CEO Option Compensation Can Be a Bad Option: Evidence from Product Market Relationships

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Abstract

This paper studies how firms' important customer relationships can affect the choice of CEO compensation structure. We hypothesize that having major customers raises the costs associated with CEO risk-taking incentives, leading to lower option-based compensation. Using import tariff cuts as exogenous shocks to customer relationships, we find firms with major customers significantly reduce CEO option-based compensation following tariff reductions. We also document that following tariff cuts, the value of these relationships as well as the firm itself significantly decline in response to higher option compensation. Our study provides new insights into how important stakeholders shape executive compensation decisions.

Keywords: Compensation, Firm Performance, Product Market, Risk Taking, Supply Chain

JEL Classifications: G30, J33, L22

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This paper studies how firms' important customer relationships can affect the choice of CEO compensation structure. We hypothesize that having major customers raises the costs associated with CEO risk-taking incentives, leading to lower option-based compensation. Using import tariff cuts as exogenous shocks to customer relationships, we find firms with major customers significantly reduce CEO option-based compensation following tariff reductions. We also document that following tariff cuts, the value of these relationships as well as the firm itself significantly decline in response to higher option compensation. Our study provides new insights into how important stakeholders shape executive compensation decisions.

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1. Introduction

Option compensation is an important component of executive pay in the United States. By providing convex payoffs, option-based compensation is viewed as a standard mechanism to reduce manager risk-aversion and encourage value-enhancing risk-taking.[1] While stock options can better align CEO and shareholder interests, they are also associated with less desirable effects. By increasing executive risk-taking incentives, CEO stock option compensation can raise a firm's risk of financial distress and intensify conflicts of interests between shareholders and other key stakeholders with debt or debt-like claims (for example, see John and John, 1993; Opler and Titman, 1994; Berger, Ofek, and Yermack, 1997; Kuang and Qin, 2013).

Production is a fundamental function of the firm and preserving valuable product market relationships, such as major customers, is crucial to firm value. In the United States, nearly half of public firms depend on at least one large customer for a substantial portion of their sales, i.e. representing at least 10% of sales (Ellis, Fee, and Thomas, 2012). Prior literature suggests that suppliers commonly make relationship-specific investments in their major customer relationships and the health of these valuable trading relationships can significantly affect firm value.[2] Once these investments are made, a supplier faces substantial losses if its major customer terminates the trading relationship.

While recent evidence suggests that important product-market relationships affect a firm's corporate governance by increasing the incidence of anti-takeover provisions so as to reduce a firm's takeover likelihood (Johnson, Karpoff, and Yi, 2015; Cen, Dasgupta, and Sen, 2016; Cremers, Litov, and Sepe, 2017; Harford, Schonlau, and Stanfield, 2017) and that increasing debtholder bargaining power leads firms to reduce the risk-taking incentives of its executives (Akins et al., 2017), we are the first to examine how the bargaining power of important product market relationships affects executive compensation. As a nexus of the contracting relationships among stakeholders, a firm's bargaining position relative to its

[1] For example, see Defusco, Johnson, and Zorn (1990), Mehran (1992), Tufano (1996), Guay (1999), Cohen, Hall, and Viceira (2000), Knopf, Nam, and Thornton (2002), Coles, Daniel, and Naveen (2006), Low (2009), Dong, Wang, and Xie (2010), Gormley, Matsa, and Milbourn (2013), and Shue and Townsend (2014).
[2] Classical works in this area include Titman (1984), Joskow (1988) and Titman and Wessels (1988).

stakeholders determines the economic rents it captures from these relationships over time and is a major component of firm value (Jensen and Meckling, 1976). Therefore, in selecting a CEO compensation structure to maximize shareholder value, boards should take into account the impact that CEO risk-taking incentives have on its other significant stakeholder relationships (John and John, 1993).

We hypothesize that having concentrated customers raises the costs associated with granting CEOs option compensation, leading to lower risk-taking incentives of option compensation. The existing literature finds that CEO stock option compensation leads to increased leverage, and thus also increases the likelihood of financial distress and credit ratings downgrades.[3] However, an important indirect cost of financial distress is the expected loss of customers as the probability of financial distress increases. Customers face heightened uncertainty about a supplier's reliability in terms of product quality and timeliness of product deliveries and servicing as the supplier firm becomes riskier.[4] Thus, CEO option compensation can lead to reduced customer demand for a firm's products and services, thus producing unstable trade relationships. Such unstable customer relationships are particularly costly for firms with concentrated customer bases. Firms with concentrated customers usually make relationship-specific investments for their major customers, and these customer-specific assets will lose value if the customer terminates the trade. Therefore, executive option-based compensation is associated with higher costs for firms with concentrated customers relative to firms with diversified customer bases. As a result, firms with concentrated customers should have a more customer-friendly CEO compensation structure exhibiting lower risk-taking incentives associated with option-based compensation.

Consistent with the above perspective, we expect firms experiencing an exogenous shock that weakens their bargaining power relative to their customers, are likely to experience a larger reduction in CEO stock option compensation when they have a concentrated customer base.

[3] See Mehran (1992); Cohen, Hall, and Viceira (2000); Dong, Wang, and Xie (2010; Kuang and Qin (2013); and Shue and Townsend (2017).
[4] See Klein, Crawford, and Alchian (1978); Williamson (1979); Titman (1984); Opler and Titman (1994); Hortaçsu et al. (2013); Wowak, Mannor, and Wowak (2015).

Williamson (1979) argues that firms optimally adjust governance structures so as to reduce contracting costs with key stakeholders by attenuating incentives towards ex post opportunism. Specifically, these adjustments act as a pre-commitment mechanism against ex post opportunism. Thus, the strength of these adjustments should reflect the importance of these stakeholder relationships and specifically the relative bargaining power of their customers (Hui, Klasa, and Yeung, 2012). This reduction in stock option compensation strengthens the firm's pre-commitment mechanism to avoid ex post opportunism. This in turn reduces the likelihood of relationship termination and the loss in value of relationship-specific investments for firms with concentrated customers.

To test our hypothesis and address endogeneity concerns, we exploit industry-level tariff reductions as quasi-natural experiments. Consistent with the evidence of Martin and Otto (2017), tariff reductions in a supplier firm's industry unexpectedly increase the bargaining power of customers relative to the supplier by intensifying supplier industry competition and reducing customer switching costs to foreign rivals. We find novel evidence that customer considerations have a first-order effect on a CEO's option-based compensation. Following tariff reductions, firms with major customers experience greater reductions in CEO option compensation and risk-taking incentives relative to firms without a large customer.[5] Given the existence of major customers, firms reduce the proportion of annual compensation awarded in the form of stock options by an average of 25.6% following tariff reductions. In an alternative test, we use propensity score matching to correct for endogenous selection across observable factors. We repeat the above analysis on a matched sample and conclude that our findings are robust to this matching approach. Taken together, these empirical results provide strong evidence that customer considerations have a substantial impact on a firm's executive compensation structure.

Our empirical results also provide strong evidence that reducing CEO stock option compensation helps bond a firms' pre-existing relationships with their major customers.

[5] We do not find evidence that this effect is driven by a change in stock volatility for firms with large customers. There is no significant change in the stock volatility of firms with large customers around the tariff reductions. In untabulated tests, we find no evidence that the result is driven by changes in CEOs around these tariff cuts.

Following tariff reductions, a decrease in CEO option-based compensation and risk-taking incentives lead to significantly higher growth in sales to their major customers and a lower probability of relationship termination. We document that this effect also adversely impacts the overall performance of supplier firms. Lower CEO option compensation and risk-taking incentives significantly decrease firm value in the presence of concentrated customers.

We further show that the negative relation between an increase in major customer bargaining power and a supplier CEO's option compensation exhibits significant cross-sectional differences based on customer and supplier characteristics. Specifically, we find our results are centered in supplier firms that have higher leverage, a higher probability of financial distress, higher asset specificity, and greater product differentiation. These results are consistent with the negative link between customer concentration and CEO option-based compensation occurring through the existence of customer-specific assets and financial distress. In addition, the negative link is also centered among firms that have higher industry concentration, a higher fraction of domestic sales, and a higher fraction of sales within the industry subject to tariff shocks. These results suggest that supplier firms where we would expect the greatest increases in competition as a result of tariff cuts significantly reduce option compensation, consistent with a supplier response to the increase in customer bargaining power. We also find stronger results with large corporate (rather than government) customers that are more likely to switch to foreign suppliers. In a series of robustness tests, we rule out several alternative channels driving our results, including a decline in stock prices or an increase in industry risk driving our results.

This study contributes to the existing literature in several ways. First, our study contributes to a growing literature documenting that important stakeholders have real effects on corporate decisions.[6] Several prior studies document that creditor and labor bargaining power affects CEO compensation. John and John (1993) show the important relation between

[6] Large customers affect a firm's takeover probability (Harford, Schonlau, and Stanfield, 2017), the level of takeover protections (Johnson, Karpoff, and Yi, 2015; Cen, Dasgupta, and Sen, 2016), financial leverage (Kale and Shahrur, 2007; Banerjee, Dasgupta, and Kim, 2008); equity issuance (Johnson, Kang, Masulis and Yi, 2017), and equity investments in economically-linked firms (Fee, Hadlock, and Thomas, 2006). Financial distress (Hertzel et al., 2008) and gains from merger activity (Fee and Thomas, 2004) can also spillover from customers to suppliers.

debtholders and executive compensation structure, Edmans and Liu (2011) demonstrate the importance of debt-equity holder conflicts in CEO risk taking, Akins et al. (2017) find that increases in creditor bargaining power leads to reductions in executive option compensation, and Huang et al. (2017) find that labor unions bargaining power influences CEO pay. Despite this prior evidence, there is little existing theoretical or empirical work that examines the impact of large and economically important customer relationships on the choice of CEO compensation contracts. This study helps fill this important gap. We advance our understanding of these issues by showing the importance of product market relationships for firm governance and managerial compensation policies more specifically. Our results also partially support the efficient contracting theory of executive compensation (e.g. Edmans and Gabaix, 2009; Frydman and Jenter, 2010; Murphy, 2013). In response to an increase in customer bargaining power, the board of directors appears to substantially adjust senior manager compensation by reducing risk-taking incentives so as to maintain major product market relationships and stengthen firm performance.

Second, we find that a firm can optimize its governance practices so as to bond their trading relationships. Our findings support Williamson (1979), who argues that firms optimally adjust governance structures so as to reduce contracting costs with key stakeholders, in part by attenuating incentives towards ex post opportunism. Along with Hui, Klasa, and Yeung (2012), Johnson. Karpoff, and Yi (2015), Cen, Dasgupta, and Sen (2015), and Cremers, Litov, and Sepe (2016), we find a new channel through which firms use governance policies as bonding devices. In this context, we investigate how listed firms adjust their governance practices to reassure major customers by altering executive compensation policies. Compared to other governance related bonding mechanisms, adjusting managerial compensation to protect relationship-specific investments is a potentially less costly approach to reassuring major stakeholders.[7] Thus, shareholders should support policies that can enhance shareholder wealth.

[7] Johnson, Karpoff, and Yi (2015), Cen, Dasgupta, and Sen (2016), and Cremers, Litov, and Sepe (2017) find that anti-takeover provisions can serve as a bonding device of important business relationships. Yet, institutional investors generally have strong resistance to anti-takeover proposals.

2. Hypothesis Development

Managerial risk-aversion is a fundamental component of the agency problem associated with separating ownership and control (Jensen and Meckling, 1976; Fama, 1980). In order to mitigate manager's risk-aversion, it is a common practice to give key executives convex payoffs through option-based compensation. Existing studies generally conclude that granting stock options to executives encourages greater risk-taking activity. For instance, it leads to increased leverage (Mehran, 1992; Cohen, Hall, and Viceira, 2000; Dong, Wang, and Xie, 2010; Shue and Townsend, 2017), riskier investment policy (Coles, Daniel, and Naveen, 2006; Low, 2009), discourages hedging (Tufano, 1996; Knopf, Nam, and Thornton, 2002; Rajgopal and Shevlin, 2002), and raises both stock volatility (Defusco, Johnson, and Zorn, 1990; Guay, 1999) and the likelihood of ratings downgrades (Kuang and Qin, 2013). Overall, the past literature suggests that greater risk-taking incentives for senior managers through option grants are associated with more corporate risk-taking, which in turn raises the probability of financial distress.

While CEO stock option compensation can reduce shareholder-manager conflicts, it can impose costs on a firm's customers *ex post* and lead to unstable trade relationships. Specifically, CEO stock option grants can adversely impact a firm's customers by encouraging post-contractual opportunism and increasing the probability of a supplier's financial distress. Supply interruptions and the deterioration of product quality are first-order concerns for a customer. For instance, Maksimovic and Titman (1991) argue that a customer expects to face greater risks of supplier liquidation or change of control when suppliers are financially distressed. A supplier's willingness to produce high-quality products also falls significantly with financial distress, making its customers bear greater uncertainties about both the quantity and quality of products purchased from the supplier (Maksimovic and Titman, 1991). Consistent with the above prediction, Hortaçsu et al. (2013) find that a rise in a supplier's probability of financial distress significantly reduces major consumer demand for its core products. Additionally, Opler and Titman (1994) suggest that the loss of valuable customer relationships to be an important component of the cost of bankruptcy.

CEO stock option compensation can also impose costs on a firm's customers *ex ante*. Given the arguments above, customers should rationally assess supplier risk-taking incentives embedded in their executive compensation plans prior to entering into and throughout the life of any important customer-supplier relationship. Supplier CEO option compensation can reduce its major customer's willingness to pay a higher price for its products (Titman, 1984; Hortaçsu et al., 2013), purchase more goods from the supplier, and maintain pre-existing trading relationships for a longer duration. For example, supplier CEO stock option compensation can discourage RSI by the customer, which reduces the switching costs the customer faces. Therefore, supplier CEO option compensation can also lead to unstable customer relationships *ex ante.*

Unstable trade relationships are particularly costly for firms with a concentrated customer base. Firms with economically large and longer-term trading relationships are more likely to make relationship-specific investments (RSIs) when producing customized products for these customers (Titman, 1984; Joskow, 1988; Titman and Wessels, 1988). Once RSIs are made, a supplier's relationship-specific assets lose value if the large customer terminates the trading relationship. The loss in customer-specific asset value can be substantial and has economically large impacts on supplier profitability. To avoid a loss in value of its RSI, firms with major customers should ceteris paribus reduce risk-taking more than firms with a diversified customer base. Consistent with this conjecture, Kale and Shahrur (2006) and Banerjee, Dasgupta, and Kim (2008) find that both customers and suppliers in bilateral relationships maintain lower leverage to reduce the loss of RSI should the counterparty fail.

Taken together, supplier CEO option compensation can lead to unstable customer-supplier relationships. Due to the existence of customer-specific assets, CEO option compensation is costlier for firms with concentrated customer bases relative to firms with diversified customers. In equilibrium, the level of option compensation is determined by the relative importance of the customer relationship and the relative bargaining power of the supplier/CEO and the customer (Hui, Klasa, and Yeung, 2012; Akins et al., 2017). We predict that following a decline in switching costs for customers and an increase in customer bargaining power relative to that of its supplier, firms with major customer relationships will award their

CEOs lower stock option compensation than firms without large customers. Lower CEO stock option compensation is also predicted to strengthen a firm's relationships with major customers, leading to increases in major customer sales and longer-lasting relationships. We formalize this analysis in the main hypotheses that follow:

Hypothesis 1. *Following a shock that increases customer bargaining power, firms with a major customer experience a larger reduction in CEO stock option compensation than firms without a concentrated customer base.*

Hypothesis 2. *Following a shock that increases customer bargaining power, a decrease in CEO stock option compensation is predicted to strengthen a firm's relationships with its major customers.*

3. Data and Empirical Methodology

3.1. Data

3.1.1. Compensation Data

We extract executive compensation data from the Execucomp database from 1992-2005. Stock volatility is calculated from daily stock returns taken from CRSP and calculated over the prior fiscal year, and annual dividend yields are taken from Compustat and averaged over the past three years. We use this information to calculate the Black-Scholes values of stock options after accounting for expected annual dividends. To be consistent with the treatment in Execucomp, we winsorize return volatilities and dividend yields at the 5th and 95th percentiles.

Tariff reductions may reduce the value of supplier firms by increasing competition for customers and the value of a supplier CEO's options may decrease after tariff cuts, even if the number of options or option granting behavior is unchanged. As a result, a decline in value of total option grants may not represent firms actively decreasing option compensation to act as a pre-commitment mechanism as predicted by our hypothesis, but rather through a stock price channel. Therefore, we use *Flow Vega* as the primary measure of CEO risk-taking incentives of option compensation. We define *Flow Vega* as the dollar change in the executive's current

annual option grants (and not total option portfolio) for a one percent change in the annualized standard deviation of the stock's daily returns. This measure captures changes in the risk-taking incentives given by new option grants and not the value of preexisting grants. We also define an alternative measure, *Pct Option*, as the portion of CEO compensation comprised of stock options, which is calculated from the *ex ante* value of stock options as a fraction of *ex ante* annual total compensation. The portion of CEO compensation measures the use of options to remunerate executives and reflects risk-taking incentives that can be easily interpreted from a firm's financial reports.

In a series of robustness checks, we also use the following alternative measures of CEO option compensation: (1) *Vega*; (2) *Vega* scaled by total assets; (3) the value of option-based compensation divided by stock compensation; and (4) the number of options granted in the current year divided by the number of shares outstanding. Following the existing literature (Guay, 1999; Core and Guay, 2002; Coles, Daniel, and Naveen, 2006), *Vega* is computed as the dollar change in the executive's total option portfolio for a one percent change in the annualized standard deviation of the stock's daily returns. The dollar value of *Vega* is stated in 2012 dollars. CEO compensation *Vega* is winsorized at 99th percentile, since these variables are by definition truncated at zero.

3.1.2. Firm-level Customer Relationship Data

We extract the firm-level customer information from the Compustat Segment files from 1992 to 2005. Our primary variable of interest is *Large Customer*, an indicator variable equal to 1 if firm *i* has one or more large customers that usually account for more than 10% of its sales in year *t* and 0 otherwise. This measure allows us to capture all publicly traded firms with actual materially important customers. Therefore, it is the most appropriate for the purposes of studying the compensation policies of firms with important customers and not just of firms from industries with higher average product market relationships with other industries.[8] We also include two

[8] Due to differences in research questions, other studies utilize industry-level measures of product-market flows obtained from the Bureau of Labor Statistics. For example, Martin and Otto (2017) examine the impact of supplier

alternative measures of significant trading partners that identify whether the large customer is a government agency or a corporation (including both public and private firms). *Corporate Customer* and *Government Customer* are indicator variables that equal 1 if the firm has one or more large corporate customers or large government customers respectively that account for more than 10% of its total sales and equals 0 otherwise.

Since 1998, firms are no longer required to report identities of their important customers under SFAS No.14, but the existence of a major customer must be reported. Reporting the actual sales level is also voluntary under this requirement. Due to this reporting practice, measures computed with customer identities and sales levels are understated and subject to downward biases. Therefore, *Large Customer* is the most complete measure of the existence of large trading relationships. However, for completeness, we also utilize several additional measures of significant trading partners for robustness. These alternative measures include: the sum of total percentage sales to large customers (*Sum Sale*), long-term large customers based on sales in the last two years (*Large Customer 2yr*), and number of large customers (*Number Customers*).

The prior literature analyzes the existence of key suppliers as another type of important trading partner on various firm policies (Kale and Shahrur, 2007; Banerjee, Dasgupta, and Kim, 2008; Hui, Klasa, and Yeung, 2012; Johnson, Karpoff, and Yi, 2015). However, we focus on the role of large customers for several reasons. First, large customers are the main sources of a firm's revenues and several studies suggest that large customers have stronger wealth effects on a firm than its suppliers (Hertzel et al., 2008; Pandit, Wasley, and Zach, 2011). Second, and partially due to the above reasoning ~~and as discussed above~~, SFAS only requires public firms to report significant customers, but not their key suppliers. Thus, it is only possible to identify whether a firm is an important customer to a public supplier from the Compustat Segment files, but not whether the supplier is important to their business. Third, it is easier to identify the implications of large customers on firm value (for example, subsequent sales growth) than that of suppliers.

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tariff reductions on customer investment. As such, the Compustat firm-level data would be inappropriate since it identifies public supplier firms with important customers and only public customers are identified. See Harford, Schonlau, and Stanfield (2017) for an in-depth discussion of the differences between these data sources.

Nevertheless, we also examine the impact of having important suppliers (defined as *Large Supplier*) on a firm's CEO compensation policy as an untabulated robustness test.

3.1.3 Import Tariff Data

We use the import tariff data compiled by Fresard (2010) covering the period 1974-2005.[9] The tariff data only exists for manufacturing industries (2000-3999 SIC range). Following Fresard (2010), we identify a tariff cut as a large negative tariff change in a specific 4-digit SIC industry that is 2.5 times larger than the industry's median tariff change.[10] *Tariff* $Cut_{j,t}$ is an indicator variable that equals 1 if the supplier is in industry *j* which experiences a tariff cut at time *t* and 0 otherwise. To ensure that the tariff changes only reflect non-transitory shocks and thus are relatively permanent changes in the competitive environment, we exclude tariff cuts followed by equivalently large increases over next two years. As a result, we identify 257 tariff cuts in 86 unique 4-digit SIC industries in the 1992-2005 period. Figure 1 displays the 257 industry-level tariff reductions by year for our sample.

3.2. Sample Formation

We merge the Execucomp compensation data with the Compustat Segment and company financial data, and require the firm-years to be in the manufacturing industries described above. These requirements yield a sample of manufacturing firms for the period 1992-2005. We use reductions in import tariffs for specific manufacturing industries to capture exogenous increases in competitive pressures experienced by individual firms and the increase in a large customer's bargaining power relative to a supplier. To avoid obvious endogeneity, we require that customers are also not directly subject to a tariff reduction. Thus, we drop 45 firm-years where firms have only one large customer and this large customer is subject to a concurrent tariff cut. This leads to a maximum of 6,356 firm-years as a result of the above requirements. After requiring the

[9] Available on Laurent Fresard's webpage: http://terpconnect.umd.edu/~lfresard/

[10] Our results are also robust to the use of alternative cutoffs to determine significant tariff cuts, such as a negative tariff change that is 2 or 3 times larger than the industry median tariff change.

availability of lagged values of the controlled variables, we are left with a final sample of 836 unique firms.

The mean and median statistics for key variables along with other CEO and firm characteristics are presented in Panel A of Table 1. As shown in the table, 48% of all the firm-year observations in our final sample have one or more major customers. Although the compensation data requirement restricts our sample to well-established firms (S&P 1500 firms), the existence of large customers is commonly observed and accounts for nearly half of all the firm-years. As a result of the large disparity in firm size between these two samples of firms with and without large customers, we primarily rely on a multivariate analysis of stock option compensation. We also use propensity score matching to help mitigate tangible disparities in firm characteristics between treatment and control samples as discussed in Section 3.4 below.

3.3. Import Tariff Reductions as Quasi-Natural Experiments

To address concerns about reverse causality in the relation between firms having a large customer and the proportion of CEO stock option compensation, we use a quasi-natural experiment to examine how firms change their CEO compensation policies in response to exogenous changes in competitive pressure. Following Fresard (2010) and Valta (2012), we use staggered reductions in import tariffs within selected U.S. manufacturing industries as unexpected intensifications of competitive pressures faced by suppliers. Following these tariff reductions, customers face lower switching costs that lead to a higher likelihood of a supplier losing an existing major customer, which improves the bargaining position of customers relative to suppliers. Importantly, Martin and Otto (2017) find evidence consistent with tariff cuts in supplier industries improving the bargaining power of customers. Specifically, they document that firms in industries with suppliers subject to tariff cuts significantly increase investment. To reduce the likelihood of major customers switching to foreign rivals, firms that are in industries subject to import tariff reductions are predicted to award their CEOs significantly lower stock option compensation.

As pointed out by Fresard (2010), the tariff reductions have to satisfy three requirements under the parallel trends assumption to be a valid experiment for establishing causality: 1) They must substantially change competition in the industry after the tariff cuts; 2) The industry-level tariff cuts are exogenous to the determinants of CEO risk-taking incentive awards; and 3) Tariff reductions are unexpected.

Tariff reductions make it significantly less costly for foreign firms to directly compete with domestic firms. This naturally leads to significant increases in competitive pressures on domestic firms. Past studies including Bertrand (2004), Irvine and Pontiff (2009), and Fresard (2010) find that the market share of foreign competitors significantly rises following tariff cuts. Also, tariff cuts effectively intensify competition in domestic markets (Bernard, Jensen, and Schott, 2006; Lee and Swagel, 1997; Trefler, 1993). In Table 9, we perform univariate tests of the effects of tariff cuts on total industry sales and industry concentration, and find evidence consistent with Fresard (2010). Both total industry sales and industry concentration of domestic firms dramatically fall. These findings indicate a significant rise in industry competition (this finding is likely to understate the actual increase in competition, since only data on domestic firms is available) and an increased probability of domestic firms losing large customers.

Industry-level tariff cuts need to be exogenous to the factors that drive CEO compensation structures to make for a useful quasi-natural experiment. The tariff reductions are events that repeat themselves on multiple occasions for various groups of firms. An advantage of using repeated experiments is that one can show that the treatment effects are similar across time, and that they are not driven by a particular group of firms in a particular industry over a few adjacent years. Of course, there may be a concern that policy makers consider industrial performance and financial conditions when granting trade protections. Another potential concern is that larger firms are more capable of lobbying politicians for trade protections. Thus, to address concerns about the randomness of this experiment, we also include controls for firm performance (ROA, sale growth), financial strength (leverage, cash holdings) and firm size in our main specification. These control variables are measured prior to each tariff cut to avoid

them reflecting the impacts of subsequent tariff reductions on firm performance, financial condition, or total size.

Finally, to be a valid experiment the tariff cuts should not be anticipated, and thus firms should not be preemptively making adjustments in CEO's risk-taking incentives. To ensure this assumption holds, we perform a falsification test on the pre-treatment trends. We construct a pre-trend indicator variable that equals 1 if a firm-year is 1 or 2 years before an industry-level tariff cut, and then regress *Flow Vega* on this indicator interacted with our main explanatory variables. The results (shown in the Table 9) show that there is no significant change in the use of option-based compensation before these tariff cuts.

3.4. Propensity Score Matching

We use propensity score matching to form an alternative matched sample, so as to mitigate the possibility that observed differences following tariff reductions in CEO option compensation between large-customer and non-large-customer firms are potentially due to differences in observable firm characteristics. Following the recommendations of Atanasov and Black (2016), we estimate propensity scores and form the matched sample based on scores in the entire portion of our sample period that precedes tariff reductions to ensure that the tariff reductions produce covariate balance between the two groups of firms. Propensity scores are estimated using a probit model that is based on the following matching criteria: *Vega*, *Delta*, sales, return volatility, the natural log of firm age, *Sales Growth*, *ROA*, *Tobin's Q*, *Leverage*, *ExCash* (excess cash), *CAPEX* (capital expenditures), R&D intensity, and the log number of business segments, which are all defined in Table A.1. As the next step, we match each large customer firm-year observation to the corresponding nearest *two* nearest neighbor firm-year observations. The matched firm-year observations must be drawn from the same year as the large customer firm-year observations, and they must not have experienced tariff reductions in the past two years. There are 2,722 large customer firm-year observations in the treatment sample and 8,166 pseudo-firm-year observations in the final matched sample.

Table 1, Panel B reports the means for CEO and firm characteristics of large-customer firm-years and non-large customer firm-years in the matched sample. As a result of matching, the two samples of firms with and without large customers exhibit similar firm characteristics. We find that firm size, risk, performance, investment expenditures, financial policies, sales concentration, and corporate governance are not significantly different between the two samples. The only significant difference between the two samples is *CEO Age* and this difference is economically small. To address the concern that CEOs in firms with large customers are significantly younger than CEOs in firms without large customers, we control for CEO age as a robustness check in our main specifications. This does not alter our conclusions. Thus, we view our matched samples as having balanced covariates. Firms with and without large-customers are likely to have similar time trends in their proportion of CEO option compensation in our matched sample before the occurrence of an exogenous shock.

Figure 2 displays the overlap of the covariates in our matched sample by plotting the distribution of all the key covariates, including firm size, firm risk, ROA, book leverage, and cash holdings. As seen in Figure 2, the distributions of the covariates for the treated and control observations are very similar over all the key covariates. Together with the prior analysis, this provides collaborating evidence that our matching procedure enables us to draw valid inferences on the effects of tariff changes for executive compensation and firm value.

4. Empirical Results

4.1. Summary Statistics of Import Tariff Cuts and CEO Stock Option Compensation

Table 2 summarizes the mean and median, and quartile values of the magnitudes of tariff rates and tariff rate changes among the firm-years with tariff reductions. It also reports the mean differences in the proportion of CEO stock option compensation for firms with and without large customers before and after tariff reductions. As shown in Panel A of Table 2, there are 257 industry-level tariff reductions for the 1992-2005 period. Import tariffs in manufacturing industries are generally very low following tariff reductions in our sample period, with a mean tariff rate of 1.83% and a median of 1.37%. Among firm-years subject to tariff reductions, the

magnitude of the typical cut is large, with a mean tariff rate change of -0.59% and a median tariff rate change of -0.43%, which represents an approximately 33% mean reduction. We conclude that the economic significance of these tariff cuts is large and it should lead to significant changes in a firm's competitive environment. Further validation of the economic significance of tariff reductions is shown in the Panel A of Table 9.

As shown in Panel B of Table 2, the industry-level tariff cuts contain 972 firm-years, which account for 15% of all the firm-years in our sample (972 out of 6,356 firm-years). Columns 1 and 2 show that following these tariff reductions mean CEO option compensation of all firms declines significantly from 36% to 32%. Also after a tariff cut, the mean value of *Flow Vega* exhibits a small decline of $1,582. The change in *Flow Vega* is not statistically significant but the change in *Pct Option* is statistically significant at the 1% level. Columns 3 and 4 report the mean changes in stock option compensation in the subsample of firms with at least one major customer. Following the tariff cuts, firms with large customers experience a larger reduction in *Pct Option* compared to firms without large customers (as shown in columns "(4)-(3)" and "(6)-(5)"). This also results in reductions in *Flow Vega* by firms with large customers following tariff cuts, but the change is not statistically significant. Overall, our univariate results provide evidence that changes in CEO stock option compensation are more responsive to tariff reductions in firms with large customers. In other words, firms dependent on major customers tend to reduce CEO stock option compensation more after exogenous shocks to the strength of their large customer relationships.

4.2. Multivariate Analysis of CEO Stock Option Compensation and Large Customer Relationships

Estimates of difference-in-difference OLS regressions are shown in Table 3. To test hypothesis 1, we are primarily interested in the changes in CEO risk-taking incentives from new option grants and the proportion of option compensation after the tariff reductions. The dependent variable in Panel A of Table 3 is the natural log of one plus the dollar change in the executive's current option grants for a one percent change in the annualized standard deviation of

the stock's daily returns (*Flow Vega*). Studying the CEO's risk-taking incentives from new option grants mitigates the alternative stock price channel and provides evidence of real changes in a firm's executive compensation in reaction to the tariff cut. All of our OLS regressions include firm and year fixed effects to capture unobserved time invariant firm characteristics and general macroeconomic factors.[11] Additionally, standard errors are clustered by firm to account for the lack of independence across individual firm observations.

Results in column 1 indicate that after tariff cuts, firms with large customers provide significantly lower risk-taking incentives through current CEO stock option grants compared to those without large customers. This result is statistically significant at the 1% level. Since firms with *Vega* equal to zero in the year before the tariff cuts already have the lowest possible *Vega*, it is not possible to reduce the risk-taking incentives provided to these CEOs further, so in column 2 we re-estimate the relation after excluding this subsample of firms. In columns 3 and 4, we report regression results based on our matched sample and we find that the results remain robust.

While *Flow Vega* appropriately captures the risk-taking incentives provided to a CEO through new option grants, it is potentially more difficult for important customers to observe or calculate. In Panel B, we define the dependent variable as the natural log of one plus the fraction of CEO annual compensation in stock options (*Pct Option*). It also offers a clear interpretation of the economic significance of any estimated effects. As reported in Panel B, we continue to find evidence in support of hypothesis 1, the proportion of the option compensation given to CEOs of supplier firms are significantly reduced following the tariff cuts. Economically, the difference between these two groups of firms following the tariff cuts is large. In column 1, the average firm with a large customer is predicted to reduce its proportion of CEO stock option compensation 25.9% more than firms without a large customer all else being equal.

In untabulated tests, we also examine the large customer effect following tariff cuts on total CEO pay, the fraction of total CEO pay in cash compensation, and the fraction of total CEO pay in stock grants. We find that the total compensation in the presence of significant customers

[11] The number of observations in our full sample decreases from 6,356 to 6,315 due to the use of firm fixed effects, and firms that only appear once are dropped in the final regression sample.

does not change significantly following tariff reductions. However, there is moderate evidence that both the fractions of total CEO pay in cash compensation and stock grants increase around tariff cuts. This result indicates that the reduction in CEO option-based compensation is largely offset by an increase in cash compensation and stock grants. Thus, total CEO compensation in the presence of significant customers remains unchanged around tariff reductions.

Overall, the empirical evidence in Table 3 strongly supports hypothesis 1. We find compelling evidence that following import tariff reductions, which act as exogenous shocks to existing large customer relationships, firms with large customers provide their CEOs with significantly less stock option compensation.

4.3. Supplier CEO Stock Option Compensation and the Strength of Large Customer Relationships

In this section, we test the channel through which CEO option compensation reduces firm value. Specifically, we examine if stock option compensation weakens large customer-supplier relationships following import tariff reductions. For this purpose, we extract sales data for major customer-supplier pairs from the Compustat Segment files. Under SFAS accounting rules, firms are required to report the existence of customers who account for more than 10% of their sales. Due to this reporting practice, Compustat Segment files only contain trading relationships for firms that have large customers. Since 1998, reporting sales percentages and customer identities became voluntary. We use supplier GVKEYs and customer IDs from the Compustat Segment files to identify supplier-customer pairs and to validate and match listed customer names to existing firms by hand where possible.

We limit our analysis of trading relationships to suppliers that report both the amount of sales and the identities of its large customers to allow us to identify each unique supplier-major customer pair. We then calculate the annual change in sales for a particular customer-supplier relationship (*Change in Reported Sales*). For every unique customer-supplier relationship, we calculate the total length of the relationship in years. There are 284 unique suppliers with CEO compensation data available, 772 unique trading relationships, and 1,812 relationship-year

observations after requiring information on key control variables and dependent variables. We further restrict the sample to include only firms with positive CEO portfolio Vegas in the previous year, which reduces the sample size slightly to 1,705. In addition, calculating sales growth to a particular customer requires past sales data, which requires that we have this trading relationship data for at least two years. This reduces the sample size for the customer sales analysis to 1,206.

Panel A of Table 4 reports the summary statistics of the characteristics of these major customer-supplier relationships. On average, the mean relationship length is 4.6 years and the median is 4 years, indicating that long-term trading relationships commonly exist when a firm reports having major customers. On average, large customer sales equals $458 million, and 20% of the total sales of firms with large customers come from sales to those customers (sale dependence). Median sales to a large customer is only $153 million, while median sale dependence on a large customer is 15% of total sales. Overall, the statistics in Table 4 indicate that the major customer-supplier relationships in our sample are generally large and stable relationships.

Panel B of Table 4 compares the length and sales growth of these large trade relationships before and after the tariff reductions. Overall, there is no significant difference in the strength of these relationships following tariff cuts. One exception to this statement is that the relationships' average length is significantly shorter when supplier CEOs' stock option compensation is above the sample median, as shown in columns 3 and 4.

Table 5 reports the results from a multivariate diff-in-diff analysis of supplier CEO stock option compensation and the strengths of the major customer-supplier relationships. We use OLS regressions with supplier-customer pair and year fixed effects in columns 1 and 2 where standard errors are clustered by supplier-customer pair. The dependent variable in columns 1 and 2 is the natural logarithm of one plus *Change in Reported S*ales, which is the sale growth to a particular large customer *j* as reported by the supplier firm in percentage terms. Results in columns 1 and 2 indicate that greater risk-taking incentives from new option grants and a higher fraction of option-based compensation lead to significantly lower sales growth to its major customers when

the firm's industry experiences tariff reductions. These results are statistically significant at the 10% and 5% levels. Economically, a 1% increase in the annual option usage as a form of compensation is predicted to be associated with a 6.5% decrease in the subsequent sales growth to the *same* large customer following a tariff cut.

The dependent variable in columns 3 and 4 is *Termination*, an indicator variable that equals one if the trade relationship is no longer reported by the supplier firm as significant next year and 0 otherwise. We use logit regressions with supplier industry and year fixed effects and standard errors clustered by supplier-customer pairs. The results in columns 3 and 4 document that supplier firms with higher CEO risk-taking incentives due to option compensation following large tariff cuts significantly increase the likelihood of customer relationship termination, as indicated by the significant positive interaction term. This result is statistically significant at the 10% level in column 3 and 5% level in column 4.

We do not find evidence that tariff reductions themselves significantly weaken the existing major customer-supplier relationships, which is in line with Bernard, Jensen and Scott (2006) and Fresard (2010). However, we do find some trading relationships are weakened and others are strengthened, which leads to an overall neutral effect of tariff reductions. In particular, we find that CEO stock option compensation affects the reallocation of major customer sales following reductions in import tariffs. Firms with higher CEO stock option compensation are predicted to experience a weakening of their major customer relationships and a decline in large-customer sales growth, while at the same time facing a higher probability of relationship termination following tariff reductions. This result is consistent with hypothesis 2. It also provides strong support for our hypothesis that firms with concentrated customers reduce their CEO option compensation following shocks to their customer relationships, so as to bond these valuable relationships.

4.4. Multivariate Analysis of CEO Stock Option Compensation and Firm Value

In Table 5, we find evidence that lower supplier CEO stock option compensation strengthens its relationships with major customers, and leads to gains in major customer sales

and longer-lasting relationships. Due to strengthened pre-exiting major customer relationships, lower CEO stock option compensation is also expected to reduce supplier losses in its RSI and leads to rising sales to major customers, and thus, positively affect a supplier's overall operating performance. However, if suppliers do not reduce option compensation to provide a stronger pre-commitment mechanism in the face of reduced switching costs by major customers, then suppliers can expect to experience a subsequent deterioration of their customer relationships, which then leads to a reduction in firm performance and value.

To test this prediction, we examine whether changes in a supplier CEO's option compensation lead to changes in firm value when the firm has a large customer. Table 6 presents difference-in-difference regression results for the positive CEO compensation Vega sample, however results remain robust to including firms with zero compensation Vega. In this test, we split our sample into firm-years with and without large customers, and compare the differences in firm value caused by changes in CEO option compensation following tariff reductions. Results in columns 1 and 2 indicate that following tariff reductions, firms with large customers experience significantly larger declines in firm value if their CEOs have greater risk-taking incentives from stock option compensation. This result is statistically significant at the 10% and 5% levels, respectively. Economically, after the tariff reductions, firms with large customers experience a 2.7% decline in Tobin's Q after a 1% relative increase in the proportion of CEO stock option compensation (column 2). However, as shown in columns 3 and 4, the CEO stock option compensation of firms without large customers does not significantly affect firm value.

4.5. Firm Heterogeneity and Large Customer Characteristics in Compensation Structures After Tariff Cuts

To demonstrate the robustness of our results, in this section, we examine cross-sectional differences in firms with large customers that change their CEO stock option compensation in response to tariff reductions. For the remainder of our tests, we only report tests using *Flow Vega* as the dependent variable and restricting the sample to firms with positive CEO compensation Vega in the prior year for brevity. However, results remain robust to using *Pct Option* or to

including firms with zero CEO compensation Vega. In particular, we expect the observed negative relation between *Large Customer* and CEO option compensation following a tariff cut (reported in Table 3) to be concentrated in firms with a higher probability of financial distress, greater customer-specific assets, and a higher sensitivity to industry tariff cuts.

In columns 1 and 2 of Panel A in Table 7, we split firm-years by whether they have leverage above or below our sample median. We find that following tariff cuts, firms with a large customer and high leverage significantly cut CEO option compensation (at the 1% level), while firms with a large customer and low leverage do not. This is consistent with our expectation that higher leverage, which can be encouraged by high CEO option compensation, reduces customer demand for the firm's products. As existing large customer relationships become more vulnerable following tariff reductions in the industry, firms with higher leverage have a greater need to reduce CEO option-based compensation so as to protect their valuable customer relationships by reassuring these customers of the financial viability of its supplier. We find consistent statistically significant evidence in columns 3 and 4, where we split our sample into firms with higher and lower probabilities of financial distress (following Fong et al. (2014)) using the sample median as the cutoff.

The increased costs of contracting due to ex post opportunism are much greater for firms with higher asset specificity or more differentiated products (for example, see Gibbons (2005)), given a customer's greater reliance on its supplier's financial health. Moreover, a supplier with higher asset specificity or differentiated products suffers from a greater loss in RSI if the customer terminates the trade relationship (Banerjee et al., 2008). Similarly, major customers are more concerned about potential financial distress by a supplier that produces differentiated products, due to the higher switching costs. Therefore, we expect suppliers with greater asset specificity or product uniqueness are more likely to reduce CEO option compensation following increased threats of foreign competition.

In columns 1 and 2 of Panel B in Table 7, we split firm-years by whether firms have asset specificity above or below the median in our sample, where asset specificity is defined as the gross value of machinery and equipment scaled by lagged total assets (James and Kizilaslan,

2014). In columns 3 and 4, we alternatively split firm-years by median product uniqueness. Following Titman and Wessels (1988) and Masulis, Wang and Xie (2007), we define product uniqueness using the ratio of selling expense to total assets. Consistent with the discussion above, we find that firm-years with above median asset specificity (in column 1) and above median product uniqueness (in column 3) significantly reduce CEO option-based compensation. These results are statistically significant at 5% and 1% in the subsample of firm-years with above median asset specificity and product uniqueness (respectively), but are not significant in the subsample of firm-years with below median asset specificity or product uniqueness. Moreover, differences in above- versus below-median estimates are statistically significant for both characteristics. Overall, we find persuasive evidence that customer RSI creates strong incentives for a supplier to reduce CEO stock option compensation following tariff cuts.

In Panel C of Table 7, we split our full sample of firm-years by supplier-firm industry characteristics. In columns 1 and 2, we find that as the result of facing intensified competition due to tariff cuts, firms with large customers that are in industries with above median market concentration significantly reduce the proportion of CEO option-based compensation. In contrast, firms with large customers in less concentrated industries do not. Similarly, in columns 3 and 4 we find that firms with a greater concentration of sales in industries subject to tariff cuts significantly reduce option-based compensations if they have large customers. We do not find a similarly significant relation in firms that have a lower percentage of sales in these industries. These results are consistent with our expectations that firms need to make greater reductions in CEO option compensation if they have valuable customer relationships and they are more affected by tariff reductions in their industries.

We next explore the heterogeneity in key characteristics of suppliers and their large customers and report these results in Table 8. We split all supplier firm-years by the median fraction of domestic sales to total sales as reported in columns 1 and 2 of Panel A. We expect firms with a larger proportion of domestic sales to be impacted by tariff cuts to a greater degree. We find that when firms have large customers and a higher than median fraction of domestic sales, they significantly reduce CEO option-based compensation following tariff cuts, as shown

in column 1. This result is statistically significant at 1%. In contrast, there is no significant reduction in the subsample of firms less dependent on domestic sales, as shown in column 2.

Next, we differentiate large customers into corporate customers versus government customers in Panel B. We predict that large corporate customers are more likely to switch to a foreign supplier as imports become cheaper after the tariff reductions. However, since large government customers strongly prefer to trade with domestic firms, we predict firms with government customers are less sensitive to tariff cuts.[12] Consistent with this prediction, the results in columns 1 and 2 of Panel B show a stronger reduction in CEO stock option compensation for firms with large corporate customers relative to large government customers. The coefficient on the interaction of the tariff cut and large corporate customer indicators in column 1 is larger than that in column 1 of Table 3, suggesting that conditional on having a large corporate customer, the effect on a supplier CEO's compensation structure is larger than the average effect for all firms with large customers. In comparison, the coefficient of the interaction of the tariff cut and large government customer indicators in column 2 of Panel B is not statistically significant, which supports large government customers not having a significant effect on supplier CEO compensation structures.

4.6. Implementation of FAS 123R as an Exogenous Shock to Option-based Compensation

Our primary analysis utilizes tariff cuts as a plausibly exogenous shock to the competition for large customers, which enhances customer bargaining power. As discussed in Section 3.3, this setting has several desirable empirical properties including multiple events that shock many different industries at different points in time. To strengthen the external validity of our findings, we also use an alternative exogenous shock to option-based compensation (rather

[12] Another alternative explanation is that government customers mainly purchase goods for consumption rather than production, where poorer quality products from suppliers lead to less severe reputational or monetary losses (Banerjee et al., 2008). Also, government buyers may not be driven by a profit motive, and can sometimes provide help to distressed firms and save their employees from losing jobs, therefore they can be less sensitive to the risk-taking of their suppliers. These predictions similarly point to a stronger empirical relation for corporate customers.

than a shock to competition for customers) to confirm the negative option-value link in the presence of concentrated customer base.

Specifically, following Hayes, Lemmon, and Qiu (2012), we use the change in the accounting valuation of stock options under the Financial Accounting Standards Board's Statement, FAS 123R. Following FAS 123R, firms are no longer able to expense employee stock options at their intrinsic value, but instead they must expense these options at their much higher fair values. The change in accounting treatment under FAS 123R significantly reduced the accounting benefits of expensing option-based compensation and we observe that CEO stock option compensation significantly declines after FAS 123R.[13] To exploit this quasi-natural experiment, we define the post-123R period as fiscal years 2005 through 2013. After requiring necessary data from the RiskMetrics Director and Governance Databases, and Compustat, our supplier sample consists of 2,811 large-customer firm-years and 3,979 non-large-customer firm-years from 1996-2013.

We compare the impact of FAS 123R on supplier values in the subsamples of large-customer and non-large-customer firm-years based on OLS regressions. We use Tobin's Q as the main dependent variable and study the impact of FAS 123R on firm value in the two subsamples of supplier firm-years. We include all the control variables used in our baseline regressions in Table 4 as well as board independence, the E-index, and CEO ownership percentage as added control variables along with CEO and firm fixed effects, where standard errors are clustered by firm. In untabulated results, we find that the coefficient on the Post-123R indicator is positive and statistically significant at the 5% level in the large-customer firm-years subsample, but it is insignificant in the non-large-customer firm-year subsample. This result is consistent with the findings in our baseline regressions reported in Table 4. It indicates that the reduction of option-

[13] It is important to note that while this alternative setting provides a plausibly exogenous shock to option compensation, utilizing FAS 123R introduces several econometric issues and potentially confounding effects not present in our tariff analysis. First, FAS 123R adoption represents a simultaneous shock to the option compensation to all industries, and reduces the power of econometric tests due to the shared shock among all firms. Second, due to the timing of the single shock (in the post-SOX period and near the start of the global financial crisis), it is difficult to separate the effects of the FAS 123R from other potentially confounding macroeconomic factors occurring around the same time.

based compensation significantly increases firm value in the presence of important product market relationships.

We repeat the analysis in Table 5 using Post-123R as the focal variable in untabulated tests. We find strong evidence that adoption of FAS 123R significantly reduces the termination likelihood for existing large customer relationships. We also find moderately significant evidence that the sales growth rates to the same large customers rise following the adoption of FAS 123R. Overall, our results indicate that following a negative shock to CEO stock-option compensation levels, the values of firms with large customers significantly improve, reflecting strengthened trading relationships. These findings support the results in Tables 4 and 6 and provide external validity to our previous inferences using an alternative quasi-natural experiment.

4.7. Additional Robustness Tests

To ensure our results are robust to a variety of alternative explanations and definitions, we conduct a variety of other robustness tests. First, we assess whether tariff cuts impact the stock volatility of firms with large customers more than firms without large customers. Since one of our option compensation measures (*Pct Option*) is value-based, changes in stock volatility could influence our results. To ensure that this is not the case, we explicitly test whether stock volatility of firms with large customers increased following tariff cuts in untabulated tests. We do not observe a significant change in stock volatility around the tariff cuts for firms with or without large customers. Furthermore, we do not observe a significant difference between the two subsamples. This provides evidence that the reduction in option compensation that we observed is not due to a change in stock volatility around tariff cuts.

In further untabulated tests, we repeat our primary analysis using alternative measures of CEO risk-taking incentives including: 1) CEO *Vega*; 2) CEO *Vega* scaled by total assets; 3) the market value of CEO option compensation divided by CEO stock compensation; and 4) the number of CEO options granted in current year divided by number of shares outstanding. We obtain qualitatively similar results. These results are robust to alternative measures of major trading relationships, including: 1) the number of large customers (*Number Customer*); 2) the

combined percentage of sales to all large customers *(Sum Sale*); 3) an indicator of large longer-term customers (*Large Customer 2yr*); and 4) an indicator of major suppliers (*Large Supplier*).

We also check whether firms with potentially higher supplier CEO turnover rates in the face of tariff reductions are driving our results. In our sample, there are 52 CEO turnovers after a firm is also subject to tariff reductions. When these 52 firm-years are excluded from our analysis, we find that our main results remain robust.[14]

To ensure that our findings are not being driven by the general decline in option compensation that occurs in the 2000s due to the passage of the 2002 Sarbanes-Oxley Act as well as the 2004 FAS 123R accounting rule, we repeat our analysis for years 2001 and before. In untabulated results, we continue to find consistent evidence that supports our primary findings in the overall sample.

We also repeat our primary analysis using the Coarsened Exact Matching (CEM) approach as an alternative matching method to propensity score matching. Some recent studies criticize the fragility and biases in PSM and find evidence that CEM dominates PSM in terms of providing more stable/credible evidence (Iacus, King & Porro, 2011). We find quantitatively and qualitatively similar results for our primary analysis using CEM matching in untabulated robustness tests.

Finally, in other untabulated robustness tests, we perform our analysis on a comprehensive set of firms based on OLS regressions over the period 1992-2009 and study the relation between the fraction of CEO option compensation, the presence of a large customer, and firm value. While we lose the causal nature of tariff cuts in these tests, this approach allows us to understand whether our results are externally valid for a broad sample of firms, and not just in manufacturing industries. We continue to find strong results in support of our main hypothesis that are consistent with our difference-in-differences estimates presented earlier. Taken together, these tests indicate that the results reported for firms with large customers are robust to different

[14] We include firm-years with CEO turnovers in our main test since they can represent one particular source for changes in firm risk-taking policies.

variable definitions as well as producing externally valid estimates of the relations between CEO option compensation and risk-taking, as well as firm performance and value.

5. Conclusion

We examine the influence that an important stakeholder (namely a large customer) can have on a firm's CEO option compensation choice. Using import tariff reductions as exogenous shocks to existing customer relationships, we provide strong evidence that an increase in customer bargaining power leads firms with concentrated customers to significantly reduce risk-taking incentives through option-based compensation. We further document that following tariff cuts supplier firms with higher risk-taking incentives significantly weakens the relationships with their major customers, and experience reduced sales growth to these customers and an increased likelihood of relationship termination. Furthermore, this also leads to a reduction in firm value. This indicates that CEO option compensation can have an adverse effect on important customer relationships and firm value at the presence of large customers.

Moreover, our results are stronger if firms with large customers face a higher likelihood of losing major customers, greater costs of unstable customer relationships, and are more responsive to tariff reductions. Given the existence of large customers, firms exhibiting a higher likelihood of financial distress, greater customer-specific assets, and greater sales sensitivity to tariff reductions all reduce CEO risk-taking incentives associated with option compensation more aggressively following these shocks. Finally, our results indicate that increasing CEO risk-taking incentives of option compensation is not wealth increasing for firms with large customers.

Bringing these findings together, this study sheds new light on the importance of customer-supplier relationships for optimal CEO compensation policy. We find that CEO risk-taking incentives can weaken these major trading relationships ex post and that having a large customer can lead to reduced CEO stock option compensation ex ante. Also, we find that raising CEO risk-taking incentives can actually undercut firm performance when a firm has a large customer. These results add support to the notion that firms modify governance mechanisms so as to bond their relationships with important stakeholders. These results also suggest that when

making real decisions firms can face serious implicit or explicit constraints, which are imposed by important stakeholders.

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Table 1. Summary Statistics

This table summarizes the means and medians of our key compensation variables and various CEO and firm characteristics. Panel A reports the summary statistics of the full sample and Panel B reports the summary statistics of our matched sample. The full sample consists of 6,356 firm-years and 836 unique ExecuComp firms in U.S. manufacturing industries for 1992 – 2005. To construct the matched sample, we estimate propensity scores and match each *large customer* firm-year observation to the corresponding 2 firm-year nearest neighbors. Propensity scores are estimated from the probit model that uses matching criteria includes: Vega, Delta, sale, return volatility, the natural log of firm age, sales growth, ROA, Tobin's Q, ExCash, leverage, capital expenditure, R&D intensities, and number of business segments. We also restrict the matched pseudo large customer firm-year observation to be in the same year as the real large customer firm-year observation, and it does not experience tariff reductions for the past two years. *Large Customer* is an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Summary Statistics of the Full Sample

	All Firms		
	N	Mean	Median
Large Customer	6,356	0.48	0.00
Pct Option	6,356	0.358	0.359
Flow Vega ($000s)	6,356	42.040	12.140
Delta ($000s)	6,356	533.409	197.949
Total Compensation ($000s)	6,356	3554.400	1957.490
Other Firm and CEO Characteristics			
Sale ($ millions)	6,356	4054.960	779.286
Total Assets	6,356	4641.360	801.157
Firm Risk	6,356	10.165	10.128
Sales Growth	6,356	0.759	0.737
ROA	6,356	0.135	0.158
Tobin's Q	6,356	2.359	1.743
CAPEX	6,356	0.066	0.049
R&D Intensity	6,356	0.075	0.038
Leverage	6,356	0.234	0.201
ExCash	6,356	0.087	0.093
Business Segments	6,108	2.544	2.000
Sale HHI	6,108	0.753	0.915
Board Independence	3,128	0.644	0.667
Board Size	3,128	9.188	9.000
BCF Index	4,657	2.081	2.000
Institutional Block	6,356	0.685	1.000
CEO Age	6,124	55.521	56.000
CEO Tenure	6,356	7.645	5.000
CEO Own	5,548	0.028	0.003

Panel B: Matched Sample Validation

Variables	Large Customer=0 (N=5,444)			Large Customer=1 (N=2,722)			Difference of Means	Difference of Medians
	N	Mean	Median	N	Mean	Median		
Sales ($ millions)	5,444	1780.450	419.520	2722	1671.500	390.540	0.0260	28.980
Firm Risk	5,444	10.420	10.490	2722	10.420	10.470	0.0040	0.019
Sales Growth	5,444	0.780	0.750	2722	0.772	0.750	0.0070	0.001
ROA	5,444	0.110	0.150	2722	0.108	0.150	0.0030	0.000
Tobin's Q	5,444	2.460	1.790	2722	2.480	1.790	-0.0150	-0.004
CAPEX	5,444	0.070	0.050	2722	0.073	0.050	-0.0010	-0.001
R&D Intensity	5,444	0.090	0.060	2722	0.095	0.060	-0.0010	0.001
Leverage	5,444	0.220	0.170	2722	0.221	0.170	0.0000	0.004
ExCash	5,444	0.080	0.100	2722	0.082	0.100	0.0010	-0.001
Business Segments	5,444	2.190	1.000	2722	2.210	1.000	-0.0230	0.000
Sale HHI	5,444	0.820	1.000	2722	0.829	1.000	-0.0130	0.000
Board Independence	2,298	0.640	0.670	1149	0.640	0.670	0.0030	0.000
Board Size	2,298	8.380	8.000	1149	8.319	8.000	0.0580	0.000
BCF Index	3,521	1.960	2.000	1675	1.973	2.000	-0.0160	0.000
Institutional Block	5,444	0.630	1.000	2722	0.622	1.000	0.0090	0.000
CEO Age	2,335	54.251	55.000	1203	53.249	53.000	1.002***	2.000***
CEO Tenure	5,520	3.886	1.000	2760	3.674	1.000	0.2120	0.000
CEO Own	3,265	0.021	0.001	1617	0.021	0.001	0.0000	0.000

Table 2. Summary Statistics of Import Tariff Cuts and CEO Stock Option Compensation.

Panel A of this table summarizes the characteristics of the 257 industry-level tariff reductions in the full sample containing 836 firms and 6,356 firm-years for 1992-2005. Panel B summarizes the CEO stock option compensation characteristics around tariff reductions in the full sample. *Pct Option* is the dollar value of stock options as a fraction of CEO total compensation. *Flow Vega* is the dollar change in the executive's current annual option grants associated with a 0.01 change in the firm's return volatility. *Large Customer* is an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Characteristics of Imports Tariff Cuts

Variable	**N**	**Mean**	**25%**	**Median**	**75%**	**Minimum**	**Maximum**
% Tariff Change	257	-0.59	-0.70	-0.43	-0.21	-7.45	0.00
Total Tariff (in %)	257	1.83	0.38	1.37	2.56	0	19.97

Panel B: Option Compensation before and after Tariff Cuts in the Full Sample

	All Firms (N=6,356)			**Large Customer=1 (N=3,030)**			**Large Customer=0 (N=3,326)**		
	Tariff cut=0	Tariff cut=1	Difference of Means	Tariff cut=0	Tariff cut=1	Difference of Means	Tariff cut=0	Tariff cut=1	Difference of Means
	(1)	(2)	(2) - (1)	(3)	(4)	(4) - (3)	(5)	(6)	(6) - (5)
Flow Vega ($000s)	43.378	41.796	1.582	30.761	28.877	-1.883	53.795	53.509	0.286
Pct Option	0.364	0.323	-0.041***	0.378	0.319	-0.059***	0.351	0.326	-0.025*
Observations	5,384	972		2,594	436		2,790	536	

Table 3. Difference-in-Difference Estimations: The Presence of Concentrated Customers and CEO Stock Option Compensation.

This table presents results from difference-in-difference regressions on the full sample and a matched sample of U.S. manufacturing firms for 1992-2005. In Panel A, the dependent variable is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. The dependent variable in Panel B is the natural logarithm of one plus *Pct Option* in all columns, and *Pct Option* is the value of stock options as a fraction of CEO total compensation. Columns (1) & (2) present regression results in the full sample without matching, and columns (3) & (4) present regression results for our matched sample, where each *large customer* firm-year observation is matched to the corresponding 2 firm-year nearest neighbors. Columns (2) & (4) reports results only using the subsample where the total portfolio Vega of the supplier firm CEOs' compensation is greater than zero in the year prior to the tariff cut. *Tariff* Cut_t is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. *Large Customer* is an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. We estimate OLS regressions and use firm and year fixed effects with firm clustered standard errors in all specifications. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Risk-taking Incentives from Current Option Grants

	Dependent Variable: Ln(1+Flow Vega $_t$)			
	Full sample		*Matched Sample*	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.629***	0.548**	-0.042	-0.062
	(2.62)	(2.21)	(-0.15)	(-0.20)
Large Customer $_{t-1}$: b	0.120	0.140	0.008	0.007
	(0.67)	(0.77)	(0.15)	(0.13)
*a * b*	-0.891***	-0.893***	-0.259*	-0.254*
	(-2.79)	(-2.72)	(-1.79)	(-1.69)
Ln(Sale) $_{t-1}$	0.438***	0.377**	0.221	0.246
	(2.98)	(2.57)	(1.28)	(1.36)
ROA $_{t-1}$	0.253	0.098	0.546	0.486
	(0.71)	(0.27)	(1.14)	(1.05)
Sale Growth $_{t-1}$	-0.106	0.009	-0.111	-0.163
	(-0.30)	(0.03)	(-0.27)	(-0.39)
Leverage $_{t-1}$	-0.798**	-0.846**	-0.549	-0.465
	(-2.34)	(-2.51)	(-1.37)	(-1.09)
ExCash $_{t-1}$	0.125	-0.011	-0.081	-0.105
	(0.32)	(-0.03)	(-0.15)	(-0.21)
Delta $_{t-1}$	0.001*	0.001	0.001*	0.001***
	(1.65)	(1.63)	(1.69)	(2.76)
HHI $_{t-1}$	0.292	0.439	0.538	0.268
	(0.39)	(0.59)	(0.50)	(0.25)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	6,315	6,033	8,128	7,619
Adjusted R^2	0.351	0.302	0.426	0.366

Panel B: Value of Stock Options as a Fraction of CEO Total Compensation

	Dependent Variable: Ln(1+Pct Option $_t$)			
	Full sample		*Matched Sample*	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.147*	0.121	-0.039	-0.033
	(1.71)	(1.36)	(-0.35)	(-0.28)
Large Customer $_{t-1}$: b	0.048	0.061	0.002	0.002
	(0.70)	(0.87)	(0.12)	(0.11)
*a * b*	-0.258**	-0.271**	-0.105*	-0.109*
	(-2.15)	(-2.19)	(-1.87)	(-1.86)
Ln(Sale) $_{t-1}$	0.135**	0.106*	0.045	0.051
	(2.32)	(1.83)	(0.65)	(0.71)
ROA $_{t-1}$	0.184	0.119	0.331*	0.305*
	(1.30)	(0.83)	(1.91)	(1.76)
Sale Growth $_{t-1}$	-0.087	-0.036	-0.092	-0.112
	(-0.62)	(-0.25)	(-0.52)	(-0.64)
Leverage $_{t-1}$	-0.308**	-0.323**	-0.185	-0.169
	(-2.37)	(-2.50)	(-1.13)	(-0.97)
ExCash $_{t-1}$	-0.066	-0.120	-0.157	-0.183
	(-0.44)	(-0.80)	(-0.83)	(-1.03)
Delta $_{t-1}$	0.001	0.001	0.000	0.000
	(0.18)	(0.10)	(0.25)	(1.26)
HHI $_{t-1}$	0.047	0.090	0.085	0.018
	(0.17)	(0.32)	(0.20)	(0.04)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	6,315	6,033	8,128	7,619
Adjusted R^2	0.326	0.275	0.416	0.357

Table 4. Summary Statistics of Significant Customer-Supplier Relationships.

This table reports summary statistics of the trading relationships between supplier firms and their large customers. Data is drawn from Compustat Segment files and we restrict it to significant trade relationships of US manufacturing suppliers for the period 1992-2005 after requires tariff reductions data. Due to the reporting practice required by SFAS, Compustat Segment files only contain firms that have significant customers (typically more than 10% of the firm's total sales). This sample contains 284 unique supplier firms, 772 unique large trading customer relationships and 1,812 relationship-years for the 1992-2005 period. *Flow Vega* is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Characteristics of Significant Trade Relationships

Variable	**N**	**Mean**	**Median**	**25%**	**75%**	**Std Dev**
Reported Sales (in $ million)	1,812	457.82	152.95	53.34	403.16	1135.18
Relationship Length (years)	1,812	4.60	4.00	2.00	6.00	3.30
Sale Dependence of Supplier (in %)	1,812	19.60%	15.00%	10.80%	22.50%	21.20%

Panel B: Characteristics of Significant Trade Relationships around Tariff Reductions

	All Firms (N=1,812)			**> Median Flow Vega (N=906)**			**< Median Flow Vega (N=906)**		
	Tariff cut=0	*Tariff cut=1*	*Difference of Means*	*Tariff cut=0*	*Tariff cut=1*	*Difference of Means*	*Tariff cut=0*	*Tariff cut=1*	*Difference of Means*
	(1)	(2)	(1) - (2)	(3)	(4)	(4) - (3)	(5)	(6)	(6) - (5)
% Change in Reported Sales	4.68	4.67	-0.01	4.72	4.64	-0.08	4.64	4.70	0.06
Relationship Length	4.6	4.93	0.33	5.03	4.34	0.69*	4.86	4.84	-0.03
Observations	1605	207		809	97		796	110	

Table 5. Difference-in-Difference Estimations: CEO Stock Option Compensation and Large Trading Relationships around Tariff Reductions.

This table presents results from difference-in-difference regressions in a sample of trades between US manufacturing suppliers and their major customers for 1992-2005. The dependent variable in Columns (1) & (2) is the natural logarithm of one plus *Change in Reported Sales*, and *Change in Reported Sales* is the sale growth to a particular large customer *j* as reported by the supplier firm in percentage terms. The dependent variable in Columns (3) & (4) is *Termination,* which is an indicator variable that equals to 1 if a trade relationship is no longer reported as significant by the supplier firm in the next year and 0 otherwise. It is set to missing if either supplier or customer firm disappears in the Compustat universe. *Flow Vega* is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Pct Option* is the dollar value of stock options as a fraction of total compensation. OLS regressions in columns (1) & (2) are estimated with relationship and year fixed effects and standard errors clustered by trade relationships. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. The logit models in columns (3) & (4) are estimated with year fixed effects and standard errors are clustered by trade relationships. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

	Change in Reported Sales $_{j, t+1}$		**Termination $_{j, t+1}$**	
	OLS	OLS	Logit	Logit
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.183	0.245*	-0.969	-1.107
	(1.44)	(1.85)	(-1.36)	(-1.54)
Ln(1+Flow Vega $_t$): b1	0.006		0.014	
	(1.15)		(0.72)	
a * b1	-0.014*		0.144*	
	(-1.66)		(1.92)	
Ln(1+Pct Option $_t$): b2		0.010		0.036
		(0.76)		(0.74)
a * b2		-0.065**		0.446**
		(-2.35)		(2.08)
Sale Dependence $_{t-1}$	0.015***	0.015***	-0.022***	-0.022***
	(7.12)	(7.10)	(-3.52)	(-3.52)
Relationship Length $_{t-1}$	0.620***	0.625***	-0.033	-0.032
	(4.20)	(4.20)	(-1.33)	(-1.28)
Ln(Sale) $_{t-1}$	-0.096	-0.102	-0.098	-0.090
	(-1.06)	(-1.12)	(-1.44)	(-1.33)
ROA $_{t-1}$	-0.354	-0.342	-1.259*	-1.319**
	(-1.24)	(-1.21)	(-1.91)	(-1.98)
Sale Growth$_{t-1}$	0.036	0.036	0.447	0.471
	(0.21)	(0.21)	(0.87)	(0.92)
Firm Age$_{t-1}$	0.144	0.141	0.008	0.008
	(1.59)	(1.57)	(1.47)	(1.47)
R&D $_{t-1}$	0.831**	0.807**	-1.251	-1.221
	(2.19)	(2.13)	(-1.20)	(-1.17)
Leverage $_{t-1}$	-0.102	-0.102	0.209	0.183
	(-1.12)	(-1.12)	(0.69)	(0.60)
ExCash $_{t-1}$	-0.092	-0.091	0.329	0.361
	(-1.17)	(-1.16)	(1.31)	(1.42)
Relationship FE	Yes	Yes	No	No
Supplier Industry FE	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1,206	1,206	1,705	1,705
Adjusted/Pseudo R^2	0.169	0.171	0.235	0.235

Table 6. Difference-in-Difference Estimations: CEO Stock Option Compensation, Large Customers, and Firm Value.

The table presents results of difference-in-difference regressions on a sample of U.S. manufacturing firms for 1992-2005. The dependent variable in all columns is the natural logarithm of one plus *Tobin's Q*, and Tobin's Q equals to the market value of a firm's total assets divided by its beginning-year book value. Panels A presents regression results in the full sample without matching, and Panel B presents regression results with our matched sample, where each *large customer* firm-year observation is matched to the corresponding 2 firm-year nearest neighbors. We estimate OLS regressions and use firm and year fixed effects with firm clustered standard errors in all specifications. Columns (2) & (4) in Panel A and B reports estimates based on the subsample where the Vega of a CEO's compensation for the year prior to the tariff cut is positive. *Flow Vega* is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Pct Option* is the Black-Scholes value of CEO stock options as a fraction of total compensation. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. *Large Customer* is an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

	Dependent Variable: Ln(1+Tobin's Q $_{t+1}$)			
	Large Customer $_{t-1}$ =1		*Large Customer $_{t-1}$ =0*	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.049	0.062	-0.076*	-0.045
	(1.05)	(1.37)	(-1.94)	(-1.22)
Ln(1+Flow Vega $_t$): b1	-0.003		-0.001	
	(-1.58)		(-0.56)	
a * b1	-0.009*		0.002	
	(-1.75)		(0.54)	
Ln(1+Pct Option $_t$): b2		-0.009		-0.001
		(-1.59)		(-0.15)
a * b2		-0.027**		-0.004
		(-2.12)		(-0.36)
Other Control Variables in Table 3	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,642	2,642	2,964	2,963
Adjusted R^2	0.667	0.667	0.728	0.728

Table 7. Cross-Sectional Variations: Supplier Characteristics and CEO Risk-taking Incentives around Tariff Reductions

This table presents results from OLS regressions on a sample of U.S. manufacturing firms for 1992-2005. The dependent variable in all panels is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. *Large Customer* an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. *Leverage* is the book value of total current debts plus long-term debts and scaled by total assets. *Distress* is the distance to default measure from Fong, Hong, Kacperczyk, and Kubik (2014). *Asset Specificity* is defined as the gross value of machinery and equipment scaled by lagged assets. *Product Uniqueness* is the ratio of selling expense to assets as a proxy for product uniqueness. *Industry Concentration* is the Herfindahl-Hirschman Index (HHI) of the supplier firm's 4-digit SIC industry. *% Sales in Affected Industry* is the percentage of the supplier's sales in industries that are experiencing tariff reductions. We split the full samples into high and low subsamples based on the sample's median. Control variables (not reported for brevity) are the same as in Table 3. Standard errors are clustered by firm in all specifications. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Supplier Financial Distress and CEO Stock Option Compensation around Tariff Reductions

	High Leverage	*Low Leverage*	*High Distress*	*Low Distress*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.653**	0.269	0.643**	0.152
	(2.15)	(0.63)	(2.04)	(0.35)
Large Customer $_{t-1}$: b	0.204	-0.062	0.124	-0.060
	(0.68)	(-0.28)	(0.39)	(-0.26)
*a * b*	-1.350***	-0.388	-1.448***	-0.213
	(-2.92)	(-0.78)	(-3.18)	(-0.42)
Other Control Variables in Table 3	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,959	2,916	2,965	2,912
Adjusted R^2	0.306	0.340	0.308	0.336

Panel B: Supplier Relationship-Specific Investments and CEO Stock Option Compensation around Tariff Reductions

	High Asset Specificity	*Low Asset Specificity*	*High Product Uniqueness*	*Low Product Uniqueness*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.787**	0.143	1.283***	0.055
	(2.43)	(0.34)	(3.85)	(0.15)
Large Customer $_{t-1}$: b	-0.176	0.518**	0.044	0.141
	(-0.62)	(2.05)	(0.17)	(0.51)
*a * b*	-1.116**	-0.362	-1.649***	-0.152
	(-2.51)	(-0.69)	(-3.65)	(-0.32)
Other Control Variables in Table 3	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,993	2,955	2,945	2,984
Adjusted R^2	0.308	0.334	0.296	0.340

Panel C: Tariff Impacts and Supplier CEO Stock Option Compensation around Tariff Reductions

	High Industry Concentration	*Low Industry Concentration*	*High % Sales in Affected Industry*	*Low % Sales in Affected Industry*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	1.028***	-0.049	0.808***	-0.153
	(2.93)	(-0.13)	(2.79)	(-0.30)
Large Customer $_{t-1}$: b	-0.012	0.130	-0.142	0.295
	(-0.04)	(0.57)	(-0.45)	(1.09)
*a * b*	-1.287***	-0.343	-1.085***	-0.465
	(-2.76)	(-0.67)	(-2.69)	(-0.65)
Other Control Variables in Table 3	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,888	3,029	2,994	2,915
Adjusted R^2	0.278	0.340	0.307	0.344

Table 8. Difference-in-Difference Estimations: Customer Firm Characteristics and Supplier CEO Stock Option Compensation around Tariff Reductions

This table presents results from OLS regressions on a sample of U.S. manufacturing firms for 1992-2005. The dependent variable is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is 2.5 times larger than the industry's median tariff change and 0 otherwise. *% Domestic Sales* is the percentage of the supplier's total sales to domestic customers. *Corporate (Government) Customer* is an indicator variable that equals to 1 if the firm has one or more large corporate (government) customers, which usually account for more than 10% of its total sales and 0 otherwise. Standard errors are clustered by firm in all specifications. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Proportion of Domestic Sales and CEO Stock Option Compensation around Tariff Reductions

	High % Domestic Sales	*Low % Domestic Sales*
	(1)	(2)
Tariff Cut $_t$: a	0.808***	-0.153
	(2.79)	(-0.30)
Large Customer $_{t-1}$: b	-0.142	0.295
	(-0.45)	(1.09)
*a * b*	-1.085***	-0.465
	(-2.69)	(-0.65)
Other Control Variables in Table 3	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	2,951	2,964
Adjusted R^2	0.319	0.333

Panel B: The Presence of Significant Corporate vs. Government Customers and CEO Stock Option Compensation around Tariff Reductions

	(1)	(2)
Tariff Cut $_t$: a	0.545**	0.135
	(2.21)	(0.68)
Corporate Customer$_{t-1}$: b	0.083	
	(0.45)	
*a * b*	-0.961***	
	(-2.95)	
Government Customer$_{t-1}$: c		1.295*
		(1.84)
*a * c*		-0.508
		(-0.49)
Other Control Variables in Table 3	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	6,033	6,033
Adjusted R^2	0.312	0.311

Table 9. Validity Checks for the Tariff Reduction Experiments.

This table presents results from OLS regressions on a sample of U.S. manufacturing firms for 1992-2005. The dependent variable in Panel B is *Flow Vega*, which is the dollar change in the executive's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. *Pre Cut* is an indicator variable that equals 1 if the current industry-year of a firm is 1 or 2 years before an industry-level tariff cut and 0 other wise. *Large Customer*$_{t-1}$ is an indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Impact of Tariff Reductions on Industry Sales and Concentration

	Tariff cut=0	**Tariff cut=1**	**Difference of Means**
	(1)	(2)	(2) - (1)
Mean Industry Sales ($ mil)	989,217	562,651	-426,565***
Mean Industry Concentration	0.344	0.301	-0.043***
Observations	1,115	257	

Panel B: Falsification Test of Pre-treatment Trends

	Ln(1+Flow Vega $_t$)	**Ln(1+Pct Option $_t$)**
	(1)	(2)
Pre Cut$_t$: a	-0.240	-0.043
	(-0.70)	(-0.36)
Large Customer$_{t-1}$: b	-0.057	-0.002
	(-0.30)	(-0.03)
*a * b*	0.457	0.165
	(1.20)	(1.17)
Other Control Variables in Table 3	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	6,033	6,033
Adjusted R^2	0.311	0.279

Figure 1: Industry Import Tariff Reductions by Year, 1992-2015

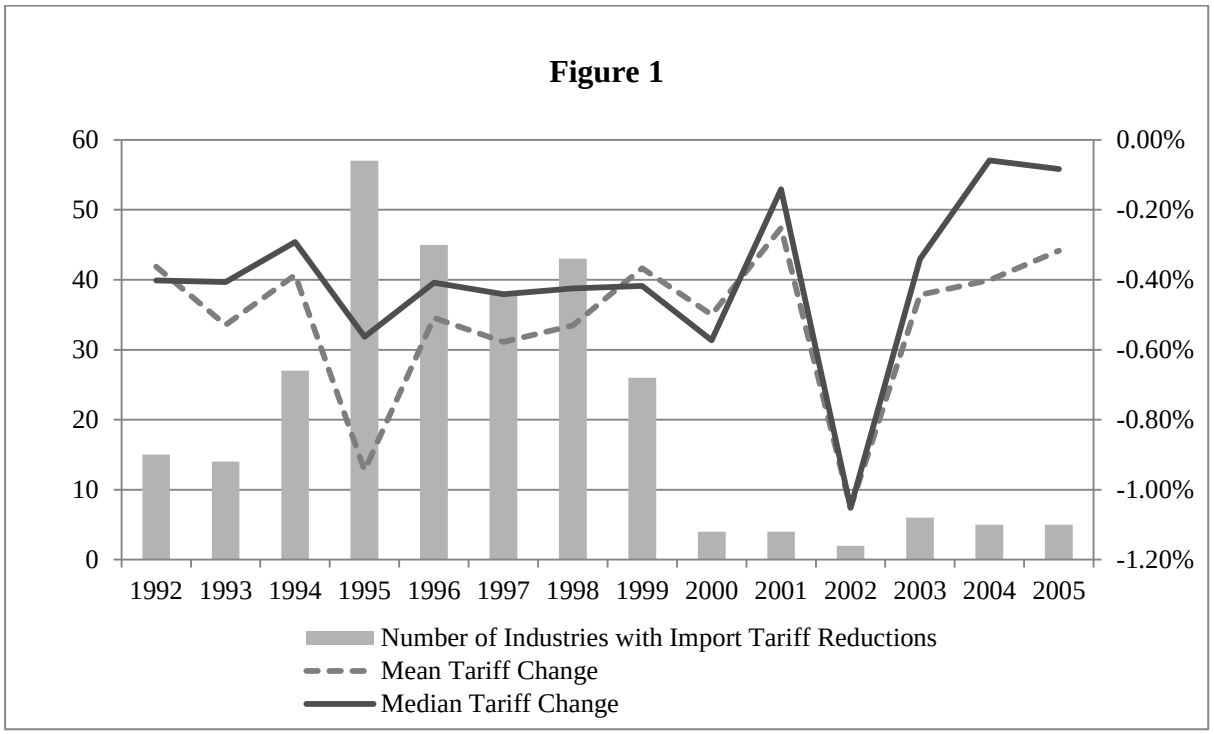
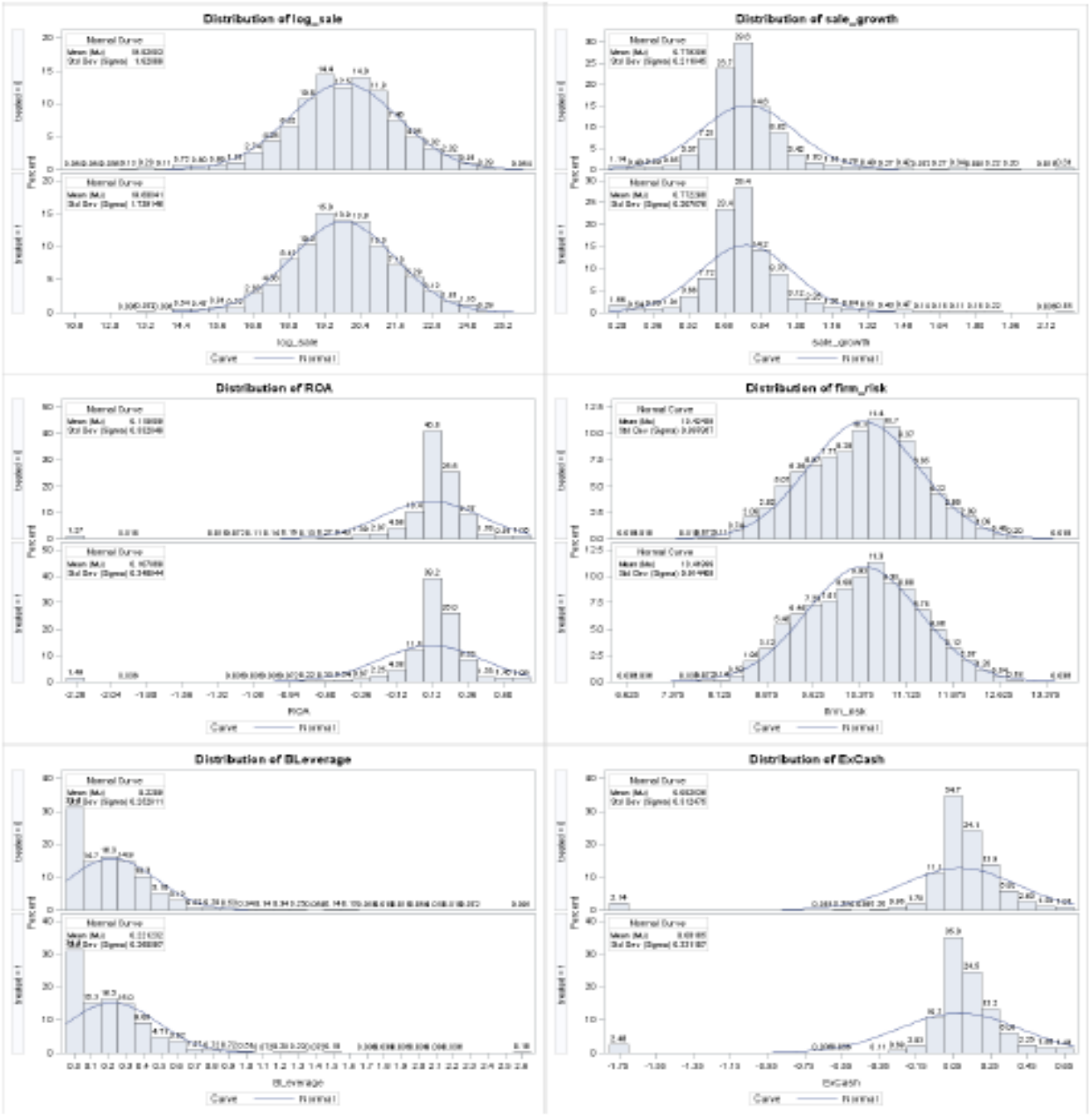


Figure 2: Distributions of Key Matched Sample Covariates

This figure presents histograms of the distributions of six key covariates of treated firm-years with their matched firm-years using the matched sample discussed in Table 1, Panel B. The vertical axis of each histogram is the proportion of firm-years with covariates in a given range. In each pair of histograms, the treated sample is below the matched sample. From the top left to the bottom right, the reported covariate distributions are of *Log(Sale)*, *Sales Growth*, *ROA*, *Firm Risk*, *Leverage*, and *ExCash*, and are as defined in the appendix.



Appendix: Table A.1. Variable Definitions

Label	Definition	Data Source
Stock Option Compensation Measures		
Flow Vega	The dollar change in the executive's current year's stock option grants associated with a 0.01 increase in the firm's return volatility.	Execucomp
Pct Option	The dollar value of CEO stock option grants as a fraction of total compensation.	Execucomp
Vega	The dollar change in the executive's total option portfolio associated with 0.01 increase in the firm's return volatility.	Execucomp
Quasi-Natural Experiment Variables		
Tariff Cut	An indicator variable that equals 1 if the negative tariff change in a specific industry is 2.5 times larger than its median change and 0 otherwise.	Fresard (2010)
Key Explanatory Variable at Firm Level		
Large Customer	An indicator variable that equals 1 if a firm has reported one or more major customers which usually account for more than 10% of its total sales and 0 otherwise.	Compustat Segment
Corporate Customer	An indicator variable that equals 1 if a firm has reported one or more large corporate customers that usually accounts for more than 10% of its total sales and 0 otherwise.	Compustat Segment
Government Customer	An indicator variable that equals 1 if a firm has reported one or more government customers that usually accounts for more than 10% of its total sales and 0 otherwise	Compustat Segment
Trading Relationship Measures		
Change in Reported Sales	Sales growth to a particular large customer as reported by the supplier in percentage terms.	Compustat Segment
Termination	An indicator variable that equals one if a trade relationship is no longer reported as significant by the supplier firm in the next year and 0 otherwise. It is set to missing if either supplier or customer firm disappears in the Compustat universe.	Compustat Segment
Length	The relationship length between a firm and its large customer.	Compustat Segment
Sale Dependence	The fraction of a firm's sale to the large customer divided by the supplier firm's total sales.	Compustat Segment
Control Variables		
BCF	Entrenchment index	IRRC governance

Board Independence (BI)	The percentage of independent directors on board	IRRC director
Board Size	Log(1+number of directors)	IRRC director
Business Segments	Log of Number of Business Segments	Compustat Segment
CAPEX	(Capital Expenditures - Sale of Property)/ Lagged Book Value of Assets	Compustat
Cash Compensation	Sum of salary and bonus	Execucomp
CEO Age	CEO Age in years	Execucomp
CEO Own	CEO's share ownership excluding options as CEO's percent shares owned to total common shares	Execucomp
CEO Tenure	CEO Tenure	Execucomp
Delta	The sensitivity of wealth from CEO's stock and option portfolio to firm performance.	Execucomp
ExCash	(Net Cash Flow from Operating Activities - Depreciation/Amortization + R&D Expense)/ Lagged Book Value of Assets	Compustat
Firm Risk	log(variance of daily returns over firm fiscal year)	CRSP
HHI	The Herfindahl-Hirschman index (HHI) of a firm's 4-digit SIC industry.	Compustat
Institutional Block	An indicator variable that equals 1 if the firm has one or more institutional investors whose share ownerships are greater than 5% of the firm's total shares and 0 otherwise.	Thompson Reuters
Leverage	(Total Current Debt + Long Term Debt)/ Lagged Book Value of Assets	Compustat
Pct Cash	The fraction of (salary + bonus) of total compensation	Execucomp
Pct Stock	Dollar value of stock grants' dollar as a fraction of total CEO compensation	Execucomp
RD	R&D intensity. R&D expense/Lagged Book value of assets. Missing values are set to 0.	Compustat
ROA	Operating Income Before Depreciation/ Lagged Book Value of Assets	Compustat
Sale	Total net Sales during the fiscal year	Compustat
Sales Growth	log[Sale(t) / Sale(t-1)]	Compustat
Sale HHI	(Sum of squared Segment Sales)/(squared Firm Sales).	Compustat Segment
Selling Expense	Selling Expense / Total Assets	Compustat
Tobin's Q	(Total Assets - Book Value of Equity + Market Value of Equity) / Lagged Book Value of Assets	Compustat

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