Much Ado About Nothing? Overreaction to Random Regulatory Audits*

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Regulators often audit firms to detect non-compliance. Exploiting a natural experiment in the lobbying industry, we show that firms overreact to audits and this response distorts prices and reduces welfare. Each year, federal regulators audit a random sample of firm-client pairs. Following an audit, we find that audited clients are more likely to retain the audited lobbying firm, and they pay a lower price for the same amount of services. Estimating a dynamic structural model with our natural experiment, we show that this pattern is driven by overreaction: clients are almost indifferent to audits, but lobbying firms mistakenly believe their clients view audits as extremely negative events. Therefore, lobbyists offer unnecessary price discounts to retain audited clients. In a counterfactual world with no overreaction, we estimate that price corrections and better client-firm matching quality would increase welfare by 6.4%. Our results are the first to document an unintended effect of regulation on prices and matching, as regulated entities overreact to regulatory actions.

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1 Introduction

Firms are often subject to regulatory audits. For instance, the Securities and Exchange Commission analyzes trading data to identify financial misconduct, and bank regulators conduct on-site examinations to ensure banks meet their obligations. Audits are thus a fundamental aspect of regulation, designed to detect non-compliance by regulated firms. However, we posit that audits can disrupt markets if audited firms do not fully understand their consequences, leading them to overreact or underreact. Combining a natural experiment and a dynamic structural model, we document a systematic overreaction by firms to annual audits conducted by federal regulators. The overreaction prompts audited firms to offer unnecessary price discounts, resulting in poorer client-firm matching and welfare losses.

As an illustrative example, suppose a bank discloses it is being audited by regulators, and the disclosure is followed by both deposit outflows and higher deposit rates. It is possible that the audit lowered client demand, leading to deposit outflows, and that the bank optimally reacted by increasing deposit rates to retain clients. However, it is also possible that both outcomes were driven by an omitted variable, which triggered the audit in the first place. Moreover, identifying client responses to the audit is difficult because the bank simultaneously reacts to possible future audit-driven penalties. This example illustrates the challenges in estimating client responses to regulatory audits. It is even harder to estimate whether audited firms correctly anticipate these responses.

To overcome these challenges, we exploit a unique setting: the annual audit of lobbying firms by the Government Accountability Office (GAO). Each year, the GAO randomly selects 100 lobbyist-client pairs and closely inspects their regulatory filings for errors and omissions. This is an ideal setting which addresses all the challenges described above. First, these audits

must be randomly assigned, and are thus uncorrelated with unobservables. Second, audits are publicly announced, so it is reasonable to expect a client response to audits. Third, while audits are publicly announced, the results of those audits are not, and non-compliance is typically addressed by refiling the disclosure forms. Audit responses are thus likely to be driven only by client reactions and lobbyists' anticipation of these reactions. Finally, lobbyists must disclose comprehensive data on their activity every quarter, allowing us to observe lobbying activity for the universe of audited and non-audited lobbyists. While we cannot directly observe lobbyist beliefs about client preferences, we can back out lobbyist beliefs with a structural model. Estimating the structural model using this natural experiment, we find that lobbyists overreact to audits in anticipation of a strong client response — in contrast, we find that clients barely react to audits.

To conduct our analysis, we construct a unique database that tracks all lobbying activity and all GAO audits since their inception. We manually collect the names of audited firms and clients from 1,307 GAO audits conducted between 2008 and 2020, and match the names to the OpenSecrets database, which includes all the information from the lobbying disclosure forms. For each client-lobbyist pair in every quarter, we observe the services provided by the lobbyist and the price paid by the client, in addition to other variables. We can thus track price changes over time and terminations of client-lobbyist relationships. The final sample includes 60,829 unique client×firm pairs and 214,901 client×firm observations.

Our goal is to study how audits affect prices and client retention. To guide the analysis, we develop a dynamic model of lobbyist-client relationships. In our model, a lobbyist decides each period how much to charge a client and the client decides whether to retain the lobbyist or leave forever. Crucially, the client's utility from the lobbying relationship can be impacted by an audit, which arrives at a random time. Key to our model, the lobbyist and the client

can form different beliefs about the effect of an audit. The client believes that an audit lowers its annual utility from lobbying by a parameter a^C. The lobbyist believes the effect of an audit on client utility is a^L. Note that a^C and a^L can theoretically be positive or negative. The lobbyist and client observe when an audit occurs, then the lobbyist sets a price. After observing the price, the client privately observes its outside option, which represents the value of finding another lobbyist or ceasing lobbying activity altogether. The outside option evolves randomly over time. In equilibrium, the client leaves when the value of its outside option exceeds its expected value from continuing the lobbying relationship. The lobbyist sets prices that are optimal given (i) its belief a^L and (ii) the equilibrium behavior it would expect from a client with audit utility a^L.

Our model provides clear predictions on how an audit affects prices and retention decisions, as a function of the subjective beliefs a^C and a^L. In one scenario, the client and the firm have identical beliefs about the audit's negative value ($a^C = a^L < 0$). In this case, our model predicts that an audit will lower prices and lower client retention. Intuitively, in this scenario, an audit reduces the client's demand for lobbying services. This increases the probability of separation, while encouraging the firm to offer price discounts to retain some of their clientele. In another scenario, the client and the firm hold different beliefs about the audit's impact on clients: the firm believes audits are quite harmful for clients and this belief is overly pessimistic relative to the client's belief ($a^L < 0$, $a^L \ll a^C$). In this case, our model predicts that the audit will lower prices but increase client retention. Intuitively, the lobbyist overreacts: he mistakenly believes that the audit will lower client demand substantially, and in response quotes a lower price to the client. However, the client is less averse to the audit or perhaps is even indifferent. Since the audit barely impacts the client, the reduced price makes the client more likely to re-hire the lobbyist.

In a series of regressions, we find that an audited client is more likely to retain the audited firm and the audited client pays a lower price. The audit effect is statistically significant, even conditional on a tight set of controls and fixed effects that ensure we estimate the audit's causal effect. Audits causally increase retention rates by 5.6-6.8% of the average retention rate and reduce prices by 3.2-4.5% of the average price.[1] Through the lens of our model, our findings imply overreaction: the lobbyist mistakenly believes that the client substantially dislikes audits, and thus offers a lower price. The client has a more benign view of audits, and combined with the lower price, he becomes more likely to stay. For example, the audited client might be somewhat concerned about being publicly associated with an audited lobbyist, but the audited lobbyist dramatically overestimates the extent to which this impacts audited clients.

We cannot directly test for lobbyist overreaction since beliefs are unobservable. Nevertheless, subsequent tests show that alternative channels are unlikely. First, audits have no impact on the amount of services the audited client receives from the audited firm. In other words, price discounts are unlikely to be driven by an intensive-margin reduction in the quantity of lobbying services purchased. Second, the audit probability is uncorrelated with all observable characteristics of a lobbyist-client pair after controlling for appropriate fixed effects.[2] This confirms that audits are randomly assigned, as required by law, and thus our results are not driven by unobserved client or firm characteristics. Third, audits have no impact on the audited client's relations with non-audited lobbying firms, and no impact on the non-audited clients of the audited firm. Combined, those tests confirm that our re-

[1] The magnitudes are not particularly large, likely because audits are quite rare (less than 1% of pairs are audited in a given year) and lobbying relations are sticky (the unconditional survival rates are 82%).

[2] Specifically, in all of our specifications, we look within a given lobbying firm in a given year, comparing clients that filed the same number of forms and thus have the same number of "audit lottery tickets." See Section 4.1 for details.

sults are not driven by firm-level or client-level shocks. Instead, they reflect a pair-specific response to a random pair-specific regulatory audit.

Next, we use the results of the natural experiment to estimate our model of lobbyist-client relationships. Specifically, we use a Generalized Method of Moments (GMM) estimator to choose model parameters such that our model reproduces the audit treatment effects we identify empirically.[3] Our GMM estimates show the degree of lobbyists' overreaction: the client in our model thinks an audit eliminates 1.3% of its flow utility from lobbying (a^C), while the lobbyist thinks an audit eliminates 21.6% of the client's utility (a^L). We can also quantify the impact of an audit on welfare. After an audit, the lobbyist offers a large price discount that far outpaces the client's actual utility loss because $a^L \ll a^C$. Consequently, the client's continuation value – the lifetime value from the lobbying relationship – rises by 6.7% after an audit. In contrast, the lobbyist mistakenly commits to an unnecessarily low price while incorrectly fearing the client will likely leave promptly. Because of that, the lobbyist's continuation value falls significantly by 72.1% after an audit.

Finally, we study how prices and welfare would change under counterfactual policies. In a world with no audits, prices would decline by 0.4%. Removing audits leads the lobbyist to gain more from a continued relationship with the client, encouraging him to charge a lower price to retain clients. The client benefits from the discount and from the lack of audits. Thus, agents' continuation values rise by 2.4%-7.4% and total welfare increases by 7.4%.[4] Next, we consider an alternative scenario in which audits occur with the usual frequency, but lobbyists no longer overreact. This corresponds to a counterfactual policy in which the

[3]We calibrate other parameters which are directly measurable, such as the probability of an audit. Our asymptotic GMM standard errors are quite small, since the random assignment of audits yields two moments that tightly identify a^L and a^C: the treatment effect of an audit on prices and client retention.

[4]Of course, removing audits will likely have other negative effects which could negate the gains we can measure in our model.

GAO debriefs clients and lobbyists about the implications of an audit. Absent overreaction, the lobbyist is more confident about post-audit client retention and thus decides to charge higher post-audit prices (1.7%). This lowers the client's post-audit continuation value by 9.4%, but increases the lobbyist's continuation value substantially.[5] Interestingly, removing overreaction also meaningfully changes pre-audit behavior. Lobbyists charge lower pre-audit prices (-0.4%), because the increase in their post-audit continuation value makes losing a client more costly. Even with the lower price, the pre-audit lobbyist continuation value increases by 6.4%: the increase in post-audit continuation value outweighs the decrease in pre-audit prices. For the client, the decrease in pre-audit prices outpaces the increase in post-audit prices, leading in balance to a higher pre-audit client continuation value (1.9%). In summary, we find that correcting lobbyist beliefs to prevent overreaction would lead to a Pareto improvement for clients and lobbyists.

There is a growing recognition of the need to better understand how regulation in all its forms affects economic activity. Against this backdrop, our paper makes four contributions. First, current studies focus on the direct costs firms must expend in order to comply with regulatory requirements.[6] We highlight an unintended and indirect cost based on overreaction to regulatory actions. In particular, we show that firms mistakenly assess how their clients would react to random regulatory audits, and consequently offer unnecessary price discounts. Second, we document the impact on prices and firm-client matching quality, a novel aspect of regulatory burden. Relying on a structural model, we further quantify the welfare implications of our reduced-forms findings. Third, we highlight the reallocative effect of regulation,

[5]Most of this gain is driven by belief correction, rather than the price increase.

[6]For instance, measures based on the number of rules (La Porta et al. (1998); Botero et al. (2004); Bandiera et al. (2000); Nicoletti and Scarpetta (2003); Djankov, McLiesh, and Ramalho (2006); Mulligan and Shleifer (2005)), the length of the regulatory text (Dawson and Seater (2013); Al-Ubaydli and McLaughlin (2017)), and the estimated costs of compliance (Trebbi and Zhang (2022); Calomiris, Mamaysky, and Yang (2020); Kalmenovitz (2023); Kalmenovitz, Lowry, and Volkova (2021)).

as welfare and surplus shift from firms to clients. This strikes a middle path between classic theories of regulation, ranging from public interest to public choice,[7] and offers a balanced perspective on the economic consequences of regulatory burden. Fourth, we highlight a potential drawback of regulatory audits. Financial regulators increasingly rely on such audits, preemptively searching for non-compliance rather than responding to whistleblowers and media reports (Dyck, Morse, and Zingales (2010); Kandrac and Schlusche (2021); Agarwal et al. (2014)). We show that this could trigger overreaction by targeted firms, distort prices and reduce welfare. This is particularly important given that failure rates in proactive audits tend to be low, but the overreaction could impose significant costs on firms, regardless of how strictly they comply with all relevant regulations.

2 Background and setting

2.1 Institutional setting

In this section, we discuss institutional details that are relevant for this paper. The information is based on public filings and on interviews we conducted with four lobbyists who were audited in recent years.

The Lobbying Disclosure Act (LDA) was introduced in December 1995.[8] A cornerstone of lobbying regulation, the LDA aims to increase the accountability and transparency of the U.S. lobbying industry. Most notably, the LDA requires all active registrants (lobbyists)[9] to file activity reports with the Clerk of the U.S. House of Representatives and Secretary of the U.S. Senate. In September 2007, the LDA was amended by the Honest Leadership and

[7] Pigou (1938); Joskow and Rose (1989); Demsetz (1974); Melody (2016), versus Tullock (1967); Stigler (1971); Krueger (1974); Posner (1974); Peltzman (1976); Becker (1983); Baumol (1986); Olson (2009))

[8] Public Law 104-65, 109 Stat. 691, codified at Title 2, Chapter 26 of the U.S. Code.

[9] In this paper we use the terms "registrant" (from the LDA), "lobbyist" (individual), and "lobbying firm" (organization) interchangeably, unless noted otherwise.

Open Government Act of 2007 (HLOGA).[10] HLOGA increased the frequency of disclosure filings and introduced enhanced civil and criminal penalties for non-compliance.

Our paper is centered on one important innovation of HLOGA: the annual audit process (§1614). The audit is conducted by the Government Accountability Office (GAO), an independent federal agency that regularly evaluates the performance of other federal agencies and the implementation of many federal laws and regulations. To carry out the audit, the GAO must select "a *random sampling* of publicly available lobbying registrations and reports filed under this chapter" (italics added). During the audits, the GAO is authorized to request further information and documentation from audited registrants. Finally, the GAO publishes an annual report with a summary of the findings and recommendations on how to improve compliance. Importantly, this annual publication includes the names of all audited lobbyists, making these audits public information.

Following the HLOGA, the GAO has conducted the mandatory annual audit every year since 2008. Each year, the agency selects around 100 LDA reports filed in the previous quarters. Note that each report is filed by a registrant on behalf of a single client, implying an audit covers a specific lobbyist-client pair. The reports are selected randomly. This is an explicit requirement set forth in the U.S. Code, and we verify this below in Section 4.1.

Based on our interviews of audited lobbyists, a typical audit goes as follows. First, a team of GAO auditors contacts the lobbying firm, informing them that they were randomly selected for an audit. The auditors then request documentation, such as internal emails and invoices, to verify the details found in the LDA form. That includes information on revenues, which individual lobbyists worked with the client, which federal agencies were lobbied, and what specific issues were covered. After reviewing the materials, the auditors meet with

[10]Public Law 110-81, 121 Stat. 735.

the lobbying firm to summarize their findings and potentially ask further questions. If the audit reveals an inaccuracy, the firm is typically asked to re-file an amended LDA form. If the audit reveals an especially suspicious activity, the GAO would refer the matter to the Department of Justice for potential criminal investigation.

2.2 Data and descriptive statistics

We begin by downloading all GAO annual reports for the years between 2008 and 2020. Those 13 reports cover 1,307 audits in total — roughly 100 audits per report. Each audit is conducted at the pair level, registrant and client. The GAO report thus publicizes both lobbyists and clients that have been audited. We hand-collect the names of audited registrants and clients in each year to construct a dataset of audits.[11] We match this to a comprehensive dataset covering all U.S. lobbying activity. This dataset comes from OpenSecrets (OS), a nonprofit firm that aggregates and cleans data from publicly available LDA forms.[12] The OS dataset provides information on all registrant-client lobbying pairs since 1998. The information collected from the original LDA forms includes, among other things, the dollar amount paid by each client to each lobbying firm and the topics and agencies lobbied by the firm on the client's behalf. In matching the firm×client pairs from GAO to the firm×client pairs in the OS database, the main challenge is that firm and client names could be spelled differently. We manually inspect the matching and two research assistants independently verified the match accuracy. By the end of this process, we were able to match 1,298 audit pairs to their respective information on the OS database.

The final sample includes 60,829 unique client×firm pairs. We track those pairs over 13 years, from 2008 till 2020, for a total of 214,901 client×firm observations. Note that we set

[11] Table A.1 lists the number of audits by year and the coverage rate (pairs matched to the OS database).
[12] See https://www.opensecrets.org/.

the year end on June 30, to match the GAO's audit routine. For example, to conduct its 2014 audit, GAO picked a random sample from all LDA forms filed between 2013Q3-2014Q2.[13] Table 1 provides descriptive statistics. The average pair has 0.6% unconditional probability of being audited. One in six pairs (17%) is a firm representing itself, rather than hiring an outside lobbyist. Lobbying relationships are sticky: the one-year survival rate, that is, probability of having a relationship at time $t+1$ conditional on having one at time t, is 83%. The 2-year survival rate is 66%. The average lobbying relationship is 4 years old (17.2 quarters). While our sample is limited to 2008-2020, we observe the pairs from 1999 until 2023. Therefore, we can accurately identify pair formation and survival rates. The average pair reports $83,800 of quarterly lobbying expenses, in constant 2023 USD.[14] Conditional on survival, the pair's lobbying expenses tend to decrease over time: the average year-on-year change in expenses is -2.4%, and the 2-year change is -4.1%. We use expenses or prices interchangeably to refer to this transfer from clients to lobbyists. Finally, we note that the average client retains 3.6 separate lobbying firms, who are in touch with 3.4 federal agencies on the client's behalf.

3 Model

In this section, we introduce a dynamic model of lobbyist-client relationships. The model will provide a conceptual framework to interpret our reduced-form results in Section 4, and to evaluate the welfare implications of counterfactual scenarios in Section 5.

[13] This convention varied slightly before 2013. Due to varying conventions, the third quarter of 2010 was covered by both the 2010 and 2011 reports. For simplicity, we attribute all lobbying activity in this quarter to the 2011 report.

[14] That is, we convert all dollar amounts to 2023 US dollars using a price index from the Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/CPALTT01USQ657N.

3.1 Setup

There are two agents, a lobbyist and a client. Time is discrete with infinitely many dates ($t = 0, 1, 2, 3, ...$). All agents are risk neutral and share a common discount factor β. At an unmodeled starting date, the client hires the lobbyist. In each period $t > 0$, the lobbyist chooses a price to charge the client. The client decides each period whether to retain the lobbying firm at the new price, or leave forever.

At the start of each period, the client-lobbyist pair is audited by the government with exogenous probability $\alpha \in (0, 1)$. Audits are i.i.d across periods. Once the client-lobbyist pair is audited, we assume for simplicity that it can never be audited again.[15] An audit permanently changes the value of the lobbyist's services for this client. Prior to an audit, the client receives utility v in each period that it retains the lobbyist. The exogenous parameter v is common knowledge. After the audit, this per-period client utility changes to $v + a$. The exogenous parameter a captures the true value of audit, which could be positive or negative.[16] Key to our model, we allow the lobbyist and the client to have different beliefs about a. We denote the client's subjective belief as a^C and the lobbyist's subjective belief as a^L. We assume that each side, the lobbyist and the client, is certain their belief is correct and that the other side holds the same belief. For example, the lobbyist believes that $a^L = a$ and further believes that $a^C = a^L$. Note that a^C and a^L could be positive or negative, and we do not take a stand on how close either one is to the true value of audit a. After observing whether an audit occurs, the lobbying firm chooses a price p_t to charge the client.

[15] In the data, the unconditional probability of a pair being audited twice is 0.08%.

[16] On one hand, the audit might increase transparency and incentivize the audited firm to work harder on behalf of the audited client. On the other hand, the audit might stir tensions and incentivize the audited firm to invest more in its non-audited clients. The net effect could therefore be positive or negative. For tractability, we model the direct value of audit through the client's utility function. However, as we explain below, the audit also endogenously affects the lobbyist's equilibrium payoff.

The lobbying firm has a cost c for serving the client. If the client retains the lobbying firm, the lobbyist gets utility $p_t - c$. Clients have an exogenous price sensitivity δ. Let A_t denote an indicator which equals one if an audit has occurred by time t. Then the client's net per-period utility from retaining the lobbyist in period t is:

$$u_t \equiv v + a^C \cdot A_t - \delta p_t. \tag{1}$$

The client has an outside option. This represents the value the client receives from searching for another lobbyist or ceasing all lobbying activity. Each period the client's outside option is updated stochastically as an i.i.d draw ω_t from a standard normal distribution. We assume these i.i.d draws are independent of the random audit realization. Each period, after all parties observe whether an audit occurs and after the lobbyist offers a price p_t, the client privately observes the value of its outside option ω_t. The lobbying firm knows the distribution of ω_t but never observes the realizations $\{\omega_t\}_{t\geq 0}$.[17] At the end of the period, the client decides whether to renew the contract with the lobbyist for price p_t. If the client retains the lobbyist, he receives the flow utility u_t and the game proceeds to the next period. If the client leaves the lobbyist, the client gets utility ω_t and the game ends.

To provide some intuition, the normal distribution of ω_t can be thought of as a normalization. Suppose the client has a valuable outside option (ω) because the lobbying market is competitive. Holding the price fixed, we can always lower v, δ, and the expected value of the outside option in a manner that leaves the client's behavior unchanged: the outside option

[17] This matters for two reasons. First, if the lobbyist could observe ω_t before choosing the price, it would always set the price such that the client receives zero surplus. The client's private information is thus the only reason the client obtains a positive continuation value. Second, if the lobbyist could observe ω_t, it could help the lobbyist realize that $a^C \neq a^L$. Because the lobbyist never observes ω_t, it can maintain the potentially mistaken belief that $a^C = a^L$. For simplicity, we assume that the lobbyist does not update its belief about ω_t in a Bayesian fashion.

is less attractive and the value of staying is lower, so the client's probability of leaving is unchanged. Likewise, if the outside option has a high variance, we can proportionally shrink v, δ and the variance of the outside option in a way that leaves client behavior unchanged. In this sense, the parameters v, δ can be interpreted as capturing both factors relating to the modeled lobbyist-client pair and the unmodeled broader lobbying industry.

3.2 Equilibrium

We focus on Markov perfect equilibria (MPE). Our equilibrium concept imposes two restrictions. First, we focus on equilibria in which the lobbyist charges the same price $p_t = p_n$ each period until an audit occurs, and a potentially new price $p_t = p_a$ forever once an audit occurs. This is a natural assumption because the realization of the client's outside option is i.i.d across periods, so the only meaningful distinction between periods is whether an audit has occurred.[18] Second, we require that strategies must be subgame perfect. This means that the client leaves the lobbyist if, and only if, the outside option (ω) exceeds the sum of the client's utility from retaining the lobbyist (u) and the client's equilibrium continuation value from staying with the lobbyist (described below). Without this assumption, the client would like to commit to leaving the first time the lobbyist charges a price higher than its cost c. Such a strategy would force the lobbyist to charge the lowest possible price forever. This strategy is unrealistic and is not subgame perfect: if the client found itself in a situation where the lobbyist charged a slightly higher price one period, the client would optimally accept the price rather than following the above strategy. Likewise, the lobbyist's pricing strategy must be optimal in each period, given his intention to charge the same price in all future periods. Without this assumption, the lobbyist would like to commit to charging a

[18] For simplicity, we ignore inflation in this model. Alternatively, flow utilities and prices may be interpreted as real values adjusted for inflation.

high price today, increasing immediate profits, while promising to charge low prices in the future, so clients are willing to stay. Such a promise is not credible since the lobbyist will prefer high prices in the future, so we focus on equilibria in which the lobbyist finds its equilibrium price optimal in every period.

We formalize this as follows. An equilibrium consists of (i) prices p_a^*, p_n^* such that the equilibrium price process is $p_t = p_n^* + A_t(p_a^* - p_n^*)$; (ii) a stopping time τ^* chosen by the client;[19] and (iii) the lobbyist's subjective belief of the stopping time $\hat{\tau}^*$, that satisfy the following conditions:

1. Given the client's belief a^C, the stopping time τ^* is subgame perfect. That is, defining the client's value function

$$V(A) \equiv \mathbb{E}\left[\beta^{\tau^*}\omega_{\tau^*} + \sum_{t=0}^{\tau^*} \mathbf{1}(\tau^* > t)\beta^t \left(v - \delta p_n^* + A_t[a^C + \delta(p_n^* - p_a^*)] \right) \mid A_0 = A\right], \quad (2)$$

the stopping time satisfies

$$\tau^* = \inf\{t : \omega_t > \beta\mathbb{E}[V(A_{t+1})|A_t] + v - \delta p_t + a^C A_t\}. \quad (3)$$

2. Given the lobbyist's belief a^L, the lobbyist's subjective belief of the stopping time $\hat{\tau}^*$ is subgame perfect. That is, defining the lobbyist's perception of the client's value

[19] We assume, without loss of generality, that the lobbying firm cannot "fire" the client. This is without loss of generality because there is always some high price such that the lobbyist would prefer receiving that price to firing the client. Choosing to charge that price is weakly better than firing the client.

function[20]

$$\hat{V}(A) \equiv \mathbb{E}\Bigg[\beta^{\hat{\tau}^*}\omega_{\hat{\tau}^*} + \sum_{t=0}^{\hat{\tau}^*} \mathbf{1}(\hat{\tau}^* > t)\beta^t \left(v - \delta p_n^* + A_t[a^L + \delta(p_n^* - p_a^*)] \right) \mid A_0 = A\Bigg], \quad (4)$$

the stopping time satisfies

$$\hat{\tau}^* = \inf\{t : \omega_t > \beta\mathbb{E}[\hat{V}(A_{t+1})|A_t] + v - \delta p_t + a^L A_t\}. \quad (5)$$

3. Given the lobbyist's subjective belief of the stopping time $\hat{\tau}^*$, the lobbyist's pricing strategy is subgame perfect. Defining the lobbyist's value function

$$V^L(A) = \mathbb{E}\Bigg[\sum_{t=0}^{\hat{\tau}^*} \mathbf{1}(\hat{\tau}^* > t)\beta^t \left(p_n^* + A_t \left(p_a^* - p_n^* \right) - c \right)\Bigg], \quad (6)$$

the prices satisfy

$$p_a^* = \text{argmax}_{p_a} \left(p_a - c + \beta V^L(1) \right) \mathbb{P}\left(\omega_t < v + a^L - \delta p_a + \beta\hat{V}(1) \right) \quad (7)$$

$$p_n^* = \text{argmax}_{p_n} \left(p_n - c + \beta\mathbb{E}[V^L(A_{t+1})|A_t = 0] \right) \times \mathbb{P}\left(\omega_t < v - \delta p_n + \beta\mathbb{E}[\hat{V}(A_{t+1})|A_t = 0] \right).$$

Before exploring the model predictions, we first provide intuition for the equilibrium definition. If the client and lobbyist follow their prescribed equilibrium strategies, the expected

[20]Note that time τ^* is the period in which the client takes its outside option and leaves. In this period, the client leaves rather than paying the lobbyist, so the lobbyist receives no payoff and the client does not receive its flow utility from lobbying.

discounted value for the client in period t is $V(A_t)$ (Equation (2)). Condition 1 requires the client's equilibrium stopping time τ^* to be an optimal response to any hypothetical price the lobbyist might charge. Suppose the lobbyist deviates from the equilibrium pricing strategy in one period to charge some off-equilibrium price p_t. Condition 1 requires the client to respond optimally in this subgame, accounting for the off-equilibrium price this period and assuming equilibrium price choices going forward. This is the usual notion of subgame perfection in infinite-horizon games.

The lobbyist has his own estimate of a, denoted as a^L, which could potentially be different from the client's estimate, denoted as a^C. However, Condition 2 requires the lobbyist to have a rational expectation of what the client's subgame-perfect strategy *would be* if the client's subjective belief was a^L. The notion of subgame perfection is identical to the one from Condition 1 described above.

Finally, Condition 3 requires the lobbyist's equilibrium prices p_a^*, p_n^* to be optimal in every period. If the client and lobbyist follow their equilibrium strategies, the lobbyist's expected discounted value in period t is $V^L(A_t)$ (Equation (6)). Suppose the lobbyist is considering what price to charge in period t. Condition 3 imposes that the lobbyist's optimal response to the client's strategy is to charge $p_t = p_n^* + A_t(p_a^* - p_n^*)$, as long as the lobbyist expects to follow its equilibrium strategy going forward. This is the same notion of subgame perfection from Condition 1, except it is now applied to the lobbyist's pricing strategy.

3.3 Model predictions

In this section, we outline the main predictions from our model. For brevity, we discuss here only the economic intuition and provide the full numerical solution in Appendix A.1. Our focus is on two key outcome variables: prices and client retention (the probability of the

client re-hiring the lobbying firm).

We begin by considering how a change in client demand affects prices and retention. To that end, we increase the parameter v (utility from lobbying) and hold all other parameters fixed at the values displayed in Table 6.[21] Starting with pre-audit behavior, Panel A of Figure 1 shows that the pre-audit price p_n increases in v. Intuitively, the lobbyist faces a trade-off when choosing a price. A higher price increases profits if the client stays, but also increases the likelihood that the client will leave (Equation (3)), destroying future profits. When an increase in v raises client demand for lobbying, the lobbyist is less concerned about losing the client and thus raises prices. Next, we calculate the effect of v on client retention. Here, the main trade-off is summarized in Equation (3). On one hand, holding prices fixed, the client is less likely to leave if v is higher. However, as mentioned, v increases prices which makes the client more likely to leave. The net effect of v on client retention thus depends on which of these two forces dominates. At our preferred parameters, Panel B of Figure 1 shows that the equilibrium likelihood of the client staying with the lobbyist increases with v. Intuitively, the lobbyist increases the price when v increases. This increases the lobbyist's continuation value $V^L(A_t)$. Since the lobbyist's continuation value is higher, losing a client is costlier (Equation (7)). This weakens the lobbyist's incentive to increase prices. As a result, the lobbyist responds to an increase in v by raising prices, but the higher continuation value prevents the lobbyist from raising prices to the point that the client leaves. This intuition explains the joint impact on prices and retention, which is displayed in Figure 1.

Based on the above comparative static exercise, we can infer how an audit should impact equilibrium behavior. If an audit increases client demand for lobbying services ($a^C > 0$), then an audit should lead to an increase in prices and an increase in the likelihood that the

[21] These values correspond to the estimates from our structural estimation, which we describe in Section 4.4.

client stays with the lobbyist. Conversely, if an audit reduces client demand ($a^C < 0$), then audits should lower prices and reduce client retention. However, this crucially depends on how close the lobbyist's belief (a^L) is to the client's belief (a^C). We start with a scenario where $a^C = a^L$: client and lobbyist have identical beliefs about the audit value. We hold all parameters fixed, except that we vary a^C and a^L, and demonstrate the dynamics in Figure 2. When $a^C = a^L > 0$, an audit increases prices and the probability that the client re-hires the lobbyist. As we reduce $a^C = a^L$, the effect is dampened until $a^C = a^L$ turns negative. At that point, an audit will reduce prices and the probability the client retains the lobbyist. This leads to our first two predictions:

Model prediction 1: If the lobbyist and the client form identical beliefs about the audit value, and that consensus value is positive ($a^C = a^L > 0$), then an audit increases prices and increases client retention.

Model prediction 2: If the lobbyist and the client form identical beliefs about the audit value, and that consensus value is negative ($a^C = a^L < 0$), then an audit reduces prices and reduces client retention.

Finally, we consider an alternative scenario where $a^C \neq a^L$: the lobbyist and the client form different beliefs about the audit's value. To illustrate the dynamics in this scenario, we hold a^C fixed at 0 and vary the parameter a^L.[22] In other words, we let the client be indifferent to audits, and investigate how the lobbyist's subjective belief a^L carries over to prices and retention. The dynamics are summarized in Figure 3. In Panel A, we show the impact on prices. When $a^L < 0$, the lobbyist responds to an audit by lowering prices. The lobbyist mistakenly believes that the audit will lower the client's utility and hence the

[22]To be clear, this is for illustration purposes only; the dynamics are similar as long as a^L is large in magnitude relative to a^C.

demand for lobbying services. In response, the lobbyist quotes a lower price to the client. However, since the client is in fact indifferent to the audit, the reduced price incentivizes him to re-hire the lobbyist. Indeed, Panel B confirms that when $a^C = 0$ and $a^L < 0$, an audit makes the client more likely to stay with the lobbyist. Conversely, when $a^L > 0$, the lobbyist thinks an audit increases client demand, and therefore he offers the client a higher post-audit price. The client, though, is indifferent to the audit, and the price hike thus leads to higher probability of leaving the lobbyist. In sum, we form two predictions for a world with differing beliefs:

Model prediction 3: Suppose the lobbyist misunderstands the audit value, such that the lobbyist believes the value is high relative to the client's belief: $a^L > 0$, $a^L \gg a^C$. Then an audit raises prices and reduces client retention.

Model prediction 4: Suppose the lobbyist misunderstands the audit value, such that the lobbyist believes the audit is harmful relative to the client's belief: $a^L < 0$, $a^L \ll a^C$. Then an audit lowers prices and increases client retention.

In sum, there are four potential scenarios. They depend on the degree of agreement between client and lobbyists about the audit value (identical or different beliefs), and on the subjective belief about the audit value (positive or negative). Each scenario has a unique joint prediction on how an audit affects prices and retention. For ease of reference, we summarize the scenarios and the predictions in Table 2. In the next section, we will test the competing prediction based on the random GAO audits.

4 Results

4.1 Randomization

Our empirical strategy relies on the random assignment of GAO audits. The randomization is required by law, and is also consistent with what we learned from the lobbying firms we interviewed. To empirically examine this, we estimate the following regression:

$$\begin{aligned} Audit_{c,f,t} = \beta \overrightarrow{X}_{c,f,t} + \Lambda_{f \times t \times Forms_{c,f,t}} \\ + \Omega_{\text{Industry}_{c,f,t} \times t} + \Gamma_{\text{First Quarter}_{c,f} \times t} + \epsilon_{c,f,t} \end{aligned} \tag{8}$$

In this equation, an observation is a client c of firm f in year t. We aggregate all variables to the GAO-report year t: for example, we count the number of quarterly LDA forms filed in quarters covered by GAO report t to construct the variable $Forms_{c,f,t}$. The vector $\overrightarrow{X}$ includes the following variables, all aggregated across quarters corresponding to the GAO-report year t: the average price paid by the client c to the lobbyist f; the total number of lobbying firms hired by the client c; the total number of individual lobbyists at firm f serving client c; the total number of federal agencies contacted by firm f on behalf of client c; the number of quarters since the client c first hired firm f, averaged across quarters in year t; and an indicator equal to one if the client self-lobbies in the last quarter of year t. The dependent variable $Audit_{c,f,t}$ is an indicator which equals one if the client-firm pair was audited in GAO report t.

Our fixed-effects specification is designed to match the GAO's randomization process. Specifically, in all our baseline results, we include firm-by-year-by-number-of-forms fixed

effects. We thus look within a given lobbying firm in a given year, comparing clients that filed the same number of forms. The year fixed effects address the fact that the number of audits and the number of lobbyist-client pairs varies over time (see Table A.1), affecting audit probabilities. Moreover, when the client-lobbyist pair files more LDA forms during the year, the probability of one form being picked for an audit increases (more "lottery tickets").[23] Finally, we add firm fixed effects because within a given firm, all of its clients with the same number of forms filed are equally likely to be audited. Conditional on these fixed effects, audits should be randomly assigned across the clients of a firm. However, even with random assignment, additional fixed effects can improve precision by removing noise unrelated to the impact of an audit. For this reason, in some specifications, we include industry-by-year fixed effects (using the LDA industry classification for the client-lobbyist pair) and cohort-by-year fixed effects (comparing client-lobbyist relationships originating in the same quarter). Standard errors are always double-clustered at the firm and client level.

We estimate Equation (8) by OLS. The results are reported in Table 3. In column (1), we show that none of the variables in the vector $\overrightarrow{X}$ have any correlation with the probability of being audited. The coefficients are essentially zero and statistically insignificant. Moreover, the adjusted R^2 is negative, suggesting that those variables do not improve the model fit. In other words, two clients of a given lobbying firm with the same number of LDA filings are equally likely to be audited, regardless of how different those clients are on any observable dimension. In column (2) and column (3), we further control for year×cohort and year×industry fixed effects. Those address the possibility that GAO targets pairs from a certain vintage or from a certain industry. For instance, perhaps newly-formed pairs or specific industries are believed to be less compliant. We continue to find zero predictive

[23] In unreported specification, we find that the number of filings is indeed a significant predictor of audits.

power and an almost identical negative adjusted R^2, suggesting that those concerns are not supported by the data. Finally, we repeat all those exercises using only lobbying firms which had at least one of their clients audited during the year. All the coefficients remain zero and insignificant, and while the adjusted R^2 is positive, it is quite small.

4.2 Impact on survival and prices

In Section 4.1, we established that audits are randomly assigned. In this section, we turn to investigate how an audit changes the dynamic within the audited client-lobbyist pair. In particular, we are interested in two key objects from Section 3: the price differential between audited and non-audited clients ($p_a^* - p_n^*$), and the change in retention rate (probability of a client staying when they get audited, relative to the probability of staying when they are not audited). Our workhorse specification is:

$$\begin{aligned} Y_{c,f,t+l} = \delta Audit_{c,f,t} + \beta \overrightarrow{X}_{c,f,t} + \Lambda_{f \times t \times Forms_{c,f,t}} \\ + \Omega_{\text{Industry}_{c,f,t} \times t} + \Gamma_{\text{First Quarter}_{c,f} \times t} + \epsilon_{c,f,t}. \end{aligned} \tag{9}$$

In this equation, the vector $\overrightarrow{X}$ and the fixed effects Λ, Ω, Γ are the same as in Equation (8).[24] Likewise, the variable $Audit_{c,f,t}$ is the same indicator that equals one if the client-firm pair was audited in GAO report t. Because audits are randomly assigned conditional on the fixed effects Λ, this specification allows us to estimate the causal effect δ of audits on outcomes. We consider two outcome variables Y: future prices and future client-retention rates. Specifically, our first outcome variable is the average price paid by client c to firm

[24] In a robustness test, we remove from the sample self-auditing clients rather than directly controlling for it in Equation (9). The results are similar to the ones reported below.

f in the quarters covered by GAO year $t+l$. In different specifications, we consider prices one year after the audit ($l=1$) and two years after the audit ($l=2$). Our second outcome variable Y is an indicator equal to one if the client c continues to retain the lobbyist f in GAO year $t+l$. Standard errors are always double-clustered at the firm and client level.

We estimate Equation (9) by OLS and present the results in Table 4. In the first column, we show that an audit causally increases the likelihood that the audited client continues to retain the audited lobbyist. Specifically, one year after a client-lobbyist pair is audited, the audited client is more likely to continue hiring the lobbyist relative to non-audited clients of the audited lobbyist. Column one shows that an audit increases the likelihood of the client-lobbyist pair surviving one year by 2.8 percentage points. This treatment effect is equal to 3.4% of the dependent-variable mean. Adding year×industry and year×cohort fixed effects (column 2) does not change the coefficient meaningfully, consistent with the evidence that audits are randomly assigned and uncorrelated with unobserved heterogeneity. Columns 3 and 4 consider the impact of an audit on two-year survival rates. Column 3 shows that an audit increases the likelihood of the client-lobbyist pair surviving two years by 2.8 percentage points. This treatment effect is equal to 6.8% of the dependent-variable mean. Once again, adding year×industry and year×cohort fixed effects has little effect. Throughout columns 1-4, the coefficient on *Audit* is statistically significant at the 1% level.

In the remaining columns of Table 4, we focus on surviving pairs and examine how an audit affects the price charged by the lobbying firm. Conditional on retaining the lobbying firm, audited clients of an audited lobbyist pay lower prices than non-audited clients of the audited lobbyist. Again, the effect is statistically significant. The outcome variables are measured in thousand 2023 USD for ease of interpretation. Starting with the 1-year price change, columns 5-6 show that an audit reduces prices by \$1,400-\$1,970 (3.2%-4.5% of the

dependent variable mean). As before, the economic magnitude is not particularly large, given the rarity of audits and the fact that within-pair prices tend to be persistent (the median price change is 1.6%). The two-year post-audit price drop is larger, both in dollar terms ($3,470-$3,700) and relative to the sample mean (8.0%-8.5%). Again, adding a tighter set of fixed effects does not change the coefficient meaningfully.

In sum, our estimates show that an audit affects the dynamics between the lobbying firm and its client. Following the audit, the pair is more likely to continue their lobbying relationship. At the same time, the audited lobbying firm will charge a lower price to the audited client than the price it charges other clients. Through the lens of our model, this is evidence for parameter-scenario four ($a^L < 0$, $a^L \ll a^C$): the lobbyist believes the audit is harmful for the client and overestimates the significance of the audit relative to the client's belief. In this scenario, we predict that the audit will lower prices while increasing client retention. The lobbyist thinks that the client substantially dislikes audits ($a^L < 0$), and in response offers a lower price for the audited client. The client, however, has a more benign view of audits. Combined with the lower price, it becomes more likely to stay.

4.3 Alternative channels

In Section 4.2, we found that audits jointly lead to lower prices and higher survival rates. Our preferred explanation, based on the structural model, is centered on an overreaction channel: the lobbyist offers an unnecessary price discount to the client, due to an erroneous belief about the client's disutility from an audit. We cannot test this channel directly, since beliefs are unobservable in the data. Instead, in this section, we examine alternative channels which could lead to similar treatment effects.

One possibility is that the client purchases fewer services from the lobbying firm after

an audit. This would especially explain the lower prices, except in this alternative story the lower prices are due to an intensive-margin adjustment rather than a difference in beliefs. To test this possibility, we estimate a version of Equation (9) with two different outcome variables: the number of individual lobbyists at firm f working on behalf of the client in year $t+l$; and the number of federal agencies the lobbying firm f has contacted on behalf of the client in year $t+l$. As before, the outcomes are measured in the $l = 1, 2$ years following the audit. We use the exact same set of controls and fixed effects. The results are in Table 5, Panel A. The coefficients on *Audit* are statistically insignificant across specifications. Put differently, we cannot reject the null that an audit has no effect on the amount of services provided to the client, conditional on the client continuing to retain the lobbyist. Combined with the strong negative effect of an audit on prices, this suggests that audited clients receive a discount for buying the same amount of lobbying services.

An alternative explanation is that the post-audit price reduction is driven by client-level shocks and not by a misperception of audit utility. For example, the audit could create financial constraints for the client, leading them to request and receive a need-based discount from the lobbying firm. We cannot test this directly since we do not have financial data for the vast majority of clients in our sample, such as private firms and trade organizations. However, we can test this behavior by estimating a version of Equation (9) on the subsample of pairs which were *not* audited in a given year. Here, $Audit^{other} = 1$ if the client was audited through a different lobbying firm. In this specification, we test whether a client that was audited for his relations with lobbying firm A will subsequently receive a discount from non-audited lobbying firm B. If client-level shocks drive our results, we should continue to see a significant impact on prices and survival in the relationship with the non-audited lobbyist. However, the estimates reported in Table 5 (panel B) are statistically insignificant

and effectively zero. This suggests that the changes in prices and retention are only with respect to the lobbying firm that was audited, and not with respect to other lobbying firms hired by the audited client.

Finally, a third explanation is that an audit affects the client via lobbying-firm-level shocks. For example, perhaps the audit reduces the perceived value of the lobbying firm, forcing it to offer price discounts to all clients. To test this possibility, we again estimate a version of Equation (9) on the subsample of pairs which were *not* audited in a given year. We now replace the main independent variable *Audit* with a new variable $Audit^{other\,client}$, which equals one if the lobbyist was audited in any of its client-lobbyist relationships. Note that we can no longer use year-by-lobbyist fixed effects, because the new independent variable does not vary across clients within a given lobbyist-year. Instead, we use year $\times$ number of forms $\times$ number of clients fixed effects, to compare client-lobbyist pairs across lobbyists that are equally likely to be audited. If an audit triggers firm-wide changes within an audited lobbying firm, we expect audited firms to treat even their non-audited clients differently. However, the results in Table 5, Panel C, show that the coefficients on $Audit^{other\,client}$ are statistically and economically insignificant in all specifications. In other words, audited lobbying firms treat their non-audited clients in the same way that non-audited firms treat their non-audited clients.

In sum, we find that audits only affect the relations of the audited pair. Audits have no impact on the audited client's relations with non-audited firms (Panel B), and no impact on the audited firm's relations with non-audited clients (Panel C). Combined, those tests confirm that our results are not driven by firm-level or client-level shocks. Instead, they reflect a pair-specific response to a pair-specific regulatory audit. On one hand, an audited client might dislike the public association with an audited firm and become concerned of losing business

opportunities. On the other hand, an audited client might think that the audited firm will work harder to serve its audited client's interest and avoid future regulatory scrutiny. Either channel would affect the dynamics within the audited client-firm pair, without spilling over to other parties. The lobbyist mistakenly believes that the former effect dominates, and therefore offers a price discount. The client, however, gives more weight to the latter effect and therefore has a more benign view of audits. Combined, this leads to lower prices with higher retention rates.

4.4 Model estimation

In Section 4.2, we estimated the causal impact of an audit on client retention rates and on prices. In this section, we utilize the regression coefficients to estimate key parameters in our model (Section 3), using the Generalized Method of Moments (GMM). We first calibrate several parameters which are directly measurable. We set the audit probability α to be 0.6%, the in-sample probability that a particular lobbyist-client pair gets audited in a given year (Table 1). We set the discount rate β to equal 0.95, following standard literature assumptions. Finally, we set the lobbyist cost parameter c to equal \$44,240.[25] This value makes the lobbyist net profit margin $(p_n^* - c)/p_n^*$ match observed lobbyist net profit margins in practice.[26]

Next, we estimate the client's price sensitivity (δ) and the client's per-period flow utility (v). To that end, we first compute two moments: the average price and annual retention rate, both calculated among lobbyist-client pairs that are never audited. As discussed in Section 3.3 and Figure 1, both moments increase with v. Conversely, both moments decrease

[25] This should be interpreted as inflation adjusted to 2023 dollars, in the same way that all prices are adjusted to 2023 dollars.

[26] See https://www.yahoo.com/now/akin-gump-grows-revenue-profits-074721804.html.

with δ: a higher price sensitivity decreases retention rates, since the clients are less willing to pay for lobbying, and further decreases prices, since the lobbyist must lower prices to retain more price-sensitive clients. Intuitively, we have two equations — one equating the empirical and model-implied average price, the other equating the empirical and model-implied retention rate — in two unknowns, δ and v. We find a unique pair (δ, v) that satisfies these two equations, implying the moments identify these two parameters.

Finally, we estimate the central parameters a^C, a^L, representing the client's and the lobbyist's belief about audit utility, respectively. To that end, we use two additional moments corresponding to our natural experiment. In our model, the within-lobbyist treatment effect of an audit on prices is $p_a^* - p_n^*$. As Figure 2 and Figure 3 show, this treatment effect increases with a^L. We can thus identify the parameter a^L by equating $p_a^* - p_n^*$ with our empirical analog: the regression coefficient on *Audit* in Table 4. Our final moment is the within-lobbyist treatment effect of an audit on client retention. We calculate this treatment effect within our model in Appendix A.1.3. If $a^C = 0$, Figure 3 shows that the client-retention treatment effect declines in the parameter a^L. Intuitively, if client utility is unaffected by audits, then their price sensitivity δ combined with the price change $p_a^* - p_n^*$ determines the change in client retention. This is the "price-sensitivity component" of the audit treatment effect on client retention. If the estimated client-retention treatment effect is higher than the effect implied by this price-sensitivity component, it must be that a^C is positive: Figure 2 shows this effect increases in a^C. Conversely, if the estimated client-retention treatment effect is lower, then a^C is negative. In other words, once we have fixed a^L to match the audit treatment effect on prices, there should be a unique a^C that matches the client-retention treatment effect. Confirming this intuition, we find a unique pair (a^C, a^L) that makes these two model-implied audit treatment effects match their empirical analogs.

In summary, we calculate a GMM estimator of the parameters $\{a^C, a^L, \delta, v\}$ by matching the four empirical moments discussed above. We calculate a lobbyist-clustered covariance matrix for the empirical moments by bootstrapping 500 lobbyist-clustered samples and calculating the empirical moments in each bootstrapped sample. We use the inverse of this covariance matrix as our efficient GMM weighting matrix. We calculate asymptotic lobbyist-clustered standard errors using this bootstrapped covariance matrix and the standard formula. Intuitively, GMM standard errors are small if the empirical moments are precisely estimated and the model equivalents of these moments respond strongly to changes in model parameters. We provide details in Appendix A.1.4.

The results are in Table 6, showing the GMM estimate along with asymptotic lobbyist-clustered standard errors. There are several takeaways from this table. First, the client's estimated flow utility (v) and price sensitivity (δ) imply that the lobbyist extracts most of the surplus in the relationship. Indeed, prior to an audit, the client's per-period payoff $v - \delta p_n^*$ is slightly negative. The lobbyist knows that the client is willing to accept this slightly negative payoff due to the option value of waiting for a better outside option. Because of the client's option value, his pre-audit continuation value $V(0)$ is positive. However, the lobbyist's pre-audit continuation value $V^L(0)$ is far larger: the lobbyist extracts $V^L(0)/(V(0) + V^L(0)) = 99.2\%$ of the surplus.[27] The estimated parameters show that in the U.S. lobbying industry, lobbyists are fairly close to extracting all the surplus from clients.

As for audit value, we see that both a^C and a^L are negative. Thus, the client believes audits are harmful and the lobbyist agrees. However, a^L is an order of magnitude larger in absolute value than a^C. In other words, the lobbyist thinks audits are devastating for clients

[27] As mentioned above, the client is able to extract some surplus because of his private information about his outside option. Otherwise, the lobbyist would always set a price to give the client zero surplus, leaving the client indifferent between accepting and rejecting.

while clients view them as slightly damaging. To quantify this, we see the client thinks an audit eliminates $a^C/v = 1.3\%$ of its flow utility from lobbying, while the lobbyist thinks an audit eliminates $a^L/v = 21.6\%$ of the client's flow utility from lobbying.

Finally, as a result of this divergence between a^C and a^L, the lobbyist offers the client an unnecessary price discount. The lobbyist thinks he must substantially lower prices to compensate clients for the loss of a^L. The client is happy to pay this lower price since his loss from an audit is only a small fraction of what the lobbyist thinks the loss is. This shifts the surplus split. After an audit, the client's continuation value rises by $V(1)/V(0) - 1 = 6.7\%$. This improvement in client value comes from the price reduction outweighing the utility loss a^C in Equation (2). The combination of the price reduction and client-value improvement (the price reduction outweighs the negative utility shock a^C because $a^L < a^C$) leads to an increase in client retention which we observe after an audit (Table 4). In contrast, the lobbyist's continuation value falls significantly by $|V^L(1)/V^L(0) - 1| = 72.1\%$. The lobbyist believes it now must charge a lower price forever, and it believes the client has a far higher likelihood of leaving each period. Because of this, after an audit the lobbyist only extracts $V^L(1)/(V(1) + V^L(1)) = 97\%$ of the surplus in the relationship.

In sum, there are three main takeaways. First, prior to an audit, the lobbyist extracts almost all the surplus in the relationship (99%). Second, the lobbyist and the client believe that an audit destroys client utility. However, the lobbyist vastly overstates the damage, believing it destroys 21.6% of the client's utility (rather than 1%). Third, because the lobbyist offers the audited client an unnecessary price discount, the client's continuation value increases modestly (7%) while the lobbyist's decreases significantly (72%). Consequently, the lobbyist share of the surplus drops to 97%.

5 Counterfactual scenarios

In this section, we use our estimated model to consider three counterfactual scenarios. In each scenario, we estimate how equilibrium behavior would differ from the equilibrium behavior we estimate in our baseline model. Specifically, we examine how shifting to each counterfactual scenario would change prices, continuation values, and welfare. We express changes as a percent of the values in our baseline model (Section 4.4). Table 7 summarizes our results.

First, we consider a world with no audits. In our model, the price effect of removing audits is ambiguous. On the one hand, since the lobbyist thinks that the client dislikes audits, he believes that removing audits will improve the client's continuation value. This would lead lobbyists to charge a higher price without audits, since they believe the likelihood of a client leaving is lower. On the other hand, lobbyists dislike offering perpetual audit discounts. Without audits, the lobbyist gains more from a continued relationship with the client, encouraging him to charge a lower price to retain clients. In our counterfactual estimates, we find that the latter effect dominates: lobbyists would charge a lower price[28] in a world without audits. We confirm this is driven by an improvement in the lobbyist's continuation value $V^L(0)$, which increases by 7.4%. We also find that clients would benefit from the removal of audits: they slightly dislike audits, which are now removed, and dislike high prices, so they benefit from the lower prices lobbyists would charge without audits. Both forces lead to a small improvement in the client's continuation value ($V(0)$ increases 2.4%). Overall, welfare increases by 7.4%. Note that in this counterfactual there is no notion of post-audit prices, continuation values, or welfare.

Next, we consider a reverse counterfactual world in which audits are 10 times more frequent. This would happen, for instance, if the GAO were to permanently increase the

[28] Naturally, in this scenario there is only pre-audit price (p_n^*).

sample of audited pairs. The results mirror the effects of removing audits, with opposite signs as expected. Specifically, a higher audit probability would lower the lobbyist's continuation value. Lobbyists would consequently charge higher pre-audit prices since they care less about losing clients. This increase in prices harms clients, in addition to the increased harm from the more frequent audits due to the negative audit utility $a^C < 0$. As a result, both clients and lobbyists suffer from more frequent audits, lowering pre-audit welfare by as much as 29.4%. Once an audit has occurred, this counterfactual world looks identical to our baseline model. The only change is the probability of an audit occurring, so there are no post-audit differences between this scenario and our baseline model.

Finally, we consider a counterfactual world in which audits proceed at the usual pace, but lobbyists correctly guess client preferences: $a^C = a^L$. In other words, lobbyists no longer overreact to audits. This could happen, for instance, if the GAO changed the audit procedure to include a debriefing with both the client and the lobbyist about the audit implications. Switching to a world without overreaction means that the lobbyist is less worried about losing clients in audits. Because of that, they charge higher post-audit prices (p_a^*). These higher post-audit prices lower client post-audit continuation values ($V(1)$ declines 9.4%). However, lobbyist post-audit continuation values increase substantially (($V^L(1)$ increases 244%). Part of this lobbyist gain corresponds to the higher price p_a^*. However, most of this gain is driven by the correction of the lobbyist's previously pessimistic beliefs. Intuitively, from the lobbyist's perspective, removing overreaction means the overall surplus in the lobbyist-client relationship increases dramatically. Without overreaction, the lobbyist believes the client is far more likely to stay, which causes the lobbyist to discount future periods less. Because the lobbyist gains more than the client loses, removing lobbyist overreactions greatly increases post-audit welfare.

Removing lobbyist overreaction also meaningfully changes pre-audit behavior. While 0.6% of lobbyist-client pairs are audited in a given year, the likelihood of a lobbyist-client pair being audited at some point is much higher. Lobbyists thus care about the post-audit equilibrium when choosing pre-audit prices. Absent overreaction, we find that lobbyists charge lower pre-audit prices (p_n^*), because the increase in their post-audit continuation value $V^L(1)$ makes losing a client more costly. Even with the lower price, the pre-audit lobbyist continuation value $V^L(0)$ increases. As described above, the lobbyist now anticipates a much higher post-audit continuation value, and this outweighs the decline in pre-audit prices. Interestingly, the decrease in pre-audit prices outpaces the increase in post-audit prices for the client, leading in balance to a higher pre-audit client continuation value. Thus, removing overreactions leads to a Pareto improvement in the post-audit world. Put differently, when lobbyists overreact to audits, it introduces an inefficiency in the current system. With overreaction, lobbyists charge lower post-audit prices than they should. This seems beneficial for clients, but it also discourages them from leaving for their outside option. Without overreaction, lobbyists charge higher post-audit prices. If post-audit prices increase by \$1, it would transfer \$1 to lobbyists while costing clients less than \$1, because clients move toward a more efficient policy of exiting when their outside option is high.

6 Conclusion

Regulators increasingly rely on proactive audits. For instance, the Securities and Exchange Commission analyzes trading data to identify financial misconduct, and bank regulators conduct on-site examinations to ensure banks meet their obligations. In this paper we show that, while audits are a useful tool to detect non-compliance, they may also have an unintended harmful impact due to overreaction by target firms.

We exploit a randomized experiment, where the Government Accountability Office (GAO) audits a sample of client-lobbying firm pairs. The law requires GAO to select firms randomly, and we verify this property in conversations with multiple lobbying firms and with a set of empirical exercises. We hand-collect data on GAO audits and study how lobbying firms and their clients react to audits. To guide the analysis, we develop a dynamic structural model, where firms and clients form different beliefs about the value of audit. Our key prediction relates to a case where the client is almost indifferent to audits, while the firm believes the audit has significant negative impact on the client. In this scenario, we predict that audited clients will be more likely to retain the audited lobbying firm, and pay a lower price for the same amount of services. Our reduced-form estimates are consistent with this prediction, suggesting that firms overreact to audits.

In the second part of the paper, we quantify the implications of the overreaction using a Generalized Method of Moments (GMM). We highlight three main takeaways. *First*, the overreaction is significant: the client thinks an audit eliminates 1.3% of its flow utility from lobbying (a^C), while the lobbyist thinks an audit eliminates 21.6% of the client's utility (a^L). Second, an audit reallocates utility from firms to clients, because it leads the firm to offer an unnecessary price discount to the client. As a result, the client's continuation value – the lifetime value from the lobbying relationship – rises by 6.7%, while the the lobbyist's continuation value falls by 72.1%. *Third*, in a counterfactual world without overreaction, price corrections and better firm-client matches improve welfare. In particular, pre-audit continuation value improves by 6.4%.

There is a growing recognition of the need to better understand how regulation in all its forms affects economic activity. Against this backdrop, our paper makes four contributions. *First*, current studies focus on the direct costs firms must expend in order to comply with

regulatory requirements. We highlight an unintended and indirect cost based on overreaction to regulatory actions. In particular, we show that firms mistakenly assess how their clients would react to random regulatory audits, and consequently offer unnecessary price discounts. *Second*, we document the impact on prices and firm-client matching quality, a novel aspect of regulatory burden. Relying on a structural model, we further quantify the welfare implications of our reduced-forms findings. *Third*, we highlight the reallocative effect of regulation, as welfare and surplus shift from firms to clients. This strikes a middle path between classic theories of regulation, ranging from public interest to public choice, and offers a balanced perspective on the economic consequences of regulatory burden. *Fourth*, we highlight a potential drawback of regulatory audits. Financial regulators increasingly rely on such audits, preemptively searching for non-compliance rather than responding to whistleblowers and media reports (Dyck, Morse, and Zingales (2010); Kandrac and Schlusche (2021); Agarwal et al. (2014)). We show that this could trigger overreaction by targeted firms, distort prices and reduce welfare. This is particularly important given that failure rates in proactive audits tend to be low, but the overreaction could impose significant costs on firms, regardless of how strictly they comply with all relevant regulations.

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Table 1: **Descriptive statistics**

This table provides descriptive statistics for our main sample. The unit of observation is a client-lobbying-firm pair in a given "GAO year" t: we aggregate lobbying activity across all quarters covered by the GAO report written in year t. The sample includes all lobbyist-client pairs in all GAO years t between 2008-2020. $Audit = 1$ if the pair was audited by the GAO in report t. $Self = 1$ if the client is self-lobbying. For ease of reading, we multiply $Self$ and $Audit$ by 100 in this table to display percentages. $Duration$ is number of quarters the pair has been active, averaged across quarters in GAO year t. $Lobby\,firms$ is the number of lobbying firms hired by the client in GAO year t. $Lobbyists$ is the number of individual lobbyists hired by the lobbying firm to serve the client in GAO year t. $Agencies$ is the number of federal agencies contacted by the lobbying firm on behalf of the client in GAO year t. $Survive_{t+X} = 1$ if the client continues to retain the lobbyist in year $t+X$. Conditional on $Survive_{t+X} = 1$, $Price_{t+X}$ is the average quarterly revenues paid by the client to the firm at time $t+X$. Price variables are adjusted for inflation and reported in 2023 USD. Finally, $\Delta Price_{t,t+X}$ is the change in the variable Price between year t and $t+X$, reported in percent.

	Mean	**Median**	**SD**	**Min.**	**Max.**	**Obs.**
Audit	0.6	0.0	7.7	0.0	100.0	214,901
Self-lobby	17.4	0.0	37.9	0.0	100.0	214,901
Duration	17.2	9.5	19.4	0.0	86.0	214,901
Lobby firms	3.6	2.0	5.4	1.0	50.0	214,901
Lobbyists	2.9	2.0	2.7	1.0	105.0	214,901
Agencies	3.4	3.0	2.8	1.0	91.0	212,688
$Survival_{t+1}$	82.6	100.0	37.9	0.0	100.0	214,901
$Survival_{t+2}$	66.1	100.0	47.3	0.0	100.0	214,901
Price	83.8	34.7	366.0	1.5	48,958.0	214,901
$Price_{t+1}$	94.9	36.3	410.0	1.4	48,958.0	168,242
$Price_{t+2}$	106.0	37.2	449.3	1.3	48,958.0	133,282
$\Delta Price_{t,t+1}$	-2.4	-1.6	28.7	-99.6	100.0	162,654
$\Delta Price_{t,t+2}$	-4.1	-3.6	31.6	-99.1	100.0	127,433

Table 2: **Predictions: The impact of an audit**

We summarize the predictions from our model (Section 3.3). The client and the lobbyist form independent beliefs (a^C and a^L, respectively) on how an audit impacts the client. There are four scenarios. In scenario 1, the client and lobbyist agree that audits are beneficial: $a^C = a^L > 0$. In scenario 2, the client and lobbyist agree that audits are harmful: $a^C = a^L < 0$. In scenario 3, the lobbyist believes that audits are beneficial, and the client has a far more pessimistic view than the lobbyist (e.g., a^C is negative or small relative to a^L). In scenario 4, the lobbyist believes that audits are harmful, and the client has a far more optimistic view than the lobbyist (e.g., a^C is positive or far less negative than a^L). Each scenario has a unique joint prediction on the probability that the client retains the lobbying firm and the price charged by the lobbying firm.

Beliefs	**Price & retention effects**
(1) $a^C = a^L > 0$	When audit occurs: price $\uparrow$, retention $\uparrow$
(2) $a^C = a^L < 0$	When audit occurs: price $\downarrow$, retention $\downarrow$
(3) $a^L > 0$, $a^L \gg a^C$	When audit occurs: price $\uparrow$, retention $\downarrow$
(4) $a^L < 0$, $a^L \ll a^C$	When audit occurs: price $\downarrow$, retention $\uparrow$

Table 3: **Evidence of Audit Randomization**

This table provides evidence that audits are randomly assigned, based on an OLS estimation of Equation (8). The unit of observation is a client-lobbying-firm pair in a given "GAO year" t: we aggregate lobbying activity across all quarters covered by the GAO report written in year t. The sample includes all lobbyist-client pairs in all GAO years t between 2008-2020. All variables are defined as in Table 1. In all specifications, we include year-by-lobbying-firm-by-number-of-LDA-filings fixed effects. We thus look within a lobbying firm in a given year and compare clients that have filed the same number of LDA forms (e.g., clients that should be equally likely to be audited). In columns (2),(3),(5), and (6), we include year-by-industry fixed effects, where industry is classified at the client-lobbying-firm level by the LDA. In columns (3) and (6), we include year-by-cohort fixed effects, where a cohort is a group of client-lobbyist pairs that originated their relationship in the same quarter. In columns (4)-(6), we include only lobbying firms with at least one audited client. Standard errors are double-clustered by client and firm.

	Audit					
	(1)	(2)	(3)	(4)	(5)	(6)
Price	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Lobby firms	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Lobbyists	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Agencies	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Duration	0.00	0.00		0.00	0.00	
	(0.00)	(0.00)		(0.00)	(0.00)	
Self-lobby	0.00	-0.00	-0.00	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Obs.	164,489	163,800	163,800	37,579	36,531	36,531
Adj. R^2	-0.03	-0.03	-0.03	0.03	0.04	0.04
Year×firm×forms FE	YES	YES	YES	YES	YES	YES
Year×industry FE	-	YES	YES	-	YES	YES
Year×cohort FE	-	-	YES	-	-	YES

Table 4: **Impact on client relationships**

This table provides evidence that audits affect future prices and client-retention rates, based on an OLS estimation of Equation (9). The unit of observation is a client-lobbying-firm pair in a given "GAO year" t: we aggregate lobbying activity across all quarters covered by the GAO report written in year t. The sample includes all lobbyist-client pairs in all GAO years t between 2008-2020. All variables are defined as in Table 1. In all specifications, we include year-by-lobbying-firm-by-number-of-LDA-filings fixed effects. We thus look within a lobbying firm in a given year and compare clients that have filed the same number of LDA forms (e.g., clients that should be equally likely to be audited). In columns (2),(4),(6), and (8), we include year-by-industry and year-by-cohort fixed effects, which are defined as in Table 3. Standard errors are double-clustered by client and firm.

	$Survival_{t+1}$		$Survival_{t+2}$		$Price_{t+1}$		$Price_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Audit	2.81***	2.06***	4.36***	3.59***	-1.40*	-1.97**	-3.47***	-3.70***
	(0.66)	(0.58)	(1.28)	(1.25)	(0.84)	(0.92)	(1.10)	(1.03)
Price	0.03***	0.01***	0.05***	0.04***	0.82***	0.81***	0.77***	0.76***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.02)	(0.02)	(0.03)	(0.02)
Lobby firms	0.09***	0.05***	0.28***	0.28***	0.10***	0.09***	0.09***	0.09***
	(0.02)	(0.02)	(0.04)	(0.04)	(0.02)	(0.02)	(0.03)	(0.03)
Lobbyists	0.47***	0.33***	0.81***	0.68***	0.75***	0.76***	0.57***	0.63**
	(0.08)	(0.06)	(0.11)	(0.10)	(0.20)	(0.22)	(0.22)	(0.26)
Agencies	0.21***	0.20***	0.69***	0.59***	0.27***	0.24***	0.21**	0.18*
	(0.06)	(0.05)	(0.10)	(0.09)	(0.08)	(0.08)	(0.09)	(0.10)
Duration	-0.11***		0.16***		0.04***		0.04***	
	(0.01)		(0.01)		(0.01)		(0.01)	
Self-lobby	1.17***	0.71**	1.88**	1.92***	1.38***	1.69***	2.13***	2.59***
	(0.35)	(0.28)	(0.77)	(0.71)	(0.49)	(0.52)	(0.73)	(0.81)
Obs.	164,489	163,800	164,489	163,800	124,904	124,169	94,251	93,415
Adj. R^2	0.45	0.61	0.34	0.40	0.75	0.75	0.65	0.66
Treatment effect %	3.4	2.5	6.8	5.6	-3.2	-4.5	-8.0	-8.5
Year×firm×forms FE	YES	YES	YES	YES	YES	YES	YES	YES
Year×industry FE	-	YES	-	YES	-	YES	-	YES
Year×cohort FE	-	YES	-	YES	-	YES	-	YES

Table 5: **Alternative channels**

Panel A. Quantity of services. This table provides evidence that audits do not affect the quantity of services provided by a lobbyist, conditional on the client continuing to hire the lobbyist. We estimate a modification of Equation (9) with different outcome variables: the number of lobbyists at firm f working for client c in year $t+l$, for $l = 1, 2$ (columns 1-4); and the number of federal agencies contacted by firm f for client c in year $t+l$, for $l = 1, 2$ (columns 5-8). Otherwise, the specifications are identical to those considered in Table 4. For brevity, we suppress coefficients on all independent variables other than *Audit*. Standard errors are double-clustered by client and firm.

	$Lobbyists_{t+1}$		$Lobbyists_{t+2}$		$Agencies_{t+1}$		$Agencies_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Audit	0.01	0.01	-0.02	0.00	0.03	0.02	-0.07	-0.08
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)
Obs.	130,575	129,855	99,092	98,266	129,969	129,246	98,378	97,550
Adj. R^2	0.85	0.85	0.78	0.79	0.73	0.73	0.63	0.64
Treatment effect %	0.3	0.4	-0.6	0.1	1.0	0.5	-2.3	-2.5
Year×firm×forms FE	YES	YES	YES	YES	YES	YES	YES	YES
Year×industry FE	-	YES	-	YES	-	YES	-	YES
Year×cohort FE	-	YES	-	YES	-	YES	-	YES

Panel B. Client-level shocks. This table provides evidence that audits do not affect the relations between audited clients and non-audited lobbyists. We estimate the same specifications as in Table 4 with only two modifications: First, the sample includes only client-lobbyist pairs that were *not* audited. Second, the main independent variable, $Audit^{other}$, equals one if the client was audited in *any* of its client-lobbyist relationships. Otherwise, this table is identical to Table 4, which provides further details. For brevity, we suppress coefficients on all independent variables other than $Audit^{other}$. Standard errors are double-clustered by client and firm.

	$Survival_{t+1}$		$Survival_{t+2}$		$Price_{t+1}$		$Price_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Audit^{other}$	-0.06	-0.19	0.63	0.46	0.04	0.16	0.22	0.00
	(0.79)	(0.59)	(1.02)	(0.96)	(0.64)	(0.60)	(0.92)	(0.83)
Obs.	163,463	162,765	163,463	162,765	123,985	123,248	93,518	92,677
Adj. R^2	0.45	0.61	0.34	0.40	0.75	0.75	0.66	0.66
Treatment effect %	0.0	-0.2	0.9	0.7	0.0	0.3	0.5	0.0
Year×firm×forms FE	YES	YES	YES	YES	YES	YES	YES	YES
Year×industry FE	-	YES	-	YES	-	YES	-	YES
Year×cohort FE	-	YES	-	YES	-	YES	-	YES

Panel C. Firm-level shocks. This table provides evidence that audits do not affect the relations between audited lobbyists and non-audited clients. We estimate the same specifications as in Table 4 with only three modifications: First, the sample includes only client-lobbyist pairs that were *not* audited. Second, the main independent variable, $Audit^{other\,client}$, equals one if the lobbyist was audited in *any* of its client-lobbyist relationships. Third, we now compare clients across lobbying firms, using fixed effects for year × number of forms × number of clients. This fixed-effects specification replaces our usual specification, which compares clients within a lobbyist (see Table 4). Otherwise, this table is identical to Table 4, which provides further details. For brevity, we suppress coefficients on all independent variables other than $Audit^{other\,client}$. Standard errors are double-clustered by client and firm.

	$Survival_{t+1}$		$Survival_{t+2}$		$Price_{t+1}$		$Price_{t+2}$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Audit^{otherclient}$	-0.02	-0.02	-1.15	-1.00	-0.77	-0.62	-0.37	-0.17
	(0.50)	(0.33)	(0.90)	(0.82)	(0.75)	(0.79)	(0.79)	(1.15)
Obs.	211,350	210,838	211,350	210,838	165,683	165,150	131,194	130,629
Adj. R^2	0.34	0.57	0.24	0.33	0.87	0.87	0.83	0.83
Treatment effect %	0.0	0.0	-1.7	-1.5	-0.8	-0.6	-0.3	-0.1
Year×number of clients×forms FE	YES	YES	YES	YES	YES	YES	YES	YES
Year×industry FE	-	YES	-	YES	-	YES	-	YES
Year×cohort FE	-	YES	-	YES	-	YES	-	YES

Table 6: **Structural-estimation results**

This table displays the results of our structural estimation. In the first panel, we display GMM estimates of the model parameters. Registrant-clustered asymptotic standard errors are displayed in the last column. The second panel displays the parameters that we calibrate and the associated assumptions. We solve our model using these estimated parameters. The third panel shows the equilibrium values of various model objects at the estimated parameter values. See details in Section 4.4 and Appendix A.1.4.

Parameter	Definition	Estimate	Std error
v	Client flow utility	1.53	0.0005
δ	Client price sensitivity	0.02	0
a^C	Client audit utility	-0.02	0.0001
a^L	Perceived client audit utility	-0.33	0.0012
β	Discount factor	0.95	Calibrated
α	Audit probability (Percent)	0.6	Calibrated
c	Lobbyist cost	44.24	Calibrated

Model object	Definition	Estimate
$V^L(0)$	Pre-audit lobbyist continuation value	127.45
$V(0)$	Pre-audit client continuation value	1.02
$v - \delta p_n^*$	Pre-audit client flow utility	-0.05
$V(0) \,/\, (V(0) + V^L(0))$	Pre-audit client surplus share (Percent)	0.8
$V^L(1) \,/\, V^L(0) \; - 1$	Audit impact on lobbyist continuation value (Percent)	-72.1
$V(1) \,/\, V(0) \; - 1$	Audit impact on client continuation value (Percent)	6.7
$V(1) \,/\, (V(1) + V^L(1))$	Post-audit client surplus share (Percent)	3

Table 7: **Counterfactuals**

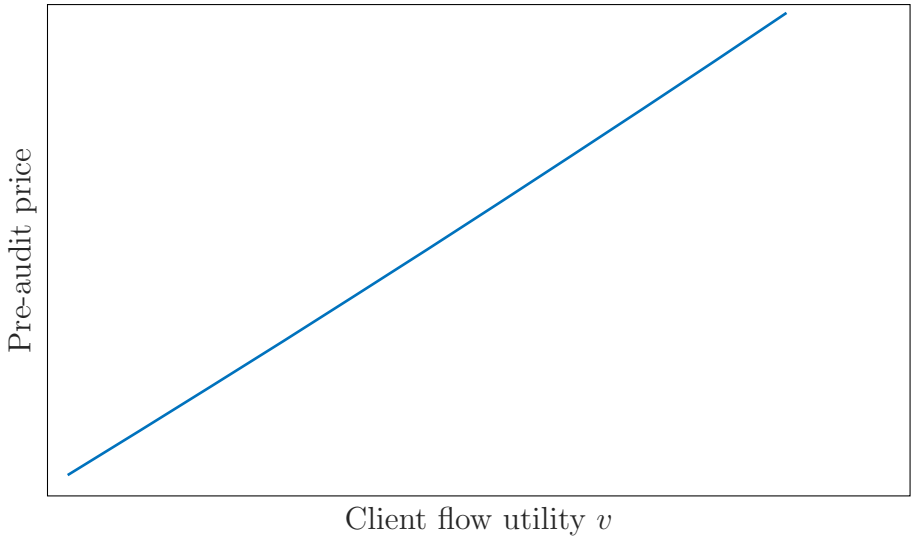
We estimate our model as described in Section 4.4 and Table 6. Using our estimated model, we explore how prices, continuation values, and welfare would change in three counterfactual scenarios: no audits ($\alpha = 0$), more frequent audits ($\alpha \uparrow$), and no overreaction ($a^L = a^C$). In the third column, we report the percentage change in the counterfactual scenario, relative to our baseline estimates (Table 6). See more details in Section 5.

Model Object	Definition	Percent change
	Scenario 1: No audits	
p_n^*	Pre-audit equilibrium price	-0.4
$V(0)$	Pre-audit client continuation value	2.4
$V^L(0)$	Pre-audit lobbyist continuation value	7.4
$V(0) + V^L(0)$	Pre-audit welfare	7.4
	Scenario 2: Audit frequency increases 1,000 percent	
p_n^*	Pre-audit equilibrium price	2.5
$V(0)$	Pre-audit client continuation value	-10.1
$V^L(0)$	Pre-audit lobbyist continuation value	-29.6
$V(0) + V^L(0)$	Pre-audit welfare	-29.4
	Scenario 3: No overreaction	
p_n^*	Pre-audit equilibrium price	-0.4
$V(0)$	Pre-audit client continuation value	1.9
$V^L(0)$	Pre-audit lobbyist continuation value	6.4
$V(0) + V^L(0)$	Pre-audit welfare	6.4
p_a^*	Post-audit equilibrium price	1.7
$V(1)$	Post-audit client continuation value	-9.4
$V^L(1)$	Post-audit lobbyist continuation value	244.3
$V(1) + V^L(1)$	Post-audit welfare	236.8

Figure 1: **Pre-audit model intuition**

This figure shows how prices and retention vary with the client's utility v. We solve the model numerically, and then vary only v while holding all other parameters fixed at the values in Table 6. Panel A plots the effect of increasing v on the pre-audit prices (p_n), and Panel B plots the effect on the pre-audit probability of the client staying with the lobbyist. In both panels, we assume an audit has not yet occurred. See Section 3.3 for details.

(a) **Equilibrium price**



(b) **Probability of client staying with lobbyist**

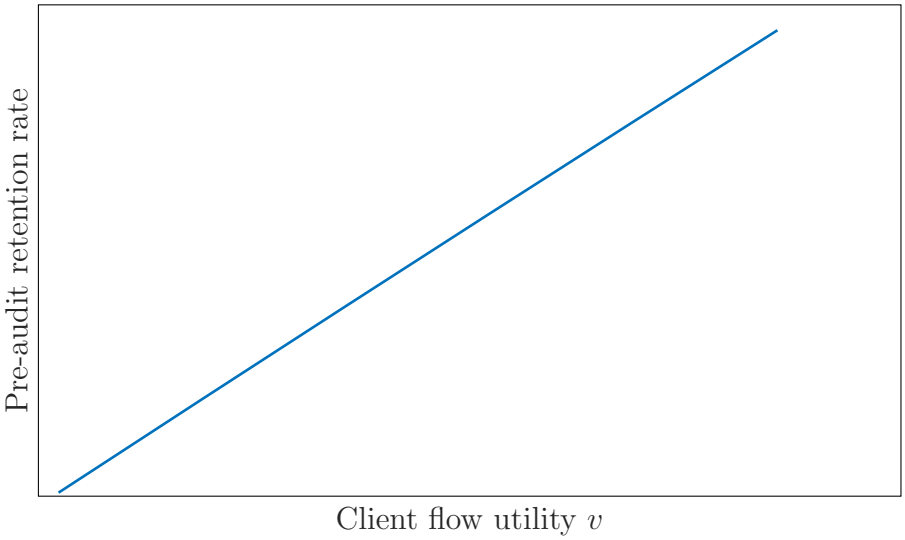
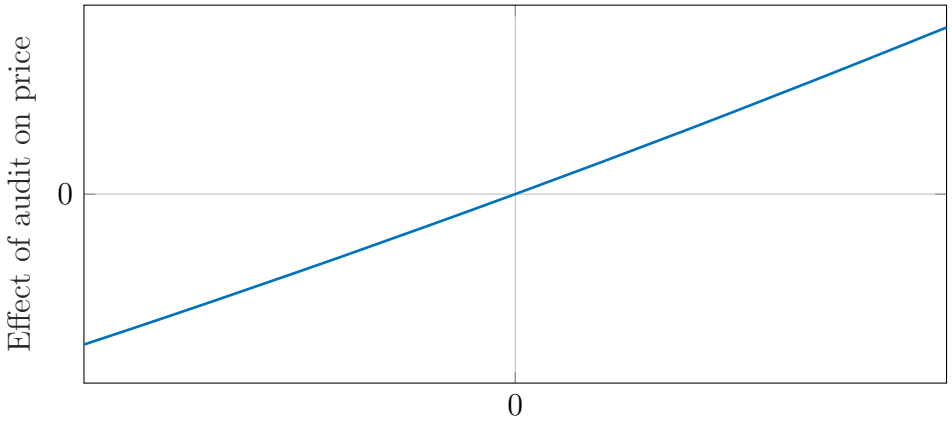


Figure 2: **Model implications with consensus**

This figure shows how prices and retention respond to audits, when firms and clients hold identical beliefs about the audit value ($a^C = a^L$). We solve the model numerically, assuming that $a^C = a^L$. We then vary only the perceived audit utility $a^C = a^L$, holding all other parameters fixed at the values in Table 6. Panel A plots the treatment effect of an audit on the price differential ($p_a^* - p_n^*$), and Panel B plots the treatment effect on the probability of the client staying with the lobbyist. See Section 3.3 for details.

(a) **Price treatment effect**

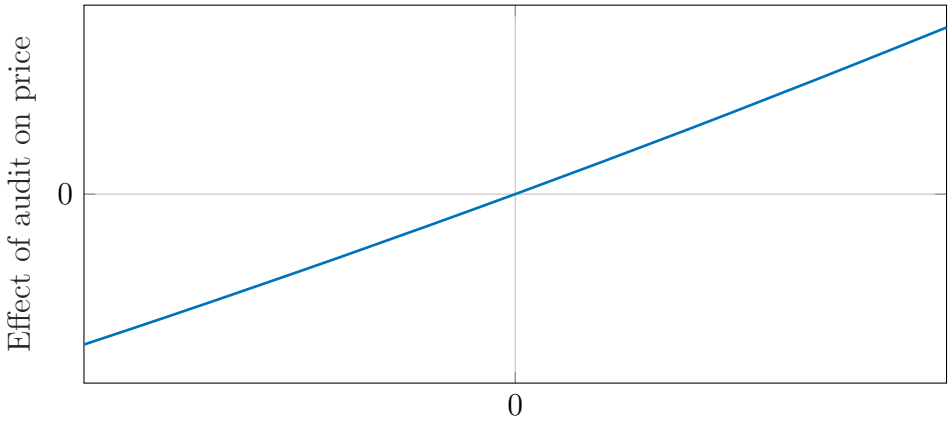


(b) **Survival treatment effect**

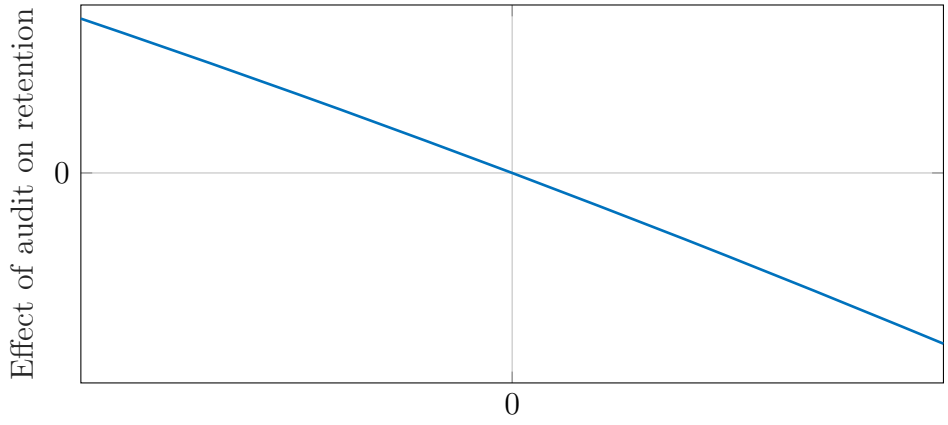
Figure 3: **Model implications with overreaction**

This figure shows how prices and retention respond to audits, when the firm potentially misunderstands the client's utility from audit ($a^C \neq a^L$). We assume the client is indifferent to audits ($a^C = 0$), and then vary the perceived client audit utility parameter a^L, holding all other parameters fixed at the values in Table 6. Panel A plots the treatment effect of an audit on the price differential ($p_a^* - p_n^*$), and Panel B plots the treatment effect on the probability of the client staying with the lobbyist. See Section 3.3 for details.

(a) **Price treatment effect**



(b) **Survival treatment effect**



Internet Appendix

Table A.1: **GAO audits: coverage**

Information collected from 13 GAO audit reports. We list the number of audits conducted in each year, and the number of client×firm pairs we were able to match with the corresponding LDA information on OpenSecrets. We also report the LDA periods associated with each GAO report. Report are typically published in the next calendar year. For instance, the 2020 report was published in 2021. Due to varying conventions, 2010Q3 was covered by both the 2010 and 2011 reports. For simplicity, we attribute all lobbying activity in this quarter to the 2011 report. See Section 2.2.

Report	**Audits**	**Found**	**Missing**	**Filing periods**
2008	100	100	0	2008Q1, 2008Q2, 2008Q3
2009	134	131	3	2008Q4, 2009Q1, 2009Q2, 2009Q3
2010	100	100	0	2009Q4, 2010Q1, 2010Q2, 2010Q3
2011	100	96	4	2010Q3, 2010Q4, 2011Q1, 2011Q2
2012	100	98	2	2011Q3, 2011Q4, 2012Q1, 2012Q2
2013	99	99	0	2012Q3, 2012Q4, 2013Q1, 2013Q2
2014	100	100	0	2013Q3, 2013Q4, 2014Q1, 2014Q2
2015	80	76	4	2014Q3, 2014Q4, 2015Q1, 2015Q2
2016	80	79	1	2015Q3, 2015Q4, 2016Q1, 2016Q2
2017	108	108	0	2016Q3, 2016Q4, 2017Q1, 2017Q2
2018	108	108	0	2017Q3, 2017Q4, 2018Q1, 2018Q2
2019	108	107	1	2018Q3, 2018Q4, 2019Q1, 2019Q2
2020	105	105	0	2019Q3, 2019Q4, 2020Q1, 2020Q2
Total:	1,322	1,307	15	

A.1 Model Solution

A.1.1 Solution of the post-audit game

First, consider periods after the audit occurs. In these periods, the lobbyist perceives the client's value function to be $\hat{V}(1)$. In these periods, our definition of an equilibrium (equation (5)) requires that:

$$\hat{\tau}^* = \inf\{t : \omega_t > \beta\hat{V}(1) + v - \delta p_a^* + a^L\}. \tag{A.1}$$

For convenience, define the shorthand

$$\hat{u}(1) \equiv \beta\hat{V}(1) + v - \delta p_a^* + a^L. \tag{A.2}$$

By the principle of dynamic programming, it follows from (A.1) that

$$\hat{V}(1) = \mathbb{E}_{\omega_t}\left[\max\left(\omega_t, \hat{u}(1)\right)\right]. \tag{A.3}$$

Let $\phi(\cdot)$ denote probability density function of the standard Normal distribution. Let $\Phi(\cdot)$ denote the cumulative density function of the standard Normal distribution. Applying standard properties of the Normal distribution,[1] we can rewrite (A.3) as

$$\hat{V}(1) = \Phi\left(\hat{u}(1)\right)\hat{u}(1) + \phi\left(\hat{u}(1)\right). \tag{A.4}$$

For any given p_a^*, we can plug in the definition of $\hat{u}(1)$ (equation (A.2)) and equation (A.4) becomes a nonlinear algebraic equation in one unknown, $\hat{V}(1)$. We can solve this numerically for $\hat{V}(1)$.

Next, we can solve for the lobbyist's equilibrium continuation value $V^L(1)$ after an audit occurs. In these periods, combining our definition of an equilibrium (equation (6)) with the principle of dynamic programming implies that

$$V^L(1) = \Phi\left(\hat{u}(1)\right)\left(p_a^* - c + \beta V^L(1)\right). \tag{A.5}$$

In words, the lobbyist believes the probability of the client leaving is $1 - \Phi(\hat{u}(1))$. In this scenario, the lobbyist gets nothing. Otherwise, the lobbyist gets $p_a^* - c$ and proceeds to the next period. We can rearrange this to obtain an explicit value for the continuation value:

$$V^L(1) = \left[1 - \beta\Phi\left(\hat{u}(1)\right)\right]^{-1}\Phi\left(\hat{u}(1)\right)\left(p_a^* - c\right). \tag{A.6}$$

Next, we use the subgame perfection condition (equation (7)) to characterize p_a^*. If the lobbyist expects to charge p_a^* in all future periods, its continuation value is given by equation

[1] See https://en.wikipedia.org/wiki/Truncated_normal_distribution

(A.6). If the lobbyist deviates to p' in some period t, its utility in that period is

$$\Phi\left(v + a^L - \delta p' + \beta \hat{V}(1) \right)(p' - c + \beta V^L(1)) \tag{A.7}$$

In words, the client's subgame-perfect strategy implies its probability of staying given the off-equilibrium price p' is given by the first term. If the client stays, the lobbyist gets utility $p' - c$ then proceeds to the next period, getting equilibrium continuation $V^L(1)$. Equation (7) requires the following: given the values of $V^L(1), \hat{V}(1)$ implied by p_a^*, the p' optimizing (A.7) coincides with p_a^*. In words, if the lobbyist expects to charge p_a^* forever, it wants to charge p_a^* today. Taking a derivative in (A.7) with respect to p', we get

$$-\delta\phi\left(v + a^L - \delta p' + \beta \hat{V}(1) \right)(p' - c + \beta V^L(1)) + \Phi\left(v + a^L - \delta p' + \beta \hat{V}(1) \right). \tag{A.8}$$

If the optimal p' coincides with p_a^*, this derivative should equal 0 when $p' = p_a^*$. Setting (A.8) equal to zero and plugging in $p' = p_a^*$,

$$0 = -\delta\phi\left(v + a^L - \delta p_a^* + \beta \hat{V}(1) \right)(p_a^* - c + \beta V^L(1)) + \Phi\left(v + a^L - \delta p_a^* + \beta \hat{V}(1) \right). \tag{A.9}$$

The equilibrium condition (7) thus implies equation (A.9). This delivers the following numerical algorithm for solving the post-audit model:

1. Guess a value of p_a^*
2. Numerically solve the nonlinear algebraic equation (A.4) to calculate $\hat{V}(1)$.
3. Calculate $V^L(1)$ using $\hat{V}(1)$, (A.2), and (A.6).
4. Using $\hat{V}(1), V^L(1)$, calculate the right side of equation (A.9).
5. Repeat steps 1-4 for different guesses of p_a^* until equation (A.9) is satisfied.

At the end of this process, we have equilibrium values of $p_a^*, \hat{V}(1), V^L(1)$. Using these values, it is straightforward to calculate the client's actual (not perceived) value function. Repeating the steps above, we define the client's actual continuation value $V(1)$ and define

$$u(1) \equiv \beta V(1) + v - \delta p_a^* + a^C. \tag{A.10}$$

Following the same steps, we arrive at

$$V(1) = \Phi\left(u(1) \right) u(1) + \phi\left(u(1) \right). \tag{A.11}$$

Given the value of p_a^* calculated above, we can numerically solve this nonlinear algebraic equation for $V(1)$. Finally, given the calculated values of $V(1), \hat{V}(1)$, the equilibrium client leaving time τ^* and perceived leaving time $\hat{\tau^*}$ are given by equations (3) and (5) in the equilibrium definition. On the equilibrium path, the leaving times are given by these formulas with $p_t = p_a^*$.

A.1.2 Solution of the pre-audit game

Next, consider periods before the audit occurs. After observing no audit in period t, the lobbyist perceives the client's value function to be $\hat{V}(0)$. Prior to observing whether an audit occurs at time $t+1$, the lobbyist's time-t expectation of the client's time-$t+1$ continuation value is

$$\mathbb{E}[\hat{V}(A_{t+1})|A_t = 0] = \alpha\hat{V}(1) + (1-\alpha)\hat{V}(0). \tag{A.12}$$

Thus, if there is no audit in period t, our definition of an equilibrium (equation (5)) requires that:

$$\hat{\tau}^* = t \iff \omega_t > \beta \left(\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0) \right) + v - \delta p_n^*. \tag{A.13}$$

For convenience, define the shorthand

$$\hat{u}(0) \equiv \beta \left(\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0) \right) + v - \delta p_n^*. \tag{A.14}$$

By the principle of dynamic programming and the same properties of the Normal distribution used above, it follows from (A.13) that

$$\hat{V}(0) = \Phi\left(\hat{u}(0) \right) \hat{u}(0) + \phi\left(\hat{u}(0) \right). \tag{A.15}$$

For any given p_n^*, we can plug in the value of $\hat{V}(1)$ we calculated above and the definition of $\hat{u}(0)$ (equation (A.14)) and equation (A.15) becomes a nonlinear algebraic equation in one unknown, $\hat{V}(0)$. We can solve this numerically for $\hat{V}(0)$.

Next, we can solve for the lobbyist's equilibrium continuation value $V^L(0)$ before an audit occurs. If no audit occurs in period t, we have

$$\mathbb{E}[V^L(A_{t+1})|A_t = 0] = \alpha V^L(1) + (1-\alpha)V^L(0). \tag{A.16}$$

Combining our definition of an equilibrium (equation (6)) with the principle of dynamic programming implies that

$$V^L(0) = \Phi\ (\ \hat{u}(0)\ ) \left(p_n^* - c + \beta[\alpha V^L(1) + (1-\alpha)V^L(0)] \right). \tag{A.17}$$

We can plug in the value of $V^L(1)$ calculated above and rearrange this to obtain an explicit value for the continuation value:

$$V^L(0) = \Big[1 - \beta(1-\alpha)\Phi\left(\hat{u}(0)\right)\Big]^{-1} \Phi\left(\hat{u}(0)\right)\Big(\beta\alpha V^L(1) + p_n^* - c\Big) . \tag{A.18}$$

Next, we use the subgame perfection condition (equation (7)) to characterize p_n^*. If the lobbyist expects to follow its equilibrium pricing in all future periods, its continuation value is given by equation (A.18). If the lobbyist deviates to p' in some period t, its utility in that period is

$$\Phi\left(v - \delta p' + \beta\Big[\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0)\Big]\right)\left(p' - c + \beta\Big[\alpha V^L(1) + (1-\alpha)V^L(0)\Big]\right) . \tag{A.19}$$

This has the same interpretation as equation (A.7), except we are using expected next-period continuation values. Taking a derivative in (A.19) with respect to p', we get

$$\begin{aligned} &-\delta\phi\left(v - \delta p' + \beta\Big[\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0)\Big]\right)\left(p' - c + \beta\Big[\alpha V^L(1) + (1-\alpha)V^L(0)\Big]\right) \\ &+\Phi\left(v - \delta p' + \beta\Big[\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0)\Big]\right) . \end{aligned} \tag{A.20}$$

If the optimal p' coincides with p_n^*, this derivative should equal 0 when $p' = p_n^*$. Setting (A.20) equal to zero and plugging in $p' = p_n^*$,

$$\begin{aligned} 0 = &-\delta\phi\left(v - \delta p_n^* + \beta\Big[\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0)\Big]\right)\left(p_n^* - c + \beta\Big[\alpha V^L(1) + (1-\alpha)V^L(0)\Big]\right) \\ &+\Phi\left(v - \delta p_n^* + \beta\Big[\alpha\hat{V}(1) + (1-\alpha)\hat{V}(0)\Big]\right) . \end{aligned} \tag{A.21}$$

The equilibrium condition (7) thus implies equation (A.21). This delivers the following numerical algorithm for solving the pre-audit model:

1. Solve the post-audit model following the previous section to obtain $p_a^*, V^L(1), \hat{V}(1), V(1)$.
2. Guess a value of p_n^*
3. Numerically solve the nonlinear algebraic equation (A.15) to calculate $\hat{V}(0)$.
4. Calculate $V^L(0)$ using $\hat{V}(0)$, (A.14), and (A.18).
5. Using $\hat{V}(0), V^L(0)$, calculate the right side of equation (A.21).

6. Repeat steps 2-5 for different guesses of p_n^* until equation (A.21) is satisfied.

At the end of this process, we have equilibrium values of $p_n^*, \hat{V}(0), V^L(0)$. Using these values, it is straightforward to calculate the client's actual (not perceived) value function. Repeating the steps above, we define the client's actual continuation value $V(0)$ and define

$$u(0) \equiv \beta \left(\alpha V(1) + (1-\alpha)V(0) \right) + v - \delta p_n^*. \tag{A.22}$$

Following the same steps, we arrive at

$$V(0) = \Phi \left(u(0) \right) u(0) + \phi \left(u(0) \right). \tag{A.23}$$

Given the value of p_n^* calculated above, we can numerically solve this nonlinear algebraic equation for $V(0)$. Finally, given the calculated values of $V(0), \hat{V}(0)$, the equilibrium client leaving time τ^* and perceived leaving time $\hat{\tau^*}$ are given by equations (3) and (5) in the equilibrium definition. On the equilibrium path, the leaving times are given by these formulas with $p_t = p_n^* + A_t(p_a^* - p_n^*)$.

A.1.3 Model proxies for empirical statistics

In this section, we describe model proxies for various statistics.

To begin, note that a lobbyist-client pair that is never audited will have a realized price p_n^* in each period. Thus, the average price among never-audited lobbyist-client pairs is:

$$\text{Model-implied average price given no audits} = p_n^*. \tag{A.24}$$

Next, consider a comparison across clients for a given lobbyist in a given year. Audited clients will be charged p_a^* in the model. Not-yet-audited clients will be charged p_n^*. Thus, comparing audited to nonaudited clients of a given lobbyist, the difference in prices will be $p_a^* - p_n^*$.

$$\text{Model-implied within-lobbyist price treatment effect of an audit} = p_a^* - p_n^*. \tag{A.25}$$

Next, note that

$$\mathbb{E}[V(A_{t+1}) | A_t = 0] = \alpha V(1) + (1-\alpha)V(0), \tag{A.26}$$

so equation (3) implies that a not-yet-audited client will stay with the lobbyist with probability

$$\mathbb{P}(\text{Stay} | A_t = 0) \equiv \Phi \left(\beta \left(\alpha V(1) + (1-\alpha)V(0) \right) + v - \delta p_n^* \right). \tag{A.27}$$

In particular, taking an average across all never-audited client-lobbyist pairs in all years, the fraction of client-lobbyist-years in which the relationship lasts until the next year is

$$\begin{aligned}&\text{Model-implied continuation rate for never-audited pairs} = \mathbb{P}(\text{Stay}|A_t = 0)\\ &= \Phi\left(\beta\left(\alpha V(1) + (1-\alpha)V(0)\right) + v - \delta p_n^*\right). \qquad \text{(A.28)}\end{aligned}$$

Finally, equation (3) implies that after an audit, a client will stay with the lobbyist with probability

$$\mathbb{P}(\text{Stay}|A_t = 1) \equiv \Phi\left(\beta V(1) + v - \delta p_a^* + a\right). \qquad \text{(A.29)}$$

Consider a comparison across clients for a given lobbyist in a given year. Audited clients will stay on until the next period with probability $\mathbb{P}(\text{Stay}|A_t = 1)$. Not-yet-audited clients will stay on with probability $\mathbb{P}(\text{Stay}|A_t = 0)$. Thus, comparing audited to nonaudited clients of a given lobbyist, the difference in continuation rates will be

$$\begin{aligned}&\text{Model-implied continuation treatment effect of an audit} = \mathbb{P}(\text{Stay}|A_t = 1) - \mathbb{P}(\text{Stay}|A_t = 0)\\ &= \Phi\left(\beta V(1) + v - \delta p_a^* + a\right) - \Phi\left(\beta\left(\alpha V(1) + (1-\alpha)V(0)\right) + v - \delta p_n^*\right). \qquad \text{(A.30)}\end{aligned}$$

Figure 1 plots (A.24) and (A.28) as functions of v. Figures 2 and 3 plot (A.25) and (A.30) as functions of a and a^L.

A.1.4 GMM Estimator

As discussed in the text, we calibrate the parameters α, c, β.

Let M_{emp} denote a 4×1 vector of empirical moments. For any fixed value of $\theta = \{a^L, a^C, \delta, v\}$, Let $M_{model}(\theta)$ denote a 4×1 vector with the model equivalents of these moments. These model equivalents are always calculated by numerically solving the model for an equilibrium as described above, taking the parameter vector θ as given.

The first component of M_{emp} is the average price across all client-lobbyist-years for client-lobbyist pairs that are never audited. The first component of M_{model} is p_n^*, the model equivalent. The second component of M_{emp} is the sample probability of a client-lobbyist pair surviving from one audit year to the next, calculated across client-lobbyist pairs that are never audited. The second component of M_{model} is the model equivalent given in equation (A.28). The third component of M_{emp} is the coefficient on *Audit* from a within-lobbyist regression of next-year price on *Audit* and controls. Specifically, we take the estimate from column (6) of Table 4. The third component of M_{model} is the model equivalent, $p_a^* - p_n^*$.

The fourth component of M_{emp} is the coefficient on *Audit* from a within-lobbyist regression of next-year client-lobbyist-pair survival on *Audit* and controls. Specifically, we take the estimate from column (2) of Table 4. The fourth component of M_{model} is the model equivalent given in equation (A.30).

We bootstrap 500 lobbyist-clustered samples from our dataset and calculate M_{emp} in each bootstrapped sample. Using these estimates, we calculate the empirical lobbyist-clustered covariance matrix C of the empirical moments M_{emp}. Let $W = C^{-1}$ denote the inverse covariance matrix. We estimate the model-parameter vector θ by minimizing the GMM objective:

$$\hat{\theta} = \min_{\theta} (M_{emp} - M_{model}(\theta))' W (M_{emp} - M_{model}(\theta)). \tag{A.31}$$

Using the matrix W, we calculate the asymptotic lobbyist-clustered covariance matrix for our estimated parameter vector $\hat{\theta}$ by the usual formula. We report standard errors based on this covariance matrix.