Mitigating Policy Uncertainty: What Financial Markets Reveal About Firm-Level Lobbying

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We are grateful to participants at various seminars and conferences. Any remaining errors are our own.

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Abstract

Elections can lead to substantial policy changes and, thus, are a significant source of risk. Firms can respond to such policy uncertainty by lobbying, but it is hard to quantify whether they do so and, if so, how much lobbying benefits them. We construct a new dataset and leverage investors' expectations of variability in stock returns in the aftermath of the 2020 US presidential election to generate a new firm-level measure of exposure to policy uncertainty. We show that lobbying reduces policy uncertainty, and that this result holds even after controlling for selection into lobbying and sectoral heterogeneity. We then develop and quantify a model of heterogeneous firms with endogenous lobbying. We find that affecting policy through lobbying is costly and the returns from it are highly skewed and rapidly diminishing. Thus, while lobbying expenditures reduce the impact of policy risk, few firms anticipate sufficient gains to invest in it.

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Policy uncertainty has negative effects on economic and financial outcomes, such as growth, stock prices, investments, and employment (Baker and Bloom, 2013; Baker et al., 2016; Gulen and Ion, 2016; Pástor and Veronesi, 2013; Kumar et al., 2023). For firms, elections are a particularly salient source of policy uncertainty. When elections are highly competitive, their outcomes are (ex-ante) less predictable: firms cannot fully anticipate the winners and, thus, the future policies they will implement.

But firms do not sit idly by when faced with such risks: for example, they can actively lobby to navigate policy risks that may impact their operations. Indeed, several authors argue that lobbying has become an increasingly important strategy to mitigate political risk (Lux et al., 2011; Hadani and Schuler, 2013; Mellahi et al., 2016; Hadani et al., 2017; Abdurakhmonov et al., 2022; Brown et al., 2022), especially in times of heightened aggregate policy uncertainty (e.g., wars, crises, etc., see Ban et al., 2019). However, because policy benefits and uncertainty are difficult to observe, the impact of lobbying on firm-level policy uncertainty is hard to quantify. This is particularly important given that most of the variation in measured political risk occurs at the level of the firm, rather than at the sector or economy level (Hassan et al., 2019).

Is lobbying effective in mitigating firm-level policy uncertainty borne from electoral turnover? If so, by how much? And why? This paper investigates these questions by studying the role of lobbying in mitigating uncertainty associated with changes in regulation or public policy and future government actions.

To do so, we first construct a novel measure of firm-level policy risk using pre-electoral option prices to assess investors' expectations of variability in stock returns in the election's aftermath.[1] In particular, our measure is based on the differential price jumps of short-dated and long-dated options around the election. It is easily computable for publicly listed firms, it provides pre-electoral information (rather than the information

[1]Options are financial contracts that give the buyer the right, but not the obligation, to buy or sell a stock or other asset at a specified price by a certain date. Due to their structure, they can be used to hedge against potential losses or to speculate on potential gains, and are traded on individual stocks, indices, and other assets, with expiration dates ranging from a few hours to several years.

captured in measures based newspaper articles or earnings calls), and it is available at the firm-level. Using these option-derived risk expectations, we can then compare how market-driven assessments of political risk expectations vary across lobbying and non-lobbying firms. We focus on the 2020 U.S. election—a period marked by substantial social, health, and economic challenges—with data from approximately 2,500 publicly traded companies and examine how corporate lobbying efforts during this time might have shielded firms from the risks associated with policy uncertainty.[2]

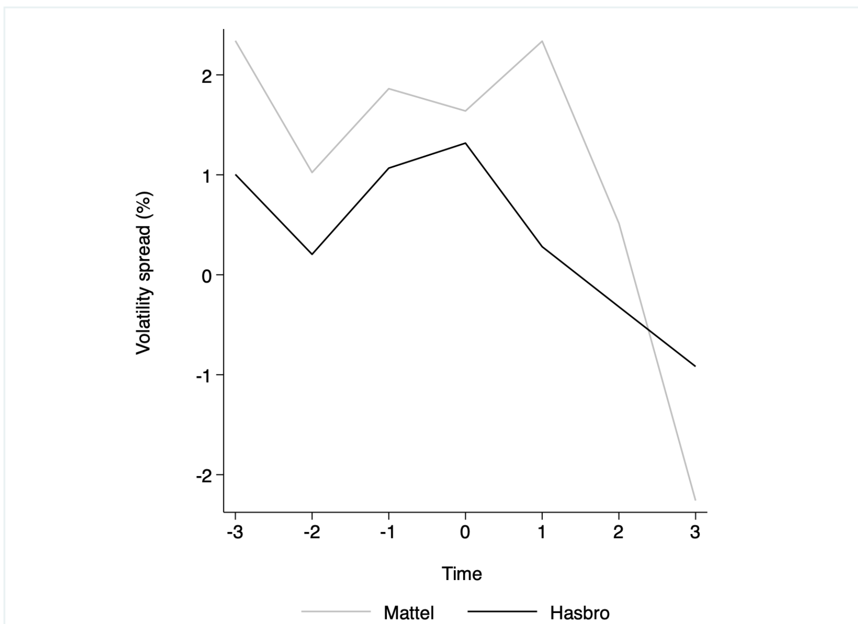
Our first main result is that the policy uncertainty implied by the market's expectations of future stock price movements, as reflected in options prices, is significantly lower for lobbying firms relative to non-lobbying firms. The magnitude is a difference of 0.35-0.66 daily standard deviation units (11.5-21.8 percent of the sample mean) and holds even after accounting for selection into lobbying and sector/firm heterogeneity (observable and unobservable) by both linear regressions and simultaneous equations models (e.g., Heckman, 1978). Our results indicate that the market anticipates greater post-electoral variance in stock returns for firms that do not engage in lobbying compared to their lobbying counterparts. This suggests that firms without proactive political engagement are seen as more vulnerable to electorally-induced policy risks. In contrast, lobbying appears to mitigate these risks, as evidenced by the smaller volatility spreads for lobbying firms, which is consistent with existing qualitative evidence (LaPira and Thomas, 2017).

To illustrate the intuition behind our argument, consider two leading toy manufacturing firms, Mattel and Hasbro. Figure 1 shows the companies' daily volatility spreads around election day (Time 0 is November 3rd, 2020), calculated using call option prices obtained from OptionMetrics. The graph shows that the difference in volatility between short-term and long-term options (i.e., volatility spread) increased for both firms as the election approached (due to heightened uncertainty), and then dropped once the election outcome was revealed and its effects were assimilated into stock prices. However, Mattel (denoted by a gray line) had a higher volatility spread than Hasbro between October 29th and

[2]We replicate our analyses for the 2016 U.S. election in Appendix B.1.

November 5th, 2020. This suggests that the market may have viewed Mattel as more exposed to election-related risks than Hasbro. Both firms are leaders in the same industry, with diversified portfolios, and had also recently reported their latest quarterly results.[3] Hasbro, however, spent US$400,000 on lobbying activities in the lead-up to the election, whereas Mattel reported no such expenditures. If lobbying effectively helps firms mitigate election-related policy risks, the market may have perceived Hasbro as less vulnerable to potential policy shifts, leading to its lower volatility spread pre-election, and its larger jump with the election realization.

FIGURE 1. Volatility spread of Mattel and Hasbro



Notes: The window of seven trading days centered on the 2020 United States Federal election (October 29th-November 6th) is identified in the horizontal axis as -3, -2, -1, 0, 1, 2, 3 with day zero denoting November 3rd, election day. The volatility spreads are calculated using 30- and 60-day standardized options data from OptionMetrics.

The patterns in Figure 1 are, of course, merely illustrative. Differences in perceived policy (e.g., regulatory) variability between firms may result from their approaches to political engagement, such as varying lobbying expenditures, but they could also be influenced by other factors like business models, financial health, and market positions.

[3]Mattel released its third-quarter earnings on October 22, and Hasbro on October 26, 2020.

Importantly, lobbying is a strategic decision; firms lobby only if they believe it will be beneficial. Therefore, the comparison is only valid for similar firms. Nevertheless, our first set of empirical results demonstrate that the patterns in Figure 1 hold more generally, even when accounting for selection into lobbying. We further show that this mechanism through lobbying holds even after controlling for the way we measure lobbying (extensive or intensive margins, accounting for lobbying persistence or in-house lobbying) and additional political explanations proposed by the political science literature (e.g., PAC contributions, measures of revolving door connections, firm-level political ideology). Therefore, our evidence shows that lobbying can mitigate policy risk beyond these other strategies.

However, not all firms engage in lobbying, raising a crucial question: What drives a firm's decision to lobby? Is it primarily driven by costs or benefits? To address these issues, we develop and estimate an equilibrium model of heterogeneous firms with endogenous lobbying. In the model, there is a mass of firms that can differ both in terms of fundamental productivity and efficiency of lobbying activity (e.g., different firms may have different capabilities in lobbying, perhaps related to connections, access, firm size, existing regulations, etc.). Firms have incentives to lobby in order to shape future policies and protect themselves from the risks to profits tied to policy uncertainty. The returns to lobbying may not be linear, and the firm will also have to pay a fixed and variable cost to lobby. We find that the multiple channels of benefits only outweigh costs for approximately a third of firms, which we estimate to be due to highly skewed distributions of benefits compared to comparable costs. Therefore, only firms that see lobbying as advantageous will engage in it. The model provides a clear, lobbying-specific mechanism for our previous results. It is also quantifiable.

This quantification provides our second set of empirical results. It reveals that a combination of high variable costs in influencing policies, positive fixed costs of lobbying, and a highly skewed distribution of firms' returns in lobbying result in only a small set of firms engaging in lobbying activities. This finding aligns with evidence that barriers to entry, such as initial costs and the need for relationship-building with policymakers, play a crucial role in determining which firms engage in lobbying (Kerr et al., 2014). It also partially explains why only a limited number of firms choose to lobby (Ansolabehere et al., 2003).

This study relates to various strands of the extensive literature on lobbying.[4] Specifically, it builds on research examining how firms engage in lobbying to secure private benefits, including favorable regulation (Richter et al., 2009; Kang, 2016; Kim, 2016; Brown and Huang, 2020), privileged access to licenses or procurement contracts (Goldman et al., 2013; Ağca et al., 2019; Ağca and Igan, 2023), and reduced market competition (Faccio and Zingales, 2022). Our argument that lobbying serves as a strategic tool for firms to protect themselves from a wide scope of potential policy changes aligns with the broader literature (e.g., Baumgartner and Berry, 2009; Drutman, 2015).

While previous studies have shown that firms resort to lobbying during periods of high policy uncertainty (e.g., Liu, 2020; Shang et al., 2023; Ban et al., 2019), some of them cannot distinguish between policy uncertainty and broader economic uncertainty, while others assume uniform firm responses to political risk (Kumar et al., 2023). We address these limitations by leveraging firm-level high-frequency financial data to capture firm-specific ex-ante uncertainty and providing a detailed analysis of the mechanisms by which lobbying affects uncertainty. Therefore, our analysis aligns with recent work that uses model-based estimation to analyze rent-seeking in lobbying (Kang, 2016) or quantify the impact of lobbying on government contract allocation (Cox, 2022).

Our work is also related to Grotteria (2023) and Ho et al. (2024). The first combines empirical evidence with a theoretical model to demonstrate that lobbying may be a means to reduce risk as much as a source of political risk. While Grotteria (2023) focuses on the difference in the political-risk premium of high- versus low-lobbying firms, and how it endogenously affects R&D investments, our study emphasizes how firms manage their exposure to policy uncertainty—what Grotteria (2023) refers to as ex-ante political risk. While both our study and the findings in Ho et al. (2024) suggest that option investors

[4]See De Figueiredo and Richter (2014) and Bombardini and Trebbi (2020) for recent overviews.

anticipate the financial performance and stock returns of politically active firms to be less sensitive to political risk, our study addresses broader questions regarding the motives and consequences of firm-level lobbying.

1. Data and Stylized Facts

To examine the role of lobbying in mitigating policy uncertainty associated with the 2020 U.S. election, we combine firm-level economic and political data from various sources. First, to build our measure of policy uncertainty, we identify all US-listed firms with tradable options from OptionMetrics' Ivy DB database. We then merge these data with information on each firm's lobbying expenditures, as reported by *LobbyView* (Kim, 2018). Next, for each of the firms in our sample, we collect data on their characteristics from Compustat, including size, tangibility, return on assets, indebtedness, cash holdings, and R&D intensity. We also calculate each firm's age using the date of their first day of trading obtained from the Center for Research in Security Prices (CRSP). Finally, we classify the firms into different sectors using their 4-digit SIC codes in Compustat, and group them using the Fama-French 12-industry classification system (Fama and French, 1997). As we describe in our analysis, these variables constitute the standard measures used to evaluate firm characteristics and financial outcomes.

To study our main mechanism and possible political confounders, we also gather firm-level data from the following sources to evaluate firms' regulatory exposure and political activism: a measure of political uncertainty developed by Hassan et al. (2019) using computational linguistics, government contracts from Fazekas et al. (2023), former regulators' employment from Emery and Faccio (2020), an indicator of policy preferences developed by Steel (2024) based on Bonica's CFScores (Bonica, 2014), employee and political action committees (PACs) donations from Stuckatz (2022), measures of firms' political hedging and political connections from Christensen et al. (2020), and the breadth of policy engagement based on the data in Kim et al. (2024). Finally, we obtain information on the exact dates of each firm's corporate events from LSEG Data & Analytics.[5]

1.1. Measuring Electorally-Induced Policy Risk

Policy uncertainty is a complex and multifaceted concept that can be challenging to measure. While stock prices are often used as a proxy for market sentiment and uncertainty, they usually reflect market sentiment *after* an event has occurred, as compared to our *before* (ex-ante) focus. Alternative measures based on newspaper articles (e.g., Baker et al. (2016)) or earnings calls (e.g., Hassan et al. (2019)) face challenges such as textual ambiguity, lagged responsiveness to real-time shifts, and strategic framing by corporate actors.

We use options, which are a more effective way to capture the market's perception of election-induced policy uncertainty (hereafter, also called "policy risk" for convenience) for individual firms before the uncertainty is resolved. Options allow investors to separate the directional and volatility components of risk. Moreover, they are intrinsically forward-looking contracts, providing an ex-ante assessment of the market's expectations about future price movements.[6] This approach draws on established financial theories and practices, particularly those related to how equity volatility responds to pre-scheduled news releases.[7]

[5]See Appendix A and Table A6 for more details on the data construction and variable definitions.

[6]Once dominated by institutional investors and hedge funds, the options market has undergone a significant shift in recent years. Retail investors now account for nearly half of total trading, often focusing on earnings announcements or other market events expected to trigger high volatility (de Silva et al., 2023). In addition, retail investors can access firms' lobbying expenditures, reported in quarterly filings, through tools like Quiver Quantitative's Corporate Lobbying Dashboard.

[7]These pre-scheduled news releases include: (i) earning announcements (Patell and Wolfson, 1979; Patell and Wolfson, 1981 Ederington and Lee, 1996; Dubinsky et al., 2019); (ii) Federal Open Market Committee (FOMC) meetings (Chen and Clements, 2007; Vähämaa and Äijö, 2011; Gospodinov and Jamali, 2012); as well as (iii) monthly employment, CPI, and PPI report dispatches (Nikkinen and Sahlström, 2004). Similar to these events, national elections usually have a predictable schedule. In this case, an important source of uncertainty is the electoral outcome, which is only revealed with certainty after the election concludes (Gemmill, 1992; Mnasri and Essaddam, 2021; Kelly et al., 2016).

For firm i, the variance implied by the price of an option that expires T trading days in the future, quoted on day t prior to the election, can be formally expressed as:

$$\sigma_{i,t,T}^2 = \sigma_i^2 + T^{-1}\sigma_{E_i}^2, \tag{1.1}$$

where σ_i^2 represents i's baseline implied variance in annualized units and $\sigma_{E_i}^2$ captures the anticipated post-electoral variance in firm i's stock returns (see Appendix D for details).

Neither the baseline volatility σ_i, nor the term σ_{E_i} can be directly observed. However, we can estimate the latter using the prices of options with different maturities traded just before the November 3, 2020 election. The reason is that major news events, such as elections, tend to impact asset prices. After the event passes, market volatility subsides, and implied volatility drops. The size of the expected decline in volatility depends on the amount of return variation investors expect the event to create.(Patell and Wolfson, 1979; Patell and Wolfson, 1981; Barth and So, 2014; Dubinsky et al., 2019).[8]

With a window of observations very close to the election, all movement in volatilities comes from the second term of equation (1.1), so it suffices to estimate $\sigma_{E_i}^2$. Focusing on pre-election day t, the post-electoral variance in a firm i's stock returns can be estimated via:

$$\hat{\sigma}_{E_i}^2 = \frac{\sigma_{i,t,30}^2 - \sigma_{i,t,60}^2}{\frac{252}{30} - \frac{252}{60}}, \tag{1.2}$$

where $\sigma_{i,t,30}^2$ and $\sigma_{i,t,60}^2$ are firm i's annualized implied variances associated with the near- and far-term options, based on OptionMetrics' implied volatility for standardized 30- and 60-day options, and the denominator accounts for the term structure of the options. As there may be measurement error in the option market for some firms with low liquidity, we use the five-day averages of $\sigma_{i,t,30}^2$ and $\sigma_{i,t,60}^2$ on trading days $t-4$ to t, where day t is the election day (i.e. November 3, 2020).[9]

[8]This is closely related to the term-structure measure of Dubinsky et al. (2019) and the excess variance measure of Iselin and Van Buskirk (2023) in studies that capture anticipated event-induced return variation.
[9]The standardized options in the IvyDB database are interpolated from available option price data and are only included if there is sufficient data to ensure accuracy. We also average the call and put implied volatilities to mitigate microstructure noise and improve estimate accuracy. Given our focus on the election's

For ease of interpretation, our main variable converts $\hat{\sigma}^2_{E_i}$ to a daily basis using the number of trading days to option maturity, and expresses it in standard deviation units,

$$PolicyRisk(\hat{\sigma}_{E_i}) = \sqrt{\frac{\hat{\sigma}^2_{E_i}}{21}}. \tag{1.3}$$

The estimated average policy risk in our sample is 3.01%, indicating that the 2020 US general election had a significant impact on market uncertainty even in a year marked by extreme market fluctuations due to the global pandemic.[10] Furthermore, we find substantial heterogeneity in the expected magnitude of election-related price changes across firms: those in the top quartile of the policy risk distribution have values that are approximately 2.25 times higher than firms in the bottom quartile. This suggests significant variation in exposure to the 2020 US general election.

1.2. Firms' Lobbying Activities in the Lead-up to the 2020 Election

The Lobbying Disclosure Act (LDA) of 1995 requires firms to disclose their lobbying expenses to the Secretary of the Senate's Office of Public Records.[11] We use this requirement to collect lobbying data from the third quarter of 2019 through the second quarter of 2020, as compiled by *LobbyView* (Kim, 2018). This data source provides detailed information on the amount each firm spends on lobbying, along with their unique 6-digit alphanumeric code assigned to each company by Compustat (GVKEY) which enables us

impact, we exclude any observations with post-electoral spreads larger than their pre-electoral counterparts from our sample. We also restrict our analysis to firms whose options do not require significant price movements to support their price, as they are likely to be the most representative of overall market expectations. This approach leads to a conservative estimate of the effect of lobbying on policy risk.

[10] To place this excess risk into context, the standard deviation of the daily returns for the firms in our sample during the third quarter of 2020 was 4.8%. Furthermore, the null hypothesis that the average policy risk in our sample is zero is strongly rejected by a two-tailed one-sample t-test (t = 42.598, p = 0.0000). Note that this estimate is likely conservative, as Jensen's inequality implies that the average of the standard deviations (used here) is less than the square root of the average of the variances.

[11] As of 2021, firms must file with the U.S. Senate Office of Public Records if their in-house lobbying expenditures exceed US$14,000 in a quarter or if a lobbying firm's expenditures on their behalf exceed US$3,000. Once a registration is filed, firms must submit a quarterly report until they notify that lobbying activities have ceased.

to link firm-level lobbying expenditures to the firm-level OptionMetrics data. We successfully match this information with our policy risk estimates for 98.7% of the US-listed firms with tradable options described above.[12] Our sample includes 2,492 observations. Because the LDA has strong enforcement, we deem that firms without entries in *LobbyView* —approximately 68.2% of the firms in our sample—did not engage in reportable firm-level lobbying at the federal level in the lead-up to the 2020 election.[13]

For each firm, we use the amount spent in lobbying and a binary variable for lobbying activity (i.e., equaling 1 if a firm reported spending a strictly positive amount on lobbying, and 0 otherwise) as measures of lobbying. Table 1 presents the distribution of firms' lobbying activity in the lead-up to the 2020 US general election across various sectors. The data indicate that Utilities, Chemical and Allied Products, Consumer Non-Durables (Food, Tobacco, Textiles), and Manufacturing have the highest percentages of firms that engage in lobbying. These findings are consistent with evidence showing that these industries are most likely to be affected by government regulation in developed countries (DellaVigna et al., 2016). They are also in line with historical patterns, as similar industries have been found to be among the top lobbying sectors in previous studies. For instance, Tobacco, Defense, and Chemicals were among the leading lobbying sectors in Hill et al. (2013)'s analysis of lobbying activity from 1999 to 2011. The similarities between our sample of US-listed firms with tradable options and those in previous studies give us confidence that our data are representative of the broader population of lobbying firms, at least with regards to lobbying activity across sectors.[14]

[12]To ensure accurate matching, we also employ a fuzzy matching algorithm to match firms by name and subsidiary names, in addition to using the GVKEY identifier. See Appendix A.1 for details.

[13]Thirty firms in our data have lobbying reports but do not have expenditures exceeding US$5,000. For these firms, the lobbying amount is reported as zero, but it is possible a firm had small but positive lobbying expenditure. We code these firms as non-lobbying, but our results are robust to instead excluding these firms.

[14]In Appendix A.2, we present details about the cross-sectional generalizability of the sample. In Appendix B.1, we show that the statistics of policy risk (Section 1.1) and lobbying replicate to the 2016 election.

TABLE 1. Lobbying Activity Across Sectors

Sector	Number of firms	Number of lobbying firms	Percent of lobbying firms	Lobbying expenditures
Consumer nondurables (food, tobacco, textiles)	103	35	33.981	1.246
Consumer durables (cars, appliances, furniture)	72	21	29.167	1.066
Manufacturing (machinery, trucks, planes)	218	74	33.945	1.486
Energy (oil, gas, coal extraction)	83	26	31.325	1.836
Chemicals and allied products	60	29	48.333	0.906
Business equipment (computers, software)	465	130	27.957	1.231
Telephone and television transmission	54	18	33.333	3.845
Utilities	59	38	64.407	1.583
Retail, wholesale, restaurants	168	43	25.595	1.498
Healthcare, medical equipment, and frugs	357	115	32.213	1.522
Financial services	538	156	28.996	1.811
Other	315	108	34.286	1.375
Total	2492	793	31.822	1.526

Note: We group the firms in our sample using the Fama-French 12-industry classification system. The last column shows the average lobbying expenditures (in USD million) among firms that lobby.

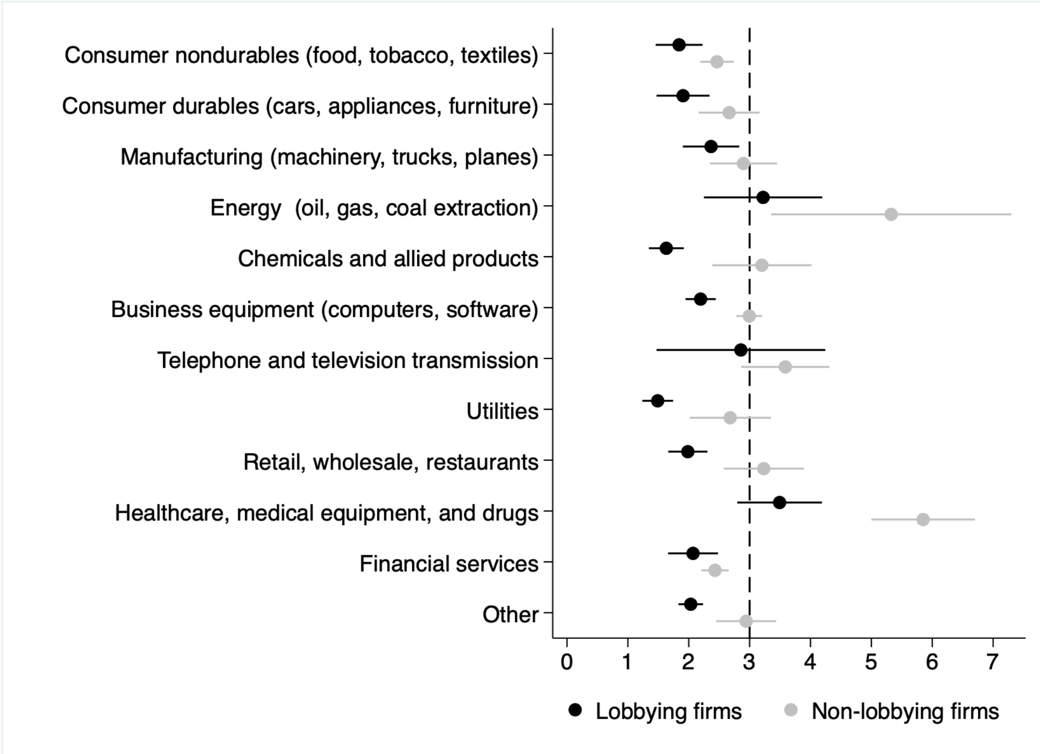
1.3. Lobbying versus Non-Lobbying Firms

Figure 2 shows the estimated average policy risk measure associated with the 2020 US general election for lobbying and non-lobbying firms across sectors.

We see considerable cross-sectional variation in the average policy risk: some sectors have much larger anticipated post-election price changes than others. Within each sector, non-lobbying firms tend to have higher average policy risk measures than lobbying firms, suggesting that lobbying activity may be associated with lower policy risk. This pattern is particularly evident in the Healthcare, Medical Equipment, and Drugs, and the Retail, Wholesale and Restaurants sectors. The former results may be due to the emphasis on healthcare policy and potential changes to the Affordable Care Act during the 2020 US general election. Similarly, partisan disagreements over trade policy and potential changes to tariffs may have affected the Retail, Wholesale and Restaurants sector.

To further examine the political and financial sources of heterogeneity in policy risk, we focus on firm-level characteristics. On the financial side, we follow the extant literature and include indicators of firm size (including market capitalization, total assets, revenue, and workforce, firm age), as well as other observable indicators, such as return on assets,

FIGURE 2. Policy risk by sectors and lobbying



Notes: The y-axis represents the sector, and the x-axis indicates the average policy risk measure (across firms in a sector) expressed in daily standard deviation units, together with their 95% confidence intervals. We group the firms in our sample using the Fama-French 12-industry classification system. The dashed line represents the average policy risk in our sample.

cash holdings, R&D intensity, and corporate events (Borghesi and Chang, 2015; Unsal et al., 2016; Abdurakhmonov et al., 2022).[15] On the political side, the existing literature shows that a firm's regulatory exposure and political connectedness can influence its decision to lobby (Hillman et al., 2004; Fouirnaies and Hall, 2018; Pham, 2019; Christensen et al., 2020; Teso, 2023; Kim et al., 2024). The literature also suggests that campaign contributions from corporations can shape policy outcomes (Fouirnaies and Hall, 2018;

[15] U.S. elections occur during a period when firms publicly reveal their third-quarter financial results. Earnings announcements are associated with significant and rapid equity price reactions. Therefore, if a firm's expected earnings announcement date falls within this 30-day window, our estimate of election-induced policy risk may be overstated. To address this concern, we use the exact date of firms' earnings news announcements to create a variable that takes the value of 1 if a firm's earnings announcement date fell in the 30-day window following the 2020 US general election, and 0 otherwise.

Teso, 2023) and can serve as strategic tools for firms to gain access to legislators, often functioning as precursors to lobbying efforts (Snyder Jr, 1990; Tripathi et al., 2002; Kim et al., 2024). Therefore, we also consider the variables capturing firms' regulatory exposure and political activism described above.

Table 2 shows the differences in these observable indicators between lobbying and non-lobbying firms. The data reveals significant differences in financial and operational characteristics between these two groups. Lobbying firms tend to be larger, older, more profitable, and have more resources than non-lobbying firms. They also have higher levels of tangible assets, return on assets, and debt ratios, but lower levels of cash holdings and R&D expenditures. Table 2 also reveals significant differences in regulatory exposure and political activity between lobbying and non-lobbying firms. Lobbying firms tend to have higher firm-level risk, are more likely to receive government contracts, and have more revolving door connections. Additionally, lobbying firms exhibit higher levels of political activism, including campaign contributions, PAC contributions, and political hedging. They also tend to have more legislative connections and policy engagement. Finally, the last row shows that a higher percentage of lobbying firms held their earnings announcement calls outside of a 30-day window following the November 3, 2020 election.

1.4. Lobbying and Policy Uncertainty

The previous evidence shows that non-lobbying firms generally exhibit higher levels of policy risk compared to lobbying firms. In fact, the descriptive statistics in Table A3 in Appendix A further show that firms in the top decile of lobbying expenses have the lowest mean and median policy risk values, a statement visually supported by Figure A1. These observations replicate in the 2016 data, as shown in Appendix B.1. These findings, together with our motivating Figure 1, suggest that increased lobbying expenditures may correlate with reduced policy uncertainty. However, as shown in Table 2, there are significant differences in firm characteristics, regulatory exposure, and political activism

TABLE 2. Differences between lobbying and non-lobbying firms

	Non-Lobbying		Lobbying		Difference	
	N	Mean	N	Mean	Difference	p-value
Policy risk	1699	3.338	793	2.313	-1.025	0.000
Lobbying activity						
Expenditures (USD mill.)	1699	0.000	793	1.526	1.526	0.000
In-house lobbying	1699	0.000	793	17.139	17.139	0.000
Size						
Market value (USD mill.)	1634	7874.511	787	31326.741	23452.230	0.000
Total assets (USD Mill.)	1690	19088.307	792	49720.098	30631.790	0.000
Sales (USD Mill.)	1689	4506.152	792	14378.682	9872.530	0.000
Number of employees (thousands)	1645	11.472	789	31.462	19.990	0.000
Net income (US mill.)	1689	344.315	792	1303.650	959.335	0.000
Income taxes (USD mill.)	1689	114.188	792	278.937	164.749	0.000
Dividends - total (USD mill.)	1681	178.208	790	585.112	406.904	0.000
Other observable indicators						
Firm age	1699	19.014	793	30.494	11.480	0.000
Tangible assets/assets	1607	0.221	777	0.249	0.028	0.000
Return on assets	1689	-0.044	792	0.011	0.054	0.000
Tobin's Q	1629	2.398	787	2.299	-0.099	0.429
Debt ratio	1686	0.298	790	0.353	0.056	0.000
Cash holdings/assets	1690	0.203	792	0.148	-0.055	0.000
R&D expenditures/assets	1009	0.097	414	0.068	-0.029	0.000
Regulatory exposure						
Firm-Level risk (Hassan)	1559	129.615	783	147.709	18.904	0.000
Government contracts (logged)	1699	1.362	793	4.191	2.829	0.000
Revolving door	1699	0.129	793	0.773	0.644	0.000
Political activism						
CF score (Bonica)	1699	0.044	793	0.002	-0.043	0.035
Campaign contributions (logged)	1699	0.174	793	2.241	2.067	0.000
PAC contributions (logged)	1699	0.310	793	3.280	2.970	0.000
Political hedging	1699	0.034	793	0.294	0.260	0.000
Political connections	1699	0.196	793	1.813	1.617	0.000
Policy engagement	1699	0.066	793	1.550	1.484	0.000
Earnings announcements						
30-day window	1699	0.516	793	0.401	-0.115	0.000

between lobbying and non-lobbying firms. Thus, a naive comparison across them may not caputure the actual effect of lobbying.

A first approach to account for these differences and isolate effects of lobbying on policy risk is to estimate linear regression models of our firm-level measure of policy risk on firm characteristics and lobbying decisions while controlling for a variety of such confounding factors. The Ordinary Least Squares (OLS) estimates for each of five increasingly demanding specifications are presented in Columns (1)-(5) of Table 3. Standard errors for these specifications are clustered by sector using the Fama-French 12 industry classification.

The results in Columns (1)-(5) reveal that the estimated coefficients associated with our lobbying measures are negative and statistically different from zero, indicating that lobbying firms experienced lower anticipated post-electoral price movements than non-lobbying firms. These findings are not only statistically significant but also economically meaningful. For example, the estimated coefficient of -0.588 in Model (1) corresponds to a reduction of approximately 18.4% in the size of the anticipated electorally-induced volatility, relative to the sample mean. This decrease is equivalent to about about 0.16 of a standard deviation, indicating a meaningful impact.

Column (1) presents the estimates from a simple specification, only controlling for firm size, and for tangibility. Proxied by the logged number of employees, firm size reflects the scale of exposure to political uncertainty as well as the resources available for lobbying (Kerr et al., 2014). Tangible assets scaled by total assets, in turn, indicates how a firm's asset structure may affect its vulnerability to policy shifts and incentives to lobby (Borghesi and Chang, 2015; Hassan et al., 2019). These firm-level characteristics are conventionally recognized as key determinants of policy risk exposure and corporate political engagement (Hadani et al., 2017; Abdurakhmonov et al., 2022). We find that larger firms tend to experience lower levels of policy uncertainty. In contrast, firms with a higher proportion of tangible assets exhibit higher anticipated post-electoral volatility.

Column (2) further controls for firm age (in years) as well as *30-Day Window*. The former captures organizational maturity and experience, which can influence resilience to policy changes and lobbying strategies (Shang et al., 2023; Timbate et al., 2024), while the latter allays the concern that our measure of policy risk may capture effects from

TABLE 3. Lobbying and policy risk

	Least Squares					Heckman
	(1)	(2)	(3)	(4)	(5)	(6)
Policy risk (anticipated post-electoral volatility)						
Lobby	-0.558**	-0.463*	-0.427*	-0.347*		-0.660**
	(0.173)	(0.163)	(0.173)	(0.137)		(0.209)
Lobbying expenditures (logged)					-0.029*	
					(0.011)	
Employees (logged)	-0.529**	-0.436**	-0.423**	-0.334**	-0.332**	-0.315**
	(0.109)	(0.092)	(0.090)	(0.030)	(0.030)	(0.030)
Tangible assets	1.220**	$1.212^{\dagger}$	1.385*	$1.175^{\dagger}$	$1.179^{\dagger}$	1.137*
	(0.560)	(0.553)	(0.619)	(0.549)	(0.550)	(0.536)
Firm age		-0.007**	-0.005*	-0.002	-0.002	-0.002
		(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Firm-level risk			0.001*	0.001	$0.01^{\dagger}$	$0.001^{\dagger}$
			(0.000)	(0.000)	(0.000)	(0.000)
Government contracts (logged)			-0.005	0.006	0.006	
			(0.009)	(0.009)	(0.009)	
Revolving door			0.016	-0.022	-0.018	
			(0.024)	(0.033)	(0.031)	
CF score			-0.097	-0.112	-0.115	
			(0.248)	(0.269)	(0.269)	
PAC contributions			0.007	0.019	0.020	
			(0.013)	(0.013)	(0.014)	
Political hedging			$-0.385^{\dagger}$	-0.462*	-0.424*	
			(0.206)	(0.167)	(0.160)	
Policy engagement			-0.003	-0.006	-0.003	
			(0.015)	(0.015)	(0.015)	
30-day window		0.868**	0.866**	0.616**	0.617**	0.621**
		(0.104)	(0.117)	(0.162)	(0.160)	(0.160)
Constant	3.865**	3.437**	3.099**	3.306**	3.297**	2.988**
	(0.232)	(0.221)	(0.265)	(0.330)	(0.328)	(0.420)
Selection equation						
Firm age						-0.001
						(0.001)
Employees (logged)						0.149**
						(0.031)
Tangible assets						-0.092
						(0.212)
Firm-level risk						0.000**
						(0.000)
Government contracts (logged)						0.022**
						(0.006)
Revolving door						0.206**
						(0.070)
CF score						-0.232*
						(0.107)
PAC contributions						0.057**
						(0.011)
Political hedging						1.476**
						(0.175)
Policy engagement						0.231*
						(0.107)
Rho						0.063**
						(0.019)
Constant						-1.302**
						(0.108)
Additional controls	NO	NO	NO	YES	YES	YES
Observations	2,337	2,337	2,217	2,177	2,177	2,177

All specifications include sector fixed effects (not shown). The omitted category is "Other." Standard errors are clustered by the Fama–French 12 industry classification and shown in parentheses. The models in columns (4)-(6) also include the following variables: Market value, Total assets, Sales, Net income, Income taxes, Dividends, Return on assets, Tobin's Q, Debt ratio, and Cash holdings

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

firm's expected earnings announcements. The findings suggest that older firms tend to experience lower levels of anticipated post-electoral volatility. They also indicate that firms whose earnings announcements fell in the 30-day window following the 2020 election experienced higher anticipated volatility. The inclusion of these additional covariates, however, does not significantly affect our main result.

Columns (3)-(4) further incorporate the variables associated with firms' regulatory exposure and political activism listed in Table 2.[16] These include: (i) Hassan et al. (2019)'s *Firm-Level Risk* reflecting firms' exposure to policy uncertainty as discussed in earnings calls; (ii) measures of government contract dependency and former regulators' employment to account for the potential impact of regulatory risks on firms' lobbying decisions, given possible bureaucratic discretion (Ağca et al., 2019; Ağca and Igan, 2023; Cox, 2022) and to account for revolving doors (government bureaucrats bringing their expertise and connections to private industry (Emery and Faccio, 2020; Lee and You, 2023)); (iii) firm policy preferences (based on their donation patterns, Bonica, 2014; Steel, 2024); and (iv) other forms of political activism to mitigate political risk, such as PAC donations as well as political hedging strategies, since maintaining relationships with politicians from both parties can help firms to mitigate political risk and ensure access to policymakers regardless of the political landscape (Pham, 2019; Christensen et al., 2020); and (v) the number of bills firms have lobbied on in the past (a measure for the scope and persistence of a firm's policy engagement), which helps us distinguish between companies that are consistently active across a wide range of policy issues and those that engage more sporadically or in a limited number of areas (Kim et al., 2024). Column (4) augments the specification in (3) with the inclusion of additional firm-level characteristics. We find a positive relationship between firm-level risk and anticipated policy uncertainty, whereas the use of political hedging strategies is associated with reduced anticipated post-electoral volatility.

[16] We only exclude the variable *Political Connections* as it is highly correlated with *Political Hedging*.

Column (5) shifts focus to the intensive margin by replacing the binary indicator with a continuous measure of lobbying expenditures. The estimated coefficient of -0.030 is statistically different from zero, suggesting that firms that spend more on lobbying experience incrementally lower anticipated post-electoral volatility. To interpret the coefficient's economic significance, we can examine the effect of moving from the lowest to the highest percentiles of lobbying spending. These calculations reveal that moving from non-lobbying firms to the highest spenders is associated with a 13.77% decrease in anticipated volatility. Taken together, these findings indicate that not only does the decision to lobby matter (extensive margin), but also the intensity of lobbying efforts (intensive margin) plays a significant role in mitigating policy uncertainty around elections.

Put together, Columns (2)-(5) indicate that our main finding is robust to the inclusion of additional controls and different measurements of lobbying: the coefficients are negative and statistically significant throughout. The magnitude is still large, although smaller than those in (1) possibly due to the differences in firm characteristics, regulatory exposure, and political activism. An alternative explanation may be the high correlation between some of the additional covariates included in these specifications.[17]

Whether a firm decides to lobby or not, however, is unlikely to be exogenous. In general, firms that expect to benefit from lobbying undertake it, while those that do not anticipate benefits, do not. To explore the role of selection into lobbying, we consider a simultaneous equations model with two equations. In the first stage, a probit model is estimated to predict the probability of a firm lobbying as a function of observable firm/sector characteristics (i.e., treatment assignment). In the second stage a linear regression model is estimated via OLS to predict the outcome variable – post-electoral volatility– based on the predicted probability of lobbying and the control variables. The model also includes a set of auxiliary parameters, including the correlation between the treatment-assignment errors and the outcome errors, the variance of the outcome errors, and the variance of the treatment-assignment errors. We estimate the model by maximum likelihood, with

[17]See Tables **??** and A5 in Appendix A for more details on these correlations.

standard errors clustered by sector based on the Fama-French 12 industry classification. The likelihood function is given by the joint probability density function of the outcome variable and the treatment variable, conditional on the covariates (Heckman, 1978).

The results of the model estimation are presented in Column (6) of Table 3. The estimates for the selection equation reveal several factors that influence a firm's decision to engage in lobbying. Larger firms and those with greater regulatory exposure - such as government contracts or former regulators on staff - are all more likely to lobby. In contrast, firms with more conservative political leanings, as measured by the CF Score, are less likely to lobby. In addition, firms that are already active in the political process, through activities like political action committee contributions, political hedging, and policy engagement, are also more likely to lobby. Note also that the estimated correlation of the treatment-assignment and outcome errors, denoted by ρ, is positive and statistically significant. This suggests that unobserved factors that increase the likelihood of lobbying are positively correlated with factors that increase anticipated post-electoral volatility. Nonetheless, Column (6) reveals that the impact of lobbying on anticipated post-electoral volatility remains negative and statistically significant after accounting for selection (point estimate -0.661, z-score: 3.16). In terms of magnitude, the size of this coefficient is larger, compared to the OLS estimates of linear models, suggesting that failing to account for selection bias may underestimate the true impact of lobbying.

The analysis of the relationship between lobbying and ex-ante policy risk (anticipated post-electoral volatility) in Table 3 may be subject to several concerns. First, lobbying is a multifaceted phenomenon, including in-house lobbying versus other forms of lobbying activity. Second, the endogeneity of lobbying decisions raises questions about whether the results would be robust if lobbying expenditures were used as the endogenous variable instead of a binary lobbying indicator. Third, lobbying behavior tends to be "sticky," meaning firms do not typically start and end lobbying activities right around elections. Fourth, the Heckman selection model requires specific parametric assumptions to be valid, particularly when there are no excluded exogenous variables. Lastly, one may wonder whether the observed effect is specific to the 2020 election or a more general phenomenon.

To address these concerns, we present additional results in Appendix B. Our findings indicate that in-house lobbying has a significant negative association on our measure of policy risk. We also employ instrumental variable approaches using lagged lobbying expenditures as an instrument for contemporaneous variables. Our results are consistent with our main findings, suggesting that lobbying is associated with lower anticipated post-electoral volatility. In addition, the use of lagged lobbying expenditures as an instrumental variable helps account for the persistent nature of lobbying activities. Next, we implement a control function approach and a quantile treatment effects model (D'Haultfœuille et al., 2018), which are less reliant on the strong assumptions of the Heckman model and more robust to non-normality and parametric specification concerns.[18] The recovered estimates are consistent with those in Column (6) of Table 3, providing further evidence that firms were able protect themselves against the policy uncertainty associated with the 2020 US general election through lobbying, and that the firms likely to benefit most from lobbying (e.g., larger firms) were more likely to select into it. Finally, we replicate our analyses using data from the 2016 election, as we show in Section B.1. We construct the data similarly to the 2020 data and describe the 2016 variables in Table B5. The results for the 2016 election are very similar to those in Table 3. Thissuggests that the relationship between lobbying and anticipated post-electoral volatility is robust and consistent across election cycles, including years where different parties won the presidential election, and those with more unexpected outcomes (Trump's win in 2016) and less surprising ones (Biden was favored and won in 2020).

The findings in Table 3 suggest that electorally-induced policy uncertainty is smaller for lobbying firms. But it does not tell us why: e.g., whether that is to mitigate their political

[18]The latter approach estimates a semiparametric sample-selection model without an instrument or a large support regressor.

risk exposure. In addition, we cannot attribute the results in the selection equation – that larger firms are more likely to lobby – to productivity or higher profits, as we do not directly observe either variable. For both of these questions, we propose and estimate a theoretical model.

2. Model: Heterogeneous Firms with Endogenous Lobbying

We build a model of heterogeneous firms that choose lobbying endogenously. In it, both firms and financial market participants face uncertainty about how future policy will be different from current policy. This uncertainty is due to potential changes in government policies post-election (e.g., whether Trump tariffs will be kept, what will be the majority in Congress and how that impacts firm-specific benefits like tax breaks, etc.). Firms make lobbying decisions in the face of this uncertainty. While firms may dislike uncertainty, lobbying may shift policies in their favor and reduce the amount of uncertainty they face.

The model adapts Huneeus and Kim (2021), emphasizing the role of lobbying related to policy uncertainty, but simplifying it along other dimensions. Because our focus is on the impact of lobbying, we present a version of the model that focuses on lobbying decisions. Appendix C provides a version of the model with consumers and firm production decisions.

2.1. Set-up

A mass M of firms is distributed across the economy. We assume there is only one industrial sector, thereby focusing on lobbying activity per sector. Each firm i chooses whether or not to lobby and the intensity of lobbying, l_i.

There is also a continuum of investors who play the role of participants in the financial sector. While they do not affect consumers or firms, they buy options, which are affected by the firms' choices, in a perfectly competitive market. We discuss these market participants in Section 2.6.

2.2. The Firm's Problem

Firms are heterogeneous along two dimensions. We parameterize this heterogeneity by $\phi_i = (\phi_i^L, \phi_i^D)$, where ϕ_i^L is the term reflecting the returns to a given lobbying expenditure, detailed below; and ϕ_i^D is an exogenous distortion term, microfounded below. Both elements of ϕ_i are observed by the firm, but unobservable in a dataset.

Each firm, i, has the following profit function:

$$\pi(l_i) = \eta_i(l_i) - l_i - f^L \tag{2.1}$$

where l_i is both the amount of lobbying and the cost of lobbying, and f^L is the fixed cost of lobbying.[19] Thus, firms choose both whether to lobby and also how much to spend on lobbying. The firm-specific random variable η_i captures policy uncertainty, where a higher realization of η_i is interpreted as the realization of a policy that will benefit the firm. It can be interpreted as the realization of economic shocks, a sectoral policy, or a firm-specific policy (e.g., government contracts or a firm-specific subsidy).[20]

The firm does not know the realization of η_i when it chooses lobbying, l_i. But by choosing lobbying, it can affect the distribution of η_i (e.g., by affecting the policies the firm is exposed to). The firm believes that, with probability p_e, the policy will not change. If the policy does not change, η_i remains at some status-quo (firm-specific) value, $q_{e,i}$ (e.g., grants, tax breaks or tariffs are kept). However, with probability $(1 - p_e)$, the policy will change, but how it will change is uncertain. The firm believes that, if there is a change, policies may be such that $\eta_i \sim N(\mu(l_i), \sigma^2(l_i))$. Hence, the election may affect policies in an imperfectly predictable way, but these potential changes can be mitigated through lobbying. Indeed, both the mean and variance of proposed and approved alternative policies may differ (e.g., as found in Kang, 2016).

[19] We do not need a free entry condition to close the model, so we assume the draws of ϕ_i^L and ϕ_i^D are costless.

[20] As shown in Hassan et al. (2019), among others, most of the recent research indicates that individual firms exhibit unique political risk profiles. This evidence suggests that firms use lobbying practices to handle their individual exposure to policy risk, rather than to address collective risk.

Following the firm's lobbying decision, there is an election and η_i and, thus, firm profits, are realized.[21] Before the election, the firm believes

$$\eta_i \sim N(p_e q_{e,i} + (1-p_e)\mu(l_i), (1-p_e)^2\sigma^2(l_i)).$$

Afterwards, $\eta_i = q_{e,i}$ or $\eta_i \sim N(\mu(l_i), \sigma^2(l_i))$. The realization of this variable generates a jump in stock prices by affecting the mean and/or variance of the profit function (2.1).

Regarding firm preferences over profit, we choose to be flexible and allow firms to be risk-neutral (i.e., maximize expected profits) *or* risk-averse (i.e., have an insurance motive, as in LaPira and Thomas, 2017) by having CARA preferences

$$v_i(\pi(\eta_i)) = -\frac{e^{-\alpha\pi(\eta_i)}}{\alpha} \tag{2.2}$$

that are increasing in profits, $\pi(\cdot)$, where profits are given by equation (2.1). Thus, if $\alpha = 0$, we are in the standard problem of maximizing expected profits. If $\alpha > 0$, the firm is risk-averse.

In this setting, the solution to the problem of choosing l_i by maximizing pre-electoral expected profits is equivalent to maximizing the certainty equivalent of (2.1). That value, as perceived *before the election* for a firm i with CARA preferences facing normally distributed policy uncertainty, is:[22]

$$\pi^{CE}(l_i) = p_e q_{e,i} + (1-p_e)\mu(l_i) - \frac{\alpha(1-p_e)^2\sigma^2(l_i)}{2} - l_i - f^L. \tag{2.3}$$

When the firm is risk-neutral (i.e., $\alpha = 0$), then it only cares about the mean of η_i, and not the variance of profits.

[21] This is a static model in the sense that agents only play once. We interpret this as a model holding around the election, so that the main source of uncertainty is electoral, consistent with our empirical exercise.

[22] Note that η_i is the only source of uncertainty in profits (2.1), so the other terms only affect the mean of that function.

Let $\phi_i^D \equiv p_e q_{e,i}$. Relative to a standard profit maximizing function, the somewhat novel part of (2.3) is the structure of

$$\tau(\phi_i, l_i) \equiv \phi_i^D + \left((1-p_e)\mu(l_i) - \frac{\alpha(1-p_e)^2\sigma^2(l_i)}{2} \right), \tag{2.4}$$

which, following Huneeus and Kim (2021), we call the distortion function. The distortion function is comprised of exogenous distortions ($\phi_i^D = p_e q_{e,i}$) and those due to endogenous lobbying choices. The exogenous term captures the existing policies and the ex-ante chance they remain, while the endogenous term is affected by lobbying, as lobbying will affect the mean and variance of future policies if there is a change.[23]

2.3. Intensity of Lobbying

We follow Huneeus and Kim (2021) in parametrizing the endogenous distortions term as $(\phi_i^L l_i)^\delta$, where $0 < \delta < 1$ is the elasticity of endogenous distortions to expenditure (l_i).

Hence, the total amount of distortions in firm choices due to lobbying and policy uncertainty is given by:

$$\tau(\phi_i, l_i) = \underbrace{\phi_i^D}_{Exogenous\ Distortions} + \underbrace{(\phi_i^L l_i)^\delta}_{Endogenous\ Distortions}, \tag{2.5}$$

where $\phi_i^D = p_e q_{e,i}$ and $(\phi_i^L l_i)^\delta = (1-p_e)\mu(l_i) - \frac{\alpha(1-p_e)^2\sigma^2(l_i)}{2}$.

The total distortion includes both an exogenous component (ϕ_i^D) and an endogenous component that is a function of both resources allocated to lobbying (l_i)[24] and a measure of the firm-specific returns to lobbying (ϕ_i^L). The parameter δ captures the decreasing marginal returns to lobbying in profits. Meanwhile, ϕ_i^L parameterizes returns to – or capabilities of – lobbying. Our preferred interpretation is that ϕ_i^L reflects i's benefit from keeping privileges or accessing new opportunities. This is consistent with existing literature, where some firms that have more favorable regulation (e.g., Dal Bó, 2006), better

[23] In Huneeus and Kim (2021), $\tau(\cdot)$ multiplies the price and therefore acts as an ad-valorem tax or subsidy that distorts production decisions. Here, the additively separable specification follows directly from our assumptions on policy uncertainty.

[24] We assume, for simplicity, that these are collected as revenue and rebated lump-sum to consumers.

political connections (e.g., Fisman, 2001; Faccio, 2006; Akcigit et al., 2023) or access to politicians (e.g., Cotton, 2009; Kalla and Broockman, 2016) may have better returns to their lobbying effort. Here, firms with more privileges to lose (and, say, better possibilities at keeping them) have an increased marginal benefit from lobbying, are more likely to obtain/preserve more favorable policies and, thus, engage with (and choose more) lobbying to mitigate the effects of potential policy shifts on their operations. Hereafter, we call ϕ_i^L firm i's "lobbying favorability."[25] Finally, lobbying may have different marginal effects (and elasticities) on the mean and variance of policies, through the different mappings $\mu(l_i)$ versus $\sigma(l_i)$. In the following subsection, we address the firm's decision of whether to pay the fixed cost f^L in order to lobby.

However, if a firm does select into lobbying, it will choose l_i by comparing extra revenue from the distortion $\tau(\phi_i, l_i)$ to the variable cost of lobbying, l_i. Thus, lobbying is not binary: one can choose to lobby, but also how much to spend in it.

Inserting equation (2.5) into the firm objective function in equation (2.1), we see that firms who choose positive levels of lobbying optimally equate the marginal revenue of lobbying to the marginal cost of lobbying, which is 1. The optimal level of lobbying is therefore

$$l_i^*(\phi_i) = \left(\frac{1}{\delta(\phi_i^L)^\delta}\right)^{\frac{1}{\delta-1}}, \tag{2.6}$$

which only depends on the firm's lobbying favorability ϕ_i^L and δ, the parameter that governs the curvature of the distortions-to-lobbying function.

[25]This accommodates how firms use lobbying to maintain regulatory stability during political transitions (De Figueiredo and Richter, 2014), and that lobbyists engage with policymakers to shape legislative priorities and mitigate risks associated with potential shifts in government leadership or policy direction (Kerr et al., 2014; Bertrand et al., 2014). Likewise, LaPira and Thomas (2017) provides qualitative evidence from biographies and interviews, suggesting that revolving-door lobbyists are hired to insure against unpredictable governments, rather than solely for access. Finally, lobbyists monitor electoral developments to provide firms with early warnings about potential regulatory changes, enabling proactive adjustments to corporate strategies (Blanes-i Vidal et al., 2012).

2.4. Entry into Lobbying

A firm will only devote a strictly positive quantity of resources to lobbying if the benefits of lobbying outweigh both the variable (l_i) and fixed costs (f^L). Firms for whom the fixed cost of lobbying is too high relative to ϕ_i^L stay out of the sector altogether and are content with full risk exposure.

Given the optimal intensive margin of lobbying, a firm with type ϕ_i will lobby if

$$[\phi_i^L l_i^*(\phi_i)]^\delta - l_i^*(\phi_i) - f^L \geq 0. \tag{2.7}$$

Using equation (2.6), the cutoff favorability for a firm to lobby is

$$\bar{\phi}^L = (f^L)^{\frac{1-\delta}{\delta}} \left(\delta^{\frac{\delta}{1-\delta}} - \delta^{\frac{1}{1-\delta}}\right)^{\frac{\delta-1}{\delta}}. \tag{2.8}$$

Only firms with $\phi_i^L \geq \bar{\phi}^L$ will lobby. Notice that ϕ_i^D does not enter into this extensive margin decision.

2.5. Equilibrium

In the main text, we analyze the partial equilibrium implications of firms' choices: firms are the only actors in the lobbying model, and each firm's payoffs from lobbying is only a function of its own lobbying choices, the fixed cost of lobbying, its lobbying favorability ϕ_i^l, and δ. Equilibrium in this partial equilibrium lobbying model requires that the firm: (i) optimally chooses whether to pay the fixed cost of lobbying to enter the lobbying sector; and (ii) conditional on entering the lobbying sector, chooses the amount of lobbying $l_i^*(\phi_i^L)$ expenditure to maximize profits as given by equation (2.1). In Appendix C, we consider the general equilibrium counterpart of this model, where equilibrium requires that each of the mass of M firms satisfies these same two requirements.

2.6. Incorporating Option Traders

We complete our model by introducing investors who engage in option trading. Firms do not explicitly consider option prices in their choices, as their objectives are simply to maximize (preferences over) profits. However, investors can use these financial derivatives to hedge against or speculate on potential electorally-induced stock price changes. As a result, firms' decisions will influence their own value, which will in turn affect the choices of option traders.

In Appendix D, we extend the Black-Scholes option-pricing formula to incorporate a single, predictably-timed price jump on the first trading day after the election. Our essential innovation is to posit that the excess variance attributed to the election in equation (1.1) depends on firms' endogenous lobbying choices.

From equation (2.1), it can be seen that the only change to profits around the election is the change due to the realization of η_i. In addition, Sections 2.3 and 2.4 show that the model links the firm's decisions on lobbying, l_i^* in equations (2.6) and (2.7) to firm types. We can thus link the variance implied by option prices on pre-election day t to each firm's endogenous lobbying choices through:

$$\sigma_{i,t,T}^2 = \sigma_i^2 + T^{-1} b^2 (1 - p_e)^2 \sigma^2(l_i), \tag{2.9}$$

where σ_i^2 represents firm i's baseline implied variance in annualized units, T is the number of trading days until the option's maturity, b is a scaling factor that determines how stock prices respond to changes in profit expectations, p_e is the probability that η_i will remain at some status-quo (firm-specific) value, and $\sigma_i^2(l_i)$ captures the expected election-induced variance in returns, given firm i's lobbying expenditures l_i (see Appendix D for more details). The decreased policy risk due to lobbying discussed in Section 1.1 can now be interpreted through the firm's endogenous choices.

Finally, while our assumptions simplify the exposition relative to a model with multiple lobbying firms and explicit effects on policy through agenda setting, we show in Appendix

C.5 that the effects on the mean and variance of policies can arise naturally when we consider an appropriate extension of our theoretical environment based on Judd (2023). There, firms in a sector can bargain with one another to decide which policies to lobby.

3. Quantifying the Model

The model makes two main contributions. First, it provides a clear pathway to understand the regression results in Table 3: firms anticipate that elections can change policies and they react accordingly by lobbying. Firms' lobbying choices depend on their lobbying favorabilities, the effects of lobbying on policies, and the fixed and variable costs of lobbying. Second, the model provides a tight link between these parameters and data. For example, the model explains how our policy risk measure can be written in terms of firms' choices and their effects on policy outcomes. We are interested in quantifying which mechanisms (lobbying favorability, fixed costs, concavity of returns) drive selection into and the returns from lobbying. While the model is simple, we can fit it to showcase which parameters seem to best explain the data.

3.1. Identification and Estimation

In the data, we observe each firm i's decision to lobby, $d_i \in \{0, 1\}$, and how much they spend in lobbying close to the election, l_i^*. In the model, the former is determined as a function of parameters (ϕ_i^L, f_L, δ) through equation (2.7), while the latter is determined via equation (2.6). Recall that we also observe firm characteristics, denoted z_i, which include the (log) number of employees, the ratio of tangible assets to total assets, and Fama-French sector fixed effects to account for sector-level heterogeneity.

We assume the following two conditions which allow us to identify (ϕ_i^L, f_L, δ) using the model's mappings.

Assumption 1 (Parametrization): Let $\log(\phi_i^L) \sim_{iid} N(m + z_i'\beta, \sigma_\phi^2)$.
(i.e., ϕ_i^L is lognormally distributed across firms).

Assumption 2 (Location Normalization): $m = 0$.

Assumption 1 imposes a parametric assumption on the heterogeneity of firm-level lobbying favorability/privileges. The parametric choice of lognormal is standard, and it has the benefit of allowing thicker tails for unobserved heterogeneity. We allow both observable and unobservable heterogeneity in lobbying productivities, as the unobserved component is normally distributed with mean 0, while the observable part has a linear index specification.

Assumption 2 is a location normalization, normalizing the mean of ϕ_i^L when $z_i = 0$: i.e., a firm with no employees and no market value would have 0 favorability in lobbying. This allows us to separately identify the fixed cost (f_L) from the mean of ϕ_i^L, as both parameters affect the decision to enter lobbying in a similar way.

Under these assumptions, the distribution of lobbying spending is a Truncated Normal distribution, with mean, variance and lower bound that are a function of the parameters of interest - see equation (E.2) in the Appendix. Lemma 3.1 summarizes that they are separately identified - pinned down from the observed distribution of lobbying spending across different firms and their characteristics. The proof is in Appendix E.

Lemma 3.1. *Under Assumptions 1-2,* $(\delta, \sigma_\phi^2, f_L, \beta)$ *are identified. Furthermore,* $\sigma(l_i)$ *is identified.*

The identification of the first set of parameters only requires firm-level characteristics and lobbying expenditures. They can be estimated consistently via Maximum Likelihood, given the known distribution (Truncated Normal), given in equation (E.2).

Then, we can use data on the cross-section of *realized*/post-electoral implied volatilities for lobbying firms to identify $\sigma(l_i)$, which governs the role of lobbying in reducing policy uncertainty due to the 2020 (or 2016) election. As the identification does not rely on further assumptions, these parameters can be estimated nonparametrically in a regression counterpart of (2.9).

3.2. Results

We present the Maximum Likelihood estimates of $(\delta, \sigma_\phi, f_L)$ across four specifications in Table 4 below. The specifications only differ in the variables used for observed heterogeneity of ϕ_i^L in Assumption 1. In particular, Columns (1)-(2) use different variables for observed heterogeneity in lobbying favorabilities, which are similar to those in Section 1.4: Column (1) only uses a measure of firm size (log number of employees), while Column (2) augments it with Tangible Assets/Assets (as in Table 3). Meanwhile, Columns (3)-(4) introduce fixed effects for each Fama-French sector category. Our results are robust across these specifications. Standard errors are computed by the bootstrap.

TABLE 4. Parameter estimates across specifications

Parameter	(1)	(2)	(3)	(4)
Elasticity of endogenous distortions to lobby	0.336 (0.003)	0.339 (0.003)	0.336 (0.003)	0.337 (0.003)
Standard deviation of lobbying benefits	3.165 (0.160)	3.127 (0.164)	3.165 (0.159)	3.151 (0.163)
Fixed cost of lobbying	12652.955 (558.971)	12496.089 (665.626)	12653.056 (555.955)	12588.715 (555.131)
Number of employees (logged)	10.886 (0.057)	10.846 (0.061)	10.607 (0.057)	10.070 (0.062)
Tangible assets/assets		-2.252 (0.006)		1.945 (0.006)
Sector fixed effects	No	No	Yes	Yes
Number of firms that lobby	714	700	714	700

Standard errors in parentheses, computed using 999 bootstrap replications. Lobbying spending is based on firms spending positive values in Q2 of 2020. The number of firms depends on the availability of data for the covariates.

The results show that marginal returns to lobbying decrease strongly, as captured by δ. Indeed, we estimate that parameter to be close to 0.33, significantly away from 1 (which would reflect constant returns). The bootstrapped confidence intervals are tight, such that $\delta \in [0.330, 0.344]$ for Column 3.

In addition, we find that larger firms are also those that have higher favorabilities from lobbying, suggesting a positive correlation across lobbying and productive activities. Indeed, the coefficient on the number of employees is positive and statistically significant across specifications, even conditional on sector-level heterogeneity. This is consistent with such firms having larger privileges from maintaining existing policies, higher benefits from alternative ones, or from having more political connections or access, which enhance the returns from lobbying expenditures on policy. We caveat, though, that these results are limited by the assumptions of the model: they cannot go beyond the limitations given by unobserved heterogeneities, captured by the parametric distribution (Assumption 1).

Meanwhile, we find positive and statistically significant fixed costs for lobbying, consistent with the barriers to entry arguments (e.g., Kerr et al., 2014). The fixed costs are estimated to be approximately US$$12,500$ (in 2020 values). This value is fully consistent with market values, when those are available. For instance, LobbyIt, an existing lobbying firm in Washington D.C., summarizes pricing in the lobbying industry in 2023 as “Most lobbying firms charge as much as US$$15,000$ as a minimum retainer, with the entire process reaching US$$50,000$ per month or more for full advocacy services, with many of their ‘billed-for’ activities remaining largely undefined.”[26] The minimum retainer is consistent with our estimates for the fixed cost, while our model also has marginal costs depending on the extent that one lobbies.

The combination of heterogeneity in firms’ returns from lobbying (due to both observed and unobserved differences across firms) and a positive fixed cost is how our model explains why only 32% of firms in our data lobby. This is not an assumption, but rather an empirical result: the model could also generate a small number of firms lobbying with much lower fixed costs, but with a distribution of ϕ_i^L which had a lower mean and variance. However, the estimated fixed cost and heterogeneity in lobbying types is required to fit both lobbying entry and the heterogeneity in observed lobbying expenditures.

[26]See https://lobbyit.com/pricing/#top, retrieved January 24, 2023.

We now turn to examining the impact of lobbying on financial volatility. As discussed in Section 2.6, the function $\sigma(l_i)$ capturing the relationship between lobbying expenditures and policy variance in our model also affects options' implied volatility. Therefore, we can quantify the impact of lobbying on financial volatility by fitting the post-electoral implied volatility (over 30 days) to lobbying expenditures using a local-linear non-parametric estimator. In Table 5, we present two specifications: with and without sector fixed effects.

TABLE 5. Estimates of the relationship between lobbying expenditures and policy variance

Parameter	Specification 1	Specification 2
Average Derivative	-2.590 (0.510)	-0.742 (0.142)
Sector fixed effects	No	Yes
Number of firms that lobby	717	717

Standard errors in parentheses, computed using 999 bootstrap replications. An Epanechnikov kernel is used, with bandwidth computed by cross-validation. For interpretability, l_i is measured in hundreds of thousands of dollars spent on lobbying in Q2 of 2020.

The average derivative of $\sigma(l_i)$ in lobbying is negative and statistically significant across specifications. It is also robust to outliers in lobbying spending (e.g., firms spending over US$50 million per year) and still holds even if we restrict to firms spending at least US$100,000 per year. Hence, lobbying can affect post-election policies and, thus, implied volatility. This indicates that lobbying mitigates electoral risk, allowing us to go beyond the associations found in Section 1. The magnitude of these coefficients is that an increase of US$1 million in lobbying spending implies an average decrease of 15% (7.42 divided by the mean of 49.5) of the 30-day annualized implied volatility through decreasing policy variance.[27] These estimates are informative about how lobbying affects the mean and variance of firms' profits. They also capture the effect of lobbying on the

[27] The effect of lobbying expenditures on policy risk reduction may appear to be quantitatively small, but it is significant and relevant for investors. It is also small enough to be consistent with evidence that lobbying can affect policy (e.g., Kang, 2016), although this is an average over heterogeneous effects.

mean and variance of policies (2.5), even if we cannot pin down each component exactly. After all, when $\alpha \to 0$, only the mean term matters, while the variance term dominates when $\alpha \to \infty$. A well calibrated estimate from the literature ($\alpha = 0.1$),[28] together with our estimates from Table 5, suggests that the variance term is significant, but unlikely to capture the full marginal effect of lobbying. Thus, both terms may matter.

4. Conclusion

Using a novel firm-level measure of uncertainty, based on option prices, we find that lobbying can reduce policy uncertainty associated with electoral turnover. We believe our results provide further insights. First, from the perspective of risk-averse investors, policies that restrict lobbying can increase investors' exposure to risk. This should be considered when discussing lobbying reform and the benefits of lobbying restrictions (e.g., Ellis and Groll, 2020). Second, our model estimates show that the returns to lobbying diminish rapidly, there are significant fixed costs, and the distribution of lobbying favorabilities is highly skewed. This implies that few firms anticipate enough benefits to merit paying the associated costs. This provides some progress in explaining why more firms do not lobby and why the amount of money in U.S. politics appears small relative to the realized gains from lobbying (Ansolabehere et al., 2003).

Our results were shown to be robust to different years, to different potential confounders (whether political or financial) and different specifications. Together with our theoretical mechanisms, we see our results as being about lobbying and going beyond other forms of corporate political activity. Nevertheless, we acknowledge that electoral risk is just one subset of the broader political uncertainty landscape, and regulatory risks from federal agencies can also influence firm behavior and lobbying decisions (Cooper and Boucher, 2019; Wellman, 2017). However, by focusing on elections, we prioritize a mechanism where investor expectations and policy uncertainty are directly observable

[28] Brenner (2015), Table 4, finds that the median relative risk aversion is 1, and the mean and 80th percentile is 3. From Dittmann and Maug (2007) Table 1, Panel A, average wealth is 34.6 million. Thus, an estimate of (average) absolute risk aversion is the former divided by the latter: $3/34.6 \approx 0.09$.

and quantifiable. This approach does not negate the relevance of other political risks but reflects a deliberate methodological choice to isolate electoral risk as a distinct channel above and beyond other "baseline" activities.

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Online Appendix for *Mitigating Policy Uncertainty: What Financial Markets Reveal About Firm-Level Lobbying*

Appendix A. Additional Information on the Data and Empirics

A.1. Additional Information on Data Matching

Here we supplement the high-level overview of the data assembly process in Section 1 with additional details on our matching procedure.

A.1.1. **OptionMetrics and LobbyView.** By statute, the lobbying information contained in LobbyView should contain the universe of firms that lobby the U.S. government above a very minimal threshold. If our process that matches OptionMetrics firms to LobbyView firms is thorough, we should have no lobbying firms that are mis-categorized as non-lobbying firms (i.e., false negatives).

To match between OptionMetrics and LobbyView, we first match on firm tickers. Since LobbyView does not have tickers, we first match ticker information to LobbyView firms using the variable gvkey and the Wharton Research Data Services gvkey-ticker correspondence file. We are able to match 823 firms through this process.

We then run a fuzzy name matching algorithm between the unmatched OptionMetrics firms and LobbyView; here, we find an additional 109 matches.[1] Next, we repeat the fuzzy matching procedure on the still-unmatched firms, this time using the Wharton Research Data Services' list of firm subsidiaries to make an additional 86 matches, for a total of 1,018 of the 3,128 OptionMetrics firms having lobbying records in LobbyView.

A.1.2. **OptionMetrics and Compustat.** We next turn to finding firm-level financial information in Compustat for each firm in OptionMetrics. We are able to match all but four OptionMetrics firms to a record in Compustat through the following process.

We first use the Compustat firm identifier gvkey that is present in both Computstat and OptionMetrics, resulting in 843 matches. We then use the Compustat identifier CUSIP, which finds another 2,167 firms. Next, we turn to the ticker, which matches another 73 firms. Finally, we compile a list of changes in the ticker from 2018 to 2022 from www.stockanalysis.com, which allows us to match 42 more firms for a total of 3,125.

A.2. Additional Information on the Sample

We use the following criteria to construct our sample of firms, presenting descriptive statistics for three key characteristics of firms in Table A1 for each main stage of our selection process. Column (1) corresponds to the publicly-traded firms included in the Compustat database for the years 2019 or 2020. In column (2), we exclude the firms from

[1]Since LobbyView did not have gvkey matches for firms with IPOs after 2018, we investigated whether this could lead to false negatives. We compiled a list of IPOs after 2018 from www.stockanalysis.com, and our fuzzy name matching algorithm was able to find the vast majority of these firms. We therefore kept the firms with post-2018 IPOs in our sample.

column (1) that do not have tradable options. Next, in column (3), we further restrict our attention to the subset of firms in column (2) for which our estimator of policy risk is defined and that also satisfy the criteria discussed in Footnote 9 in Section 1.1. Our final sample in column (4) consists of the subset of firms included in column (3) without missing data on the two main size characteristics that we use in our analysis (Number of Employees and Tangible Assets). Compared to the full set of publicly-traded firms in Compustat, the firms in our final sample are about 60% larger in terms of employees and about three times larger in terms of market value. There is no appreciable difference in terms of tangible assets.

TABLE A1. Firms' characteristics by selection criteria

Firm Characteristics	(1) Compustat	(2) Options	(3) Filters	(4) Final Sample
Number of Emp. (Thousands)	11.465	16.595	17.952	18.642
	(48.989)	(59.298)	(63.306)	(64.511)
Tang. Assets/Assets (USD Mill.)	0.255	0.232	0.230	0.230
	(0.289)	(0.249)	(0.244)	(0.243)
Market Value (USD Mill.)	5,267.209	13,004.030	15,498.180	15,934.940
	(31,231.490)	(52,609.230)	(59,514.220)	(60,975.690)
Observations	11,669	3,390	2,492	2,337

Sample averages. Standard errors in parentheses.

In Table A2, we provide information about the attrition of the firms with options in column (2) of Table A1 once we consider whether our estimator of policy risk is defined and the criteria discussed in Section 1.1 are satisfied (column (3) of Table A1), as well as the missing data on the two main size characteristics that we use in our analysis (column (4) of Table A1). First note that, out of our 1,018 matched lobbying firms, 32 of these firms do not have tradable options, and so they are already removed when we move to column (2) of Table A1. We also reclassify 33 firms as non-lobbying firms that are in the LobbyView data, but that do not report strictly positive lobbying expenditure. Finally, a further 19 firms do not have data for the key Compustat variables for size and so are screened out between columns (3) and (4) of Table A1.

TABLE A2. Sample attrition by lobbying and non-lobbying firms

	Non-Lobbying		Lobbying		All	
	N	Percent	N	Percent	N	Percent
Firms with Options	2437	100.000	953	100.000	3390	100.000
Policy risk measure not defined	2171	89.085	895	93.914	3066	90.442
Post-election spread > pre-election spread	1814	74.436	807	84.680	2621	77.316
Price-movement condition on Delta	1699	69.717	793	83.211	2492	73.510
Missing Data on Size Indicators	1563	64.136	774	81.217	2337	68.938

Each row in Table A2 shows a subset of observations that meet the specified criteria, with fewer observations meeting the criteria in each subsequent row. Across the three conditions that we apply to move from column (2) to column (3) of Table A1, approximately 70 per cent of non-lobbying firms satisfy these conditions, compared to 83 percent for the lobbying firms in our sample. Our final sample, once the observations with missing size data are removed, includes approximately 64 per cent of the non-lobbying firms with options, compared to 81 percent of the lobbying firms with options.

Data Sources:

(1) OptionMetrics LLC. OptionMetrics IvyDB US [dataset]. Wharton Research Data Services (WRDS). https://wrds.wharton.upenn.edu/ Accessed February 18, 2025.

(2) Standard & Poor's. Compustat [dataset]. Wharton Research Data Services (WRDS). https://wrds.wharton.upenn.edu/ Accessed February 18, 2025.

(3) Center for Research in Security Prices (CRSP), Booth School of Business, University of Chicago. CRSP US Stock Database [dataset]. Wharton Research Data Services (WRDS). https://wrds.wharton.upenn.edu/ Accessed February 18, 2025.

(4) BoardEx. BoardEx [dataset]. Wharton Research Data Services (WRDS). https://wrds.wharton.upenn.edu/ Accessed February 18, 2025.

(5) London Stock Exchange Group (LSEG). LSEG Data and Analytics [dataset]. https://www.lseg.com/en/data-analytics Accessed February 18, 2025.

(6) Kim, I. S. (2018). Lobbyview: Firm-level lobbying & congressional bills database. https://www.lobbyview.org/data-download/ Accessed February 18, 2025.

(7) Buzard, Kristy; Canen, Nathan; Saiegh, Sebastian, 2025, "Replication Data for: Mitigating Policy Uncertainty: What Financial Markets Reveal About Firm-Level Lobbying" https://doi.org/10.7910/DVN/U10SJ6, Harvard Dataverse. Accessed September 25, 2025.

A.3. Descriptive Statistics - Electorally-Induced Policy Risk

Table A3 presents descriptive statistics for our dependent variable, policy risk across different categories of firms: all firms, non-lobbying firms, lobbying firms, and lobbying firms categorized by their lobbying expenses—up to the 75th percentile, between the 75th and 90th percentile, and in the top decile. The statistics reveal variations in policy uncertainty across these categories, with non-lobbying firms generally exhibiting higher levels of uncertainty compared to lobbying firms. Firms with the highest lobbying expenses (top decile) show the lowest mean and median uncertainty values.

TABLE A3. Descriptive Statistics - Electorally-Induced Policy Risk

	Mean	Standard Deviation	Median	Skewness	Kurtosis	N
All Firms	3.012	3.529	2.166	5.878	49.804	2492
Non-Lobbying Firms	3.338	3.939	2.403	5.485	42.541	1699
Lobbying Firms	2.313	2.278	1.739	6.136	58.451	793
Lobbying Expenses ($\leq$ 75th percentile)	3.294	3.861	2.387	5.546	43.577	1869
Lobbying Expenses (75th-90th percentile)	2.491	2.429	1.910	5.270	40.939	373
Lobbying Expenses (top decile)	1.677	1.087	1.385	3.302	19.377	250

FIGURE A1. Policy Risk by Lobbying

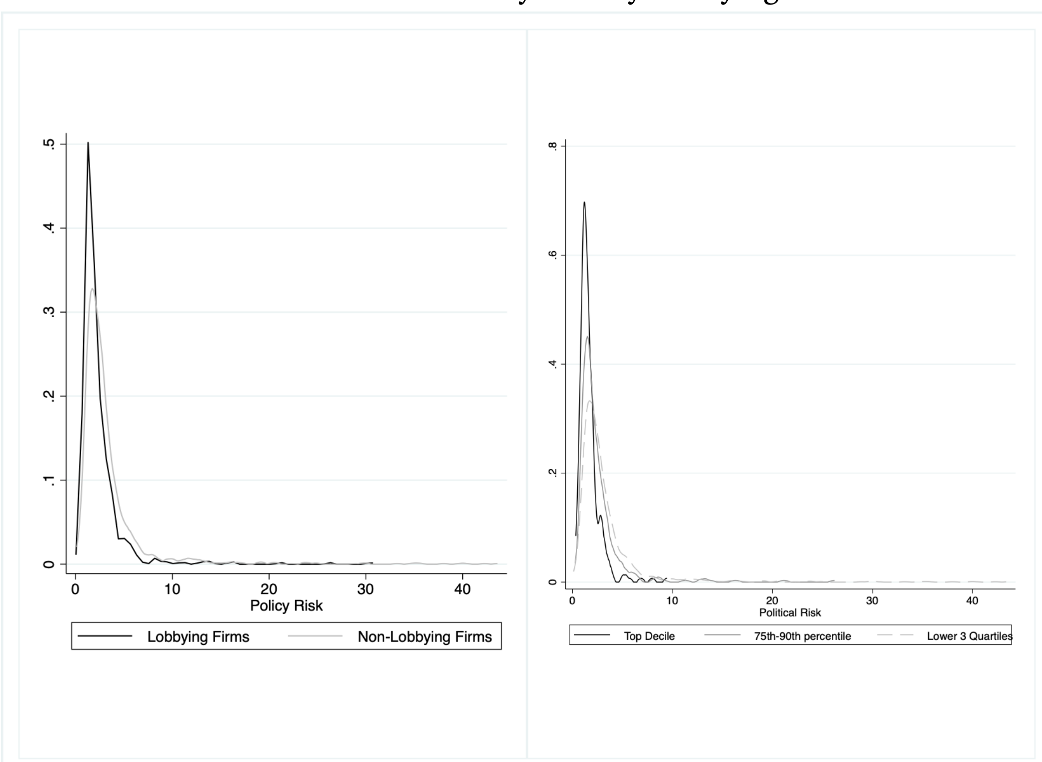


Figure A1 shows the distribution of electorally-induced policy risk across different firm categories. The left panel compares lobbying firms and non-lobbying firms, revealing that non-lobbying firms generally experience higher levels of policy risk. The right panel further breaks down lobbying firms by their lobbying expenses, categorizing them into the top decile, the 75th–90th percentile, and the lower three quartiles. Firms in the top decile of lobbying expenses exhibit the narrowest distribution and the lowest levels of political risk, while firms in the lower quartiles show a wider spread of risk. These graphs visually reinforce the descriptive statistics presented earlier, suggesting that higher lobbying expenditures may be associated with reduced policy uncertainty.

TABLE A4. Correlation Matrix Heatmap - Firm Characteristics

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.00	0.40	0.14	0.17	0.12	0.22	0.17	0.16	0.25	0.23	-0.11	0.00	-0.29
2		1.00	0.14	0.39	0.31	0.51	0.37	0.38	0.42	0.29	-0.12	0.10	-0.34
3			1.00	0.00	-0.08	0.05	-0.01	0.02	0.03	0.08	-0.12	0.22	-0.30
4				1.00	0.33	0.62	0.81	0.69	0.65	0.10	0.05	-0.01	-0.02
5					1.00	0.41	0.47	0.48	0.52	0.04	-0.07	-0.05	-0.04
6						1.00	0.65	0.69	0.62	0.09	-0.05	-0.01	-0.10
7							1.00	0.85	0.65	0.12	-0.00	-0.02	-0.04
8								1.00	0.66	0.08	-0.02	-0.02	-0.04
9									1.00	0.10	-0.03	0.02	-0.09
10										1.00	-0.30	-0.08	-0.40
11											1.00	0.00	0.34
12												1.00	-0.24
13													1.00

Legend: - **Color Scale:** Red indicates positive correlation, blue indicates negative correlation. The intensity of the color represents the strength of the correlation. - **Variables:** 1: Firm Age; 2: Employees (Logged); 3: Tangible Assets; 4: Market Value; 5: Total Assets; 6: Sales; 7: Net Income; 8: Income Taxes; 9: Dividends; 10: Return on Assets; 11: Tobin's Q; 12: Debt Ratio; 13: Cash Holdings.

TABLE A5. Correlation Matrix Heatmap - Exposure/Activism

	1	2	3	4	5	6	7	8	9
1	1.00	-0.02	0.04	0.05	0.08	0.07	0.04	0.10	0.06
2		1.00	0.01	0.05	0.03	0.07	0.05	-0.04	-0.02
3			1.00	0.80	0.56	0.60	0.23	0.29	0.32
4				1.00	0.60	0.63	0.24	0.27	0.30
5					1.00	0.93	0.30	0.35	0.41
6						1.00	0.33	0.37	0.43
7							1.00	0.25	0.20
8								1.00	0.23
9									1.00

Legend: - **Color Scale:** Red indicates positive correlation, blue indicates negative correlation. The intensity of the color represents the strength of the correlation. - **Variables:** 1: Firm-Level Risk (Hassan); 2: CF Score (Bonica); 3: Campaign Contributions (Logged); 4: PAC Contributions (Logged); 5: Political Hedging; 6: Political Connections; 7: Government Contracts (Logged); 8: Revolving Door; 9: Policy Engagement.

Table A6. Variable Definitions and Sources

Variable	Definition	Data Source
Policy Risk	Estimated as: $\hat{\sigma}^2_{E_i} = \frac{\sigma^2_{i,t,30} - \sigma^2_{i,t,60}}{\frac{252}{30} - \frac{252}{60}}$ where t denotes the pre-election day,$\sigma^2_{i,t,30}$ and $\sigma^2_{i,t,60}$ are firm i's annualized implied variances of the 30-day and 60-day options, respectively; and expressed on a daily basis using the number of trading days to option maturity,in standard deviation units, $Daily(\hat{\sigma}_{E_i}) = \sqrt{\frac{\hat{\sigma}^2_{E_i}}{21}}$	OptionMetrics
Lobby	This variable takes the value of 1 if a firm reported spending a strictly positive amount on lobbying from the third quarter of 2019 through the second quarter of 2020, and 0 otherwise.	LobbyView
Expenditures (USD Mill.)	Total amount of lobbying expenditures reported between the third quarter of 2019 through the second quarter of 2020.	LobbyView
In-House Lobbying	Percentage of lobbying activities conducted in-house	LobbyView
Market Value (USD Mill.)	The market value of equity divided by the book value of equity.	Compustat
Total Assets (USD Mill.)	Total Assets	Compustat
Sales (USD Mill.)	Gross Sales	Compustat
Number of Employees (Thousands)	Number of Employees	Compustat
Net Income (US Mill.)	Net Income	Compustat
Income Taxes (USD Mill.)	Income Taxes	Compustat
Dividends - Total (USD Mill.)	Dividends	Compustat
Firm Age	Firm age in years (rounded) on the first day of June, 2020, calculated using the first date of trading after the initial public offering (IPO).	CRSP
Tangible Assets/Assets	Ratio of Property, Plant and Equipment to Total Assets	Compustat
Return on Assets	Ratio of Net Income to Total Assets	Compustat
Tobin's Q	The market value of equity plus the book value of assets minus the book value of equity plus the deferred taxes, all divided by the book value of assets.	Compustat
Debt Ratio	Ratio of the sum of Long Term Debt and Debt in Current Liabilities to Total Assets	Compustat
Cash Holdings/Assets	Ratio of Cash and Short-Term Investments to Total Assets	Compustat
R&D Expenditures/Assets	Ratio of lagged &D expenditures to Total Assets	Compustat
Firm-Level Risk (Hassan)	Disclosure of political risk based on conference-call transcripts (2002-2019 Average)	Hassan et al (2019)
Government Contracts (Logged)	Annual average of the sum of dollars obligated in all federal contracts in the United States from 2004 to 2015, inclusive.	Fazekas et al (2023)
Revolving Door	Number of individuals with prior experience in one of 187 executive branch agencies in the United States in the year 2018.	Emery and Faccio (2020)
CF Score (Bonica)	Firm-level average of ceo and employees ideology in 2020. Based on Bonica's CFScore. More liberal (conservative) donors receive lower (higher) scores	Steel (2024)
Campaign Contributions (Logged)	Employee donations based on FEC records in 2018	Stuckatz (2022)
PAC Contributions (Logged)	Corporate Political Action Committee (PAC) contributions based on FEC records in 2018	Stuckatz (2022)
Political Hedging	Measured as $1 - \frac{\lvert REP-DEM \rvert}{REP+DEM}$ over the six years ending in October before each election between 1998 and 2016, where REP (DEM) represent the total number of Republican (Democrat) candidates who receive political contributions from a firm (Averaged)	Christensen et al (2020)
Political Connections	Natural logarithm of one plus the number of political candidates (House, Senate, and Presidential) to whom a firm contributed money to over the six years ending in October before each election between 1998 and 2016 (Averaged).	Christensen et al (2020)
Policy Engagement	Number of bills in the US House and Senate lobbied by each firm in 2018	Kim et al (2024)
Window	This variable that takes the value of 1 if a firm's earnings announcement date fell in the 30-day window following the 2020 US general election, and 0 otherwise.	LSEG Data & Analytics

Appendix B. Robustness Tests

Table B1 presents the estimates from additional models examining the robustness of the relationship between lobbying and anticipated post-electoral volatility.

In Column (1), we present OLS estimates from a linear regression that uses in-house lobbying expenditures as our measure of lobbying (rather than a binary measure of lobbying, or the total amount spent, like in Table 3). The relationship is still negative and statistically significant.

In Columns (2)-(3), we consider Instrumental Variables estimates, where we instrument the decision to lobby. These are a linear counterpart to the selection model (6) in Table 3. In Column (2), we instrument the binary outcome of whether a firm lobbies with firm characteristics and political engagement factors. Thus, we model that pre-existing firm characteristics influence lobbying which are then associated with policy risk. The Hansen J-statistic is 7.688 ($p = 0.262$) fails to reject the null hypothesis of valid overidentifying restrictions, given a valid instrument. The instruments appear strong (F-stat is 73.47, Kleinbergen-Paap LM statistic is 291, with a p-value under 0.0001). Similar results hold in Column (3) where we use lagged lobbying expenditure (Q2 2020) as the main variable and instrument it by earlier quarters' lobbying expenditures to account for persistence in lobbying decisions. In this case, we assume that exogenous shocks (like in the model) are realized, which can change one's decision to lobby relative to past choices, conditional on firm characteristics. In both specifications, the effect of interest is still negative and statistically significant.

Column (4) then builds on the simultaneous equations system estimates of Table 3, Column (6) with different variables in the second stage. Meanwhile, Column (5) weakens the assumptions of normality in the latter (and of instruments in the previous columns) by not requiring the presence of instruments or large support regressors (D'Haultfœuille et al., 2018). This is based on the assumption that selection becomes independent of the covariates when the outcome takes arbitrarily large values. As they write, this assumes "that...if selection is indeed endogenous, one can expect the effect of the outcome on selection to dominate those of the covariates, for sufficiently large values of the outcome." This can then be estimated in a semiparametric approach (i.e., not requiring other parametric assumptions). The estimates show a statistically and economically significant difference in policy risk between lobbying and non-lobbying firms.

In summary, the estimates consistently show that lobbying is associated with lower anticipated post-electoral volatility, using various econometric techniques to address potential endogeneity and selection issues.

TABLE B1. Lobbying and Policy Uncertainty

	Least Squares	2SLS		Heckman	Extremal Quantile
	(1)	(2)	(3)	(4)	(5)
Policy Risk (Anticipated Post-Electoral Volatility)					
Lobby				-0.875**	-0.734**
				(0.203)	(0.153)
Lobbying Expenditures (Logged)		-0.032*			
		(0.015)			
In-House Lobbing	-0.007*				
	(0.003)				
Lobbying Exp. (Logged) 2020Q2			-0.043**		
			(0.011)		
Employees (Logged)	-0.342**	-0.331**		-0.396**	
	(0.027)	(0.070)		(0.059)	
Tangible Assets	1.186†	1.089*		1.374**	
	(0.546)	(0.448)		(0.504)	
Firm Age	-0.002	-0.003		-0.006*	
	(0.003)	(0.003)		(0.003)	
30-Day Window	0.623**	0.635**	0.626**	0.868**	
	(0.161)	(0.136)	-0.135	(0.138)	
Constant	3.266**	3.183**	2.949**	2.719**	
	(0.330)	(0.294)	(0.331)	(0.292)	
First Stage					
Firm Age		-0.002		-0.002	
		(0.007)		(0.002)	
Employees (Logged)		0.700**		0.132**	
		(0.113)		(0.027)	
Tangible Assets		-0.091		0.021	
		(0.596)		(0.170)	
Firm-Level Risk		0.002*		0.000	
		(0.001)		(0.000)	
CF Score		-0.893**		-0.225**	
		(0.241)		(0.072)	
PAC Contributions		0.221**		0.061**	
		(0.041)		(0.013)	
Political Hedging		7.131**		1.460**	
		(0.661)		(0.186)	
Government Contracts (Logged)		0.090**		0.025**	
		(0.024)		(0.007)	
Revolving Door		0.391**		0.195**	
		(0.144)		(0.062)	
Policy Engagement		0.332**		0.227*	
		(0.090)		(0.091)	
Lobbying Exp. (Logged) 2020Q1			0.681**		
			(0.054)		
Lobbying Exp. (Logged) 2019Q4			0.128†		
			(0.066)		
Lobbying Exp. (Logged) 2019Q3			-0.004		
			(0.095)		
Lobbying Exp. (Logged) 2019Q2			0.132		
			(0.085)		
ρ				0.087*	
				(0.043)	
Constant		0.605	0.262*	-1.115**	
		(0.500)	(0.131)	(0.130)	
Additional Controls	YES	YES	YES	NO	NO
Observations	2,177	2,177	2,177	2,217	2,337

All specifications include sector fixed effects (not shown). The omitted category is "Other". Standard errors (in parenthesis) are clustered by the Fama–French 12 industry classification in models (1) and (4). Models (2) and (3) are estimated using robust standard errors. Standard errors are estimated via bootstrap in Model (5).The models in columns (1), (2) and (3) also include the following variables: Market Value, Total Assets,Sales, Net Income, Income Taxes, Dividends, Return on Assets, Tobin's Q, Debt Ratio, and Cash Holdings

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

B.1. 2016 Election

We replicate the analysis from Sections 1.2-1.4 using data from the 2016 election. The data sources and assembly process are identical to those described in Appendix A.1. When combining OptionMetrics and Lobbyview data, we successfully match 511 firms based on their gvkey. Additional matches are found through fuzzy name matching: 5 more firms are matched between OptionMetrics and Lobbyview, and 17 more are matched using the Wharton Research Data Services' list of firm subsidiaries. This matching process yields a total of 533 lobbying firms, with 517 having a strictly positive amount of lobbying expenditure. As shown in Table B2, these lobbying firms account for approximately 28% of our final sample for 2016, which is very similar to the composition of our 2020 sample.

TABLE B2. Lobbying Activity Across Sectors - 2016 Election

Sector	Number of firms	Number of lobbying firms	Percent of lobbying firms	Lobbying expenditures
Consumer non-durables	69	24	34.783	0.986
Consumer durables	43	13	30.233	1.592
Manufacturing	163	49	30.061	2.170
Oil, gas and coal extraction	94	33	35.106	1.695
Chemical and allied products	51	17	33.333	1.022
Business equipment	310	71	22.903	1.154
Telephone and television transmission	54	20	37.037	2.415
Utilities	59	30	50.847	1.276
Whole sale, retail and some services	180	39	21.667	1.200
Healthcare, medical and drugs	199	73	36.683	2.051
Finance	398	72	18.090	0.984
Other	245	76	31.020	1.673
Total	1865	517	27.721	1.526

Note: We group the firms in our sample using the Fama-French 12-industry classification system. The last column shows the average lobbying expenditures (in USD million) among firms that lobby.

To construct our 2016 sample of firms, we begin with the 10,537 publicly-traded firms listed in the Compustat database for 2015 or 2016. We then exclude firms without tradable options, reducing the sample to 3,448 firms. Further refinement yields a subset of 2,514 firms for which our policy risk estimator is defined and that meet our criteria. After excluding firms with missing data on any of the indicators used in our analysis, our final sample consists of 1,865 observations.

TABLE B3. Differences between lobbying and non-lobbying firms

(A) 2016 Election

	Non-Lobbying		Lobbying		Difference	
	N	Mean	N	Mean	Difference	p-value
Policy Risk	1348	1.791	517	1.215	-0.577	0.0000
Lobbying Activity						
Expenditures (USD Mill.)	1348	0.000	517	1.522	1.522	0.0000
In-House Lobbying	1348	0.000	517	20.023	20.023	0.0000
Size						
Market Value (USD Mill.)	1320	3899.743	516	19626.964	15727.221	0.0000
Total Assets (USD Mill.)	1344	9899.322	517	31357.213	21457.892	0.0000
Sales (USD Mill.)	1344	2912.719	517	13184.009	10271.290	0.0000
Number of Employees (Thousands)	1325	9.496	515	35.241	25.745	0.0000
Net Income (US Mill.)	1344	103.103	517	629.973	526.870	0.0000
Income Taxes (USD Mill.)	1344	42.459	517	265.509	223.050	0.0000
Dividends - Total (USD Mill.)	1324	84.453	511	448.710	364.257	0.0000
Other Observable Indicators						
Firm Age	1344	15.980	517	28.946	12.966	0.0000
Tangible Assets/Assets	1256	0.219	507	0.284	0.064	0.0000
Return on Assets	1344	-0.013	517	0.009	0.022	0.0167
Tobin's Q	1318	2.002	515	1.976	-0.026	0.7606
Debt Ratio	1336	0.278	514	0.315	0.037	0.0030
Cash Holdings/Assets	1344	0.183	517	0.147	-0.036	0.0008
R&D Expenditures/Assets	781	0.069	266	0.055	-0.015	0.0818
Regulatory Exposure						
Firm-Level Risk (Hassan)	1337	116.007	517	141.161	25.154	0.0000
Government Contracts (Logged)	1348	1.606	517	4.680	3.075	0.0000
Revolving Door	1348	0.148	517	0.787	0.639	0.0000
Political Activism						
CF Score (Bonica)	1348	0.121	517	0.110	-0.011	0.6342
Campaign Contributions (Logged)	1348	0.288	517	2.611	2.323	0.0000
PAC Contributions (Logged)	1348	0.425	517	4.090	3.664	0.0000
Political Hedging	1348	0.040	517	0.318	0.278	0.0000
Political Connections	1348	0.215	517	1.958	1.743	0.0000
Policy Engagement	1348	0.019	517	1.752	1.734	0.0000
Earnings Announcements						
Window	1348	0.295	517	0.195	-0.100	0.0000

TABLE B4. Lobbying and Policy Uncertainty - 2016 Election

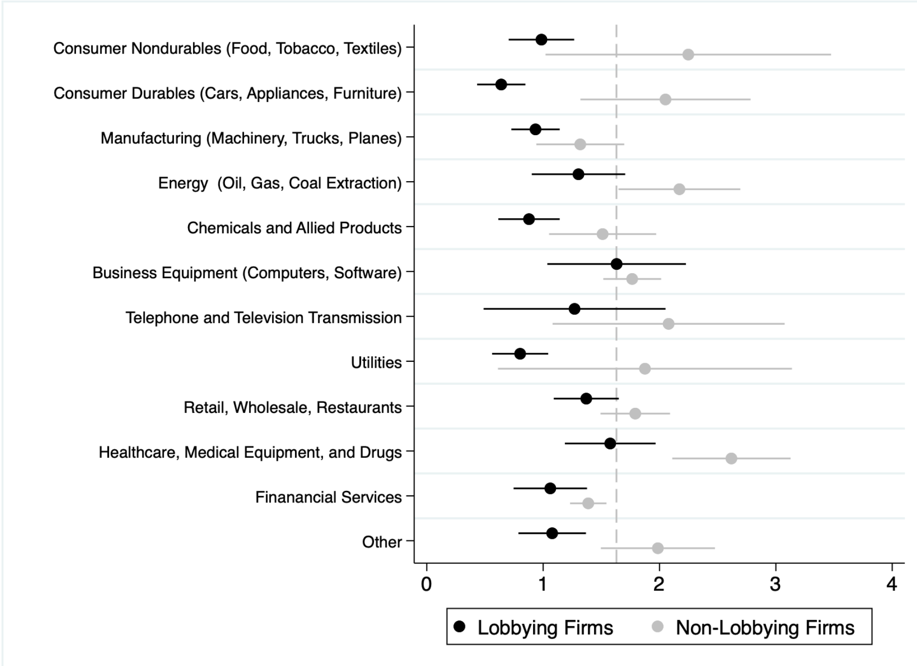
	Least Squares					Heckman
	(1)	(2)	(3)	(4)	(5)	(6)
Policy Risk (Anticipated Post-Electoral Volatility)						
Lobby	-0.377**	-0.257**	-0.162	-0.217**		-0.677**
	(0.090)	(0.077)	(0.097)	(0.057)		(0.099)
Lobbying Expenditures (Logged)					-0.017**	
					(0.005)	
Employees (Logged)	-0.300**	-0.281**	-0.259**	-0.203**	-0.202**	-0.190**
	(0.047)	(0.038)	(0.040)	(0.049)	(0.049)	(0.051)
Tangible Assets	0.310	0.346	0.378	0.375	0.371	0.466
	(0.314)	(0.315)	(0.338)	(0.332)	(0.332)	(0.313)
Firm Age		-0.005*	-0.003	-0.001	-0.001	-0.002
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm-Level Risk			0.001	0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)	(0.001)
CF Score			-0.053	-0.017	-0.018	
			(0.156)	(0.189)	(0.189)	
PAC Contributions			-0.017*	-0.011	-0.010	
			(0.007)	(0.009)	(0.009)	
Political Hedging			-0.298	-0.298†	-0.291†	
			(0.178)	(0.140)	(0.140)	
Government Contracts (Logged)			-0.010	-0.015†	-0.015†	
			(0.007)	(0.007)	(0.007)	
Revolving Door			-0.011	-0.017	-0.016	
			(0.027)	(0.022)	(0.021)	
Policy Engagement			0.009	0.015	0.017	
			(0.013)	(0.019)	(0.020)	
30-Day Window		0.642**	0.632**	0.473***	0.472**	0.482**
		(0.115)	(0.108)	(0.132)	(0.132)	(0.133)
Constant	2.210**	2.060**	1.927**	1.879**	1.877**	1.925**
	(0.146)	(0.166)	(0.168)	(0.214)	(0.214)	(0.245)
Selection Equation						
Firm Age						0.005*
						(0.002)
Employees (Logged)						0.122**
						(0.025)
Tangible Assets						0.564*
						(0.276)
Firm-Level Risk						0.001**
						(0.000)
CF Score						-0.202†
						(0.107)
PAC Contributions						0.076**
						(0.014)
Political Hedging						1.232**
						(0.187)
Government Contracts (Logged)						0.026*
						(0.013)
Revolving Door						0.114
						(0.127)
Policy Engagement						
Rho						0.130**
						(0.028)
Constant						-1.749**
						(0.170)
Additional Controls	NO	NO	NO	YES	YES	YES
Observations	1,745	1,741	1,733	1,682	1,682	1,682

All specifications include sector fixed effects (not shown). The omitted category is “Other.” Standard errors are clustered by the Fama–French 12 industry classification and shown in parentheses. The models in columns (4)-(6) also include the following variables: Market Value, Total Assets,Sales, Net Income, Income Taxes, Dividends, Return on Assets, Tobin’s Q, Debt Ratio, and Cash Holdings. The variable Policy Engagement is omitted in Model (6) due to collinearity.
† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

TABLE B5. Variable Definitions and Sources - 2016 Election

Variable	Definition	Data Source
Policy Risk	Estimated as: $\hat{\sigma}^2_{E_i} = \frac{\sigma^2_{i,t,30} - \sigma^2_{i,t,60}}{\frac{252}{30} - \frac{252}{60}}$ where t denotes the pre-election day,$\sigma^2_{i,t,30}$ and $\sigma^2_{i,t,60}$ are firm i's annualized implied variances of the 30-day and 60-day options, respectively; and expressed on a daily basis using the number of trading days to option maturity,in standard deviation units, $Daily(\hat{\sigma}_{E_i}) = \sqrt{\frac{\hat{\sigma}^2_{E_i}}{21}}$	OptionMetrics
Lobby	This variable takes the value of 1 if a firm reported spending a strictly positive amount on lobbying from the third quarter of 2015 through the second quarter of 2016, and 0 otherwise.	LobbyView
Expenditures (USD Mill.)	Total amount of lobbying expenditures reported between the third quarter of 2015 through the second quarter of 2016.	LobbyView
In-House Lobbying	Percentage of lobbying activities conducted in-house	LobbyView
Market Value (USD Mill.)	The market value of equity divided by the book value of equity.	Compustat
Total Assets (USD Mill.)	Total Assets	Compustat
Sales (USD Mill.)	Gross Sales	Compustat
Number of Employees (Thousands)	Number of Employees	Compustat
Net Income (US Mill.)	Net Income	Compustat
Income Taxes (USD Mill.)	Income Taxes	Compustat
Dividends - Total (USD Mill.)	Dividends	Compustat
Firm Age	Firm age in years (rounded) on the first day of June, 2016, calculated using the first date of trading after the initial public offering (IPO).	CRSP
Tangible Assets/Assets	Ratio of Property, Plant and Equipment to Total Assets	Compustat
Return on Assets	Ratio of Net Income to Total Assets	Compustat
Tobin's Q	The market value of equity plus the book value of assets minus the book value of equity plus the deferred taxes, all divided by the book value of assets.	Compustat
Debt Ratio	Ratio of the sum of Long Term Debt and Debt in Current Liabilities to Total Assets	Compustat
Cash Holdings/Assets	Ratio of Cash and Short-Term Investments to Total Assets	Compustat
R&D Expenditures/Assets	Ratio of lagged &D expenditures to Total Assets	Compustat
Firm-Level Risk (Hassan)	Disclosure of political risk based on conference-call transcripts (2002-2016 Average)	Hassan et al (2019)
Government Contracts (Logged)	Annual average of the sum of dollars obligated in all federal contracts in the United States from 2004 to 2015, inclusive.	Fazekas et al (2023)
Revolving Door	Number of individuals with prior experience in one of 187 executive branch agencies in the United States in the year 2015.	Emery and Faccio (2020)
CF Score (Bonica)	Firm-level average of ceo and employees ideology in 2016. Based on Bonica's CFScore. More liberal (conservative) donors receive lower (higher) scores	Steel (2024)
Campaign Contributions (Logged)	Employee donations based on FEC records in 2018	Stuckatz (2022)
PAC Contributions (Logged)	Corporate Political Action Committee (PAC) contributions based on FEC records in 2016	Stuckatz (2022)
Political Hedging	Measured as $1 - \frac{\lvert REP-DEM \rvert}{REP+DEM}$ over the six years ending in October before each election between 1998 and 2014, where REP (DEM) represent the total number of Republican (Democrat) candidates who receive political contributions from a firm (Average)	Christensen et al (2020)
Political Connections	Natural logarithm of one plus the number of political candidates (House, Senate, and Presidential) to whom a firm contributed money to over the six years ending in October before each election between 1998 and 2014 (Average).	Christensen et al (2020)
Policy Engagement	Number of bills in the US House and Senate lobbied by each firm in 2014	Kim et al (2024)
Window	This variable that takes the value of 1 if a firm's earnings announcement date fell in the 30-day window following the 2016 US general election, and 0 otherwise.	LSEG Data & Analytics

FIGURE B1. Policy Risk by Sectors and Lobbying - 2016 Election



Notes: We group the firms in our sample using the Fama-French 12-industry classification system. The dashed line represents the average policy risk in our sample.

Appendix C. Model with Consumption and Production

In this Appendix, we develop the full model that includes both production and consumption choices. Here, we assume that firms are not required to produce in order to lobby or to lobby in order to produce. We demonstrate below that this assumption, along with the the additivity of the distortion term, implies that neither the newly-introduced firm productivity parameter ϕ_i^P or the level of production impact the lobbying decision in contrast to Huneeus and Kim (2021). Thus, firm lobbying decisions are independent of both firm production decisions and consumers' choices. This implies that we do not need to pursue identification of consumer-specific or production-specific parameters to learn about lobbying choices; that is, the results in Section 3.1 apply equally to this model.

C.1. Consumer Choices

A representative consumer supplies labor and receives firm profits and government revenues. The representative consumer's consumption decision also sets the demand curve that producers face.

We assume aggregate demand is determined by the equation

$$Y = \left[\int_{\omega} c(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}}$$

Since each variety ω is the product of an associated firm with i, the optimal consumption of firm i's variety is $c(\phi_i) = p(\phi_i)^{-\sigma} D$ with $D = EP^{\sigma-1}$. Here, $E = wN + p_K K$ is aggregate expenditure and the aggregate price index is $P = \left[\int p(\phi_i)^{1-\sigma} M d\hat{G}_p(\phi) \right]^{\frac{1}{1-\sigma}}$. M is the endogenous mass of firms, and $\hat{G}_p$ is the endogenous probability function over firm states after selection into production. The model is closed by assuming that aggregate expenditure equals aggregate income; i.e. $E = I$ so that $Y = \frac{E}{P}$.

C.2. Production Decisions

In addition to choosing lobbying, l_i, each firm i produces a unique variety ω using capital k_i and labor n_i. Firms are heterogeneous along three dimensions. This heterogeneity is parametrized by the triple $\phi_i = \left(\phi_i^P, \phi_i^L, \phi_i^D\right)$, where ϕ_i^P is the productivity draw; ϕ_i^L is the term reflecting the returns to a given lobbying expenditure; and ϕ_i^D is an exogenous distortion term, microfounded below.[1] All three elements of ϕ_i are observed by the firm, but unobservable in a dataset.

Each firm, i, has the following profit function:

$$\pi(n_i, k_i, l_i) = py(n_i, k_i) + \eta_i - wn_i - p_K k_i - l_i - f^P q - f^L q - f^E q \tag{C.1}$$

where p is the price, $y(n_i, k_i)$ is output, η_i is the firm-specific random variable that captures policy uncertainty, w is the wage, n_i is labor, p_K is price of capital, k_i is capital, and l_i is both the amount of lobbying and the cost of lobbying. Meanwhile, $f^P q$ is the fixed cost of production, $f^L q$ is the fixed cost of lobbying, and $f^E q$ is the fixed cost that must be paid to receive a productivity draw.[2] Fixed costs are expressed in terms of the unit cost of production, q, so that they do not induce any distortion in production choices.

The firm will choose the triple of capital, lobbying and labor (n_i, k_i, l_i), but does not know η_i when it does so. The additive distortion function means that government policies, and therefore lobbying choices, won't affect prices or the quantities produced.

The solution to the problem of choosing (n_i, k_i, l_i) by maximizing preferences over (C.1) is equivalent to maximizing the certainty equivalent of (C.1). That value, as perceived *before the election* for a firm i with CARA preferences facing normally distributed policy

[1]We allow flexible correlations between productivity draws, ϕ_i^P and lobbying draws, ϕ_i^L, so that it can be completely possible that highly productive firms are also comparatively good at lobbying.

[2]We do not need a free entry condition to close the model of distortions. For simplicity, then, we assume that firms have to pay an entry cost in order to get a draw for ϕ_i^P, but the draws of ϕ_i^L and ϕ_i^D are costless.

uncertainty, is:[3]

$$\pi^{CE}(n_i,k_i,l_i) = \quad py(n_i,k_i) + p_e q_{e,i} + (1-p_e)\mu(l_i) - \frac{\alpha(1-p_e)^2\sigma^2(l_i)}{2}$$
$$-wn_i - p_K k_i - l_i - f^P q - f^L q - f^E q. \tag{C.2}$$

The firm's lobbying problem is therefore equivalent to maximizing the certainty equivalent (C.2). When the firm is risk-neutral (i.e., $\alpha = 0$), then it only cares about the mean of η_i, and not the variance of profits.

We assume that producers use Cobb-Douglas, constant returns to scale technology. That is, $y(\phi)$ from Equation C.1 is defined by

$$y(n_i,k_i) = \phi_i^P n_i^{\alpha^N} k_i^{\alpha^K}$$

where $\alpha^N + \alpha^K = 1$.

Conditional on entry into production, the firm's optimal production/pricing decision implies that

$$p_i(\phi) = \frac{\sigma}{\phi_i^P(\sigma-1)} q \tag{C.3}$$

where $q = \left(\frac{w}{\alpha^N}\right)^{\alpha^N}\left(\frac{p_K}{\alpha^K}\right)^{\alpha^K}$ is the raw unit cost. Hence, in this simple monopolistically competitive market, firms charge a fixed markup over marginal costs. Notice that the production decision is independent of both ϕ_i^D and ϕ_i^L.

C.3. Firm Entry into Production

As is standard in heterogeneous firms models, we assume firms have to pay an entry cost $f^E q$ in order to get their ϕ_i^P draw. For simplicity, we assume that the draws of ϕ_i^D and ϕ_i^L are free. We then have the free entry condition $V^E = \mathbb{E}\left[\bar{V} - f^E q\right] = 0$, where V^E $(\bar{V})$ is the expected net (gross) value of entry. $\bar{V} = \bar{\pi}$, where $\bar{\pi}$ is the average profit of firms in the entry period.

Firms that pay the entry cost receive a draw from G, the exogenous probability function over firm states, and then decide whether or not to produce. If they choose to produce, they must pay the fixed cost $f^P q$. Firms will produce if a positive level of production leads to non-negative profit (net of lobbying activity and the sunk entry cost). We can therefore

[3]Note that η_i is the only source of uncertainty in profits (C.1), so the other terms only affect the mean of that function.

determine the cutoff ϕ^{P^*} for producing as follows:

$$p(\phi_i^P)y(\phi_i^P) + \phi_i^D - wn(\phi_i^P) - p_K k(\phi_i^P) - f^P q = 0 \tag{C.4}$$

$$\frac{r(\phi_i^P)}{\sigma} - f^P q + \phi_i^D = 0 \tag{C.5}$$

$$\frac{(\frac{\mu}{\phi_i^P} q)^{1-\sigma} D}{\sigma} - f^P q + \phi_i^D = 0 \tag{C.6}$$

$$\phi^{P*}(\phi_i^D) = \frac{\sigma q}{\sigma - 1} \left[(f^P - \phi_i^D) \frac{\sigma}{D} \right]^{\frac{1}{\sigma-1}} \tag{C.7}$$

where Equation C.6 uses $r(\phi_i^P) = p(\phi_i^P)^{1-\sigma} D$ from the demand side. This cutoff endogenously determines the distribution of firms who enter production, $\hat{G}_p$.

C.4. Equilibrium

In the general version of the model considered here, it remains true that each firm's payoffs from lobbying is only a function of its own lobbying choices, the fixed cost of lobbying, its lobbying favorability ϕ_i^L, and δ. In addition, lobbying and production decisions are independent of each other, and consumer choices only affect production decisions. Equilibrium requires each of the mass of M firms (1) optimally chooses whether to pay the fixed cost of lobbying to enter the lobbying sector, and (2) conditional on entering the lobbying sector, chooses the amount of lobbying $l_i^*(\phi_i^L)$ expenditure to maximize profits as given by Equation C.1.

C.5. Discussion on how Lobbying can Affect Mean and Variance of Policies

As in the main text, suppose that the choice of lobbying expenditures l_i^* happens before the election. Let us now outline an extended subgame occurring in our "after election period" if replacement occurs (if there is a change in government). This subgame is dynamic and follows Judd (2023).

Assume that there are left/middle/right politicians, who are recognized randomly to propose a policy, and who bargain over a policy on the real line. Elected politicians bargain over policy, but firms that have $l_i^* > 0$ are able to influence them. Each firm's probability of meeting politicians (i.e., access) is proportional to l_i^*.

Hence, higher-spending firms have more access and possibility to affect policies. If access is available, they offer a binding contract of policy x and a transfer m. If the politician that is being accessed accepts the policy, it is kept. If (s)he rejects, (s)he proposes another policy and keeps the transfer. Multiple firms may try to affect policies after the election, but l_i^* is what guarantees that possibility *for each firm*. The proposed policy (whether affected by the firm or not) must receive a majority to pass. Judd (2023) shows that, in this environment, the presence of multiple firms' access to politicians (i.e., $l_i^* > 0$ for multiple i) is enough to affect policy: equilibrium policies have a smaller support than when $l_i^* = 0$. Hence, the set of possible policies under lobbying is smaller than the set of policies in the absence of lobbying, with both the mean and variance being affected.

Appendix D. Option Pricing with Jumps

Here we expand on the financial side of the model - i.e., how investors price firm i's options when i is subject to uncertainty over policies, η_i. As in Dubinsky et al. (2019), we consider an extension of the Black-Scholes model with a single price jump occurring immediately after the election. Equation (C.1) indicates that the change in firm i's profits associated with the election outcome is solely driven by the realization of η_i, which follows a normal distribution with mean $p_e q_{e,i} + (1-p_e)\mu(l_i)$ and variance $(1-p_e)^2\sigma^2(l_i)$.

As the market updates its expectations of firm i's future profitability in response to the new information, the firm's stock returns will also be affected by the realization of η_i. The price adjustment, however, may have a different order of magnitude than the change in profit expectations. This can be represented by the linear function $f(\eta_i) = b\eta_i$, where b is a constant scaling factor that determines the extent to which the price adjustment responds to changes in profit expectations.[1]

Using the linearity property of expectation:

$$E[f(\eta_i)] = b \cdot [p_e q_{e,i} + (1-p_e)\mu(l_i)],$$

and the variance scales by the square of the constant:

$$Var(f(\eta^i)) = b^2 \cdot (1-p_e)^2\sigma^2(l_i)$$

Let T_e be the election date, and Z_e a random variable representing the jump size of the log stock price after the outcome of the election is revealed. The distribution of the log-returns of firm i's stock price between times t and $T > T_e$ can be expressed as

$$\log\left(\frac{S_T^i}{S_t^i}\right) \sim N\left(\left(r - \frac{\sigma^2}{2}\right)(T-t) + b[p_e q_{e,i} + (1-p_e)\mu(l_i)], \sigma^2(T-t) + b^2(1-p_e)^2\sigma^2(l_i)\right),$$

where r is the constant risk-free rate, σ is the baseline volatility, T is the maturity date, and t is the current time ($t < T_e < T$).[2]

[1]See Cochrane (2005) for a discussion of scaled payoffs in the context of asset pricing theory.

[2]Notice that if the policy will not change, $p_e = 1$, and η_i remains at some status-quo (firm-specific) value, $q_{e,i} = 0$, then the distribution of log returns reduces to a standard Black-Scholes model without jumps.

The martingale condition requires $E[e^{Z_e}] = 1$.[3] As Z_e depends on the realization of η_i, we would need:

$$e^{b[p_e q_{e,i}+(1-p_e)\mu(l_i)]+b^2(1-p_e)^2\sigma^2(l_i)/2} = 1.$$

Taking the natural log:

$$b[p_e q_{e,i} + (1 - p_e)\mu(l_i)] + \frac{b^2(1 - p_e)^2\sigma^2(l_i)}{2} = 0$$

The term $\frac{b^2(1-p_e)^2\sigma^2(l_i)}{2}$ is always positive for $b \neq 0$, $0 < p_e < 1$, and real $\sigma(l_i)$. Normalizing $q_{e,i} = 0$, we can solve for $\mu(l_i)$:

(D.1) $$\mu(l_i) = -\frac{1}{2}b(1 - p_e)\sigma^2(l_i).$$

This result has several implications: (1) the expected value of the jump component is negative; (2) the magnitude of $\mu(l_i)$ increases as p_e decreases (i.e., as $(1 - p_e)$ increases); (3) $\mu(l_i)$ is proportional to the square of $\sigma(l_i)$; (4) as p_e approaches 1, $\mu(l_i)$ approaches 0; (5) as b approaches zero (i.e. prices respond very little to the new information regarding firm i's profits), then $\mu(l_i)$ approaches 0; (6) when $b > 0$, the negative $\mu(l_i)$ compensates for the positive contribution of the variance term $\frac{(1-p_e)^2\sigma^2(l_i)}{2}$, maintaining the overall expected value of the jump factor at 1.

As long as the martingale condition in equation (D.1) holds, the implied volatility of a European option that expires T calendar days in the future, quoted on day t prior to the election, on the stock of firm i, can be represented by the following function:

(D.2) $$\sigma_{i,t,T} = \begin{cases} \sqrt{\sigma_i^2 + \sigma_E^2(l_i)} & \text{if } 0 \leq \text{t} \leq T_e \\ \sigma_i & \text{if } T_e < t \leq T, \end{cases}$$

where σ_i^2 is firm i's baseline implied variance in annualized units, and T_e denotes the election date.[4] The expected election-induced variance in firm i's stock returns, $\sigma_E^2(l_i)$, is given by:

(D.3) $$\sigma_E^2(l_i) = T^{-1}b^2(1 - p_e)^2\sigma^2(l_i),$$

where b is the scaling factor that determines how prices respond to changes in profit expectations, p_e is the probability that $\eta^i = q_{e,i}$, and T is the number of trading days until the option's maturity.

An examination of equation (D.2) reveals that the implied volatility continuously increases prior to the release of new information associated with the election, and then it

[3] If the expected size of the jump is zero, then, $E[e^0] = 1$.

[4] We assume that implied volatility reverts to baseline volatility on the day after the election (i.e. total implied volatility, $\sigma_{i,t,T} = \sigma_i$). While this simplification is made for ease of implementation and intuition, the analysis in Dubinsky et al. (2019) indicates that the term estimator derived from equation D.2 remains valid even though implied volatility may not immediately revert to its baseline level after an event.

discontinuously drops immediately after. Furthermore, equation (D.3) indicates that the implied variance increases at a rate proportional to T^{-1} as the event approaches, implying that the term structure of implied volatilities slopes downward. This is because, for a fixed time t before the election, $\sigma_E^2(l_i)$ decreases as T increases, resulting in lower implied volatilities for options with longer maturities.

Building on this insight, Dubinsky et al. (2019) propose an estimator to measure the amount of return variation created by pre-scheduled news releases, as anticipated by investors and reflected in option prices. Given two options maturing at $T_1 < T_2$ after the election day, if $\sigma^2_{i,t,T_1} > \sigma^2_{i,t,T_2}$, the expected election-induced variance in firm i's stock returns can be estimated via:

(D.4) $$\hat{\sigma}_E^2(l_i) = \frac{\sigma^2_{i,t,T_1} - \sigma^2_{i,t,T_2}}{b^2(1-p_e)^2(T_1^{-1} - T_2^{-1})},$$

Equation (D.4) is analogous to the term-structure measure in Dubinsky et al. (2019), $(\sigma^{\mathbb{Q}}_{j,term})^2$, except for the adjustment by $b^2(1-p_e)^2$ to account for the effect of the election on firm i's profits. The estimator is well defined when the expression in the numerator is non-negative, and the denominator is non-zero. The first condition will be satisfied as long the hypothesis of a decreasing term structure is not violated (i.e., $\sigma^2_{i,t,T_1} - \sigma^2_{i,t,T_2} \geq 0$). The second condition requires that $b \neq 0$ (i.e. that the prices react to expected changes in profits) and $p_e \in [0, 1)$.[5]

Appendix E. Proof of Statistical Identification

Proof of Lemma 3.1. Let us first rewrite the equation defining equilibrium lobbying levels for those that choose interior values (equation (2.6)), as:

(E.1) $$\log(l_i^*) = -\frac{1}{\delta-1}\log(\delta) - \frac{\delta}{\delta-1}\underbrace{(z_i'\beta + \varepsilon_i)}_{\log(\phi_i^L)}, \text{ where } \quad \varepsilon_i \sim_{iid} N(0, \sigma_\phi^2).$$

If $l_i^* > 0$ for every firm, then Assumption 1 would imply that $\log(l_i^*) \sim N(-\frac{1}{\delta-1}\log(\delta) - \frac{\delta z_i'\beta}{\delta-1}, \left(\frac{\delta}{\delta-1}\right)^2 \sigma_\phi^2)$. However, we only observe lobbying for firms with $\log(\phi_i^L) > \log(\bar{\phi}^L)$, i.e., with a lower truncation. Hence, conditional on z_i:

(E.2)
$$\log(l_i^*) \sim \mathit{Truncated\ Normal}\left(-\frac{1}{\delta-1}\log(\delta) - \frac{\delta z_i'\beta}{\delta-1}, \left(\frac{\delta}{\delta-1}\right)^2 \sigma_\phi^2, -\frac{1}{\delta-1}\log(\delta) - \frac{\delta\log(\bar{\phi}^L)}{\delta-1}, \infty\right).$$

[5]Note that, under the normalization of $q_{e,i} = 0$, the value of η_i will be zero whenever $p_e = 1$, implying that the numerator should also be zero. Therefore, even in the boundary case where $p_e = 1$ the estimator is well-defined whenever $\sigma^{\mathbb{Q}}_{j,term} = 0$.

While identification of the parameters of a Truncated Normal is well-studied, the parameters in which we are interested are functions of the Truncated Normal parameters.

We first note that the three parameters of the Truncated Normal distribution of interest are identified. This is because the truncation point is known from the support of the distribution, while the first two (the mean and variance of the original Normal distribution) are identified from its truncated counterpart. However, this is not the same as identification of $(\delta, \sigma_\phi^2, f_L, \beta)$.

To see that (δ, β) are identified, first note that under Assumption 2, the mean of $\log(l_i^*)$ is a known function of δ, β and z_i.

Now, β is identified by the variation of z_i and how that affects lobbying. To see this, take three sets of firms with different values of z_i, labeled z_1, z_2, z_3 and with positive lobbying. This exists because of variation in each z_i (Section 3) and Assumption 1. Then, the change in (mean) lobbying expenditures between the firms with characteristics z_1, z_2 is given by:

$$\begin{aligned}\Delta_{1,2} &= \left(-\frac{1}{\delta-1}\log(\delta) - \frac{\delta z_1'\beta}{\delta-1}\right) - \left(-\frac{1}{\delta-1}\log(\delta) - \frac{\delta z_2'\beta}{\delta-1}\right)\\ &= -\frac{\delta(z_1-z_2)'\beta}{\delta-1}.\end{aligned}$$

Hence, the ratio between changes in lobbying expenditures between firms with characteristics z_1 and z_2, and z_2 and z_3 is given by:

$$\frac{\Delta_{1,2}}{\Delta_{2,3}} = \frac{(z_1-z_2)'\beta}{(z_2-z_3)'\beta} \Rightarrow 0 = (\Delta_{1,2}(z_2-z_3)' - \Delta_{2,3}(z_1-z_2)')\beta,$$

which is a linear equation whose only unknown is β. Hence, with variation in each dimension of z_i, β is identified. Given $z_i'\beta$, mean (log) lobbying only depends on δ. Then, δ is identified.

σ_ϕ^2 is then identified because the variance of $log(l_i^*)$ (for firms that lobby) is identified, and the latter is a known function of only δ, σ_ϕ^2. Since δ is identified, so is σ_ϕ^2. Finally, the left truncation point is a known function of $\bar{\phi}^L$ (since δ is identified), but by definition, $\log(\bar{\phi}^L)$ is a known function of $f^L q$ and δ. Hence, f_L is also identified.

Let us move on to $\sigma(l_i)$. Recall that we observe firm-level implied volatilities after the election is realized. Thus, $\sigma^2(l_i)$ is identified as the post-election implied volatility for firms post-election using the latter's cross-section. Note that this data does not depend on b or p_e because it is after the election, and after prices adjust.

Now, we will prove that $\mu(l_i)$ is identified up to α and p_e. Recall the parametrization $(1-p_e)\mu(l_i) - \frac{\alpha(1-p_e)^2\sigma^2(l_i)}{2} = (\phi^L l(\phi))^\delta$. The distribution of the right-hand side is known from Lemma 3.1, as is $\sigma^2(l_i)$. Then, $\mu(l_i)$ is identified up to a constant. □