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Abstract

We study how the existence of important production contracts affects the choice of CEO compensation contracts. We hypothesize that having major customers raises the costs associated with CEO risk-taking incentives and leads to lower option-based compensation. Using industry-level import tariff reductions in the U.S. as exogenous shocks to customer relationships, we find firms with major customers subsequently reduce CEO option-based compensation significantly. We also show that continued high option compensation following tariff cuts, is associated with significant declines in these relationships and in these firms' performance. 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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Abstract

We study how the existence of important production contracts affects the choice of CEO compensation contracts. We hypothesize that having major customers raises the costs associated with CEO risk-taking incentives and leads to lower option-based compensation. Using industry-level import tariff reductions in the U.S. as exogenous shocks to customer relationships, we find firms with major customers subsequently reduce CEO option-based compensation significantly. We also show that continued high option compensation following tariff cuts, is associated with significant declines in these relationships and in these firms' performance. 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 align manager and shareholder interests by encouraging value-enhancing risk-taking.[1] However, in aligning manager-shareholder interests, CEO stock option compensation can also intensify conflicts of interests between shareholders and other key stakeholders by encouraging potentially excessive firm risk taking (for example, see John and John, 1993; Opler and Titman, 1994; Berger, Ofek, and Yermack, 1997; Kuang and Qin, 2013; Akins, Bitting, De Angelis, and Gaulin, 2019). In this study, we take a novel approach to further our understanding of the effects of these conflicts of interest by studying the impact of changing competitive forces on important product market relationships and executive option compensation.

Sales are fundamental to a firm's success and preserving valuable product market relationships, such as major customers, is crucial for a firm's operating performance. 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). Suppliers commonly make relationship-specific investments (RSI) in their major customer relationships and the health of these valuable trading relationships can significantly affect firm value as shown by Titman (1984), Joskow (1988) and Titman and Wessels (1988). Once these investments are made, a supplier faces substantial losses if its major customer terminates the trading relationship. Suppliers that depend on an important customer commonly state that the loss of a major customer would have a significant negative impact on their firm. For example, Scientific Atlanta Inc., a cable and telecommunications equipment manufacturer, states in its 2005 10-K filing that "A failure to maintain our relationships with customers that make significant purchases of our products and services could harm our business and results of operations. A decline in revenue from one of our key customers or the loss of a key customer could have a material adverse effect on our

[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), and Gormley, Matsa, and Milbourn (2013).

business and results of operations." Similarly, networking server and storage manufacturer Qlogic Corp. states in its 2005 10-K filing that "Any such reduction, delay or loss of [major customer] purchases could have a material adverse effect on our business, financial condition or results of operations."

From a customer's perspective, supplier reliability is critically important to the value of the ongoing customer-supplier relationship. For example, recent evidence suggests that suppliers use anti-takeover provisions to bond important product-market relationships by reducing risks associated with takeovers (Johnson, Karpoff, and Yi, 2015; Cen, Dasgupta, and Sen, 2016; Cremers, Litov, and Sepe, 2017; Harford, Schonlau, and Stanfield, 2019). As supplier risk-taking increases, customers face heightened uncertainty about supplier reliability, including product quality, the ability to service products, and the timeliness of deliveries.[2] Anecdotal evidence suggests customers take active steps to evaluate the financial risks of supplier firms, which could weaken their suppliers' reliability. For example, Dell Technologies states "[w]e consistently evaluate the financial health of our supplier base", while Verizon Communications states that any supplier-induced disruptions "could increase our costs, decrease our operating efficiencies and have a material adverse effect on our business, results of operations and financial condition."[3] It follows that by encouraging supplier risk-taking, CEO stock option compensation can lead to less stable and less reliable customer relationships.

We hypothesize that granting CEOs option compensation can reduce the value of important product market relationships, leading boards to lower option compensation so as to lower CEO risk-taking incentives. As discussed above, CEO option compensation can lead to more fragile customer relationships by reducing customer demand for a firm's products and services. Such unstable customer relationships are particularly costly for firms with important customers, since

[2] See Klein, Crawford, and Alchian (1978); Williamson (1979); Titman (1984); Opler and Titman (1994); Hortaçsu, Matvos, Syverson, and Venkataraman (2013); Wowak, Mannor, and Wowak (2015).

[3] As outlined in another example of customer sensitivity to supplier financial condition, the Internet Appendix reports that to protect against supply disruptions and as part of their supplier agreement with Verizon, Synchronoss Technologies, Inc. agreed to either obtain liability insurance through a third party or to self-insure and maintain a credit rating of at least BBB- or meet minimum net worth requirements. Additional anecdotal examples are discussed in further detail in the Internet Appendix.

suppliers usually make RSI in their major customers and these investments lose value if the customer terminates the relationship. Thus, executive option-based compensation is costlier for firms with major customers.

Williamson (1979) argues that firms optimally adjust governance structures to reduce contracting costs with key stakeholders by attenuating incentives towards ex post opportunism. Specifically, governance adjustments that reduce CEO risk-taking incentives act as a pre-commitment mechanism against ex post opportunism. Consistent with this notion, anecdotal evidence shows that board compensation committees seriously consider the health of customer relationships and discouraging excessive CEO risk-taking in designing executive compensation policies.[4] Accordingly, we expect boards of suppliers with major customer relationships to adopt lower option-based compensation to reduce CEO risk-taking incentives. Following an exogenous shock that lowers customer switching costs, we expect suppliers with major customer relationships to respond by further reducing CEO stock option compensation relative to firms without these relationships. The strength of the adjustments should reflect the importance of the customer relationships and the relative bargaining power of its major customers (Hui, Klasa, and Yeung, 2012). This reduction in stock option compensation should reduce the termination likelihood of its major customer relationship and a loss in its RSI value.

To test our hypothesis and address endogeneity concerns, we exploit industry-level tariff reductions in the U.S. as quasi-natural experiments. Tariff reductions in a firm's industry unexpectedly lower the switching costs of its important customers (to foreign rivals), raising customer bargaining power relative to its supplier by intensifying supplier industry competition (Fresard, 2010; Martin and Otto, 2020). We find novel evidence that customer considerations have a first-order effect on a supplier CEO's option-based compensation. Following tariff reductions, firms with major customers experience greater reductions in CEO option compensation and risk-

[4] For example, Huntington Ingalls Industries explicitly states in their 2017 14A filing that their executive compensation policy is designed to "promote stockholder value and focus [their] executives on performance that benefits [their] stockholders and customers, while discouraging inappropriate risk-taking behaviors".

taking incentives relative to firms without a large customer.[5] Following tariff reductions, firms with major customers reduce the proportion of annual CEO compensation awarded in the form of stock options by an average of 22.6% compared to firms without major customers. In an alternative test, we use propensity score matching to correct for endogenous selection between firms with and without major customers across observable factors. We repeat the above analysis on a matched sample and conclude that our findings are robust to this matching procedure. Taken together, these empirical results provide strong evidence that major customer relationships have a substantial impact on a firm's executive compensation structure.

Our empirical results also provide evidence that CEO option compensation significantly affects the strength of a firm's relationships with its pre-existing major customers. Following tariff reductions, higher CEO option-based compensation and risk-taking incentives lead to significantly lower growth in sales to their major customers and a higher probability of relationship termination. Following a tariff reduction, a one standard deviation rise in a supplier CEO's Vega from new option grants leads to a 7% decline in sales growth to its major customer. It also leads to a 5.2% rise in the termination probability of the major customer relationship, relative to an unconditional probability of relationship termination of 16 percent, which raises the relationship termination probability by one third. We show that this rise in the termination probability adversely impacts a supplier's overall performance. Following a tariff reduction, higher CEO option compensation and risk-taking incentives at firms with major customers also undercut firm performance measured by either Tobin's Q or ROA.

We further show that the negative relation between major customer bargaining power and supplier CEO option compensation exhibits significant cross-sectional differences based on customer and supplier characteristics. Specifically, we find our results are concentrated in suppliers that are more likely to lose valuable major customers, such as firms with higher leverage, a higher probability of financial distress, or firms that face the greatest impacts from tariff cuts.

[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 in the year of the tariff reductions. In untabulated tests, we find no evidence that the result is driven by CEO changes around these tariff cuts.

We also find stronger results for firms that face greater costs of losing valuable major customers, such as firms with greater asset specificity or product differentiation. These results suggest that supplier firms significantly reduce CEO option compensation, especially where they expect to experience the greatest impacts from tariff cuts, while less tariff affected suppliers do not significantly adjust CEO option grants.

The explanatory power of our primary hypothesis dominates that of a series of alternative explanations for the changes in CEO option compensation that we consider. Bakke, Feng, Mahmudi, and Zhu (2020) conclude that the changes in CEO option compensation they observe are driven by a general increase in product market competition, but they do not consider our primary hypothesis that the effects are due to major customer relationships. However, we conclude that our evidence cannot be explained by a general increase in product market competition acting as a substitute for the risk-taking incentives of executive option compensation. To further test the empirical validity of our results, we utilize a second shock caused by accounting rule FAS 123R, which creates an exogenous spike in the accounting costs of executive stock options that reduces firm earnings. We find that firms on average reduce CEO option compensation after this rule change and firms with large customers that reduce CEO risk-taking incentives experience a lower likelihood of losing their major customers. In further robustness tests, we confirm our results are not driven by CEO option exercise, or by substituting CEO option compensation with performance-vesting provisions in CEO grants. Our results also hold in firm-years when a CEO's option compensation cycle starts. In addition, we rule out several other alternative channels as drivers of our results, including general declines in the stock market and rising industry risk levels.

This study contributes to the existing literature in several ways. First, our study expands on the growing literature that shows how important stakeholders can affect executive compensation decisions and thus shareholder value. Several prior studies examine how creditor and employee bargaining power affect CEO compensation. Edmans and Liu (2011) demonstrate the importance of debt-equity holder conflicts in setting CEO risk-taking incentives. Akins et al. (2019) find that increases in creditor bargaining power reduce executive option compensation, while Huang, Jiang, Lie, and Que (2017) find that labor union bargaining power reduces CEO pay. Despite this prior

evidence, there is little existing theoretical or empirical work that examines how major customer relationships can affect CEO compensation structure. This study helps further our understanding of stakeholders' impacts on CEO option compensation. Moreover, we show that implementing customer-friendly compensation in turn creates shareholder value in the presence of major customer relationships.[6]

Second, our findings support a recent stream of research showing how supply chain considerations affect optimal firm decisions, firm valuation, and CEO incentives. Hertzel, Li, Officer, and Rodgers (2008) report firm-level evidence that financial distress of an important customer can lead to significant value destruction at the supplier firm. Harford et al. (2019) report that merger decisions are strongly influenced by its major supply chain relationships as well as those of its industry peers. These supply chain firms often become merger partners and their mergers tend to be more profitable.[7] Coles, Li, and Wang (2018) find that a CEO's incentives are influenced by CEO compensation at other firms within their own or related industries. They find that the maximum CEO pay at other firms in their own or related industries provides CEOs with stronger internal performance incentives. Our study shows that CEO option compensation is negatively related to the existence and the bargaining power of large customers.

[6] Chen, Su, Tian, and Xu (2020) study the relation between customer concentration and CEO risk-taking incentives. Unlike the findings of this paper, they report a positive relation between customer concentration and CEO risk-taking incentives. However, it is important to note that Chen et al. (2020)'s methodology differs substantially from this study in several important dimensions. First, we utilize firm and year fixed effects throughout and study a plausibly exogenous set of shocks to customer bargaining power, and an alternative shock to option accounting treatment. In contrast, Chen et al. (2020) do not utilize an exogenous shock and they employ more aggregated two-digit SIC industry-year fixed effects throughout their analysis. Second, our baseline analysis studies a broad sample of suppliers since we only require firms to report the existence of important customers and do not further require them also to report the sales levels to these customers, resulting in our finding more than 50% of firm-years with at least one major customer, rather than the 20% of firm-years shown by Chen et al. (2020). However, our results are also robust to using a similar sales level reporting requirement. Finally, we find that our estimated negative relation consistently impacts other firm outcomes and is robust to various robustness tests and alternative measures of risk-taking incentives. These different findings suggest the importance of controlling for time-invariant firm- and relationship-specific factors as well as utilizing plausibly exogenous shocks to customer bargaining power.

[7] Large customer relationships also affect a firm's financial leverage (Kale and Shahrur, 2007; Banerjee, Dasgupta, and Kim, 2008), equity issuance (Johnson, Kang, Masulis, and Yi, 2018), and equity investments in economically linked firms (Fee, Hadlock, and Thomas, 2006). In addition, gains from merger activity (Fee and Thomas, 2004) can spillover from customers to suppliers.

Third, we find that a firm can optimize its governance practices to reassure their trading partners. Thus, our findings support Williamson (1979), who argues that firms optimally adjust their governance structures to reduce their contracting costs with key stakeholders, in part by attenuating incentives towards ex post opportunism. Along with Hui, Klasa, and Yeung (2012), Johnson et al. (2015), Cen et al. (2016), and Cremers et al. (2017), we find a new channel by which firms use specific corporate governance policies as a bonding device. In this context, we investigate how publicly listed firms adjust their governance practices by changing executive compensation policies to reassure major customers against increasing supplier risk-taking. Compared to other governance-related bonding mechanisms, adjusting managerial compensation is a potentially low cost approach to reassuring major stakeholders.[8] Thus, shareholders should support stakeholder-oriented governance practices that can ultimately enhance firm value and shareholder wealth. By empirically showing that the presence of important customer relationships can affect CEO compensation contract structure, our results also support the efficient contracting theory of executive compensation (e.g. Edmans and Gabaix, 2009; 2016; Frydman and Jenter, 2010; Murphy, 2013; Edmans, Gabaix, and Jenter, 2017).

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 a 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 activities.[9] Overall, the past literature suggests

[8] Johnson et al. (2015), Cen et al. (2016), and Cremers et al. (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.

[9] For instance, it can lead to increased leverage (Mehran, 1992; Cohen et al., 2000; Dong et al., 2010; Shue and Townsend, 2017), lead to riskier investment policies (Coles et al., 2006; Low, 2009), discourage hedging (Tufano, 1996; Knopf et al., 2002; Rajgopal and Shevlin, 2002), and raise both stock volatility (Defusco et al., 1990; Guay, 1999) and the likelihood of credit ratings downgrades (Kuang and Qin, 2013).

that giving senior managers greater option grants is associated with more corporate risk-taking, but this in turn raises the firm's probability of financial distress.

While CEO stock option compensation can reduce shareholder-manager conflicts, it can have adverse effects on other stakeholders. For example, it can impose costs on a firm's customers *ex post* and lead to less reliable trade relationships. Specifically, CEO stock option grants can adversely impact customers by raising the probability of supplier financial distress and incentives for ex post opportunism. For instance, Maksimovic and Titman (1991) argue that a customer expects greater risk of liquidation or change of control when suppliers are financially distressed. A supplier's willingness to produce, update, or service high-quality products can also fall with financial distress, leaving its customers to bear greater uncertainties about the quality of products they purchase, their timely delivery, and their future servicing (Maksimovic and Titman, 1991). Such supply interruptions and declines in product quality are first-order concerns for customers. 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 is 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 prior to entering into and throughout the life of any important customer-supplier relationship. Thus, supplier CEO option compensation can reduce a major customer's willingness to purchase its products without a discount (Titman, 1984; Hortaçsu et al., 2013), to expand future purchases from the supplier, and to maintain pre-existing trade relationships for a longer duration. Supplier CEO stock option compensation can also discourage RSI by a customer, which reduces a customer's subsequent switching costs. Thus, supplier CEO option compensation can also lead to less durable customer relationships *ex ante* as shown by Kale, Kedia and Williams (2015).

Suppliers with economically large and longer-term trade relationships are also likely to find RSI necessary when producing customized products for these customers (Titman, 1984; Joskow, 1988; Titman and Wessels, 1988). Once RSI is made, a supplier's relationship-specific

assets lose value if the large customer terminates the trade relationship. The loss in customer-specific asset value can be substantial and can have economically large impacts on supplier profitability. Thus, less durable trade relationships are especially costly for firms with a concentrated customer base. To avoid a substantial loss in sales and in RSI value, firms with major customers should ceteris paribus take more actions to reduce firm risk-taking than firms with a diversified customer base. Consistent with this perspective, Kale and Shahrur (2007) and Banerjee et al. (2008) find that both customers and suppliers in bilateral relationships maintain lower leverage to reduce the loss in value of their RSI should one of the two major trade partners become financially distressed. Likewise, in equilibrium, the level of CEO option compensation should be determined by a customer relationship's relative importance to the supplier and the relative bargaining power of the supplier and major customer (Hui et al., 2012; Akins et al., 2019). Thus, we predict that following a decline in customer switching costs, which increases customer bargaining power, firms with major customer relationships will respond by lowering CEO stock option compensation relative to other firms. 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 reduces the switching costs of major customers, supplier firms decrease CEO stock option compensation more than firms without a major customer.*

Hypothesis 2. *Following a shock that reduces the switching costs of major customers, a firm maintaining or raising its CEO's stock option compensation is predicted to experience declining sales and shorter-lived 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 for years 1992 through 2015 for U.S. listed firms. Stock volatility is calculated from daily stock returns taken

from CRSP and calculated over the prior fiscal year, while 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 percentile levels.

Tariff reductions are likely to reduce the equity value of suppliers by intensifying competition for customers. As a result, the value of a supplier CEO's options is likely to decline after tariff cuts, even if the number of options and the firm's option granting behavior is unchanged. Thus, a decline in the value of total option grants may not represent firms actively reducing their CEOs' option compensation levels as a pre-commitment mechanism as predicted by our main hypothesis, but rather it can be caused by the stock price channel (i.e. a stock price decline). To address this concern, we use *Flow Vega* as our primary measure of the risk-taking incentives in a CEO's option compensation. We define *Flow Vega* as the inflation-adjusted dollar change in a CEO's new options granted during the current year (and not her total option portfolio) for a one percent change in the annualized standard deviation of the firm's daily stock returns. This measure captures changes in a CEO's risk-taking incentives from new option grants made in the current year, rather than from changes in the value of her preexisting grants. *Flow Vega* is winsorized at 99th percentile only, since it is by definition truncated at zero. We also define an alternative measure, *Pct Option*, as the portion of CEO compensation comprised of stock options, which is calculated from the value of a CEO's stock options as a fraction of annual total compensation. The proportion of option-based CEO compensation measures the importance of options in executive remuneration and reflects risk-taking incentives that easily can be estimated from firm financial reporting data. We also use several alternative measures of CEO stock option compensation, which are discussed in more detail in Section 4.9.

3.1.2. Firm-level customer relationship data

We extract the firm-level customer information from the Compustat Segment files for years 1992 and beyond, given that our executive compensation data starts in 1992. Our primary variable of interest is *Large Customer*, an indicator variable that equals one if firm *i* has one or more large

customers that commonly account for more than 10% of its sales in year *t* and equals zero otherwise. This measure allows us to capture all publicly traded firms with actual materially important customers. Therefore, it is the most appropriate data for the purposes of studying CEO compensation policies of firms with important customers, and not just firms in industries with higher average product market relationships compared to firms in other industries.[10] We also include two alternative measures of significant trade partners that we use to 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 one 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 equal zero otherwise.

Prior to 1998, firms were not required to report the identities of their important customers (changing with SFAS No.14), but the existence of a major customer had to be reported. Reporting the actual sales level was also voluntary. Due to this reporting practice, measures computed from customer identities and sales levels are understated and subject to downward biases. Therefore, *Large Customer* is the most complete measure of the presence of large trade relationships available. However, for robustness, we also utilize several alternative measures of significant trading partners. These alternative measures include: the sum of total percentage sales to large customers, an indicator variable that measures the existence of long-term large customers based on sales that last for at least two years, and the number of large customers.

The prior literature analyzes some of the impacts of having major suppliers as another type of important stakeholder on various firm policies (Kale and Shahrur, 2007; Banerjee et al., 2008; Hui et al., 2012; Johnson et al., 2015). However, our focus is on the role of large customers in a supplier's compensation policy 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

[10] 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 (2020) examine the impact of supplier 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 et al. (2019) for an in-depth discussion of the differences between these data sources.

a firm than its suppliers (Hertzel et al., 2008; Pandit, Wasley, and Zach, 2011). Second, and partially due to the above reasoning, SFAS only requires public firms to report their major customers, but not their major 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 a supplier is important to their customer. Third, it is easier to identify the implications of large customers on firm value (for example, subsequent sales growth) than that of large suppliers. Nevertheless, we also examine the impact of having important suppliers (defined as *Large Supplier*) on a firm's CEO compensation policy in an untabulated robustness test.

3.1.3 Import tariff data

We use the import tariff data compiled by Fresard (2010), which covers the period 1974–2005 and by Peter Schott, covering 2006–2015 (Schott, 2008). The tariff data only pertains to manufacturing industries (2000-3999 SIC range). Following Fresard (2010), we identify a tariff cut for a specific four-digit SIC industry as large if it is at least 2.5 times larger than the industry's median tariff change over the sample period.[11] $Tariff\ Cut_{j,t}$ is an indicator variable that equals one if the supplier is in industry j that experiences a tariff cut in year t and equals zero otherwise. To ensure that 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 tariff increases in the next two years.[12] We are left with 291 tariff cuts in 88 unique four-digit SIC

[11] The data is available on Laurent Fresard's webpage: http://terpconnect.umd.edu/~lfresard/ and Peter Schott's webpage: http://faculty.som.yale.edu/peterschott/sub_international.htm. Our results are also robust to the use of alternative cutoffs to determine significant tariff cuts, such as a negative tariff change that is two or three times larger than the industry median tariff change.

[12] In unreported tests, we find some, albeit insignificant, evidence of a symmetric effect when we study large tariff increases, defined similarly to tariff cuts. The insignificant empirical relation is potentially the result of low statistical power due to the small sample of large tariff increases (35 compared to 291 large tariff reductions) in the 1992-2015 sample period. Further, large tariff increases over this sample period occurred in 22 unique SIC four-digit industries (as opposed to 88 industries for tariff cuts), reflecting potential selection issues as well as a lack of representativeness for our whole sample of manufacturing firms.

industries over the 1992–2015 period. Figure 1 displays the 291 industry-level tariff reductions by year for our sample.[13]

3.2. Sample formation

We merge the ExecuComp compensation data with Compustat's Segment and company financial data, and then require all firm-years to be in the manufacturing industries described above. This leads to a maximum sample of 9,015 firm-years as a result of the above requirements. After requiring the availability of lagged values of the control variables, we are left with a final sample of 1,084 unique U.S. manufacturing firms.

The mean, median, and standard deviation statistics for key variables along with other CEO and firm characteristics are presented in Panel A of Table 1. In our full sample, 58% of all the firm-year observations 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 more than half of all the firm-years. The mean and median CEO *Flow Vega* are $46,000 and $16,000, respectively. The mean and median proportion of CEO compensation paid in stock options is 0.36 and 0.34, respectively.

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 CEO stock option compensation, we use a difference-in-differences methodology comparing these groups around a quasi-natural experiment. Specifically, we examine how firms with large customers change their CEO compensation policies in response to exogenous changes in competitive pressure relative to that in similar firms without large customers. 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. After these tariff reductions, customers face lower costs of switching to foreign suppliers.

[13] We also check whether firms' customers are directly subject to a tariff reduction in the same year and find 60 firm-years with large customers subject to concurrent tariff cuts. Our results remain essentially the same after excluding these observations.

This improves the bargaining position of customers relative to suppliers and leads to a higher likelihood of a supplier losing an existing customer.

We predict that customers' improved bargaining positions relative to suppliers will lead to a new bargaining equilibrium between suppliers and their customers, resulting in a reduction in supplier CEO risk-taking incentives. Consistent with this perspective, Martin and Otto (2020) find evidence that tariff cuts in supplier industries improve customer bargaining power. Specifically, they show that customers increase total investment in response to lower input prices and supplier hold-up problems following the tariff cuts. Thus, our study builds on their analysis by considering the impacts of an increase in customer bargaining power on supplier firms. Importantly, the difference-in-differences analysis allows us to estimate the differential effects of firms in the same industry with and without large trade relationships, while at the same time controlling for any general industry-wide effects. This allows us to control for industry-wide changes caused by tariff reductions (e.g. more entrants into an industry leading to a reduction in the optimal vega in a symmetric Nash equilibrium for the entire industry) or a negative relation between financial contracting and product market entry (e.g. Cestone and White, 2003).

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 affected industry; 2) the industry-level tariff cuts are exogenous to the determinants of our outcome variables; and 3) tariff reductions are unexpected. However, it is important to note that this methodology does not require random assignment into the group of firms with and without a major customer. Rather, it requires that the compensation policies (the dependent variables in our analysis) of these two groups of firms follow similar trends.

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) report that the market shares of foreign competitors in the affected industries significantly rise following tariff cuts. For instance, Fresard (2010) finds that import penetration increases from 12% to 15% immediately following the tariff reduction year and this trend persists over the two-year post-cut

period. Fresard also shows that following an industry tariff reduction, supplier industries' market-to-book ratios decrease on average from 2.5 to 2. In addition, tariff cuts effectively intensify competition in domestic markets (Bernard, Jensen, and Schott, 2006; Lee and Swagel, 1997; Trefler, 1993). In untabulated tests, we find that industry concentration significantly declines following tariff reductions in our sample, evidence consistent with these earlier studies.

To make for a useful quasi-natural experiment, industry-level tariff cuts need to be exogenous to the factors that drive our main outcome variables (e.g. CEO compensation structure). The tariff reductions are events that repeat themselves on multiple occasions for firms in different industries. 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 can be a concern that policy makers consider industrial performance and financial conditions before removing 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 capturing prior firm performance (ROA, sale growth), financial strength (leverage, cash holdings) and asset 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 asset size.

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

Finally, since tariff reductions are used as exogenous natural experiments in other studies (e.g. Fresard, 2010; Martin and Otto, 2020), their use is subject to the multiple hypothesis testing problem highlighted in Heath, Riggenberg, Samadi, and Werner (2020). We take several steps to

ensure our inferences are not driven by this problem. As discussed above, we confirm the findings of Fresard (2010) that tariff shocks lead to a significant increase in foreign competition and do not find evidence that the parallel trends assumption is violated. As discussed in the next section, we also find consistent evidence when we perform a matched firm analysis. Further, we confirm the external validity of our findings using FAS 123R as an alternative shock to option-based compensation and find consistent results to our tariff tests in Section 4.6. In addition, our results continue to hold in the cross-section when we do not use an exogenous shock on a full sample of firm-years in Section 4.7. Finally, we perform a series of robustness checks to reconcile our results and the assumptions behind our analysis with the existing literature.

3.4. Propensity score matching

While our methodology does not require random assignment into firms with and without major customers, we use propensity score matching to form a matched sample of similar firms that are likely to have a large customer. We perform this additional analysis to mitigate the possibility that observed differences following tariff reductions in CEO option compensation between large-customer and non-large-customer firms are due to other differences in observable firm characteristics between these two groups (and how they interact with tariff reductions). Following Atanasov and Black (2016), we estimate propensity scores and form our matched sample based on scores for the portion of our sample period that precedes tariff reductions to mitigate differences in observable characteristics between the two groups of firms. Propensity scores are estimated from a probit model based on the following matching criteria: CEO *Delta*, sales, return volatility, natural log of firm age, *Sales Growth*, *ROA*, *Tobin's Q, Leverage*, *ExCash* (excess cash), *CAPEX* (capital expenditures), R&D intensity, and the natural log of the 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 neighbor firm-year observation. The matched firm-year observations must be drawn from the same year as the large customer firm-year observations, and their industries must not have experienced tariff reductions in the past two years. There are 4,473 large-customer-firm-year

observations in the treatment sample and a like number of pseudo-firm-year observations taken from the final matched sample.

Table 1, Panel B reports means and medians for CEO and firm characteristics in the large-customer-firm-years and non-large-customer-firm-years of the matched sample. After matching, the two samples of firms with and without large customers exhibit similar firm characteristics. We find that the mean and median firm size, stock volatility, performance, investment expenditures, financial policies, sales concentration, corporate governance, and CEO characteristics of the two samples are not significantly different from each other. Figure 2 displays the overlap of covariates in our matched samples 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 across all these key covariates. Thus, we conclude that our matched samples have approximately balanced covariates. Together with the prior analysis, this provides corroborating 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, Panel A presents the means and quartiles of the tariff rates and tariff rate changes for firm-years with tariff reductions. Panel B reports the mean changes in the proportion of CEO compensation in stock options for firms with and without large customers before and after large tariff cuts. As shown in Panel A, there are 291 industry-level tariff reductions over the 1992–2015 period. Tariff changes are calculated as the current year's industry-level tariff rate on foreign imports minus the prior year's tariff rate. Among industry-years subject to tariff reductions, the magnitude of a typical cut is large, with mean and median tariff rate changes of -0.57% and -0.42% respectively, which represents about 24% = (0.57%/(0.57%+1.77%)) and 25% = (0.42%/(0.42%+1.25%)) reductions in the mean and median tariff rate relative to the level before the cut, respectively.

Since we only include non-transitory tariff reductions that are not reversed in the next two years, the tariff rates on foreign imports tend to remain persistently low for multiple years following these tariff cuts. From the customers' perspective, these multi-period cost reductions in foreign products can translate into substantial economic benefits in dollar terms, thus increasing the likelihood of some customers switching to foreign suppliers. For example, a typical decrease of 0.42% in the tariff rate would imply savings of nearly $2 million *per customer per year* for the typical supplier, given the average reported sales to a large customer from Table 4, Panel A of $466.30 million. 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.[14]

We display the impacts of tariff cuts on CEO compensation using the mean and median *Flow Vega* and the mean and median proportion of CEO option compensation to total compensation for firms with and without large customers in Table 2, Panels B and C respectively. In Figure 3, we display annual median CEO *Flow Vega* for the five-year event window surrounding the tariff reductions. Due to the univariate nature of the figure and in order to cleanly demonstrate the impact of tariffs on option compensation, we restrict observations to industries that do not experience multiple tariff changes within the five-year window (for comparability, we also impose the same restriction on the sample in Table 2, Panels B and C, but not in our multivariate analysis). As can be seen in both panels of Figure 3, where we show industries that experienced tariff cuts, there is a clear divergence of CEO *Flow Vega* and proportion of option compensation between firms with and without a large customer, consistent with Hypothesis 1. Firms with large customers reduce CEO risk-taking incentives in response to tariff reductions, while their industry peers without large customers, and firms unaffected by tariffs do not. Further, we find no evidence of violations of the parallel trends assumption, of short-term reversals, or of similar CEO risk-taking incentives reductions in non-tariff cut industries. We show similar effects in Panels B and C of Table 2. Finally, the difference-in-differences are significant for the means and medians of both CEO compensation measures. Taken together, these results provide initial evidence consistent with

[14] Import tariffs in manufacturing industries are generally very low following tariff reductions in our sample period, with a mean tariff rate of 1.77% and a median of 1.25%.

Hypothesis 1 that firms with large customers significantly reduce CEO option compensation in response to a decline in customer switching costs. We undertake a more rigorous test of Hypothesis 1 in a multivariate setting in the next section.

4.2. Multivariate analysis of CEO stock option compensation and large customer relationships

To test Hypothesis 1 more rigorously, we estimate a difference-in-difference OLS regression specification, which is reported in Table 3, Panel A. For this test, we are primarily interested in the changes in CEO risk-taking incentives from new option grants and the revisions in the proportion of compensation in option grants after the tariff reductions. The dependent variable in column 1 of Panel A is the natural log of one plus the dollar change in the CEO'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 potential effects of the alternative stock price channel and provides evidence of intended changes in CEO compensation in reaction to a tariff cut. Our OLS regressions all include firm and year fixed effects to capture unobserved time invariant firm characteristics and general macroeconomic factors.[15] Additionally, standard errors are clustered by firm to account for the lack of independence across individual firm observations.

Results in column 1 of Panel A indicate that after tariff cuts, firms with large customers provide significantly lower risk-taking incentives through CEO stock option grants compared to those without large customers. This result is statistically significant at the 1% level. While *Flow Vega* appropriately captures the risk-taking incentives provided to a CEO through new option grants, it can be more difficult for important customers to observe or calculate. In column 2, we define the dependent variable as the natural log of one plus the fraction of CEO annual compensation represented by stock options (*Pct Option*). It also offers a clear interpretation of the economic significance of the estimated effects. We find further evidence in support of Hypothesis 1: following tariff cuts, firms with large customers reduce the proportion of option to total

[15] The number of observations in our full sample decreases from 9,015 to 8,941 due to the use of firm fixed effects, and firms that only appear once are dropped in the final regression sample. In untabulated tests, the results are robust to including SIC four-digit industry x year fixed effects (the tariff cut indicator is subsumed as a result).

compensation for supplier CEOs significantly more than firms without large customers and the economic difference between these two groups of firms is large. In column 2, the average firm with a large customer is predicted to reduce its proportion of CEO compensation in stock options by 22.6% more than firms without a large customer, all else being equal. In columns 3 and 4 of Panel A, we report regression results based on our matched sample. The results remain economically and statistically similar and consistent with Hypothesis 1.

In Table 3, Panel B, we examine the large customer effect following tariff cuts on total CEO pay, the fraction of total CEO pay composed of stock grants, the fraction of total CEO pay in cash compensation, and the fraction of total CEO pay composed of other compensation (such as perquisites or defined pension benefits). We find that firms with important customers do not significantly alter their CEOs' total compensation following tariff reductions, although the decline in total compensation is close to significant (with a t-statistic of -1.64). While the components of supplier CEO compensation for the most part do not significantly change after the tariff cuts, the reduction in CEO option compensation appears to be counterbalanced by (insignificant) increases in cash and other compensation.

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 examine if, following import tariff reductions, stock option compensation weakens large customer-supplier relationships. For this purpose, we extract sales data for major customer-supplier pairs from Compustat's Segment files. We use supplier GVKEYs and customer IDs from Compustat's 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 trade relationships to suppliers that report both the amount of sales and the identities of its large customers to allow us to identify each unique major customer-supplier pair.

We then calculate the change in annual 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 326 unique suppliers with CEO compensation data available, 954 unique trade relationships, and 2,379 relationship-year observations after requiring information on key control variables and dependent variables in the initial sample. In addition, calculating a supplier's sales growth to a particular customer requires past sales data, which requires the availability of this trade relationship data for at least two years. This reduces the sample size for the customer sales analysis to 1,489.

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 six years and the median is five years, indicating that long-term trade relationships commonly exist when a firm reports it has one or more major customers. Mean sales to large customers equals $466 million, mean large customer sales relative to total supplier sales equals 20% (sale dependence), and the mean change in annual sales to a large customer is 4.7%. Median large customer sales equals $158 million, while median sales dependence on a large customer represents 16% of total sales for these firms. Overall, the statistics in Table 4 indicate that the major customer-supplier relationships in our sample are generally large and stable relationships.

Panels B and C of Table 4 compare the sales growth of these large trade relationships before and after the tariff reductions on the restricted sample of firms reported in Table 2, Panels B and C. Overall, there is a significant decline in reported sales for high *Flow Vega* firms following tariff cuts, but a small rise in reported sales for low *Flow Vega* firms. The difference between these percentage changes in sales is statistically significant. We observe similar, though insignificant, differences for firms split by *Pct Option*.

Table 5 reports the results from a multivariate diff-in-diff analysis of supplier CEO stock option compensation and the strength of major customer-supplier relationships. We use OLS regressions with supplier-customer pair and year fixed effects, allowing us to study the impact of tariff changes within each relationship. We cluster standard errors by supplier-customer pairs in all models. The dependent variable in columns 1 and 2 is the natural logarithm of one plus *Change*

in Reported Sales, which is the percentage sale growth from a particular large customer *j* as reported by the supplier. Results in columns 1 and 2 indicate that following industry tariff reductions, we find greater CEO risk-taking incentives from new option grants and a higher fraction of option-based compensation lead to significantly lower sales growth rates to major customers. These results are statistically significant at the 5% level.

We estimate a linear probability model in columns 3 and 4 where the dependent variable, *Relationship Termination*, is an indicator variable that equals one if the trade relationship is no longer reported by the supplier firm as significant in the next year and equals zero otherwise. The results in columns 3 and 4 highlight that following large tariff cuts, supplier firms with higher option-based CEO risk-taking incentives face a significantly higher termination likelihood of its major customer relationship, as indicated by significant positive interaction terms for *Flow Vega* and *Pct Option* with the tariff cut indicator. The interaction terms are statistically significant at the 10% level in columns 3 and 4. The economic impact CEO option compensation on relationship termination is also large. Following a tariff cut, a one standard deviation increase in a supplier CEO's Vega from new option grants leads to a 7% decline in the growth rate of sales to its major customer and a 5% rise in the termination probability of its major customer relationship, which represents a 31% increase in the odds of termination relative to the unconditional probability over the sample period of 16%.[16]

We do not find evidence that tariff reductions by themselves significantly weaken the existing major customer-supplier relationships, which is in line with the findings of Bernard et al. (2006) and Fresard (2010). However, we do find that some trade relationships weaken and others strengthen, 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 import

[16] We do not consider relationships to have terminated if they reappear in subsequent years. The reduced sample size in columns 3 and 4 is due to requiring firm data through year t+1. The sales growth decline is calculated by multiplying the coefficient estimate of the interaction from column 1 by the natural log of one plus the sample standard deviation of *Flow Vega* to obtain 0.07 (-0.015*ln(1+112.46)). Similarly, we calculate the odds of relationship termination by taking the exponential of the product of the interaction term's coefficient estimate in column 3 and the natural log of one plus the sample standard deviation of *Flow Vega* in Table 1, Panel A to obtain 0.052 (0.011*ln(1+112.46)).

tariff cuts. Firms with higher CEO stock option compensation following tariff reductions are predicted to experience a weakening of their major customer relationships manifested in a decline in large-customer sales growth and a higher probability of relationship termination. These results are consistent with Hypothesis 2. This evidence also provides strong support for Hypothesis 1, that firms with large customers reduce CEO option compensation following shocks to their customer relationships, presumably as one way to bond these valuable relationships and reassure their major customers.

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 this leads to gains in major customer sales and longer-lasting relationships. By strengthening major customer relationships, lower CEO stock option compensation is expected to reduce supplier losses from in its RSI value and raise sales to major customers. Thus, lowering CEO option compensation can 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 major customer relationships, which then can lead to reduced firm performance and value.

To test this prediction, we examine whether changes in a supplier CEO's option compensation lead to changes in firm performance when the firm has a large customer using a difference-in-differences regression framework and present the results in Table 6. The dependent variables are *Tobin's Q* in columns 1 - 4 and *ROA* in columns 5 - 8 respectively. In this test, we split our sample into firm-years with and without large customers, and then compare the differences in the CEO option compensation-firm performance link following tariff reductions. To avoid potential confounding effects on Tobin's Q and ROA due to major changes in firm assets, we drop 276 observations from our sample where the firm made at least one major acquisition or divestiture during the year. These are defined as mergers, acquisitions, acquisitions of majority interests, or acquisitions of assets that represent more than 20% of a firm's total market capitalization or asset sales that represent at least 20% of a firm's total market capitalization.

The results in columns 1 and 2 indicate that following tariff cuts, CEO risk-taking incentives associated with stock option compensation lead to significantly worse performance for firms with large customers. This result is statistically significant at the 5% level. Economically, after tariff reductions, firms with large customers experience a 1% decline in Tobin's Q for a 1% relative increase in *Flow Vega* (column 1). However, as shown in columns 3 and 4, CEO stock option compensation at firms without large customers does not significantly affect firm performance. The differences in the coefficients of the interaction between the CEO option compensation measures and the tariff cut indicator for these two groups of firms (between columns 1 and 3 and between columns 2 and 4 in Table 6) are statistically significant at the 1% level. We find similar results in columns 5 to 8 where the dependent variable is ROA.

4.5. Firm heterogeneity and large customer characteristics in compensation structures after tariff cuts

To demonstrate the robustness of our mainline result in Table 3, 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 results using *Flow Vega* as the dependent variable for brevity. Nevertheless, the results remain robust to using *Pct Option*. We expect to observe a negative relation between *Large Customer* and CEO option compensation following a tariff cut that is concentrated in firms with a higher probability of financial distress, greater customer-specific assets, and greater exposure to industry tariff cuts.

In columns 1 and 2 of Panel A in Table 7, we split firm-years by whether a firm has leverage above or below the 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 this effect is insignificant for firms with a large customer and low leverage. This is consistent with our expectation that higher leverage, which can be encouraged by high CEO option compensation, reduces customer demand for a firm's products. As existing large customer relationships become more vulnerable following tariff reductions in the industry, firms with higher leverage can experience greater pressure to reduce CEO option-based compensation to protect their valuable customer relationships by reassuring these customers of their continued financial viability.

Similarly, we find statistically significant evidence in columns 3 and not in column 4, where we split our sample into firms with high and low probabilities of financial distress (following Fong, Hong, Kacperczyk, and Kubik (2014)) using the median in the full sample 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 a greater loss in its RSI value if the customer terminates the trade relationship (Banerjee et al., 2008). Similarly, major customers are more concerned about the potential financial distress of a supplier that produces differentiated products, due to higher switching costs. Therefore, we expect the negative relation between *Large Customer* and CEO option compensation following a tariff cut to be stronger among firms with greater asset specificity or product uniqueness.

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. As an alternative asset specificity measure, we use the Hoberg and Phillips (2016) measure of a firm's product similarity within its industry and report this result in Panel C. Hoberg and Phillips (2016) construct an annual similarity score for each pair of firms in the same 10-K based industry from the firms' business descriptions in their respective 10-K filings. We calculate the mean similarity score for each firm-year, where a high (low) mean similarity score represents a low (high) degree of asset differentiation. We split the full sample of firm-years by the sample median asset differentiation.

We find in Table 7 that firm-years with above median asset specificity (in column 1 of Panel B), above median product uniqueness (in column 3 of Panel B), and above median asset differentiation (in column 1 of Panel C) significantly reduce CEO option-based compensation. The results in Panel B are statistically significant at 1% in the subsamples of firm-years with above

median asset specificity and product uniqueness (respectively). Moreover, the differences in these coefficients for firms above and below median asset specificity and product uniqueness are statistically significant at the 10% level. The results for asset differentiation in column 1 of Panel C are also significant at the 10% level, although the difference in coefficients not significant. Overall, we find persuasive evidence that suppliers with more RSI have stronger incentives to reduce CEO stock option compensation following tariff cuts.

We expect firms with major customers will respond to tariff shocks by reducing CEO risk-taking incentives in more concentrated industries that stand to experience a greater increase in competition from foreign suppliers, rather than industries that are already competitive. In Panel D 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-the-median market concentration significantly reduce the proportion of CEO option-based compensation. In contrast, firms with large customers in less concentrated industries do not adjust CEO compensation. Additionally, given that *Tariff Cut* is constructed using tariff reductions in firms' primary industries, we expect that firms with sales more concentrated in their primary industries will have a greater exposure to tariff shocks in those industries. 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 their valuable customer relationships are more affected by the tariff reductions.

We next study whether supplier governance alters the conclusions of our previous findings. This evidence is presented in Panel E of Table 7. As discussed in the hypothesis section, firms utilize CEO option compensation to help resolve the agency issues created by the separation of ownership and control (Jensen and Meckling, 1976), and firms utilize internal governance structures to optimally manage contracting costs (Williamson, 1979). Thus, we expect the results from Table 3, Panel A to be concentrated in firms where CEO interests are better aligned with

shareholders and with better-governed firms. Alternatively, our findings could be the result of poorly governed firms paying higher option compensation than well-governed firms, and then reducing option compensation as a result of heightened product market competition. We use CEO share ownership and the degree of board independence as our measures of strong internal governance. As reported in Panel E, we find evidence consistent with the former explanation, namely that strong internal governance leads to significant adjustments in CEO option compensation after tariff cuts. Specifically, the negative relation between tariff cuts and *Flow Vega* for firms with large customers is negative and significant for supplier-firm years with CEO share ownership above the sample median and board independence above the sample median.

We next explore how the heterogeneity in key characteristics of suppliers and their large customers affects the adjustments in CEO option compensation and report these results in Table 8. We split all supplier firm-years by the sample median fraction of domestic sales to total sales as reported in 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 that are less dependent on domestic sales, as shown in column 2.

Next, we differentiate large customers by whether they are corporations or government bodies in Panel B of Table 8. 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 prefer to trade with domestic firms, we predict firms with large government customers are less sensitive to tariff cuts.[17] Consistent with this prediction, the results in Panel B show a stronger reduction in CEO stock option compensation for firms with large corporate

[17] Another alternative explanation is that government customers mainly purchase goods for consumption rather than production, where suppliers' poorer quality products lead to less severe reputational or monetary losses (Banerjee et al., 2008). Also, government buyers may not be driven by a profit motive, and they can sometimes provide help to distressed firms to save employees from losing their 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.

customers relative to large government customers. The coefficient on the interaction of the tariff cut and large corporate customer indicators in column 1 is significantly negative. In comparison, the coefficient on the interaction of the tariff cut and large government customer indicators in column 2 of Panel B is actually positive, although not statistically significant. This supports the conclusion that large government customers do not have a significant effect on supplier CEO compensation structure.

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 use an alternative exogenous shock to option-based compensation (rather than a shock to customer switching costs) to confirm the negative link between option compensation and important customer relationships.

Specifically, following Hayes, Lemmon, and Qiu (2012) and Bakke, Mahmudi, Fernando, and Salas (2016), 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 in terms of inflating reported earnings. Bakke et al. (2016) report that option compensation and the risk-taking incentives associated with it significantly declined following this event. In untabulated tests, we observe that CEO stock option compensation significantly declines after FAS 123R.[18]

[18] 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 that are not present in our tariff analysis. First, FAS 123R adoption represents a simultaneous shock to the option compensation of all industries, which reduces the power of econometric tests due to the shared shock across the full sample of 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.

In Table 10, we repeat the customer relationship analysis similar to that found in Table 5 using FAS 123R as the exogenous shock. We define an indicator variable, *FAS 123R* that equals one for years 2005 and beyond and equals zero for earlier years. Since *FAS 123R* is subsumed by year fixed effects, and since not all firms significantly reduce option compensation following FAS 123R (Bakke et al., 2016), we interact *FAS 123R* with two variables. *Reduced Average Vega* is an indicator that equals one if the average CEO portfolio Vega falls in firm years following FAS 123R and equals zero otherwise. Similarly, we define *Reduced Marginal Vega* as an indicator that equals one if the CEO portfolio Vega falls in the first year following FAS 123R and equals zero otherwise.

We find evidence that following FAS 123R adoption, firms that reduce their CEOs' risk-taking incentives (either immediately, or on average thereafter) experience a significantly lower likelihood of losing their existing large customer. In untabulated tests, we obtain statistically stronger results when we estimate a logit model for the relationship termination likelihood and include supplier industry fixed effects in place of customer-supplier relationship fixed effects. In further untabulated tests, we find that the percentage change in supplier CEO portfolio vega negatively affects the sales growth to a specific large customer. Overall, our results indicate that following a reduction in CEO option compensation levels, the trade relationships of firms with large customers are significantly more likely to continue. These findings support the results in Tables 3-6 and provide external validity for our previous inferences under an alternative quasi-natural experiment.

4.7. Alternative product market competition mechanism

We uncover evidence consistent with our hypotheses that following an exogenous reduction in major customer switching costs, supplier firms significantly reduce option compensation to retain these important customer relationships. However, this evidence is also consistent with the findings of Bakke et al. (2020). Using a subsample of tariff reductions related to the North American Free Trade Agreement (NAFTA) as well as using increased Chinese import penetration, Bakke et al. (2020) find that firms significantly reduce option compensation. These findings are consistent with firms moving away from high CEO risk-taking incentives provided by option compensation as a result of heightened product market competition. Therefore, our

baseline result can simply be due to managers of firms with large customers experiencing greater product market competition and therefore, responding to this riskier competitive environment by reducing managers incentives to take on high risk projects by reducing CEO option compensation.

Given the similarity of predictions between the Bakke et al. (2020) substitution mechanism and our proposed mechanism that firms reduce option compensation to retain important customers, we design several tests to distinguish between the two hypotheses and fail to find evidence that the substitution effect is driving our results. First, the Bakke et al. (2020) substitution mechanism should not impact the strength of customer-supplier relationships independent of our proposed customer-retention mechanism. We show that major customer relationships are significantly more likely to decline in strength and be terminated following tariff reductions, a result inconsistent with the substitution effect. Second, as reported in Table 10, we find evidence consistent with our proposed channel when we analyze the effect of an exogenous shock to the accounting costs of option compensation. Specifically, we find following FAS 123R that major customer relationships are less likely to terminate after reductions in CEO risk-taking incentives. This accounting rule change raised the costs of option compensation, but it did not directly influence product market competition within an industry. Thus, we do not expect to observe the significant decline in the termination likelihood of major customer relationships in response to FAS 123R that we find if the substitution effect is driving our results.

Third, in Table 11, we repeat our analysis on a comprehensive set of firms based on OLS regressions over the period 1992–2015 and study the relation between the CEO risk-taking incentives (from new option grants, and the fraction of CEO option compensation) and the presence of a large customer. 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 broader sample of firms, and not just in manufacturing industries or from external shocks to product market competition. We continue to find strong results in support of our main hypothesis that are consistent with our difference-in-differences estimates presented earlier.

Finally, if an increase in product market competition from increased foreign entry were driving our results through a substitution effect, we would expect to see significant changes in

CEO delta, total compensation, and turnover in firms with major customers. In Table 3, Panel B, we find no evidence following tariff reductions that firms with major customers experience significantly different CEO total compensation or the proportion of option compensation than firms without major customers. Further, in untabulated robustness tests, we find no evidence that tariff cuts significantly affect CEO delta or turnover rates in firms with large customers. Taken together, while our analysis does not preclude a substitution effect between CEO risk-taking incentives induced by options with those induced by product market competition, we find no evidence that this mechanism is driving our observed empirical relations.

4.8. CEO risk-taking incentives from performance-vesting awards

We find evidence suggesting that firms adjust their risk-taking incentives to protect important customer relationships. Given the risk-taking incentives present in the performance-vesting (p-v) provisions of CEO grants (for example, see Bettis, Bizjak, Coles, and Kalpathy, 2010; 2018; De Angelis and Grinstein, 2019), our findings can be the result of firms with large customers substituting the risk-taking incentives of option grants with the risk-taking incentives of the p-v provisions in CEO grants (in response to tariff shocks and more generally). Therefore, we perform several tests to ensure our results are not being driven by this alternative mechanism and report these tests in Table 12. We perform analysis similar to Table 3 in Panel A and similar to Table 11 in Panel B. We obtain data on p-v provisions from Institutional Shareholder Services' Incentive Lab and merge it with the samples used in Tables 3 and 11, which limits our sample period to 1998-2015 because this database only has broad coverage starting in 1998. We first analyze a subset of firm-years without reported p-v provisions in their CEO grants in column 1 of Panel A and column 1 of Panel B of Table 12. This allows us to analyze the relation between the risk-taking incentives from CEO option grants without the potentially confounding effects of p-v grants. We continue to find that our results on option-based risk-taking incentives are robust among the firm-years without p-v stock awards.

Second, we follow the process outlined by Bettis et al. (2018) and simulate the value of and risk-taking incentives (vega) from the absolute p-v provisions in CEO grants for our samples used in Tables 3 and 11. We do so by performing 1,000,000 simulations of the underlying

accounting and stock price measures related to the p-v provisions of each grant. We then evaluate the value of each grant based on whether the grant-specific p-v provisions were met in each simulation. These values are averaged over the simulations and discounted to the grant date at the relevant risk-free rate. To calculate vega for a given grant with p-v provisions, we simulate the change in grant value from a 1% increase in the volatility of the underlying accounting and price measures used in the p-v provisions. These data requirements significantly reduce the sample of manufacturing firms with available firm-years reported in Table 3 to 1,285, and in our full sample of firms reported in Table 11 to 3,394. In unreported tests we find that the mean vega from p-v awards in our simulations are similar to those reported by Bettis et al. (2018).

We perform an analysis of tariff cuts on the risk-taking incentives of firms (similar Table 3) using the estimated vegas from p-v provisions of CEO grants, and report this result in column 2 of Table 12, Panel A. Similarly, we report results from an analysis similar to Table 11 using the estimated vegas from CEO p-v provisions in column 2 of Table 12, Panel B. Since the distribution of vegas from CEO grants with p-v provisions is highly skewed and can take values of less than or equal to zero, we utilize the inverse hyperbolic sine transformation of p-v vega.[19] We do not find evidence that CEO risk-taking incentives in p-v provisions counteract our finding that firms with large customers reduce *Flow Vega* and thus drive our primary result in Table 3. In fact, we find that following tariff cuts, firms with large customers reduce the vegas of CEO grants with p-v provisions, albeit insignificantly as seen in column 2 of Table 12, Panel A. Finally, we find that in general, firms with large customers have significantly lower risk-taking incentives in the p-v provisions of CEO grants as reported in column 2 of Table 12, Panel B.

Taken together, we find further evidence in support of our hypothesis that firms with large customers reduce CEO risk-taking incentives to protect customer-supplier relationships. We do not find evidence that our results are being driven by firms substituting CEO risk-taking incentives in option grants with those in grants with p-v provisions. In fact, we find some evidence indicating

[19]Coefficients from the regressions using the inverse hyperbolic sine transformation have a similar interpretation to coefficients estimated using log-transformed data. However, the transformation we use has the advantage of being defined for nonpositive values.

that firms also reduce CEO risk-taking incentives in grants with p-v provisions to protect important customer relationships. These findings suggest the importance of considering CEO risk-taking incentives outside of those based on option compensation. Specifically, we find some evidence that CEO risk-taking incentives are adjusted through p-v provisions and not simply through adjustments to option compensation, consistent with Bettis et al. (2018). Further, this evidence is consistent with the perspective that the negative relation between firms with large customers and CEO risk-taking incentives is not unique to CEO option compensation, but it reflects adjustments to CEO risk-taking incentives more generally.

4.9. Additional robustness tests

To ensure our results are robust to a variety of alternative explanations and definitions, we conduct a series of other robustness tests. First, if our findings are the result of suppliers adjusting option compensation in response to reduced customer switching costs, we would expect the changes to occur primarily in the subsample of firm-years where tariff cuts coincided with the beginning of (rather than during) a CEO's option cycle. We follow Hall (1999) who defines the option grant cycle to be fixed-number if the executive is granted the exactly same number of options in two consecutive years of a cycle, and fixed-value if the value of a CEO's stock option grant is within three percent of the previous year of the cycle. In Table 13, we exclude firm-years within existing fixed-number or fixed-value option cycles and find evidence consistent with the prediction above.

Second, since *Flow Vega* is calculated from option grants in a given year, our inferences may not be robust if the CEO option exercise decisions of firms with large customers are significantly impacted by tariff cuts and are therefore driving our main results. We explore this issue in Table A1 of the Internet Appendix, where we find no evidence that the results are in response to CEO option exercise behavior. Specifically, we obtain CEO option exercise information from Thomson Reuters Insider Filing Database and merge it with our existing sample. Consistent with Klein and Maug (2020), option exercises represent a small proportion of total outstanding options in the sample and thus are unlikely to have a large economic impact on the results. Importantly, we find no evidence that CEOs of supplier firms are more likely to exercise

options in response to tariff cuts. Further, we find no evidence that the vega of options exercised by supplier CEOs in response to tariff cuts are significantly different than those exercised at other times and by other firms. Thus, it appears unlikely that CEO option exercises are driving the finding that firms with large customers significantly reduce CEO risk-taking incentives in response to tariff cuts.

Third, given the changes in option compensation following FAS 123R as discussed above, we split the sample around FAS 123R (fiscal year 2005) in Table A2, Panel A in the Internet Appendix. Despite a significant reduction in the number and size of tariffs, we continue to find a significant reduction in *Flow Vega* for firms with large customers following a tariff cut in both the pre- and post-FAS 123R periods. However, we only observe a significant relation between *Pct Option* compensation for the pre-FAS 123R period. Given the decreased importance of option compensation following FAS 123R, it is unsurprising that thereafter firms no longer significantly reduce the CEO's proportion of option compensation in response to tariff cuts. Nevertheless, we still observe significant reductions in CEO risk-taking incentives from CEO grants following FAS 123R. Since executive stock option compensation can start to decrease before FAS 123R due to Sarbanes-Oxley (SOX), we perform another split of sample centered on 2003 and report this result in Panel B. Similar to the results reported in Panel A, we find our main variable remains statistically significant both in the pre- and post-SOX periods.

Fourth, 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 quasi-market value-based, changes in stock volatility could affect this measure, which in turn could influence our results. To ensure that this does not occur, we explicitly test whether stock volatility of firms with large customers increased or that volatility of firms without large customers decreased following tariff cuts. We do not observe a significant change in stock volatility around the tariff cuts for firms with or without large customers. Nor do we observe a significant difference between the two subsamples. This provides further confirmation that the reduced CEO option compensation that we observe is not due to a change in stock volatility around the tariff cuts.

Fifth, we 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 subject to large tariff reductions. When these 52 firm-years are excluded from our analysis, we find that our main results remain robust.

In further untabulated tests, we repeat our primary analysis using alternative measures of CEO risk-taking incentives including: 1) *Portfolio Vega* (Guay, 1999; Core and Guay, 2002; Coles et al., 2006); 2) *Portfolio 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. Our results are also robust to alternative measures of major trade relationships, including: 1) the number of large customers; 2) the combined percentage of sales to all large customers; 3) an indicator for the existence of large longer-term customers; and 4) an indicator for major suppliers.

Lastly, we repeat our primary analysis using the Coarsened Exact Matching (CEM) approach as an alternative to propensity score matching. Some recent studies find evidence that CEM dominates PSM in terms of providing more stable/credible evidence (Iacus, King & Porro, 2011). In untabulated robustness tests, we find quantitatively and qualitatively similar diff-in-diff results for our primary analysis using CEM matching. Taken together, this battery of tests indicates that the results reported for firms with large customers are robust to alternative mechanisms, variable definitions, and matching methodologies.

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 a decrease in customer switching costs following tariff cuts, and a resulting increase in customer bargaining power leads firms with large customers to significantly reduce CEO risk-taking incentives from stock option compensation. We further show that following tariff cuts, supplier firms with higher CEO risk-taking incentives experience significant weakening in their trade relationships with major

customers, including reduced sales growth to these customers and an increased likelihood of relationship termination. Furthermore, CEO option compensation leads to a reduction in firm performance in the presence of major customers. Overall, we find strong support that firms reduce CEO option compensation to bond important customer relationships and thus protect shareholder value.

Our results are stronger if firms with large customers face a higher likelihood of losing major customers, or bear greater costs of less reliable customer relationships, in terms of their responsiveness to tariff cuts. Given the existence of large customers, we find that firms experience greater reductions in CEO risk-taking incentives associated with option compensation following tariff shocks if they exhibit a higher likelihood of financial distress, have greater customer-specific assets, or have greater exposure to tariff reductions. Additionally, we find that firms with major corporate customers have greater reductions in CEO option compensation, whereas firms with major government customers do not.

This study sheds new light on the important role that major stakeholders can play in firm decisions. Specifically, we show that major customer relationships can affect the optimal CEO compensation policy. We find that CEO risk-taking incentives can weaken these major trade relationships *ex post*, and that having a large customer can lead to reduced CEO stock option compensation *ex ante*. Also, we show 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 internal governance mechanisms to take account of major stakeholder interests, such as by further bonding their relationships with important customers. These results also suggest that when making real decisions, firms can face serious implicit or explicit constraints that are imposed by major 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 initial sample consists of 9,015 firm-years and 1,084 unique firms taken from U.S. manufacturing industries over 1992 – 2015 after requiring CEO compensation information from ExecuComp, stock return data from CRSP and financial data from Compustat. To construct the matched sample, we estimate propensity scores and match each *large customer* firm-year observation to the corresponding nearest neighbor in the same year. Propensity scores are estimated from a probit model where the matching criteria includes: Delta, sales, return volatility, the natural log of firm age, sales growth, ROA, Tobin's Q, ExCash, leverage, capital expenditure, R&D intensity, and number of business segments. We also restrict each matched pseudo large customer firm-year observation to be from the same calendar year as the actual large customer firm-year observation, and require that it has not experienced a tariff reduction in the past two years. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. In Panel B, we test the statistical differences in means (t-test) and medians (Mann-Whitney test) of the two subsamples. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Summary Statistics of the Full Sample

	N	Mean	Median	25th Pctl	75th Pctl	Std Dev
Compensation Characteristics						
Flow Vega ($000s)	9,015	46.15	16.38	4.09	50.84	112.46
Pct Option	9,015	0.36	0.34	0.14	0.56	0.27
Portfolio Vega ($000s)	9,015	175.11	70.41	24.93	187.94	349.15
Delta ($000s)	9,015	801.67	214.97	85.74	599.59	4047.72
Total Compensation ($000s)	9,015	4372.33	2671.13	1278.31	5776.62	4437.20
Firm and CEO Characteristics						
Large Customer	9,015	0.58	1.00	0.00	1.00	0.49
Sales ($ millions)	9,015	5170.85	1015.43	331.47	3475.34	16579.60
Total Assets ($ millions)	9,015	6264.19	1092.00	376.72	3901.56	22393.66
Firm Risk	9,015	10.03	9.99	9.33	10.67	0.96
Sales Growth	9,015	0.75	0.73	0.69	0.79	0.15
ROA	9,015	0.14	0.15	0.09	0.21	0.20
MTB	9,015	2.23	1.72	1.30	2.53	1.67
CAPEX	9,015	0.02	0.02	-0.05	0.05	0.07
R&D Intensity	9,015	0.07	0.04	0.01	0.10	0.10
Leverage	9,015	0.23	0.20	0.04	0.33	0.23
ExCash	9,015	-0.29	0.09	-0.01	0.17	0.91
CEO Own	7,903	0.03	0.00	0.00	0.01	0.39
Board Independence	5,531	70.81	75.00	60.00	84.62	16.64

Panel B: Matched Sample Validation

Variables	Large Customer=1			Large Customer=0			Difference of Means	Difference of Medians
	N	Mean	Median	N	Mean	Median		
Sales ($mil)	4,473	3238.09	724.69	4,473	3539.96	865.43	-301.87	-140.74
Total Assets ($mil)	4,473	4065.34	840.25	4,473	4567.38	951.27	-502.04	-111.03
Firm Risk	4,473	10.21	10.18	4,473	10.22	10.19	-0.01	-0.01
Sales Growth	4,473	0.75	0.74	4,473	0.75	0.73	0.01	0.00
ROA	4,473	0.13	0.14	4,473	0.12	0.14	0.01	0.00
MTB	4,473	2.32	1.76	4,473	2.33	1.80	-0.01	-0.03
CAPEX	4,473	0.03	0.02	4,473	0.03	0.03	0.00	0.00
R&D Intensity	4,473	0.09	0.06	4,473	0.09	0.05	0.00	0.01
Leverage	4,473	0.21	0.17	4,473	0.22	0.16	0.00	0.01
ExCash	4,473	-0.13	0.10	4,473	-0.14	0.10	0.01	0.01
CEO Own	3,934	0.03	0.00	3,836	0.02	0.00	0.01	0.00
Board Independence	2,799	71.23	75.00	2,834	71.02	75.00	0.22	0.00

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

Panel A of this table summarizes the characteristics of all the 291 industry-level tariff reductions in U.S. manufacturing industries for 1992–2015. Panels B and C summarize the mean and median CEO stock option compensation characteristics around tariff reductions respectively. *Total Tariff* is the industry-level tariff rate on imports which is calculated as duties collected by U.S. Customs divided by the free-on-board value of imports in the four-digit SIC industry during the year in percentage units. *Tariff Change* is the current year's industry-level tariff rate minus the prior year's tariff rate in percentage units. *Tariff Cut* is an indicator variable that equals 1 if a firm's industry currently experiences a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. *Flow Vega* is the dollar change in the CEO's current annual option grants associated with a 0.01 change in the firm's return volatility stated in 2015 dollars. *Pct Option* is the Black-Scholes value of stock options as a fraction of CEO total compensation during the year. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. In Panels B and C, we test the statistical differences in means (t-test) and medians (Mann-Whitney test) respectively. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Characteristics of Import Tariff Cuts

Variable	N	Mean	25%	Median	75%	Minimum	Maximum
Tariff Change	291	-0.57%	-0.72%	-0.42%	-0.18%	-7.45%	-0.00%
Total Tariff	291	1.77%	0.32%	1.25%	2.49%	0.00%	19.97%

Panel B: Mean Option Compensation Before and After Tariff Reductions

	Large Customer=1			Large Customer=0		
	Pre-cut	Post-cut	Difference of Means	Pre-cut	Post-cut	Difference of Means
	(1)	(2)	(2) - (1)	(3)	(4)	(4) - (3)
Flow Vega ($000s)	30.20	28.87	-1.32	34.41	46.97	12.56*
Pct Option	35.15%	29.91%	-5.24%*	34.14%	33.60%	-0.54%

Panel C: Median Option Compensation Before and After Tariff Reductions

	Large Customer=1			Large Customer=0		
	Pre-cut	Post-cut	Difference of Medians	Pre-cut	Post-cut	Difference of Medians
	(1)	(2)	(2) - (1)	(3)	(4)	(4) - (3)
Flow Vega ($000s)	12.69	8.27	-4.42**	14.79	22.40	7.62*
Pct Option	34.51%	25.36%	-9.15%*	31.24%	32.42%	1.18%

Table 3. Difference-in-Difference Estimates: The Presence of Large Customers and CEO Compensation

This table presents estimates from difference-in-difference regressions on the full sample and a matched sample of U.S. manufacturing firms for 1992–2015. Panel A presents results studying CEO stock option compensation. In columns (1) and (3), the dependent variable is the natural logarithm of one plus *Flow Vega*, which is defined as the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. The dependent variable in columns (2) and (4) is the natural logarithm of one plus *Pct Option*, where *Pct Option* is defined as the Black-Scholes value of stock options as a fraction of CEO total compensation during the year. Columns (1) & (2) present regression results for 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 its corresponding nearest neighbor in the same year as described in Table 1. Panel B presents results studying other components of CEO compensation. In column (1) the dependent variable is the natural logarithm of one plus *CEO Total Compensation*, where *Total CEO Compensation* is defined as the CEO's total annual compensation during the year (TDC1) stated in 2015 dollars. In columns (2), (3), and (4) the dependent variable is the natural logarithm of one plus the value of stock grants as a fraction of CEO total compensation (*Pct Stock*), the natural logarithm of one plus the value of other compensation as a fraction of CEO total compensation (*Pct Other*), and the natural logarithm of one plus the value of cash compensation as a fraction of CEO total compensation (*Pct Cash*). $Tariff\ Cut_t$ is an indicator variable that equals one if a firm's industry is currently experiencing a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. We estimate OLS regressions and use firm and year fixed effects with firm clustered standard errors in all specifications. Control variables take lagged values in all panels. Panel B control variables (not reported for brevity) are the same as in Panel A, with the exception of adding lagged *Portfolio Vega*. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Presence of Large Customers and CEO Option Compensation

Dep Var:	**Ln(1+Flow Vega$_t$)**	**Ln(1+Pct Option$_t$)**	**Ln(1+Flow Vega$_t$)**	**Ln(1+Pct Option$_t$)**
	Full sample		*Matched Sample*	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.471**	0.107	0.947**	0.348**
	(2.18)	(1.35)	(2.42)	(2.27)
Large Customer $_{t-1}$: b	0.072	0.025	-0.122	-0.028
	(0.50)	(0.43)	(-0.78)	(-0.40)
*a * b*	-0.710***	-0.226**	-0.908**	-0.391**
	(-2.68)	(-2.20)	(-2.00)	(-2.23)
Ln(Sale) $_{t-1}$	0.501***	0.082**	0.614***	0.135***
	(4.82)	(1.98)	(5.74)	(2.84)
ROA $_{t-1}$	-0.201	-0.071	-0.669*	-0.244
	(-0.51)	(-0.49)	(-1.70)	(-1.21)
Sales Growth $_{t-1}$	0.199	-0.047	0.491	0.166
	(0.76)	(-0.43)	(1.37)	(1.04)
Leverage $_{t-1}$	-0.321	-0.143	-0.241	-0.119
	(-1.29)	(-1.38)	(-0.73)	(-0.79)
ExCash $_{t-1}$	-0.018	0.016	-0.083	0.027
	(-0.10)	(0.25)	(-0.43)	(0.34)
Delta $_{t-1}$	0.000	-0.000	0.000**	0.000
	(0.14)	(-0.09)	(2.33)	(1.05)
HHI $_{t-1}$	0.705	0.270	0.155	0.162
	(1.10)	(1.14)	(0.25)	(0.59)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	8,941	8,941	8,872	8,872
Adjusted R^2	0.387	0.312	0.414	0.342

Panel B: Presence of Large Customers and Other Components of CEO Compensation

	Ln(1+Total CEO Compensation$_t$)	**Ln(1+Pct Stock$_t$)**	**Ln(1+Pct Other$_t$)**	**Ln(1+Pct Cash$_t$)**
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.157***	0.095	-0.016	-0.053
	(4.38)	(1.25)	(-0.33)	(-1.65)
Large Customer $_{t-1}$: b	0.016	0.049	-0.004	0.007
	(0.61)	(0.89)	(-0.11)	(0.30)
*a * b*	-0.076	-0.036	0.048	0.015
	(-1.64)	(-0.39)	(0.83)	(0.38)
Other Panel A Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	8,941	8,941	8,941	8,941
Adjusted R^2	0.715	0.508	0.270	0.546

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 the Compustat Segment files over the period 1992–2008 and we restrict the sample of significant trade relationships to those with US manufacturing suppliers. 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). The initial sample contains 326 unique supplier firms, 954 unique large trading customer relationships and 2,679 relationship-years for the 1992–2008 period (1,489 relationship-years when requiring relationship length to be greater than one year to calculate *% Change in Reported Sales*). *Flow Vega* is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. *Pct Option* is the Black-Scholes value of stock options as a fraction of CEO total compensation during the year. *Tariff Cut* is an indicator variable that equals one if a firm's industry is currently experiencing a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. In Panels B and C, we test the statistical differences in means using a t-test. ***, **, 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
% Change in Reported Sales	1,489	4.66	4.68	4.52	4.84	0.54
Reported Sales (in $ million)	1,489	466.30	158.34	54.57	431.50	921.92
Termination	1,278	0.16	0	0	0	0.37
Relationship Length (years)	1,489	6.19	5.00	4.00	8.00	3.55
Sale Dependence of Supplier (in %)	1,489	20.08%	16.00%	11.40%	24.00%	17.53%

Panel B: Change in Reported Sales of Significant Trade Relationships Subject to Tariff Reductions by Flow Vega

	> Median Flow Vega (N=126)			< Median Flow Vega (N=99)			*Diff in Diff*
	Pre-cut	*Post-cut*	*Difference*	*Pre-cut*	*Post-cut*	*Difference*	
	(1)	(2)	(2) - (1)	(3)	(4)	(4) - (3)	
% Change in Reported Sales	19.81%	8.14%	-11.66%**	13.80%	16.08%	2.28%	13.94%**

Panel C: Change in Reported Sales of Significant Trade Relationships Subject to Tariff Reductions by Pct Option

	> Median Pct Option (N=126)			< Median Pct Option (N=99)			*Diff in Diff*
	Pre-cut	*Post-cut*	*Difference*	*Pre-cut*	*Post-cut*	*Difference*	
	(1)	(2)	(2) - (1)	(3)	(4)	(4) - (3)	
% Change in Reported Sales	12.37%	9.49%	-2.88%	13.65%	13.89%	0.24%	3.12%

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

This table presents estimates from difference-in-difference regressions in a sample of trades between U.S. manufacturing suppliers and their major customers for 1992–2008. The dependent variable in Columns (1) and (2) is the natural logarithm of one plus *Change in Reported Sales*, where *Change in Reported Sales* is defined as the sales growth to a particular large customer *j* as reported by the supplier firm in percentage terms. Columns (3) and (4) present the results of a linear probability model where the dependent variable is *Relationship Termination,* which is an indicator variable that equals to one if a trade relationship is no longer reported as significant by the supplier firm in the next year and equals zero otherwise. It is set to missing if either the supplier or customer firm disappears from the Compustat universe. *Flow Vega* is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. *Pct Option* is the Black-Scholes value of stock options as a fraction of CEO total compensation during the year. All regressions are estimated with relationship and year fixed effects and standard errors clustered by trade relationships. *Tariff Cut* is an indicator variable that equals one if a firm's industry currently experiences a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. Control variables are lagged. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

	Change in Reported Sales $_{j,t}$		Relationship Termination $_{j,t+1}$	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.051	0.065	-0.250***	-0.171*
	(0.90)	(1.09)	(-2.74)	(-1.95)
Ln(1+Flow Vega $_t$): b1	0.005		-0.000	
	(1.22)		(-0.07)	
a * b1	-0.015**		0.011*	
	(-2.14)		(1.75)	
Ln(1+Pct Option $_t$): b2		0.010		-0.002
		(0.87)		(-0.20)
a * b2		-0.048**		0.028*
		(-2.02)		(1.74)
Sale Dependence $_{t-1}$	0.018***	0.018***	-0.002*	-0.002*
	(5.21)	(5.22)	(-1.65)	(-1.79)
Relationship Length $_{t-1}$	0.328	0.326	0.138	0.126
	(1.30)	(1.30)	(1.36)	(1.40)
Ln(Sale) $_{t-1}$	0.219*	0.219*	-0.005	-0.007
	(1.92)	(1.91)	(-0.07)	(-0.11)
ROA $_{t-1}$	0.011	0.009	-0.417*	-0.139
	(0.04)	(0.04)	(-1.68)	(-0.59)
Sale Growth$_{t-1}$	1.370***	1.374***	0.122	0.044
	(6.59)	(6.60)	(1.04)	(0.40)
Firm Age$_{t-1}$	-0.001	-0.000	-0.078	-0.052
	(-0.28)	(-0.18)	(-1.56)	(-1.10)
R&D $_{t-1}$	-0.227	-0.245	-0.256	-0.247
	(-0.81)	(-0.87)	(-1.50)	(-1.27)
Leverage $_{t-1}$	0.005	0.005	-0.056	0.036
	(0.06)	(0.06)	(-0.89)	(0.58)
ExCash $_{t-1}$	0.133**	0.143**	0.163**	0.139**
	(2.36)	(2.56)	(2.29)	(2.03)
HHI $_{t-1}$	-0.044	-0.024	-0.498*	-0.289
	(-0.17)	(-0.09)	(-1.96)	(-1.17)
Delta $_{t-1}$	-0.000	-0.000	-0.000**	-0.000***
	(-1.15)	(-1.16)	(-2.14)	(-2.74)
Relationship FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1,489	1,489	1,192	1,278
Adjusted/Pseudo R^2	0.225	0.225	0.300	0.291

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

The table presents estimates from difference-in-differences regressions on a sample of U.S. manufacturing firms for the 1992–2015 period. The dependent variable in columns (1) – (4) is the natural logarithm of one plus *Tobin's Q*, where Tobin's Q is defined as the market value of a firm's total assets divided by beginning-year book value of assets. The dependent variable in columns (5) – (8) is the natural logarithm of one plus *ROA*, where ROA is defined as the Operating Income Before Depreciation scaled by beginning-year book value of assets. We have dropped 276 observations from our sample where the firm has undertaken at least one major acquisition or divestiture (defined as mergers, acquisitions of majority interests, or acquisitions of assets that are more than 20% of the firm's total market capitalization) during the year to exclude Tobin's Q and ROA values driven by major restructuring activities. We estimate OLS regressions with firm and year fixed effects and cluster standard errors by firm in all the specifications. *Flow Vega* is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. *Pct Option* is the Black-Scholes value of CEO stock options as a fraction of total compensation during the year. *Tariff Cut* is an indicator variable that equals one if a firm's industry currently experiences a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. Control variables (not reported for brevity) are the same as in Table 3, Panel A. *t*-statistics are in parenthesis. We report the adjacent differences in the coefficients of the interaction terms *Tariff Cut* and *Flow Vega* (or *Tariff Cut* and *Pct Option)* for the paired subsamples where *Large Customer* equals one in odd-numbered columns and zero in even-numbered columns, respectively. The corresponding F-statistics comparing the differences in interaction coefficients between the paired subsamples are reported in square brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Dependent Variable:	**Ln(1+Tobin's Q_{t+1})**				**Ln(1+ ROA_{t+1})**			
	Large Customer =1	*Large Customer =0*	*Large Customer =1*	*Large Customer =0*	*Large Customer =1*	*Large Customer =0*	*Large Customer =1*	*Large Customer =0*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tariff Cut $_t$: a	0.014	-0.071*	0.029	-0.064*	0.156**	0.022	0.152**	0.027
	(0.33)	(-1.90)	(0.71)	(-1.82)	(2.38)	(0.28)	(2.39)	(0.37)
Ln(1+Flow Vega $_t$): b1	0.002	-0.000			0.000	-0.000		
	(0.74)	(-0.00)			(0.00)	(-0.04)		
a * b1	-0.010**	0.005			-0.013*	0.004		
	(-2.23)	(1.31)			(-1.89)	(0.57)		
Ln(1+Pct Option $_t$): b2			0.006	-0.002			-0.005	-0.002
			(1.10)	(-0.29)			(-0.48)	(-0.24)
a * b2			-0.033**	0.013			-0.036*	0.010
			(-2.57)	(1.16)			(-1.80)	(0.51)
Difference in a * b	-0.015***		-0.046***		-0.017*		-0.046*	
F Statistic	[6.65]		[7.55]		[3.10]		[2.80]	
Other Table 3A Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,019	3,148	4,019	3,148	4,019	3,148	4,019	3,148
Adjusted R2	0.656	0.718	0.656	0.718	0.461	0.538	0.461	0.538

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

This table presents estimates from OLS regressions on a sample of U.S. manufacturing firms for 1992–2015. The dependent variable in all panels is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility. *Tariff Cut* is an indicator variable that equals one if a firm's industry currently is experiencing a tariff reduction that is at least 2.5 times larger than the industry's median tariff change and zero otherwise. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. *Leverage* is the book value of total current debt plus long-term debt and scaled by total assets. *Distress* is a measure of distance to default from Fong et al. (2014). *Asset Specificity* is defined as the gross value of machinery and equipment scaled by lagged total assets. *Product Uniqueness* is the ratio of selling expense to total assets as a measure of product specificity. *Asset Differentiation* is the text-based similarity score developed by Hoberg and Phillips (2016) averaged at the firm-year level and multiplied by negative one. *Industry Concentration* is the Herfindahl-Hirschman Index (HHI) of the supplier firm's four-digit SIC industry covered by Compustat. *% Sales in Affected Industry* is the percentage of the supplier's sales coming from industries experiencing tariff reductions. *CEO Ownership* is the firm CEO's shareholdings excluding options and warrants as a percent of the firm's total common shares outstanding. *Board Independence* is the proportion of independent directors on a board. We split the full samples into high and low subsamples based on being above or below the sample median. Control variables (not reported for brevity) are the same as in Table 3, Panel A. 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	0.350	0.543	0.354	0.450
	(1.26)	(1.50)	(1.25)	(1.26)
Large Customer $_{t-1}$: b	0.059	0.114	0.150	0.006
	(0.28)	(0.62)	(0.75)	(0.03)
*a * b*	-0.936***	-0.510	-0.929**	-0.466
	(-2.59)	(-1.28)	(-2.55)	(-1.19)
Other Table 3A Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4,395	4,387	4,390	4,403
Adjusted R^2	0.387	0.426	0.384	0.428

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	0.943***	0.081	0.569**	0.425
	(3.51)	(0.23)	(2.38)	(1.00)
Large Customer $_{t-1}$: b	-0.109	0.274	-0.020	0.250
	(-0.57)	(1.31)	(-0.10)	(1.20)
*a * b*	-0.972***	-0.443	-1.031***	-0.281
	(-2.82)	(-1.02)	(-3.30)	(-0.57)
Other Table 3A Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4,643	4,190	4,687	4,148
Adjusted R^2	0.380	0.420	0.374	0.428

Panel C: Asset Differentiation and CEO Stock Option Compensation around Tariff Reductions

	High Asset Differentiation	*Low Asset Differentiation*
	(1)	(2)
Tariff Cut $_t$: a	0.803**	-0.102
	(2.41)	(-0.28)
Large Customer $_{t-1}$: b	0.289	-0.272
	(1.43)	(-1.39)
*a * b*	-0.786*	-0.286
	(-1.90)	(-0.61)
Other Table 3A Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	3,771	3,578
Adjusted R^2	0.412	0.419

Panel D: 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	0.719***	0.158	0.688**	0.026
	(2.69)	(0.38)	(2.45)	(0.06)
Large Customer $_{t-1}$: b	0.142	-0.106	0.141	0.030
	(0.74)	(-0.46)	(0.53)	(0.17)
*a * b*	-0.803**	-0.627	-0.870***	-0.628
	(-2.30)	(-1.36)	(-2.59)	(-1.10)
Other Table 3A Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	5,469	3,390	3,586	5,214
Adjusted R^2	0.399	0.381	0.375	0.417

Panel E: Internal Governance and Supplier CEO Stock Option Compensation around Tariff Reductions

	High CEO Ownership	*Low CEO Ownership*	*High Board Independence*	*Low Board Independence*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.420	0.339	0.649**	-0.249
	(1.14)	(1.01)	(2.05)	(-0.50)
Large Customer $_{t-1}$: b	-0.016	0.019	0.351	-0.195
	(-0.06)	(0.10)	(1.57)	(-0.76)
*a * b*	-0.888**	-0.397	-1.466**	-0.598
	(-2.04)	(-0.86)	(-2.30)	(-0.90)
Other Table 3A Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,594	4,104	2,326	2,968
Adjusted R^2	0.407	0.315	0.459	0.419

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

This table presents estimates from OLS regressions on a sample of U.S. manufacturing firms for 1992–2015. The dependent variable is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the CEO'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 one if a firm's industry currently experiences a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and zero 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 one when the firm reports having one or more large corporate (government) customers, which commonly account for more than 10% of its total sales and zero otherwise. Control variables (not reported for brevity) are the same as in Table 3, Panel A. 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 the Proportion of Supplier CEO Stock Option Compensation around Tariff Reductions

	High % Domestic Sales	*Low % Domestic Sales*
	(1)	(2)
Tariff Cut $_t$: a	0.688**	0.026
	(2.45)	(0.06)
Large Customer $_{t-1}$: b	0.141	0.030
	(0.53)	(0.17)
*a * b*	-0.870***	-0.628
	(-2.59)	(-1.10)
Other Table 3A Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	3,586	5,214
Adjusted R^2	0.375	0.417

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

	(1)	(2)
Tariff Cut $_t$: a	0.422**	0.049
	(2.00)	(0.28)
Corporate Customer$_{t-1}$: b	0.055	
	(0.40)	
*a * b*	-0.675**	
	(-2.51)	
Government Customer$_{t-1}$: c		-0.045
		(-0.17)
*a * c*		0.294
		(0.64)
Other Table 3A Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	8,941	8,941
Adjusted R^2	0.387	0.386

Table 9. Falsification Test of Pre-Treatment Trends for Tariff Reductions

This table presents estimates from OLS regressions on a sample of U.S. manufacturing firms for 1992–2015. The dependent variable is *Flow Vega*, which is the dollar change in the CEO's option portfolio from the current year's grants associated with at least a 0.01 increase in the firm's return volatility. *Pre-Cut* is an indicator variable that equals one if the current industry-year of a firm is one or two years before an industry-level tariff cut and zero otherwise. *Large Customer$_{t-1}$* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and zero otherwise. Control variables (not reported for brevity) are the same as in Table 3, Panel A. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

	Ln(1+Flow Vega $_t$)	**Ln(1+Pct Option $_t$)**
	(1)	(2)
Pre-Cut$_t$: a	-0.001	-0.034
	(-0.01)	(-0.45)
Large Customer$_{t-1}$: b	-0.027	-0.017
	(-0.19)	(-0.29)
*a * b*	0.003	0.061
	(0.01)	(0.60)
Other Table 3A Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	8,941	8,941
Adjusted R^2	0.386	0.311

Table 10. Difference-in-Difference Estimates: CEO Stock Option Compensation and Large Trading Relationships following FAS 123R

This table presents estimates from difference-in-difference regressions in a sample of trades between US suppliers and their major customers for 1996–2009. The dependent variable in Columns (1) & (2) is the natural logarithm of one plus *Change in Reported Sales*, where *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 *Relationship Termination,* which is an indicator variable that equals to one if a trade relationship is no longer reported as significant by the supplier firm in the next year and zero otherwise. It is set to missing if either supplier or customer firm disappears in the Compustat universe. *Reduced Average Vega* is an indicator variable that equals one if a firm reduced its average CEO portfolio Vega in the years following FAS 123R relative to the average CEO portfolio Vega before FAS 123R, and zero otherwise. *Reduced Marginal Vega* is an indicator variable that equals one if a firm reduced its CEO portfolio Vega in the year FAS 123R became effective (2005) relative to 2004, and zero otherwise. *FAS 123R* is an indicator variable that equals one for years 2005 and onwards, and zero otherwise. Control variables (not reported for brevity) are the same as in Table 5, but also include *Board Independence*, *CEO Own*, and *BCF* (as defined in Appendix 1) since the post-FAS 123R period coincides with the governance changes during the post-Sarbanes Oxley period. All regressions are estimated with relationship (i.e. supplier-customer pair) and year fixed effects. Standard errors are clustered by trade relationships. The coefficient on *Reduced Average Vega* and *Reduced Marginal Vega* is subsumed due to the inclusion of relationship fixed effects. The coefficient on *FAS 123R* in all columns is subsumed due to the inclusion of year fixed effects. t-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

	Change in Reported Sales $_{j,t}$		**Relationship Termination** $_{j,t+1}$	
	(1)	(2)	(3)	(4)
FAS 123R * Reduced Average Vega	0.049		-0.092*	
	(0.70)		(-1.86)	
FAS 123R * Reduced Marginal Vega		0.022		-0.093*
		(0.33)		(-1.88)
Other Table 5 Control Variables	Yes	Yes	Yes	Yes
Relationship FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,904	2,904	2,827	2,827
Adjusted/Pseudo R^2	0.301	0.301	0.278	0.278

Table 11. Large Customers and CEO Stock Option Compensation: Full Sample Cross Sectional Evidence

This table presents cross-sectional correlations on a full sample of U.S. non-regulated firms for 1992–2015. The dependent variable column (1) is the natural logarithm of one plus *Flow Vega*, which is the dollar change in the CEO's option portfolio from the current year's grants associated with 0.01 increase in the firm's return volatility. The dependent variable in column (2) is the natural logarithm of one plus *Pct Option*, which is the value of stock options as a fraction of CEO total compensation during the year. *Large Customer*$_{t-1}$ is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and zero otherwise. Control variables in both columns (not reported for brevity) include those in Table 3 and are defined in the appendix. Additional controls include CEO Own, CEO Age, CEO Tenure, Firm Risk, CAPEX, RD, MB, and the number of business segments. Column (1) also includes Delta and Cash Compensation, whereas column (2) includes lagged ln(1+Pct Cash) and ln(1+Pct Stock). 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.

	Ln(1+Flow Vega $_t$)	**Ln(1+Pct Option $_t$)**
	(1)	(2)
Large Customer $_{t-1}$	-0.289***	-0.108***
	(-2.70)	(-2.97)
Additional Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	15,681	15,681
Adjusted R^2	0.397	0.546

Table 12. Large Customers and CEO Risk-taking Incentives from Performance-Vesting Awards

This table reports results of robustness tests accounting for risk-taking incentives of CEO grants with performance-vesting (p-v) provisions. The information on p-v grants is from ISS IncentiveLab, which limits our sample period to post-1997. *Flow Vega* is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. In column 1 of Panel A, the dependent variable is the natural log of *Flow Vega* plus one. We begin with the main sample of Table 3 and exclude all firm-years in our sample with CEO grants with p-v provisions. *Vega from P-V Awards*$_t$ is the dollar change in CEO p-v awards during the year associated with a 0.01 increase in the firm's accounting metric and return volatility as described in Bettis et al. (2018). In column 2 of Panel A, the dependent variable is the inverse hyperbolic sine of *Vega from P-V Awards*$_t$. The Panel A sample includes all U.S. manufacturing firms with ExecuComp data and information on the required simulation variables from ISS IncentiveLab. Panel B performs similar analysis to Panel A, but following Table 11, on a more general sample of firms that includes non-manufacturing industries that are not heavily regulated. Control variables (unreported for brevity) in Panel A are the same as in Table 3, Panel A and in Panel B they are the same as in Table 11. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: Robustness Checks for Performance-Vesting (P-V) Awards using Tariff Reductions

Dep Var:	**Ln(1+Flow Vega $_t$)**	**Inverse Hyperbolic Sine of Vega from P-V Awards $_t$**
	Excludes firm-years with p-v stock grants	*All firm-years with information on required simulation variables*
	(1)	(2)
Tariff Cut $_t$: a	0.806	0.251
	(1.56)	(1.37)
Large Customer $_{t-1}$: b	-0.092	-0.030
	(-0.38)	(-0.22)
a * b	-1.163*	-0.232
	(-1.75)	(-0.85)
Other Table 3 Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	2,634	1,285
Adjusted R^2	0.364	0.549

Panel B: Robustness Checks for Performance-Vesting (P-V) Awards on a General Sample of Firms

Dep Var:	**Log(1+Flow Vega)**	**Inverse Hyperbolic of Vega from P-V Awards t**
	Excludes firm-years with p-v stock grants	*All firm-years with information on required simulation variables*
	(1)	(2)
Large Customer $_{t-1}$	-0.288	-0.155*
	(-1.62)	(-1.75)
Other Table 11 Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	5,042	3,394
Adjusted R^2	0.405	0.473

Table 13. Difference-in-Difference Estimates: Large Customers and CEO Stock Option Compensation Excluding On-going Option Cycle Years

This table presents results from difference-in-difference regressions on the sub-sample of U.S. manufacturing firms for 1992–2015 where the firm is not in the middle of an existing option cycle. The dependent variable in column (1) is the natural logarithm of one plus *Flow Vega*, which is defined as the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility. The dependent variable in column (2) is the natural logarithm of one plus *Pct Option*, where *Pct Option* is defined as the value of stock options as a fraction of CEO total compensation during the year. *Tariff Cut*$_t$ is an indicator variable that equals one if a firm's industry is currently experiencing a negative tariff change that is at least 2.5 times larger than the industry's median tariff change and equals zero otherwise. *Large Customer* is an indicator variable that equals one when the firm reports having one or more major customers, which commonly account for more than 10% of its total sales and equals zero otherwise. Control variables (not reported for brevity) are the same as in Table 3, Panel A. 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.

	Ln(1+Flow Vega$_t$)	**Ln(1+Pct Option$_t$)**
	(1)	(2)
Tariff Cut $_t$: a	0.378	0.076
	(1.52)	(0.81)
Large Customer $_{t-1}$: b	0.143	0.060
	(0.88)	(0.92)
*a * b*	-0.771**	-0.235*
	(-2.49)	(-1.94)
Other Table 3 Control Variables	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	7,733	7,733
Adjusted R^2	0.471	0.383

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

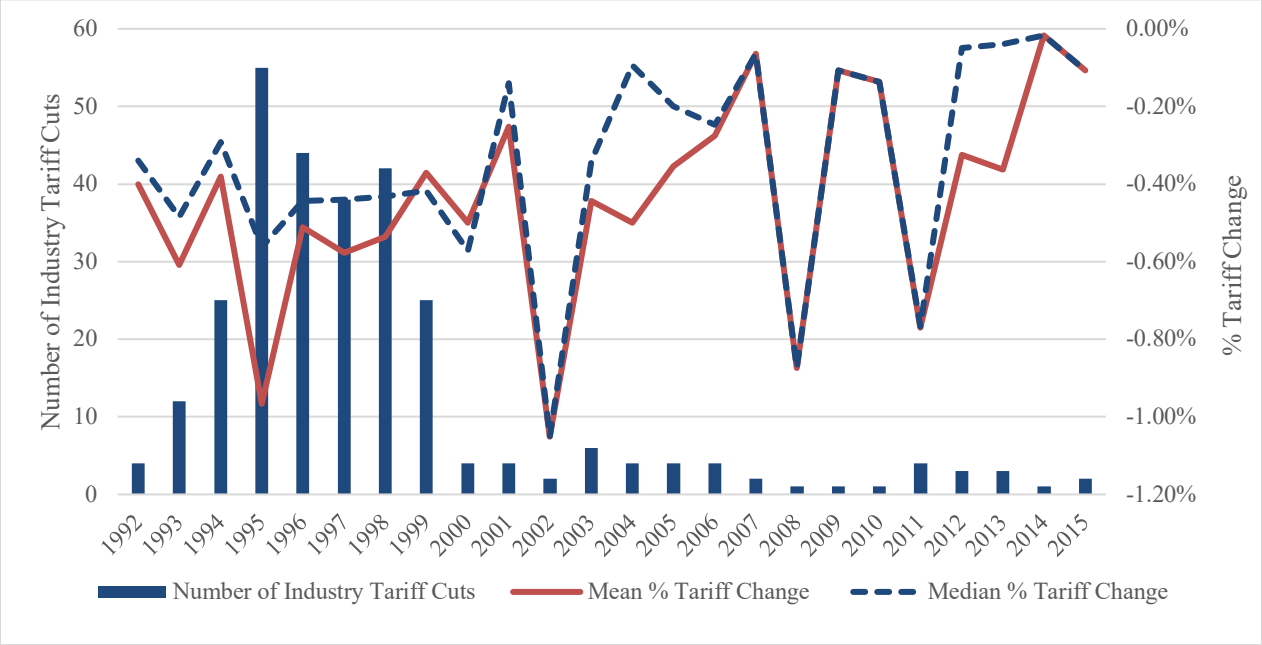


Figure 2: Distributions of Key Matched Sample Covariates

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.

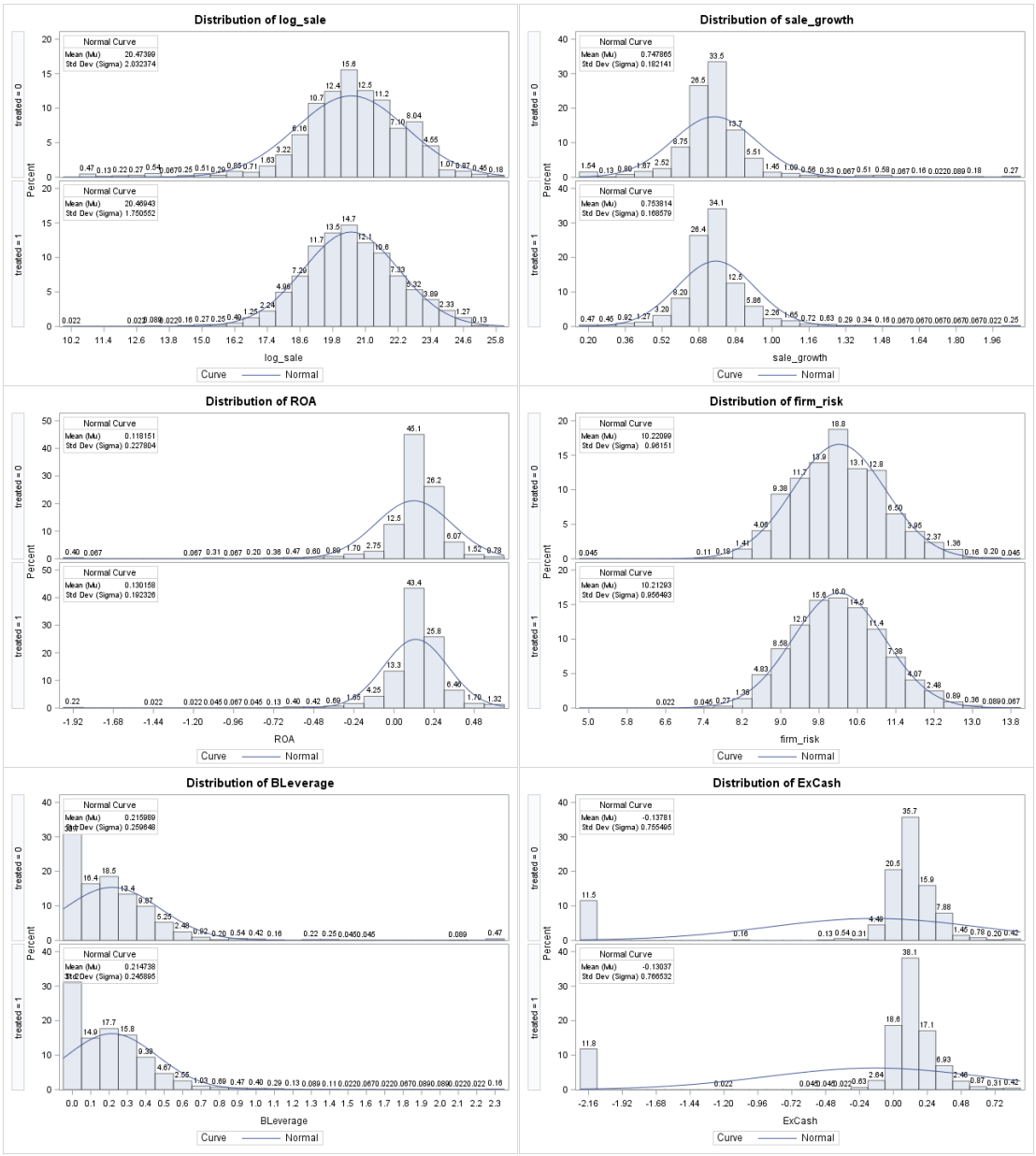
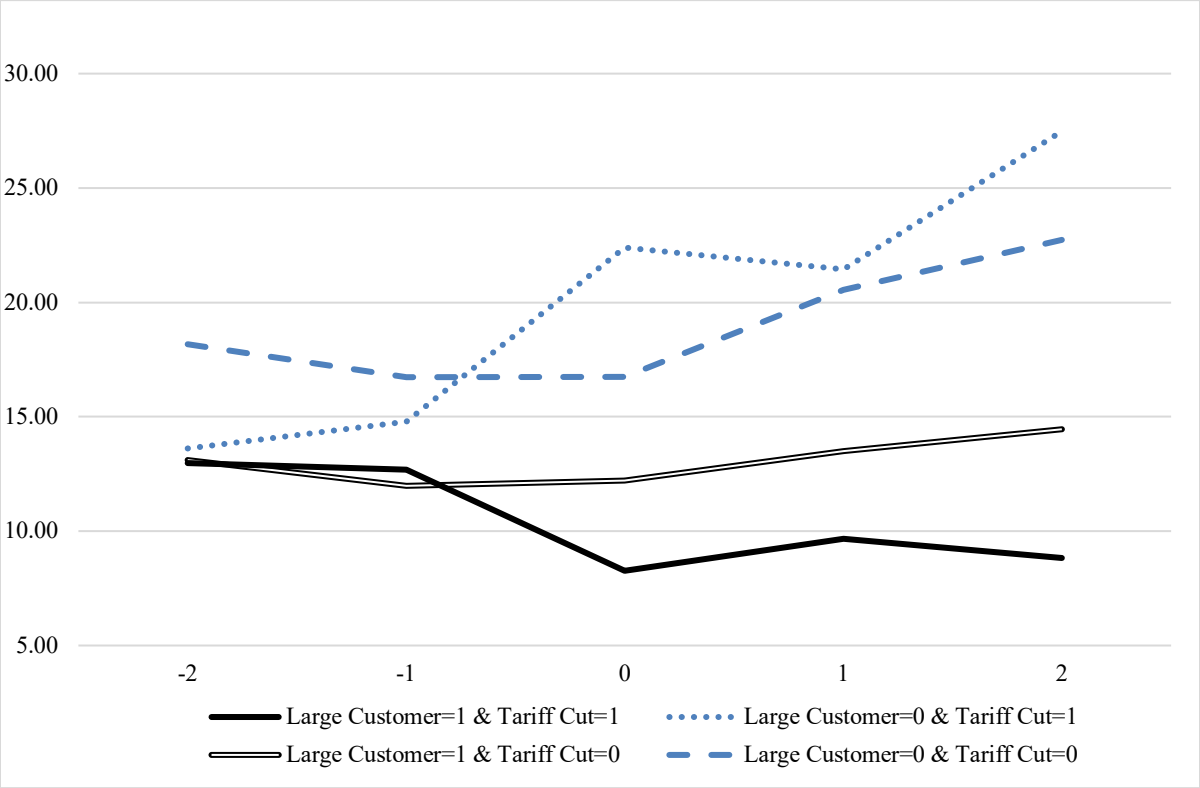
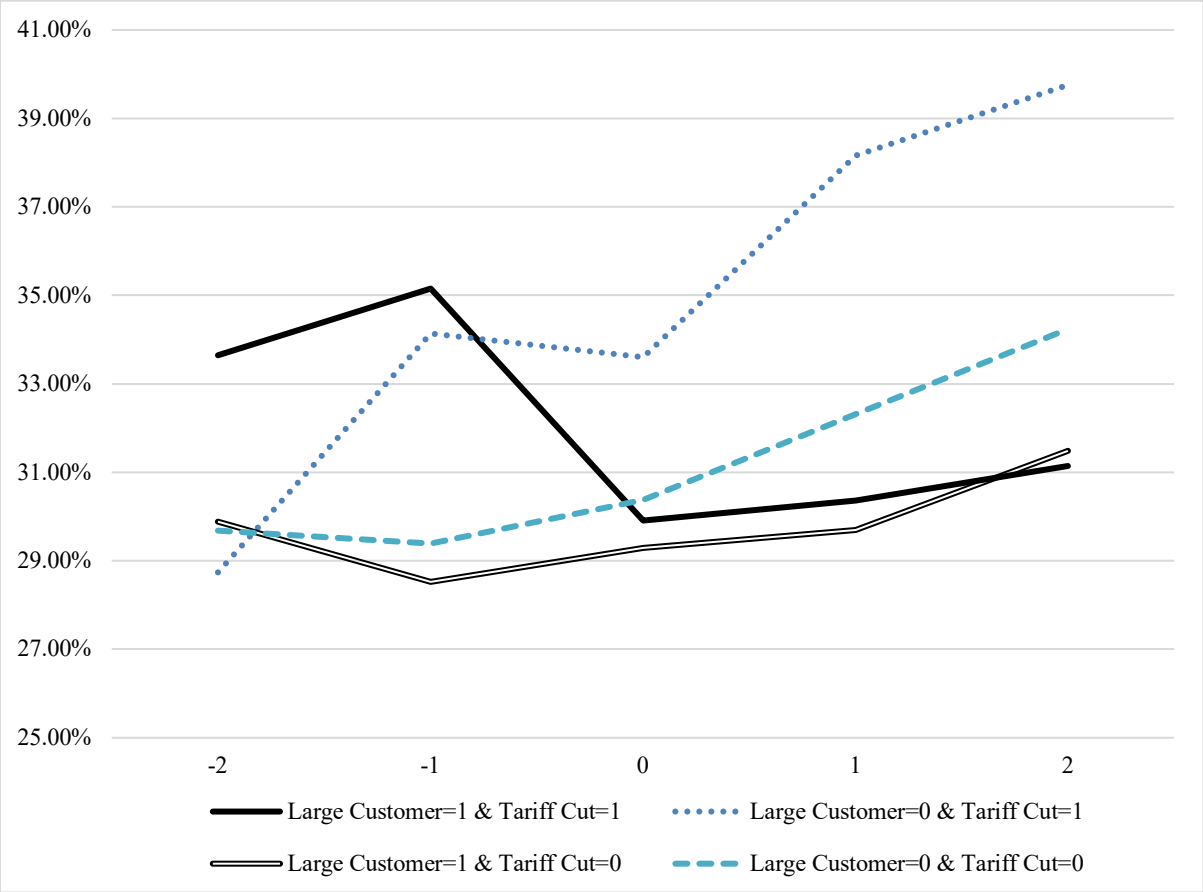


Figure 3: Option Compensation Surrounding Tariff Reductions by Firm Type

Panel A: Median Flow Vega Surrounding Tariff Reductions



Panel B: Median Proportion of Option Compensation Surrounding Tariff Reductions



Appendix: Table A.1. Variable Definitions

Label	Definition	Data Source
Stock Option Compensation Measures		
Flow Vega	Inflation-adjusted dollar change in the CEO's new options granted during the current year for a one percent change in the annualized standard deviation of the firm's daily stock returns.	ExecuComp
Pct Option	The dollar value of CEO stock option grants as a fraction of total compensation.	ExecuComp
Portfolio Vega	The dollar change in a CEO'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 one if the negative tariff change in a specific industry is at least 2.5 times larger than its median change and zero otherwise.	Laurent Fresard and Peter Schott
Key Explanatory Variable at Firm Level		
Large Customer	An indicator variable that equals one when the firm reports having one or more major customers which usually account for more than 10% of its total sales and zero otherwise.	Compustat Segment
Corporate Customer	An indicator variable that equals one when the firm reports having one or more large corporate customers that usually accounts for more than 10% of its total sales and zero otherwise.	Compustat Segment
Government Customer	An indicator variable that equals one if the firm reports having one or more government customers that usually accounts for more than 10% of its total sales and zero 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
Relationship 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 zero otherwise. It is set to missing if either supplier or customer firm disappears in the Compustat universe.	Compustat Segment
Relationship 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	The percentage of independent directors on board	IRRC director
Board Size	Log(1+number of directors)	IRRC director
CAPEX	(Capital Expenditures - Sale of Property)/ Lagged Book Value of Assets	Compustat
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 four-digit SIC industry.	Compustat
Institutional Block	An indicator variable that equals one if the firm has one or more institutional investors whose share ownerships are greater than five percent of the firm's total shares and zero otherwise.	Thompson Reuters
Leverage	(Total Current Debt + Long Term Debt)/ Lagged Book Value of Assets	Compustat
MTB	Market Value of Equity/ Book Value of Equity	Compustat
Pct Cash	The fraction of (salary + bonus) of total CEO compensation	ExecuComp
Pct Stock	Dollar value of stock grants' dollar as a fraction of total CEO compensation	ExecuComp
R&D Intensity	R&D intensity. R&D expense/ Lagged Book Value of Assets. Missing values are set to zero.	Compustat
ROA	Operating Income Before Depreciation/ Lagged Book Value of Assets	Compustat
Sales	Total net Sales during the fiscal year	Compustat
Sales Growth	log[Sale(t) / Sale(t-1)]	Compustat
Tobin's Q	(Total Assets - Book Value of Equity + Market Value of Equity)/ Lagged Book Value of Assets	Compustat

Internet Appendix to

Why CEO option compensation can be a bad option for shareholders: Evidence from major customer relationships

A.1. Examples of the Mechanisms Connecting Customers and Suppliers

In this appendix, we provide several anecdotal examples of the mechanisms discussed in the main body of the paper relating the importance of the customer-supplier relationship on the value and operations of the supplier, the importance of supplier risk to major customers, and supplier firms considering customers when setting compensation policies.

A.1.1. The Importance of Major Customer Relationships for Suppliers

Most firms with a major customer will include a discussion on the importance of the customer to the operations of the firm in their annual 10-K filing, along with other filings. We highlight several representative examples below:

A.1.1.1. Scientific Atlanta Inc., Cable Equipment Manufacturer, 2005 10-K

"A failure to maintain our relationships with customers that make significant purchases of our products and services could harm our business and results of operations. A decline in revenue from one of our key customers or the loss of a key customer could have a material adverse effect on our business and results of operations."

A.1.1.2. Analogic Corp., Imaging Systems Provider, 2001 10-K

"The Company's three largest customers in fiscal 2001, each of which is a significant and valued customer, were Philips, General Electric and Toshiba, which accounted for approximately 22.6%, 10.5%, and 7.2%, respectively, of product and engineering revenue for the fiscal year

ended July 31, 2001. Loss of any one of these customers would have a material adverse effect upon the Company's business."

A.1.1.3. Qlogic Corp., Networking Server and Storage Manufacturer, 2005 10-K

"We believe that our major customers continually evaluate whether or not to purchase products from alternative or additional sources. Additionally, customers' economic and market conditions frequently change. Accordingly, there can also be no assurance that a major customer will not reduce, delay or eliminate its purchases from us. Any such reduction, delay or loss of purchases could have a material adverse effect on our business, financial condition or results of operations."

A.1.1.4. Synchronoss Technologies Inc., Cloud-based Storage Provider, 2017 10-K

"Our top five customers accounted for 72% for the year ended December 31, 2017 compared to 74% for the year ended December 31, 2016. Of these customers, Verizon accounted for more than 10% of our revenues in 2017. There are inherent risks whenever a large percentage of total revenues are concentrated with a limited number of customers. It is not possible for us to predict the future level of demand for our services that will be generated by these customers or the future demand for the products and services of these customers in the end-user marketplace. In addition, revenues from these larger customers may fluctuate from time to time based on the commencement and completion of projects, the timing of which may be affected by market conditions or other factors, some of which may be outside of our control. Further, some of our contracts with these larger customers permit them to terminate our services at any time (subject to notice and certain other provisions). If any of our major customers experience declining or delayed

sales due to market, economic or competitive conditions, we could be pressured to reduce the prices we charge for our services or we could lose the customer. Any such development could have an adverse effect on our margins and financial position and would negatively affect our revenues and results of operations and/or trading price of our common stock."

A.1.1.5. Stoneridge Inc., Electrical Component Manufacturer, 2016 10-K

"We have several customers which account for a significant percentage of our sales. The loss of any significant portion of our sales to these customers, or the loss of a significant customer, would have a material adverse impact on our financial condition and results of operations. We supply numerous different products to each of our principal customers. Contracts with several of our customers provide for supplying their requirements for a particular model, rather than for manufacturing a specific quantity of products. Such contracts range from one year to the life of the model, which is generally three to seven years. These contracts are subject to potential renegotiation from time to time, which may affect product pricing and generally may be terminated by our customers at any time. Therefore, the loss of a contract for a major model or a significant decrease in demand for certain key models or group of related models sold by any of our major customers would have a material adverse impact on the Company. We may also enter into contracts to supply products, the introduction of which may then be delayed or cancelled. We also compete to supply products for successor models, and are therefore subject to the risk that the customer will not select the Company to produce products on any such model, which could have a material adverse impact on our financial condition and results of operations.

Due to the competitive nature of the markets we serve, we face pricing pressures from our customers in the ordinary course of business. In response to these pricing pressures we have been able to effectively manage our production costs by the combination of lowering certain costs and limiting the increase of others, the net impact of which has not been material. However, if we are unable to effectively manage production costs in the future to mitigate future pricing pressures, our results of operations would be adversely affected."

A.1.2. The Importance of Supplier Risk to Major Customers

Major customers of suppliers often include a discussion on the importance of supply continuity and make statements regarding monitoring the risk of their suppliers within their annual 10-K filings. In some circumstances, as a part of supply agreements, major customers will require suppliers to meet certain conditions to maintain supply continuity. We highlight several representative examples of firms that are listed as major customers to suppliers in our sample:

A.1.2.1. Dell Technologies, IT Infrastructure Services, 2017 10-K

"We regularly monitor economic conditions and associated impacts on the financial markets and our business. We consistently evaluate the financial health of our supplier base, carefully manage customer credit, diversify counterparty risk, and monitor the concentration risk of our cash and cash equivalents balances globally. We routinely monitor our financial exposure to borrowers and counterparties.

We monitor credit risk associated with our financial counterparties using various market credit risk indicators such as credit ratings issued by nationally recognized rating agencies and changes in market credit default swap levels. We perform periodic evaluations of our positions

with these counterparties and may limit exposure to any one counterparty in accordance with our policies. We monitor and manage these activities depending on current and expected market developments."

A.1.2.2. Verizon Communications Inc., Telecommunications Provider, 2017 10-K

"We depend on various key suppliers and vendors to provide us, directly or through other suppliers, with equipment and services, such as switch and network equipment, smartphones and other wireless devices, that we need in order to operate our business and provide products to our customers. For example, our smartphone and other device suppliers often rely on one vendor for the manufacture and supply of critical components, such as chipsets, used in their devices. If these suppliers or vendors fail to provide equipment or service on a timely basis or fail to meet our performance expectations, we may be unable to provide products and services as and when requested by our customers. We also may be unable to continue to maintain or upgrade our networks. Because of the cost and time lag that can be associated with transitioning from one supplier to another, our business could be substantially disrupted if we were required to, or chose to, replace the products or services of one or more major suppliers with products or services from another source, especially if the replacement became necessary on short notice. Any such disruption could increase our costs, decrease our operating efficiencies and have a material adverse effect on our business, results of operations and financial condition."

A.1.2.3. General Motors Company, Automotive Manufacturer, 2010 10-K

"We rely on many suppliers to provide us with the systems, components and parts that we need to manufacture our automotive products and operate our business. In recent years, a number

of these suppliers have experienced severe financial difficulties and solvency problems, and some have sought relief under the Bankruptcy Code or similar reorganization laws. This trend intensified in 2009 due to the combination of general economic weakness, sharply declining vehicle sales and tightened credit availability that has affected the automotive industry generally. Suppliers may encounter difficulties in obtaining credit or may receive an opinion from their independent public accountants regarding their financial statements that includes a statement expressing substantial doubt about their ability to continue as a going concern, which could trigger defaults under their financings or other agreements or impede their ability to raise new funds.

When comparable situations have occurred in the past, suppliers have attempted to increase their prices, pass through increased costs, alter payment terms or seek other relief. In instances where suppliers have not been able to generate sufficient additional revenues or obtain the additional financing they need to continue their operations, either through private sources or government funding, which may not be available, some have been forced to reduce their output, shut down their operations or file for bankruptcy protection. Such actions would likely increase our costs, create challenges to meeting our quality objectives and in some cases make it difficult for us to continue production of certain vehicles. To the extent we take steps in such cases to help key suppliers remain in business, our liquidity would be adversely affected. It may also be difficult to find a replacement for certain suppliers without significant delay."

A.1.2.4. Modine Manufacturing Co., Thermal Management Manufacturer, 2017 10-K

"[W]e purchase parts from suppliers that use our tooling to create the parts. In most instances, and for financial reasons, we do not have duplicate tooling for the manufacture of the

purchased parts. As a result, we are exposed to the risk of a supplier being unable to provide the quantity or quality of parts that we require. Even in situations where suppliers are manufacturing parts without the use of our tooling, we face the challenge of obtaining consistently high-quality parts from suppliers that are financially stable. We utilize a supplier risk management program that leverages internal and third-party tools to identify and mitigate higher-risk supplier situations."

A.1.2.5. Synchronoss Technologies Inc., Cloud-based Storage Provider, 2017 10-K

As part of its service provider agreement with Verizon Communications:

32. INSURANCE

32.1 Supplier shall secure and maintain at its expense during the term of this Agreement:

32.1.1 Commercial General Liability insurance (including, but not limited to, premises-operations, products/completed operations, contractual liability, independent contractors, personal and advertising injury) with limits of at least $****, combined single limit for each occurrence and $**** general aggregate.

32.1.2 Commercial Automobile Liability insurance with limits of at least $**** combined single limit for each accident covering all owned, non-owned hired and leased vehicles.

32.1.3 Workers' Compensation insurance, in compliance with the statutory requirements of the state(s) of operation and Employer's Liability insurance with limits of not less than $**** each accident/disease/policy limit.

32.1.4 A combination of primary and excess/umbrella liability policies will be acceptable as a means to meet the limits specifically required hereunder. THE REQUIRED MINIMUM LIMITS OF COVERAGE SHOWN ABOVE, HOWEVER, WILL NOT IN ANY WAY RESTRICT OR DIMINISH SUPPLIER'S LIABILITY UNDER THIS AGREEMENT.

32.1.5 Professional Liability/Errors and Omissions insurance, with limits of not less than $**** each claim.

32.2 Supplier represents and warrants that it will obtain upon or prior to the effective date of the agreement a policy or policies of insurance from an insurer(s) that (i) is licensed, authorized or permitted to do business in the state(s) where service is to be provided, and (ii) has a Best's Rating "A- VII" or better. Supplier shall deliver a Certificate of Insurance on which Verizon Communications Inc., its subsidiaries and Affiliates are named as additional insureds and listed as a Certificate Holder to the following address:

****
Verizon Sourcing LLC
One Verizon Way
Mailcode ****
Basking Ridge, NJ USA 07920

or via Verizon's vSource supplier portal. Supplier's insurer or its authorized representative shall provide no less than **** prior written notice of intent to non-renew, cancellation or material adverse change, except **** notice for nonpayment of premium shall apply.

32.3 Supplier shall waive its rights of subrogation against Verizon for all claims, as permitted by law.

32.4 Supplier agrees that Supplier's policy is primary and non-contributory with any insurance or program of self-insurance that may be maintained by Verizon.

32.5 Supplier is responsible for determining whether the above minimum insurance coverages are adequate to protect its interests. The above minimum coverages do not constitute limitations upon Supplier's liability.

32.6 Self-Insure. Should Supplier elect to self-insure any portion of the insurance required to be maintained, Supplier shall maintain a senior unsecured credit rating from Standard & Poor's, Moody's of at least BBB- or Baa2 or commensurate rating respectively. If Supplier's senior unsecured credit rating falls below either of these thresholds during the term of this Agreement, Supplier will procure insurance for the risks it is self-insuring as soon as possible but no later than **** from the date of such event. If Supplier does not have a senior unsecured credit rating described above, a minimum net worth of $**** will be required to self-insure and shall be maintained throughout the term of this Agreement. If Supplier's net worth falls below $****during the term of this Agreement Supplier will procure and maintain insurance for the risk it is self-insuring as soon as possible.

A.1.3. Suppliers Incorporating Customer Considerations into Executive Compensation

Major suppliers often explicitly mention considering customer relationships when setting compensation policies in the Compensation Committee Report in the proxy statement. We highlight several representative examples below:

A.1.3.1. ARC Group Worldwide Inc., Metal Molding and Printing, 2017 Proxy Statement

"The Company's executive compensation program is designed to integrate compensation with the achievement of our short-term and long-term business objectives and to assist us in attracting, motivating and retaining the highest quality executive officers and rewarding them for superior performance.

We believe that the compensation of our executive officers should reflect their success in attaining key operating objectives, such as growth, maintenance of market position, development of new products, maintenance and development of customer relationships and long-term competitive advantage. We also believe that executive compensation should reflect achievement

of individual goals established for specific executive officers, as well as specific achievements by such individuals over the course of the year such as development of specific products or customer relationships or agreements or executing or integrating acquisitions and strategic arrangements."

A.1.3.2. LSI Logic Corp., Semiconductor Design and Manufacturing, 2017 Proxy Statement

"Our compensation program is intended to provide each of our executive officers with a comprehensive compensation package based on performance that will motivate each of them to drive the achievement of our corporate objectives. In 2006, our principal corporate objectives were (i) to exceed our financial goals and strengthen our financial foundation and ability to increase stockholder value, and (ii) to expand and strengthen our product portfolio and customer relationships in our targeted storage and consumer electronics markets."

A.1.3.3. Huntington Ingalls Industries, Shipbuilding Company, 2017 Proxy Statement

"A significant portion of the potential compensation of our executives is at risk, and that risk increases with each executive's level of responsibility. We have designed our compensation program to balance performance-based compensation over the short- and long-term to incentivize decisions and actions that promote stockholder value and focus our executives on performance that benefits our stockholders and customers, while discouraging inappropriate risk-taking behaviors."

A.1.3.4. RealNetworks Inc., Internet Streaming Software Provider, 2010 Proxy Statement

"In establishing executive compensation, the Compensation Committee is generally guided by the following philosophy and objectives:

Attract, motivate and retain the best executives. The total compensation for executive officers should be competitive with the compensation paid by similarly situated companies in the digital media, technology and other relevant industries and the compensation packages offered by other private and public companies with which we believe we compete for talent, and should enhance retention by having long-term incentives that are subject to multi-year vesting.

Reward individual performance against the achievement of measurable performance targets. The compensation packages provided to our executive officers should include compensation that rewards performance as measured against established annual and strategic goals. These goals may cover both the unit for which the executive is responsible and the company as a whole.

Provide pay incentives that align executive compensation with the long-term interests of all of our stakeholders — shareholders, customers and employees. Executive compensation should be designed to motivate executives to build a growing, profitable and sustainable business. This can best be achieved by encouraging our executive officers to conceive, develop and market the best products and services in our chosen markets and to exceed customer expectations.

Executive compensation elements do not encourage excessive risk taking. Elements of the overall compensation packages provided to our executive officers should provide a balance between fixed and variable elements that are established at sufficient levels to discourage excessive risk taking."

A.1.3.5. II-VI Inc., Optical Products Manufacturer, 2004 Proxy Statement

"In setting compensation for the Chief Executive Officer and Chief Operating Officer, the Compensation Committee considers objective criteria including performance of the business, accomplishments of long-term strategic goals and the development of management. The Compensation Committee considers the Company's revenue growth and earnings to be the most important factors in determining the Chief Executive Officer's and Chief Operating Officer's compensation package. Along with the financial performance factors, the Compensation Committee also considers achievement of long-term strategic goals, including enhancing the Company's reputation among both its customer and investor bases during the year, and the market base salary of comparable positions."

A.1.3.6. EarthShell Corp., Food Packaging Manufacturer, 2005 Proxy Statement

"The Compensation Committee meets annually to evaluate the Chief Executive Officer's performance and to review the Chief Executive Officer's compensation. A founder of the Company and co-innovator of the EarthShell technology, Mr. Simon K. Hodson has been a driving force in making the Company - as a corporation and as a new packaging concept - a reality. His concern for the environment, coupled with his visionary leadership and commitment, has helped the Company achieve its current state of development.

In reviewing Mr. Simon Hodson's compensation, the Compensation Committee considers his principal responsibilities, which include providing overall vision and strategic direction for EarthShell, attracting and retaining highly qualified employees and developing and maintaining key customer and capital relationships."

A.2. CEO Option Exercise Decisions and Tariff Cuts

Our analysis focuses on the value of vega for the option award in the relevant year (*Flow Vega*) and did not consider the potential change to CEO vega resulting from option exercise. This could be problematic if the CEO option exercise decision of firms with large customers is significantly affected by tariff cuts. We address this issue by studying CEO option exercises.

We obtain CEO option exercise information from Thomson Reuters Insider Filing Database. We merge ExecuComp data with the information on CEO option exercises from Thomson Reuters Insider Filing Database, which limits our sample period to years 1996-2015. Expiring CEO stock options account for a small proportion of the sample, only 10% of firm-years in our sample had CEO options expiring in the same year, consistent with the findings of Klein and Maug (2020). Given that expiring options tend to have vegas close to zero, we primarily focus on early CEO option exercises when considering stock options removed from a CEO's portfolio. In addition, we also find a relatively small proportion of option exercises relative to total outstanding options (roughly 14% of outstanding options), which is also consistent with Klein and Maug (2020). This is likely to limit the economic impact of option exercises on a CEO's overall vega and any bias to our baseline analysis. Nevertheless, we explicitly examine CEO option exercises surrounding tariff reductions and report this result in Table A1.

To ensure that our baseline analysis is not in response to a change in CEO vega due to option exercises, we consider whether CEO option exercise decisions can be affected by tariff reduction events. To test this conjecture, we use the same model specification as in Table 3 of our submission where the dependent variables are measures of CEO option exercises, namely *CEO*

Option Exercise $_t$ and *Vega from Option Exercises* $_t$. These results are reported in Table A1 below. The results in columns 1 and 3 show that CEOs are marginally more likely to exercise stock options during tariff cut years and the *Flow Vega* of these options are marginally higher. Importantly, we do not observe a differential effect between firms with and without large customers. This is highlighted in columns 2 and 4, which show that the effect of tariff cuts on CEO option exercises is similar among firms with and without large customers. In other words, CEO option exercises due to tariff cuts lead to similar decreases in CEO risk-taking incentives in these two groups of firms, which is not particularly surprising. Thus, accounting for CEO option exercises is unlikely to be the cause of the main result in Table 3 in the main paper, where we find firms with large customers experience significantly larger decreases in CEO risk-taking incentives from new option grants following the tariff reductions.

A.3. CEO Option Exercise Decisions and Tariff Cuts

Given the large effect that the change in accounting treatement of options from FAS 123R appears to have had on the propensity to reward options, we replicate our baseline results of Table 3 and split the sample around FAS 123R (fiscal year 2005). This result is reported below and in Panel A of Table A2. The main variable of interest (the interaction between *Tariff Cut* and *Large Customer*) remains statistically significant in both the pre- and post-FAS 123R periods shown in columns 1 and 2 where *Flow Vega* is the dependent variable. However, we only observe a significant relation between *Pct Option* compensation for the pre-FAS 123R period. Given the decreased importance of option compensation post-FAS 123R, it is unsurprising that subsequently firms no longer significantly reduce the proportion of option compensation in response to tariff

cuts. However, we still observe significant reductions in the risk-taking incentives measured by *Flow Vega* in these grants following FAS 123R.

Given that executive stock option compensation may start to decrease before FAS 123R due to the exchange listing rule changes following SOX, we performed another split of the sample centered on fiscal year 2003 and report this result in Panel B of Table A2. Parallel to the results reported in Panel A of Table A2, we find that our main risk-taking incentives measure (*Flow Vega*) remains statistically significant both in the pre- and post-SOX periods.

References:

Klein, D., & Maug, E. (2020). How do executives exercise their stock options? *The Review of Corporate Finance Studies*.

Table A1. The Impact of Tariff Reductions on CEO Option Exercising Behavior

The table below replicates our main results using risk-taking incentive measures of CEO option exercises. The information on CEO option exercises is from Thomson Reuters Insider Filing Database, which limits our sample period to after 1995. *CEO Option Exercise* $_t$ is an indicator variable that equals to 1 if a firm's CEO has exercised stock options during the year and 0 otherwise. *Vega from Option Exercises* $_t$ is the dollar change in the stock options exercised by the CEO during the year associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. Control variables (not reported for brevity) are the same as in Table 3, Panel A of the main paper. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Dep Var:	**CEO Option Exercise** $_t$		**Ln(1+ Vega from Option Exercises** $_t$**)**	
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.041*	0.036	0.267*	0.290
	(1.86)	(1.17)	(1.67)	(1.26)
Large Customer $_{t-1}$: b	-0.016	-0.018	-0.083	-0.078
	(-0.81)	(-0.84)	(-0.63)	(-0.56)
*a * b*		0.010		-0.042
		(0.25)		(-0.15)
Other Table 3 Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	7,669	7,669	7,669	7,669
Adjusted R^2	0.312	0.311	0.255	0.255

Table A2. CEO Stock Option Compensation Surrounding FAS 123R and SOX

This table replicates our results from the main paper by splitting our main sample into subsamples based on the FAS 123R and post-SOX listing rule events, and reports the result from a validation test of industry-level tariff cuts. Panels A and B below replicates results in columns 1 and 2 of Panel A of Table 3, Panel A from the main paper around FAS 123R and SOX respectively. *Flow Vega* is the dollar change in the CEO's option portfolio from the current year's grants associated with a 0.01 increase in the firm's return volatility stated in 2015 dollars. Control variables (not reported for brevity) are the same as in Table 3, Panel A. *t*-statistics are in parenthesis and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively.

Panel A: CEO Stock Option Compensation Surrounding FAS 123R

Dep Var:	**Ln(1+ Flow Vega $_t$)**		**Ln(1+ Pct Option$_t$)**	
	Pre FAS 123R	*Post FAS 123R*	*Pre FAS 123R*	*Post FAS 123R*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.529**	0.355*	0.152*	-0.029
	(2.43)	(1.69)	(1.88)	(-0.30)
Large Customer $_{t-1}$: b	0.149	0.064	0.042	0.054
	(0.77)	(0.44)	(0.56)	(0.72)
*a * b*	-0.812***	-0.470*	-0.304***	0.009
	(-2.81)	(-1.78)	(-2.74)	(0.08)
Other Table 3 Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	5,424	3,385	5,424	3,385
Adjusted R^2	0.355	0.531	0.340	0.384

Panel B: CEO Stock Option Compensation Surrounding SOX

Dep Var:	**Ln(1+ Flow Vega $_t$)**		**Ln(1+ Pct Option$_t$)**	
	Pre SOX	*Post SOX*	*Pre SOX*	*Post SOX*
	(1)	(2)	(3)	(4)
Tariff Cut $_t$: a	0.600***	0.426	0.174**	-0.072
	(2.76)	(1.25)	(2.10)	(-0.53)
Large Customer $_{t-1}$: b	0.100	0.132	0.024	0.068
	(0.51)	(0.78)	(0.31)	(0.93)
*a * b*	-0.841***	-0.741*	-0.312***	-0.021
	(-2.88)	(-1.79)	(-2.76)	(-0.13)
Other Table 3 Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	5,424	3,385	5,424	3,385
Adjusted R^2	0.355	0.531	0.340	0.384

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