.494***	-1.279***	-1.453**	-0.209
	(0.519)	(0.481)	(0.647)	(0.583)
Missing R&D $_{t-1}$	4.903***	4.057***	3.672***	4.055***
	(0.585)	(0.519)	(0.761)	(0.627)
Log (1 + CEO Tenure $_{t-1}$)	-0.126	-0.099	-0.070	-0.128
	(0.097)	(0.089)	(0.117)	(0.105)
Cash $_{t-1}$	-0.071	-0.065	-0.038	-0.071
	(0.055)	(0.049)	(0.060)	(0.060)
ROA Volatility $_{t-3,\ t-1}$	0.815***	0.750***	0.583*	0.798***
	(0.249)	(0.241)	(0.324)	(0.291)
Cust. Num. Suppliers $_{t-1}$	-0.273	-0.274	-1.223	0.525
	(0.599)	(0.558)	(0.811)	(0.673)
Log (2-Year Stock Returns $_{t-2,\ t-1}$)	0.006***	0.006***	0.003***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Acquisitions $_{t-1}$	-0.060	-0.010	-0.054	0.013
	(0.042)	(0.040)	(0.046)	(0.054)
Supplier Control Variables				
Leverage $_{t-1}$		-0.935***	-0.590***	-1.013***
		(0.065)	(0.086)	(0.094)
M/B Ratio $_{t-1}$		0.026***	0.014***	0.029***
		(0.003)	(0.004)	(0.005)
Return on Assets $_{t-1}$		-0.928***	-0.894***	-1.106***
		(0.065)	(0.072)	(0.128)

Table 5. (Continued)

	(1)	(2)	(3)	(4)
Sales Growth $_{t-2,\ t-1}$		0.068***	0.075**	0.024
		(0.024)	(0.030)	(0.041)
Capital Expenditure $_{t-1}$		-0.001***	-0.009***	-0.001***
		(0.000)	(0.001)	(0.000)
Cash $_{t-1}$		0.001***	0.002***	0.000***
		(0.000)	(0.001)	(0.000)
ROA Volatility $_{t-3,\ t-1}$		0.771***	0.702***	0.783***
		(0.080)	(0.090)	(0.155)
Log (Market Cap $_{t-1}$)		-0.072***	0.004	0.005
		(0.009)	(0.017)	(0.018)
Observations	12,002	12,002	6,159	5,836
R-squared	0.277	0.364	0.338	0.402
Industry fixed effects	Yes	Yes	Yes	Yes
Customer-year cluster	Yes	Yes	Yes	Yes

Table 6.

The Effect of CEO Overconfidence on Durations of Customer-Supplier Relationships

This table presents results from Andersen-Gill Cox regressions (Andersen and Gill, 1982). The Andersen-Gill extension of the Cox model is designed to study multiple ordered events. In our dataset, a given customer-supplier relationship may end at a particular time point and restart in the future. Therefore, the start of a customer-supplier relationship is either the first time the relationship is documented in the Compustat business segment file or the earliest year in which the previously-terminated relationship is restarted. For analysis in STATA, a customer-supplier pair with one previous termination and one restart is represented as 2 relationships (observations) in the dataset. Following Fee, Hadlock, and Thomas (2006), if a relationship ends because the supplier/customer becomes inactive in Compustat or if the relationship lasts up till the final year of the sample period (2012), we treat the length of relationship as being right-censored. The key independent variables are *Holder 67 Relationship*, *Beginning Supplier R&D Intensity*, and *Beginning Sales Dependency*, and *Beginning Size Ratio.* A relationship is classified as a *Holder 67 Relationship* if a *Holder 67* customer CEO is incumbent between the start (inclusive) and end (exclusive) of the relationship. Since a *Holder 67 Relationship* may take at least 2 years to be established, we only include relationships that begin on or after 1995. *Beginning Supplier R&D Intensity*, *Beginning Sales Dependency* and *Beginning Size Ratio* are the values of *Supplier R&D* Intensity, *Sale Dependency*, and *Supplier-Customer Size Ratio* in the first year of the relationship respectively. Readers may refer to Appendix I or previous tables for definitions of *Holder 67*, *Supplier R&D Intensity*, *Sales Dependency*, and *Supplier-Customer Size Ratio.* In Columns (2) to (5), we also include all supplier and customer control variables used in Table 5. These control variables matched to the first year of the relationship. To verify that the assumption of hazard proportionality between *Holder 67 Relationships* and non-*Holder 67 Relationships* is satisfied, we include interactions of covariates with time in Columns (4) and (5). We allow customer-supplier relationships to end and restart in Columns (1) to (4). In Column (5), we restrict the sample to customer-supplier relationships with no restarts. Variable definitions are in Appendix 1. Clustered standard errors are reported in parentheses. Estimated coefficients of supplier and customer control variables are not presented in the table to facilitate presentation. These control variables are customer CEO stock ownership, customer CEO tenure, market capitalization, leverage, market-to-book ratio, ROA, sales growth, capital expenditure, R&D expenditure, cash, ROA volatility, number of suppliers, 2-year stock returns, and M&A activities. Estimated coefficients are presented as hazard ratios. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 6. (Continued)

	(1) Andersen-Gill Cox Model	(2) Andersen-Gill Cox Model	(3) Andersen-Gill Cox Model	(4) Andersen-Gill Cox Model	(5) Andersen-Gill Cox Model
Relationship Restarts Allowed	Yes	Yes	Yes	Yes	No
Main Covariates					
Holder 67 Relationship $_{s,i}$	0.892***	0.825***	0.803***	0.708***	0.660***
	(0.036)	(0.042)	(0.044)	(0.089)	(0.098)
Beginning Size Ratio $_{s,i}$			1.067	1.317	1.529**
			(0.084)	(0.239)	(0.325)
Beginning Supp. R&D Intensity $_{s,i}$			1.019	1.031	1.042
			(0.022)	(0.049)	(0.060)
Beginning Sales Dependency $_{s,i}$			0.781***	0.743***	0.675***
			(0.030)	(0.067)	(0.073)
Supp. & Cust. Controls	No	Yes	Yes	Yes	Yes
Interactions with Time					
Holder 67 Relationship $_{s,i}$				1.010	1.012
				(0.013)	(0.015)
Beginning Supp. R&D Intensity $_{s,i}$				0.999	0.998
				-0.005	(0.006)
Beginning Sales Dependency $_{s,i}$				1.006	1.010
				(0.009)	(0.011)
Beginning Size Ratio $_{s,i}$				0.982	0.967
				(0.018)	(0.021)
Supp. & Cust. Controls				Yes	Yes
Observations	4,974	3,579	3,060	3,060	2,208
Unique customer-supplier pairs	4,427	3,181	2,736	2,736	2,208
Customer-supplier pair-years	14,502	10,604	8,958	8,958	6,185
Log likelihood	-19,341	-13,445	-11,167	-11,142	-7,029

Table 7.
Do Overconfident CEOs Overpay Suppliers?

This table presents results from OLS regressions. The dependent variables are *Input Costs* and *Markup Percentage*. *Input Costs* is the ratio of the difference between total sales and cost of goods sold (COGS) to total sales. *Markup Percentage* is the ratio of the difference between total sales and COGS to COGS. The key independent variable is *Holder 67*. *Holder 67* is a dummy variable which equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. We restrict the sample to only include firms with at least 1 supplier in the current year and at least 1 supplier in the preceding year. Variable definitions are in Appendix 1. Robust standard errors are reported in parentheses. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 7. (Continued)

	(1) OLS: Input Costs	(2) OLS: Markup Percentage
Holder 67 $_{t-1}$	-0.014*	0.164***
	(0.008)	(0.049)
CEO Stock Ownership $_{t-1, t}$	0.001	-0.004
	(0.001)	(0.004)
Log (Total Assets $_{t-1}$)	0.004	0.007
	(0.003)	(0.023)
Leverage $_{t-1}$	-0.003	-0.109
	(0.024)	(0.153)
Market-to-Book Ratio $_{t-1}$	-0.008***	0.043***
	(0.001)	(0.011)
Return on Assets $_{t-1}$	-0.504***	2.790***
	(0.056)	(0.507)
Sales Growth $_{t-2, t-1}$	0.093***	-0.143
	(0.020)	(0.135)
Capital Expenditure $_{t-1}$	-0.050	-0.291
	(0.105)	(0.759)
R&D $_{t-1}$	-1.519***	9.640***
	(0.094)	(1.176)
Missing R&D $_{t-1}$	-0.006	0.008
	(0.022)	(0.146)
Log (1 + CEO Tenure $_{t-1}$)	-0.008	0.014
	(0.009)	(0.067)
Cash $_{t-1}$	0.145***	-0.980**
	(0.053)	(0.465)
ROA Volatility $_{t-3, t-1}$	-0.173**	1.778***
	(0.075)	(0.639)
Num. Suppliers $_{t-1}$	0.001***	-0.005***
	(0.000)	(0.002)
Log (2-Year Stock Returns $_{t-2, t-1}$)	0.030***	-0.216***
	(0.008)	(0.069)
Acquisitions $_{t-1, t}$	-0.013*	0.097
	(0.008)	(0.075)
Observations	2,244	2,244
R-squared	0.653	0.534
Industry-year fixed effects	Yes	Yes
Industry-year cluster	Yes	Yes

Table 8.
Does the Manner of Leadership Matter?

This table presents results from logit regressions. The dependent variable is *Suppliers Increase*. *Supplier Increase* is a dummy variable that equates to unity if a firm has more dependent suppliers in year t than it has in t-1, and equates to zero otherwise. Dependent suppliers are defined according to SFAS 14. The key independent variables are *CEO Media Positivity* and *Holder 67*. *CEO Media Positivity* is a dummy variable that equates to unity if the number of articles containing references to confidence is more than the number of articles containing references to non-confidence during the year, and equates to zero otherwise (Banerjee, Humphrey-Jenner, and Nanda, 2015). Missing values of *CEO Media Positivity* are set to zero. *Holder 67* is a dummy variable which equates to unity if the CEO's vested option holdings are at least 67% in-the-money on at least 2 instances (Malmendier and Tate, 2005; Malmendier et al., 2011), and equates to zero otherwise. *Holder 67* switches from zero to unity from the first such instance. We use firms of all industry types in Columns (1) and (2). In Columns (3) and (4), we split the manufacturing firms into (i) durable (SIC 3400-3999), and (ii) non-durable (SIC 2000-3399) manufacturing industry types following Titman and Wessels (1988). Variables are described in Appendix 1. Robust standard errors are reported in parentheses. ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Table 8. (Continued)

	(1) LOGIT: Suppliers Increase	(2) LOGIT: Suppliers Increase	(3) LOGIT: Suppliers Increase	(4) LOGIT: Suppliers Increase
Industry Type	All	All	Durable	Non-Durable
CEO Media Positivity $_{t-1}$	0.038	0.032	0.004	-0.122
	(0.152)	(0.152)	(0.257)	(0.336)
Holder 67 $_{t-1}$		0.228**	0.323*	0.006
		(0.109)	(0.195)	(0.229)
CEO Stock Ownership $_{t-1, t}$	-0.019	-0.021	0.027	-0.032
	(0.021)	(0.021)	(0.022)	(0.036)
Log (Total Assets $_{t-1}$)	0.801***	0.804***	1.078***	1.032***
	(0.045)	(0.045)	(0.095)	(0.107)
Leverage $_{t-1}$	-0.478	-0.452	-1.002**	-0.430
	(0.294)	(0.293)	(0.399)	(0.710)
Market-to-Book Ratio $_{t-1}$	0.043**	0.038**	0.002	-0.021
	(0.019)	(0.019)	(0.035)	(0.036)
Return on Assets $_{t-1}$	0.073	0.038	-0.131	2.606*
	(0.616)	(0.617)	(0.927)	(1.394)
Sales Growth $_{t-2, t-1}$	0.444**	0.420*	-0.035	0.473
	(0.224)	(0.225)	(0.442)	(0.392)
Capital Expenditure $_{t-1}$	0.477	0.335	-2.061	-3.458
	(1.052)	(1.056)	(2.226)	(3.294)
R&D $_{t-1}$	5.077***	4.938***	6.282***	10.993***
	(1.161)	(1.169)	(1.855)	(2.437)
Missing R&D $_{t-1}$	0.318	0.300	0.955**	0.002
	(0.203)	(0.202)	(0.382)	(0.272)
Log (1 + CEO Tenure $_{t-1}$)	0.137	0.067	0.118	-0.022
	(0.156)	(0.156)	(0.263)	(0.276)
Cash $_{t-1}$	0.295	0.296	1.095	-1.039
	(0.478)	(0.475)	(0.795)	(0.908)
ROA Volatility $_{t-3, t-1}$	0.658	0.665	-0.534	1.016
	(0.889)	(0.891)	(1.551)	(1.482)
Log (2-Year Stock Returns $_{t-2, t-1}$)	-0.054	-0.066	-0.058	0.529**
	(0.104)	(0.104)	(0.196)	(0.245)
Acquisitions $_{t-1, t}$	-0.034	-0.043	-0.106	-0.181
	(0.106)	(0.106)	(0.204)	(0.194)
Num. Suppliers $_{t-1}$	-0.011**	-0.010*	-0.060***	-0.209***
	(0.005)	(0.005)	(0.020)	(0.077)
Observations	7,923	7,923	2,799	1,959
Pseudo R-squared	0.213	0.214	0.240	0.291
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Firm cluster	Yes	Yes	Yes	Yes