The Ratchet Effect and Government Performance Targets: Small Business Goals in U.S. Federal Procurement

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Abstract

Many organizations use current performance as a basis for setting future targets when incentivizing agent effort. Within U.S. federal procurement, I demonstrate that the agency-specific small business contracting goals exhibit a ratchet effect, and I examine how this, along with the incentives of managers, affects contract awards to small businesses. Consistent with a model of within-year contracting decisions, I find that agencies award conservatively early in the year and rush to make up shortfalls toward the end of the year, an effect that is amplified by a 2013 law change that sharpened manager incentives. Using an excess bunching design around thresholds allowing for sole-source contract awards, I demonstrate that the annual cycle represents an intentional choice and leads to meaningful distortions in federal procurement. Finally, I show that small businesses are unable to adjust entry decisions in response to the annual cycle of awards.

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1 Introduction

Small businesses are targeted to receive an immense value of federal procurement contracts. From more than $600 billion in eligible contracts, the U.S. federal government has a non-binding goal of awarding 23 percent to small businesses.[1] Whether the federal goal is met depends on the contracting choices of individual agencies, each of which is tasked with its own specific target for small business awards, ranging from 13.75 percent up to a high of 70 percent. Empirically, the setting of small business goals exhibits a ratchet effect, in that an agency's awards to small businesses this year in part determines the goal it is assigned in the following year. I estimate that an agency exceeding its goal by 10 percentage points one year would on average experience a 4.2 percentage point increase in its goal in the following year.

The ratchet effect is found within many types of organizations, both public and private, and reflects an information problem. If a principal cannot observe agent effort, it may use observed output to target higher performance goals to more productive agents. This creates an incentive to withhold production so as to receive less ambitious future performance goals. (Weitzman, 1980)

The objective of this paper is to estimate how the ratcheting of small business goals distorts federal contract awards, provide evidence of potential sources of efficiency loss, and evaluate how market participants respond. I begin by documenting that federal agencies rush to meet their small business goals in the final weeks of the year. This is seen in Figure 1, which plots the federal-wide share of contract award dollars going to small businesses within each fiscal week, and the cumulative share awarded to small businesses up to that week. In the first quarter of the fiscal year, 16 percent of federal contracts are awarded to small businesses, rising to 29 percent in the fourth quarter. The cumulative award share exceeds the government-wide goal of 23 percent in precisely one week of the year, the last. This annual cycle in small business awards is unexplained by covariates such as contract size, industry effects, or place of performance. I find that agencies with a greater goal-achievement elasticity have a stronger annual cycle, which connects the observed award cycle to the ratcheting of small business targets. The cycling pattern is consistent with a model of the ratchet effect. If the agency is uncertain about its future procurement needs

[1] This in addition to goals for the use of small business subcontractors, and goals for 13 percent to disadvantaged businesses (largely minority-owned firms), 5 percent to women-owned businesses, and 3 percent each to service-disabled owned businesses and firms located with Historically Underutilized Business Zones. The disadvantaged business enterprise goal was increased from 5% to 11% in 2021 and is being further increased in increments to 15% by 2025.

and the suitability of its contracts for small businesses, it will be conservative early in the year to avoid overshooting by year's end.[2,3]

The incentive of managers is found to play a key role. As a result of the 2013 National Defense Authorization Act (NDAA), the personnel reviews of agency officials began to incorporate as a criteria the agency's performance in meeting small business goals. Subsequently, the small business share rose significantly and the within-year cycle in awards amplified. Those agencies that are further from meeting the small business goal increase small business awards at the end of the year by more, but notably this effect only appears after the NDAA was enacted.

To what extent do the actions of market participants reduce the efficiency impacts of the distortion to contract timing? If small businesses could adjust capacity allocation across the year, then distortion to contractor choice could be limited. However, I find evidence inconsistent with this hypothesis, as the number of small business offers per contract declines at the end of the year. This is more consistent with credit and capacity constraints that limit firms' ability to reallocate capacity across time.

The last part of the paper uses an excess bunching design to provide evidence that the end-of-year catch-up is the result of the intentional choices made by agencies rather than being driven by unobserved contract characteristics. For small businesses that are owned by disadvantaged individuals, women, or disabled veterans, contracts can be sole-sourced – awarded without being subject to competition – provided the contract value is below a statutory threshold. Sole-sourcing allows for a more expedited award process, and can allow agencies to quickly award contracts that help meet the small business goal. I estimate the excess mass of the contract value distribution below these thresholds, and I examine how the manipulation of the contract value differs depending on contract characteristics. In addition to providing credible evidence regarding the annual cycle of small business awards, this exercise also serves to highlight an additional source of distortion introduced by the ratcheting of small business goals. Utilizing an excess bunching approach similar to that of Diamond and Persson (2016), I find that 19 percent of contracts within $950k of the sole-source threshold are manipulated downward to be sole-sourced. The average contract within this region, including both compliers and non-compliers, is $57 thousand dollars smaller as a

[2]Uncertainty around future procurement needs was also the key mechanism in Liebman and Mahoney (2017).

[3]A useful analogy is how taxpayers make labor supply decisions under uncertainty about future income shocks will determine the marginal tax rate, or households facing electricity price uncertainty due to unforeseen demand shocks late in the billing cycle.(Borenstein, 2009)

consequence. Conditional on being manipulated, I estimate that contracts would otherwise be $335 thousand above the threshold. Consistent with an annual cycle of small business awards, the mass near the threshold is twice as great in the fourth quarter as the first, and 50 percent more pronounced after the 2013 policy change. When a contract is awarded in the fourth quarter to a favored firm, the agency's gap between its goal and its to-date achievement is 4.0 percent greater if the contract value is at the sole-source threshold.

A substantial body of theoretical literature examines the ratchet effect beginning at least with Weitzman (1980), who considers multi-firm entities and central planning, the latter being a an important motivating example due to the lack of a profit incentive to induce production. Other applications include the incentives of workers (Carmichael and MacLeod, 2000; Gibbons, 1987; Ickes and Samuelson, 1987), environmental regulation (Puller, 2006), public corruption (Choi and Thum, 2003), incentive contracts (Laffont and Tirole, 1988), and public procurement (Laffont and Tirole, 1993). Meyer and Vickers (1997) analyzes the welfare effects of using comparative performance information, and how its efficiency gains are altered by managerial incentives and the ratchet effect.

Empirically studying the ratchet effect is challenging. Performance goals may be based on past performance as well as signals of true underlying productivity observed by the principal but not the econometrician. Furthermore, productivity shocks may be serially correlated (Matějka et al., 2024). While much of the early empirical evidence regarding the ratchet effect was mostly limited to lab experiments (Charness et al., 2011; Chaudhuri, 1998; Cooper et al., 1999) and case studies (Carmichael and MacLeod, 2000), a growing empirical literature is examines data in the field. The use of ratcheting in performance targets has been documented across several settings, including executive compensation (Choi et al., 2021; Indjejikian et al., 2014; Kim and Shin, 2017), state-owned enterprises (Wei, 2021), government welfare agencies (Casas-Arce et al., 2018), and banks and retail outlets Bol and Lill (2015); Bouwens and Kroos (2011). Kim et al. (2021) and Deore et al. (2023) study the incentives that give rise to ratcheting in executive compensation. Using a survey of European financial executives, Matějka et al. (2024) find that while respondents report that performance targets rise after being exceeded in the prior year, the perceived difficulty of the following years target decreases, the opposite of what ratcheting would imply.

Liebman and Mahoney (2017) examine how federal agencies rush to spend budgets that may expire at the end of the year. In addition to losing funds that are unspent, agencies may also worry about how returning unspent funds will affect future budget allocations, a form of the ratchet effect. While my paper also studies federal procurement, my setting is

advantageous for specifically studying the ratchet effect. I can observe the targets that are set for an agency, the agency's achievement towards those targets, and how targets change in response to past performance. Furthermore, I can utilize variation in the strength of ratcheting to provide direct evidence of how the ratchet effect impacts agency performance. Finally, the sheer magnitude of the small business contracting program makes understanding the incentives it creates important.

From the accounting literature, Bouwens and Kroos (2011) examine a chain of Norwegian retail stores, where individual stores are assigned annual sales targets, which are then apportioned to quarters within the year. The managers of those stores receive a bonus by meeting the quarterly sales targets. They find that targets are ratcheted based on past sales, and that sales are lower in the fourth quarter when sales in the first three quarters exceed the target. Bol and Lill (2015) find a similar pattern studying performance target for branches of a European cooperative bank, as does Casas-Arce et al. (2018) in the context of performance targets for units in a European government agency responsible for reintegrating unemployed workers into the labor market. In their case, the performance target for the unit is annual welfare payments, and they find that fourth quarter performance is declining in the cumulative unit performance over the first three quarters.

This paper makes a contribution to the literature on the effects of affirmative action program design and how incentives within such programs influence utilization of favored firms and efficiency. Related to affirmative action in U.S. federal procurement, Carril and Guo (2023) examine the impact of affirmative action on the utilization of favored firms and the impact on contract outcomes in the context of set-asides for disabled-veteran owned firms, and Cappelletti and Giuffrida (2022) study how set-asides impact competition and contract performance.

The efficiency effects of redistributive procurement programs and how they interact with procurement design include Krasnokutskaya and Seim (2011) and Marion (2007) examine the effects of bid preference programs for small businesses on competition, efficiency, and auction entry. Affirmative action in contracting is often enacted through subcontracting requirements, and Rosa (2024) suggests that these requirements can have a limited impact on government contracting cost due to lessening prime contractor information rents, and Rosa (2020) explores the dynamic implications of these policies. Marion (2017) examines the effects of good faith effort rules on the efficiency of affirmative action. Marion (2009) estimates the effect of affirmative action on the cost of contracting. The effect of small business set-asides on firm entry and government costs were examined by Nakabayashi (2013)

in the context of Japan. A related topic is the extent to which firm size is distorted by small business subsidies, as in Onji (2009). On the benefit side, the literature has found mixed results. Chatterji et al. (2014) finds that minority entrepreneurship rose in response cities' enactment of affirmative action programs in contracting, while conversely Fairlie and Marion (2012) find that minority self-employment rose following California's Proposition 209 disallowed the consideration of race in government contracting and employment. Bates and Williams (1995) and Bates and Williams (1996) find mixed effects of affirmative action in contracting on the formation and survival of minority-owned enterprises. De Silva et al. (2020) examine the effectiveness of training for disadvantaged firms.

Several other recent papers have studied issues related to federal procurement. Carril (2021) and Calvo et al. (2019) examine performance on federal contracts depending on whether the value falls below the simplified acquisition thresholds that determine the regulations that apply to a contract. Kang and Miller (2022) examines sole-sourcing, and why the federal government awards a substantial number of contracts without being subject to competition. Also relevant for the current study is the recent literature that has developed several performance measures to evaluate different features of U.S. federal contracting.(Carril, 2021; Coviello et al., 2018; Decarolis et al., 2020; Giuffrida and Rovigatti, 2022)

The paper proceeds as follows. Section 2 describes the procurement process in the Iowa Department of Transportation and the details of the affirmative action program there. This lays the groundwork for the model of the resulting incentives, which is presented in section 3. Section 4 presents the data used. Section 5 presents the results regarding the timing of small business awards at the agency-level, and section 6 presents the results of the bunching around sole-source thresholds. Finally, section 7 concludes and discusses some potential policy implications.

2 Background

The U.S. government uses a variety of tools to encourage certain types of firms to participate as prime and subcontractors in federal procurement. The government has established non-binding goals for the share of prime and subcontracting dollars to be awarded to small businesses (SB), disadvantaged business enterprises (DBE), women-owned businesses (WBE), firms owned by service-disabled veterans (SDVB), and firms located in Historically

Underutilized Business Zones (HUB).[4] During the time period studied, the federal-wide goals for prime contract dollars as dictated by the Small Business Act were 23 percent for SBs, five percent each for DBEs and WBEs, and three percent each for SDVBs and HUBs. A firm can fall under multiple categories, and a single contract awarded to such a firm can contribute toward the attainment of multiple goals. Beyond the contract awards that occur naturally, these goals are met using a variety of tools, including limiting competition via sole-sourcing or set-asides, or using bid preferences to advantage the bids of favored firms. Agencies are also encouraged to structure contracts in such a way to make small businesses more competitive.

Each federal agency is assigned its own goal for the share of the value of its procurement contracts that are awarded to small business.[5] The goals are set on an annual basis to reflect the "the maximum practicable opportunity" (15 U.S.C. § 637(d)) for small business awards on agency contracts.[6] SBE goals vary considerably both across agencies and over time. In 2019, Department of Energy had a goal for small business prime contracting of 11.65 percent, while the Small Business Administration's goal was 71 percent.[7] Furthermore, the change in small business goals over time is non-trivial. Figure 2 shows a histogram of the year-over-year changes in the agency goal. While there is a large mass of zero or small goal changes, only 25.8 percent of agency-years have no change in the goal, and one-quarter of the agency-years experience a change in the agency goal of 3 percentage points or greater. One standard deviation of the year-over-year goal change is 2.9 percentage points compared to an unweighted mean goal of 32.2 percent.

There is not a formal rule that dictates the small business goal assigned to an agency. Rather, it is arrived at in a negotiating process between the Small Business Administration (SBA) and the head of each of the 24 cabinet-level federal agencies.[8] Toward the end of each fiscal year, the SBA reviews the agency's awards and proposes an SBE goal for the upcoming fiscal year. The agency can either accept this goal, or provide a counter-proposal. The SBA

[4]The SBA sets size standards to qualify as a small business. The threshold value, and whether the criteria is revenue or number of employees, varies by six-digit NAICS industry. In 2023, the contract-value-weighted average size thresholds were $34 million and 1221 employees across industries that respectively used revenue and number of employee criteria.

[5]This is in contrast to the goals set for the participation of DBEs, WBEs, HUBs, and SDVBs, which do not vary across agencies.

[6]Similarly, an agency-specific goal is set for awards to small business subcontractors. However, data on the value of subcontracts within individual contracts is not publicly available, so I focus attention solely on prime contracts.

[7]Appendix Table C1 displays each agency's goal for two years of the sample, 2009 and 2019, as well as the agency's percent share of federal procurement.

[8]These agencies account for over 99 percent of all federal procurement.

then ensures that the agency goals in aggregate will be sufficient to satisfy the federal-wide goal for small business awards. In the event that the SBA and the agency head fail to agree on an SB goal, the case may be submitted to the Office of Federal Procurement Policy for a resolution.

2.1 Agency accountability

Prior to 2013, the federal government consistently fell short of the federal-wide SB goal, and Congress began efforts to address these failures through legislation. These included failed Congressional bills in early 2012 that would punish agencies for contracting shortfalls by reducing agency funding or disallowing performance bonuses to agency leadership. Against this backdrop, the 2013 National Defense Authorization Act (NDAA) directed agencies to ensure that procurement officials "assume responbility for the agency's success in achieving small business contracting goals."[9] Though weaker than the earlier failed legislation, it resulted in small business contracting performance being part of performance reviews for senior executives.[10]

2.2 Sole-source awards

Contracts may be sole-sourced, i.e. awarded without being subject to competition, to favored firms, provided the value of the contract does not exceed statutory thresholds. The thresholds are adjusted for inflation every five years in accordance with the National Defense Authorization Act of 2005. At the beginning of the sample, sole-source limits were $3.5 million for all contracts in non-manufacturing industries, and $5.5 million in manufacturing (2 digit NAICS codes 31-33). The inflation adjustment in 2010 increased these thresholds to $4.0 million and $6.5 million, respectively. As a consequence of rounding (thresholds above $1 million are rounded to the nearest $500k), no adjustment was made in 2015.

Typically, contracts valued above the simplified acquisition threshold (SAT) must be

[9]The Act contained other small business provisions that were not implemented until 2016, after allowing for a period of public comment. These include whether a joint venture between two small businesses would qualify as a small business and rules pertaining to whether a small business receiving a set-aside award was limited in the portion of the contract it could award to small business subcontractors. Also the size limit on contracts that could be set-aside for women-owned small businesses was lifted.

[10]See July 15, 2014 Congressional testimony by John Shoraka to the House Subcommittee on Contracting and Workforce, and "Obama signs legislation to deliver more government contracts to small businesses," *Washington Post*, January 4, 2013.

subject to competition unless explicit approval is granted.[11] The circumstances under which sole-sourcing is allowed include when there is only one qualified provider of the good or service, the procurement is time-critical, or competition is deemed inadequate even after soliciting proposals. Even still, written justification is to be provided describing the reasons for awarding without competition, with documentation provided. Under the exceptions granted to awards to favored firms, contracts can be awarded to these firms on a sole-source basis without submitting justification, greatly speeding the procurement process.

3 Model of small-business contracting

This section presents a simple model of the awards to small businesses across the fiscal year to meet a year-end contracting goal when there is a possibility of the following year's goal being adjusted in response to the current year's small business awards. A year is divided into two periods, $t \in \{1, 2\}$, with one contract to be awarded per period. Two firms compete for the contracts, one small and one large. The cost of employing the large firm is C^L and deterministic, while the cost of employing the small firm is $C^S \sim F(C^S)$. Henceforth, it is assumed that $C^S \sim U[0, 1]$. The contract must be awarded to the lowest cost supplier, but the agency can opt to award to the small firm even if $C^S > C^L$. Let indicator $s_t = 1$ if the award was made to a small business in period t. There is an annual non-binding goal that $S = s_1 + s_2 \geq g$. If the agency fails to meet this goal, it (or its leadership) faces a penalty K. The degree of ratcheting is determined by a probability p that next year's goal, g', is adjusted to match the prior year's achievement: $E[g'] = pS + (1 - p)g$.

The timing is as follows. In period 1 of the year, the agency learns C_1^S and makes its award decision with the objective of minimizing the current and future cost of contracting, inclusive of penalties. In period 2, the small business receives a new independent cost draw, and the government again makes its award decision. It then learns its goal for the following year.

Here, I consider a year in which $g = 1$. There are three possible outcomes for next year's goal, $g' \in 0, 1, 2$, and denote the continuation value of those three possible outcomes as v_0, v_1, and v_2. Solving recursively, the desired period 2 action depends on the state variable s_1 and the realization of costs:

$$s_2 = s_1 * I(C_2^S < C_2^L) + (1 - s_1) * I(C_2^S < C_2^L + \tilde{K}). \tag{1}$$

[11] Currently the SAT is \$250,000. Contracts whose value is below this threshold are subject to less regulation, including allowing for awarding contracts without subject to competition.

where $\tilde{K} = K - p(v_1 - v_0)$, the effective penalty for missing the goal inclusive of the expected continuation value. If $s_1 = 1$ and the goal is already met, the agency awards the contract to the lowest cost firm. If $s_1 = 0$, the small business is awarded the contract unless its cost disadvantage is greater than the penalty, K, less $p(v_1 - v_0)$, the expected future gain associated with being assigned a lower goal. With $C^S \sim U[0,1]$, the expected value of s_2 is therefore

$$E[s_2] = E[s_1]C^L + (1 - E[s_1])(C^L + \tilde{K}). \tag{2}$$

Now turning to period 1, the small business is awarded the contract if

$$s_1 = I(C_1^S < C^L + \tilde{C}(p)). \tag{3}$$

The term $\tilde{C}(p)$ represents the premium the government is willing to pay to award to the small business. It captures two considerations: awarding to the small business (1) eliminates the possibility of facing a penalty this year while (2) effecting next year's cost via the ratchet effect:

$$\tilde{C}(p) = \overbrace{E[min(C^S, C^L + K + p(v_0 - v_1)] - E[min(C^S, C^L)]}^{\text{Penalty savings less benefit of downward ratchet}} - \overbrace{Pr(C_2^S < C^L)p(v_2 - v_1)}^{\text{Cost of upward ratchet}} \tag{4}$$

$$= (1 - C^L)\tilde{K} - \tilde{K}^2/2 - C^L p(v_2 - v_1). \tag{5}$$

The expected awards to small business in period 1 and 2 are respectively

$$E[s_1] = C^L + \tilde{C}(p). \tag{6}$$

and

$$E[s_2] = C^L + \tilde{K}(1 - C^L - \tilde{C}(p)). \tag{7}$$

Whether the expected value of small business awards is higher in period 2 depends on the degree of ratcheting, the size of the penalty, and the cost advantage enjoyed by the large firm. First consider the case of no ratcheting ($p = 0$), in which case $\tilde{C}(0) = K(1 - C^L - \frac{K}{2})$ and the continuation values are not relevant. When the penalty is set so that the goal is exactly met, there is no annual cycle in awards. The penalty $K = 1 - 2C^L$ will lead to $E[s_1] + E[s_2] = 1$ (the goal is exactly met) and $E[s_1] = E[s_2]$ (there is no annual cycle in awards).

To see how ratcheting can introduce a within-year cycle of small business awards, consider a model with two years, with the goal initially set at $g = 1$. The model ends after period 2, so the continuation values v_0, v_1, and v_2 are equal to the static agency cost when the goal is $g = 0$, 1, and 2, respectively. In particular, the continuation value is the sum of the expected period 1 and 2 procurement cost plus the expected penalty, each of which depends on g: $v_g = E[cost_1; g] + E[cost_2; g] + E[penalty; g]$.

With $p > 0$, the continuation values have the following intuitive form:[12]

$$v_0 = 2E[min(C^S, C^L)] \tag{8}$$

$$v_1 = E[min(C^S, C^L + \tilde{C}(0))] + E[min(C^S, C^L)] \tag{9}$$

$$v_2 = 2E[min(C^S, C^L + K)] \tag{10}$$

Furthermore, the "marginal cost" of the goal is increasing, as $v_2 - v_1 = \tilde{C}(0)(1 + C^L + \tilde{C}(0)/2)$ is greater than $v_1 - v_0 = \tilde{C}(0)(1 - C^L - \tilde{C}(0)/2)$.

Now consider the derivatives of the expected small business contracting shares with respect to the ratcheting parameter p for periods 1 and 2 respectively, with the latter using (6):

$$\frac{\partial E[s_1]}{\partial p} = \frac{\partial \tilde{C}}{\partial p} = (v_0 - v_1)(1 - C^L - \tilde{K}) - C^L(v_2 - v_1) \tag{11}$$

and

$$\frac{\partial E[s_2]}{\partial p} = (1 - E[s_1])(v_0 - v_1) - \tilde{K}\frac{\partial E[s_1]}{\partial p}. \tag{12}$$

Unsurprisingly, the possibility of a future goal reduction is a disincentive for small business awards in both periods 1 and 2. This is seen from the first term in both equations (11) and (12), which contain the difference in continuation values between goals of $g = 0$ and $g = 1$.[13]

More interestingly, two key insights from this model can be seen from examining the second term in these two equations. The first insight, seen from equation (11), is that ratcheting leads the agency to be cautious early in the year for fear of overshooting. The agency anticipates that with probability C^L the small business will be awarded the contract

[12] The expected values found in this expression can be generally written $E[min(C^S, x)] = x(1 - x/2)$. Also note that $E[min(C^S, C^L + \tilde{C}(0))] = E[min(C^S, C^L + \tilde{K})] - \tilde{C}(p = 0)(C^L + \tilde{C}(0)^2/2)$.

[13] The first term of (11) is negative so long as $\tilde{K} < 1 - C_L$. Making this assumption for $\tilde{K}$ rules out a trivial case where the cost disadvantage of even the worst possible draw for the small business would be overcome by the penalty.

next period, and the ratcheting upward of its goal would raise agency cost by $v_2 - v_1$ in the following year. The second insight is demonstrated from equation (12) and shows that the agency then plays catch-up later in the year to make up for the downward effect that ratcheting has on period 1 awards. Higher values of p reduces expected period 1 awards, which in turn leads the agency to increase awards in period 2. The strength of this effect depends on the size of the penalty.

These insights provide a rationale for how the ratchet effect can lead to higher awards late in the year. In general, however, the sign of $E[s_2] - E[s_1]$ is theoritcally ambiguous. In Appendix Figure A1, I present the parameter space that results in $E[s_2] > E[s_1]$ for different values of C^L. For most parameterizations, small business awards are higher in period 2. Only when both the large firm cost advantage is substantial, the penalty K is not large enough to overcome this advantage, *and* the ratchet probability is low do we see small business awards be higher in period 1.

Similarly, while equation (11) is negative, equation (12) cannot be unambiguously signed. To characterize whether $\frac{\partial E[s_2]}{\partial p} > \frac{\partial E[s_1]}{\partial p}$, consider the starting point of no ratcheting. As before, suppose that the penalty is $K = 1 - 2C^L$ so that the goal is exactly met when under no ratcheting, then evaluate the above derivatives at $p = 0$. As p rises from 0, s_1 falls relative to s_2 so long as C^L is above 0.1, which is low compared to the mean of the small business distribution.

4 Data

4.1 Federal contracting actions

The Federal Procurement Data System (FPDS) tracks all non-classified contract actions made by federal agencies.[14] The data contains a large amount of information about the contract award, recipient, product being purchased, nature of competition, form of compensation, among other topics for both the initial award of the contract as well as each subsequent transaction and modification. Only contracts that contribute toward meeting

[14]The data was downloaded from USAspending.gov, a website started in 2007 that contains data from each fiscal year from FY2008.

the small business goal are included.[15]

The data contains the dollar amount obligated by the transaction and the value of any options, the awarding and funding agencies, and the place and time period of contract performance. The contract recipient information includes the identity (unique ID) and location of the awardee, and the type of firm it is (small business, minority-owned, woman-owned, service disabled veteran, HUBzone). The data classifies the type of product by both its six-digit NAICS code and its Product and Service Code (PSC). Finally, the data provides details regarding the nature of competition: whether the award was subject to full and open competition, the number of offers received if open to competition, whether it was set-aside for a particular type of firm, or whether it was sole sourced.

4.2 Agency success in meeting the goal

This section shows statistics related to agency performance in meeting its small business procurement goal. The data used for this measure comes from the annual agency scorecards published by the SBA, and so represent the actual criteria used by the SBA to determine the agency's success in meeting the goal. Figure 4 displays a histogram of the the ratio of the agency's small business awards divided by its goal for the year. The typical agency meets its small business goal. The median value for this ratio is 1.065, and across agency-years, the goal is met 69.6 percent of the time. The 10th and 90th percentiles of the award ratio distribution are 0.88 and 1.27, indicating that rarely does an agency greatly exceed its goal, and rarely does it fall far short.

This distribution masks substantial changes in small business awards over time. Figure 3 shows the share of federal contracting dollars that were awarded to small businesses by fiscal year. Prior to 2013, this share steadily hovered around 22 percent. In 2013, the year the NDAA was passed and greater accountability for meeting the goal was introduced, small business awards immediately rose. The legislation was passed mid-year, which could explain why the full amount of the increase is not immediately felt. These changes can be seen in the distribution of the ratio of awards relative to agency goal. Figure 5 shows the histogram of this measure separately for the pre- and post-2013 time periods. This figure shows that

[15] A variety of exceptions are made depending on the location of performance, funding source, and industry. The complete list of exclusions are provided in the Small Business Goaling Guidelines produced by the SBA, which states that: "Most actions excluded from the goaling base are excluded because they are acquisitions on behalf of foreign governments, statutorily required directed sources, or are funded with agency generated funds." The goaling guidelines can be found here: https://www.sba.gov/document/report-sba-goaling-guidelines. (last accessed March 31, 2024)

the increase in awards from pre-2013 to post-2013 largely came from the bottom of the distribution, as the performance of the lowest awarding agencies was raised to be at or near the goal. Prior to 2013, the small business goal was met in 54.2 percent of agency-years compared to 81.25 percent after.

To provide additional evidence, I estimated a convergence-type specification, regressing agencies' pre-post-2013 change in award ratio (awards/goal) on the pre-2013 level. The regression estimates were $\Delta ratio_i = 1.56 - 1.45 ratio_{i,pre}$ with an R-squared of 0.75. This indicates that an agency meeting its goal in the pre-period ($ratio_{i,pre} = 1$) saw little or no increase in its award ratio. Conversely, an agency in the 10th percentile of the award ratio distribution ($ratio_{i,pre} = 0.75$) increased the award ratio by a 47 percent, enough to meet its goal.

5 Ratchet effect and within-year award cycle

5.1 Goal setting

I begin by providing evidence that the agency's small business goal depends on its awards in the prior year. Figure 6 plots the year-over-year change in the small business goal, $\Delta g_{it} = g_{it} - g_{it-1}$ against the lag gap in achievement, $\tilde{s}_{t-1} = s_{it-1} - g_{it-1}$. From this figure, we see a strong positive relationship, indicating that an agency that exceeds its goal in year $t-1$ experiences an increase in its goal in the following year. Table 1 presents the results of estimating the regression specification

$$\Delta g_{it} = \beta_0 + \beta_1 \tilde{s}_{t-1} + \gamma_i + \rho_t + \epsilon_{it}. \tag{13}$$

where γ_i and ρ_t represent agency and year fixed effects, respectively. The specification shown in column (1) of Table 1 excludes these fixed effects. I obtain a point estimate of β_1 of 0.33, indicating that an agency exceeding its small business goal by 10 percentage points would experience a 3.3 percentage point increase in its goal in the following year. Columns (5) and (6) of this table display specifications that add in year and agency effects. With the full set of fixed effects, the estimated coefficient rises to 0.42.

Empirically, agency goals are set so that the federal-wide goal would be met exactly

if agencies complied exactly with the implied goal.[16] A shock that increases utilization consequently would lower agency goals across the board. Column (2) of Table 1 presents the results of including an indicator for the post-2013 time period and an interaction between this indicator and $\tilde{s}_{it-1}$. The estimates indicate that the average goal was 1.3 percentage points lower in the post-2013 time period. The coefficient on the post$\times\tilde{s}_{it-1}$ interaction term is small and not statistically significant, suggesting that the gradient between the goal change and past achievement was unaffected by the reform.

Next, I examine how the ratchet effect may differ by agency size. Since goals are set as the result of negotiation, agency size may proxy for bargaining power. Column (3) includes an interaction between $\tilde{s}_{it-1}$ and the agency's share of federal procurement spending. The estimated coefficient on this interaction term is -0.3, indicating that increasing the agency share of federal procurement lowers the effect of $\tilde{s}_{it-1}$. The Department of Defense accounts for more than 60 percent of federal procurement spending, so it is instructive to consider the DoD separately as it drives much of the variation in spending share. Column (4) therefore includes a DoD indicator and its interaction with $\tilde{s}_{it-1}$. Combining the main coefficient on $\tilde{s}$, estimated to be 0.34, and the $DoD \times \tilde{s}$ coefficient estimate of -0.27, yields a DoD-specific coefficient estimate of 0.07. This indicates that the DoD's achievement does not translate readily into increases in its goal.[17]

5.2 Within-year cycle of awards

I now turn to the pattern of agency awards over the fiscal year. As discussed in the introduction, Figure 1 presents data at the fiscal week level for all federal procurement showing a dramatic increase in small business awards in the final weeks of the fiscal year. Two series are plotted in this figure the share of contracts awarded to small businesses in each fiscal week and the cumulative small business share up to that week.[18] In the first twenty weeks of the year, the weekly SBE shares typically range from 15 to 20 percent. Consequently, the cumulative SBE share as of week 18 is at its low point of the year at 17.54 percent.

[16] Taking the average goal weighted by agency contract volume yields what the government-wide achievement would be under exact compliance, and this is within a percentage point of being true in every year of the sample.

[17] It is important to note that this does not imply that the ratchet effect is not an important incentive within the DoD. It sets specific SBE goals for the sub-units within the Department, and the procurement choices made by these sub-units will aggregate.

[18] To form these measures, the total value of contract awards and the value of SBE awards are summed by week across years all years. The SBE share within week w is therefore equal to $\sum_{y=2008}^{2020} v_{wy}^S / \sum_{y=2008}^{2020} v_{wy}^T$, where v_{wy}^S is the value of awards to small businesses in week w of year y, and v_{wy}^T is the value of total awards.

Subsequently, the weekly award share begins to rise noticeably, and the cumulative share slowly begins to rise. Then in the final eight weeks of the year, there is a surge of small business awards, with a raw average of weekly SBE award share of 0.30.

While the visual evidence is striking, it is important to control for the characteristics of contracts and how they may differ over the fiscal year. Barattieri et al. (2023) and Auerbach et al. (2020) note the seasonality in the data by industry, so it is necessary to include controls for industry composition of contracts. Contract size could also differ systematically over the year, for instance if higher priority contracts are awarded early in the budget cycle, or expiring end-of-year budgets lead to different types of purchases toward the end of the year as in Liebman and Mahoney (2017). To that end, I estimate the following regression specification at the agency-week level:

$$s_{iwy} = \beta_0 + \sum_{q=2}^{4} \beta_q I(qtr_w = q) + BX_{iwy} + \rho_i + \zeta_y + \epsilon_{iwy} \tag{14}$$

where s_{iwy} is the share of an agency i's contract dollars that are awarded to small businesses in week w of fiscal year y. The variables of interest are indicators for the quarters 2, 3, and 4, $I(qtr_w = q)$. The vector of controls X_{iwy} includes the share of contract values that week by industry, four contract size bins, and region of performance. Controls for agency effects (ρ_i), year effects (ζ_y), and also year*agency effects are sequentially included.

The results of estimating (14) are presented in Table 2. The specification shown in column (1) includes only agency effects as controls, and I estimate that the small business share in quarter 2 is not statistically different from quarter 1 for the average agency. The SBE share in quarter 3 is 2.0 percentage points higher than quarter 1, while the quarter four SBE share is 4.9 percentage points higher.[19] Both of these point estimates are largely unaffected by the inclusion of year effects (column 2), agency*year effects (column 3), controls for region and industry (column 4), and transaction size (columne 5).[20]

To examine whether the increase in SBE award share occurs close to the end of the year,

[19]The magnitude of these effects is smaller than what is seen in Figure 1 because they are unweighted agency-level shares, while the SBE shares plotted in the figure are effectively weighted by agency size. In Panel A of Appendix Table C3, regression estimates that weight by agency size are shown, which as expected yield estimates of a larger magnitude.

[20]The variable of interest in these regressions is the SBE share of all procurement dollars, which includes both new contracts as well as contract actions on existing contracts. The control for transaction size may not be an adequate control for the suitability the agency's contracts for SBEs if they represent in part smaller modifications to much larger projects. To address this concern, Appendix Table C3 estimates a similar specification restricting attention to only new awards. The point estimates of the quarter 3 and quarter 4 indicators are of slightly larger magnitude than the baseline results.

I also estimate a version of (14) where indicators for fiscal week enter the specification rather than the single quarter 4 indicator. The estimates of these 13 coefficient estimates and their 95% confidience intervals are presented in Figure 7, along with the quarter 2 and quarter 3 estimates. This figure reveals that the quarter 4 effect is particularly pronounced in the final four weeks of the fiscal year.

It is important to demonstrate that the end-of-year increase in SBE share represents a conscious effort by agencies rather than being driven by the unobserved contract attributes that happen to correlate with time-of-year. A first step in that direction is to examine contract set-asides and other forms of non-competitive tender. The final column of Table 2 includes as a control variable the share of contract dollars that are awarded via set-aside by the agency in that week, and a separate control for the share awarded under less than full competition for a reason other than set-asides. Including these variables substantially attenuates the quarter 3 and 4 point estimates. Without these controls, the average agency awarded 4.9 percentage points more in contract awards in the fourth quarter than the first, but with these controls added, the coefficient estimate is 0.018, indicating that set-asides and other non-competitive awards account for two-thirds of the quarter four effect. The set-aside share coefficient is interesting in its own right. Each percentage point of additional awards via set-asides is associated with a 0.81 percentage point increase in small business awards, implying that small businesses are fairly reliant on set-aside awards at the margin.

These results imply that non-competitive awards exhibit a seasonal pattern. This is explored directly in Table 3. This is an identical regression specification as equation (14), but the dependent variable is instead the set-aside share of an agency's contracts in a given week. Table 3 presents the results.[21] As expected, there is a statistically significant increase of 3.5 percentage points in the set-aside share in the fourth quarter relative to quarter one. This estimate is virtually unaffected by the inclusion of agency, year, and agency*year effects, as well as region, industry, and contract size controls.

5.3 Connecting annual cycle to ratchet effect

To connect the annual cycle of small business awards to the ratchet effect, I estimate agency-specific ratchet coefficients in the following specification:

$$\Delta ln(g_{it}) = \beta_0 + \sum_i \beta_i \Delta ln(s_{i,t-1}) + \rho_t + \epsilon_{it}. \tag{15}$$

[21] Appendix Table C2 presents a similar set of results for other non-competitive actions.

The coefficients β_i represent agency-specific elasticities of the goal with respect to the share of agency contracts awarded to small businesses in the prior year. The mean elasticity across agencies is 0.17 (s.d.= 0.28), and for 29 percent of agencies $\beta_i \leq 0$.

Table 4 presents specifications where the degree of annual cycling is allowed to differ depending on the estimated $\hat{\beta}_i$. A one standard deviation increase in the agency elasticity increases the quarter four effect by 1.8 percentage points but does not statistically affect quarters two or three. In columns (2) and (3) of Table 4, the sample is separated into agencies with estimated β_i above or below the median agency. Again, we see a stronger quarter four effect for those agencies with higher estimated $\hat{\beta}_i$, as the point estimate is .064 (S.E.=0.0075) if $\hat{\beta}_i$ is greater than the median and 0.034 (0.010) below.

5.4 End-of-year awards and pace relative to goal

Are year-end awards greater for agencies behind their annual goal? I now estimate a regression specification where the independent variables of interest are a measure of the achievement gap as of the prior week, and an interaction of the achievement gap with the time until the end of the year. To capture time until end of year, I use indicator variables for being in fiscal weeks 47-52 (within six weeks of the year's end), weeks 41-46 (6-12 weeks away), and 12-26 weeks away (fiscal weeks 26-40). The first half of the year is combined together into the excluded category, chosen because of the general lack of a trend in SBE awards during this time as shown in Figure 1.[22] The equation to be estimated is thus

$$s_{iwy} = \gamma_0 + \gamma_1 a_{iwy} + \gamma_2 a_{iwy} I(w \geq 47) + \gamma_3 a_{iwy} I(41 \leq w \leq 46) + \gamma_4 a_{iwy} I(23 \leq w \leq 40) + \Gamma X_{iwy} + \rho_{iy} + \epsilon_{iwy} \tag{16}$$

All specifications include agency*year effects, ρ_{iy}. Some specifications also include agency*week effects and the same set of controls X_{iwy} as described for Table 2.

The variable of interest in this specification is the log of the ratio of the agency's goal for the year divided by year-to-date share of dollars awarded to small businesses: $a_{iwy} = log(G_{iy}/s_{iy,w-1})$, where w is again the week of the fiscal year. The variable a_{iwy} is an intuitive measure, as it represents how much the agency must accelerate its pace of small

[22] One advantage of including these interaction terms is that one can account for possible correlation over time in small business awards. This is a criticism of similar specifications in prior work on the ratchet effect, as described by Matějka et al. (2024). If there is a general tendency for awards in one week to be correlated with prior awards in the year, this should be captured by the interaction terms $\gamma_3 a_{iwy} I(41 \leq w \leq 46)$ and $\gamma_4 a_{iwy} I(23 \leq w \leq 40)$.

business awards to meet the year end goal. To see this, substitute $g_i = Y_i^S/Y_i$ and $s_{i,w-1} = y_{i,w-1}^S/y_{i,w-1}$, where Y_i^S is the required dollar value of awards for the year to small businesses and Y_i is the total value of agency awards. The lower case terms represent the year-to-date awards achieved. Rearranging terms, we see that $a_{iw} = ln(y_{i,w-1}/Y_i) - ln(y_{i,w-1}^S/Y^S)$. The variable a_{iw} is therefore approximately the percent difference between the share of agency dollars already awarded and the fraction of the year's small business awards already achieved.

The results are presented in Table 5. In Panel A, the specification (16) is presented including all years in the data. Early in the year, the achievement gap entering a week is uncorrelated with small business awards that week. Later in the year, there is a statistically significant acceleration in awards toward the end of the year when the agency is behind the goal. The estimate of coefficient γ_2 is 0.14, as shown in column (1), greater than the estimates of γ_3 and γ_4. Having an achievement gap of 0.10 log points in the final six weeks of the year is associated with an increase in the small business share of 0.014. This point estimate changes little upon the inclusion of contract covariates and agency*week effects.

The last three columns of this table show specifications with the share of contracts awarded via set-aside as the dependent variable. The estimates shown in columns (4) and (5) suggest that the set-aside share is higher the farther behind the agency is at the end of the year. However, upon the inclusion of agency*week effects, this coefficient is smaller and no longer statistically significant.

In Panels B and C of Table 5, I present the estimates separately for the period before and after the increased incentives for meeting the goal introduced by the 2013 NDAA. These results demonstrate that the end-of-year acceleration is concentrated in the years following the passage of this legislation. The coefficient on the interaction between a_{iwy} and the indicator for being in the final six weeks of the year is concentrated in the post-2013 period. Across the specifications with different controls, the point estimate of this coefficient varies between 0.23 and 0.26, compared to between .052 and .12 in the specifications from the pre-2013 period. The use of set-asides in the final six weeks in response to the gap between the agency's goal and its cumulative SBE utilization is also much larger in the post period. The point estimates as shown in columns (4)-(6) of the interaction between a_{iwy} and the indicator $I(w \geq 47)$ ranges from 0.074 to 0.12 depending on the specification, compared with point estimates that are virtually zero in the pre-2013 period.

5.5 Entry response by small business

The annual cycle in the small business share would lead to efficiency loss if marginal cost is increasing, for instance due to capacity constraints. This effect would be limited if small and large businesses can reallocate capacity over the year. This section addresses the question of capacity allocation by examining the number of bidders per contract. If firms are unable to reallocate limited capacity intertemporally, then there will be few potential bidders per contract when contract volume is high. This makes expected profits greater during those times, creating an incentive to reallocate capacity from when contract volume is low. If firms can take advantage, it will smooth the number of bidders per contract over time. However, liquidity constraints are likely to constrain the ability of small businesses to arbitrage intertemporal profit opportunities, in which case later in the year there are many contract opportunities relative to the number potential bidders and therefore few bidders per contract.

This subsection estimates the extent of an annual cycle in the number of small bidders per contract. Evaluating this is complicated by the fact that the federal procurement data reports only the total number of bidders, not the number of bidders by firm type. The exception is for set-aside contracts, where typically size is a criteria for qualification even if the contract is not explicitly a small business set-aside. I focus is on definitive contracts that are either set-aside or open to full competition, where the number of offers has a more clear interpretation. Because the number of bidders has an unusually large range (from 0 up to 999), the number of bids are winsorized at 10%, and the dependent variable is in logs. The following specification is estimated:

$$ln(y_{im}) = \beta_0 + \sum_{m \neq 4} \beta_m SA_{im} * I[month = m] + BX_{im} + \epsilon_{im}. \tag{17}$$

This compares the log number of offers submitted for set-aside contracts compared with contracts open to full competition, conditional on a vector of covariates, X, which includes month effects, year effects, controls for binned contract value, product code indicators, and industry indicators. The results are shown in table 6, and they suggest that small business entry into the competition for contracts follows an annual cycle that is counter-cyclical to demand for small businesses by the federal government. Beginning in the 9th month of the fiscal year, the number of bidders on set-aside contracts declines relative to open competition contracts. The month 9 point estimate is -0.09, while the 12th month point estimate is -0.23, suggesting that set-aside contracts awarded in the last month, when set-aside contract volume is highest, receive 23 percent fewer bids than open-competition contracts awarded

at the same time. This represents 0.69 fewer bidders for the average (winsorized) contract. In the specification shown in column (2), the sample is restricted to larger contracts above $25k in value, and the results are unchanged.

A reduction in the number of bids submitted by small businesses on set-aside contracts at the end of the year could represent these firms being stretched thin by the demand from federal agencies. To test this hypothesis, I form three additional measures that captures the impact of demand on small business participation. One is the share of contracts awarded by the agency non-competitively in the same month, the second is the leave-out small business award share for the agency within the same month, and third is the small business award share by the agency in the prior three months. The specification shown in column (3) includes the first measure. The point estimate on the variable of interest is -0.38, suggesting that a one standard deviation increase in the non-competitive share is associated with an 8 percent decline in the number of bidders. The specification in column (4) includes the second and third measures. Greater agency awards to small businesses in the month are associated with significantly fewer bidders on small business contracts. Furthermore, consistent with a backlog effect, the share of agency awards to small businesses in the prior three months is associated with a reduction in small business participation

6 Sole-source thresholds

In this section, I examine sole-source thresholds, and how contract values are adjusted so that awards can be made to favored firms without being subject to competition. This exercise will provide direct evidence that agencies are taking conscious action to direct contracts to small businesses, particularly toward the end of the fiscal year, and after the 2013 change in manager incentives. Furthermore, this section provides evidence more generally about these sole-source thresholds that to my knowledge has not been previously explored in the literature.

I examine the manipulation of contract values under the sole-source threshold. Contracts under this threshold can be awarded to small businesses that are minority- or women-owned, are owned by service disabled veterans, or are located in HUB Zones without going through the process of subjecting the award to competition or justifying the use of sole-sourcing. This allows contracts to be more rapidly directed toward preferred firms. As described in section 2, the non-manufacturing sole-source threshold was $3.5 million, which was increased to $4.0 million in 2010, while the threshold for manufacturing contracts was $5.5 million

prior to 2010 and $6.5 million thereafter. Government agencies can alter contract values by distorting the quantity or characteristics of the item being purchased, by including fewer contract options, or through direct negotiation between contractor and agency. Only dollars actually obligated count toward meeting an agency's affirmative action goals, while the value inclusive of options determines whether the contract is allowed to be sole sourced without justification. Changing the contract value in response to the sole-sourced threshold can represent a costly distortion, either if characteristics of the good is altered (by choosing lower quality items, or by splitting a contract that would more efficiently be provided as one) or if options are not included that otherwise would be.

To estimate the degree of excess bunching in the distribution of contract values around the sole-source thresholds, I adopt a similar approach as developed by Diamond and Persson (2016) and used by Chen et al. (2021). Using this method, I estimate the counterfactual distribution of contract value in the absence of bunching, which can then be applied to obtain an estimate of the degree of excess bunching and the magnitude of the resulting distortion in contract size. Contracts are first centered around the relevant sole-source threshold, $\tilde{v_i} = v_i - V_0$, and then grouped into J bins, v_j. The count of contracts, c_j, within each value-bin is modeled as a kth order polynomial:

$$c_j = \sum_{k=0}^{p} \beta_k \cdot (v_j)^k + \gamma_j \cdot \mathbf{1}\left[v^{*-} \leq v_j \leq v^{*+}\right] + \eta_j \tag{18}$$

The parameters v^{*-} and v^{*+} define the lower and upper bounds of the manipulation region, where some contracts with a desired centered contract value above the sole-source threshold V_0 and below v^{*+} are altered to have a centered contract value between 0 and $V_0 - v^{*-}$. Outside of the manipulation region, contracts are assumed to be unaffected by the sole-source threshold, and thus the unmanipulated distribution, $f_0(\tilde{v})$ is equal to the observed distribution $f_1(\tilde{v})$ in this range. The predicted value, $\hat{c}_j = \sum_{k=0}^{p} \beta_k \cdot (v)^k$, provides an estimate of f_0.

The order of the polynomial, k, the lower-and upper bounds of the manipulation region, v^{*-} and v^{*+}, are determined empirically using $K-$fold validation, and the parameters of the polynomial function, β_k, are estimated using non-linear least squares. Further details are provided in Appendix Section B.

The results of this estimation are presented in Figure 8. The width of the manipulation region runs from $150 thousand below the sole-source threshold to $950 thousand above, the latter indicating the most that agencies are willing to adjust the contract value downward

to award it on a sole-sourced basis to favored firms.

One object of interest that can be estimated from this exercise is the magnitude of the distortion that this creates. The dollar value of adjustment that the average contract within the manipulation region can be estimated by $\Delta v = \sum_{j/v_j \in [v^{*-}, v^{*+}]} v_j [f_1(v_j) - f_0(v_j)]$. As reported in the figure, the average contract within the manipulation region is \$57 thousand smaller than it would have been in absence of manipulation. This represents 1.3 percent of the average contract value within the manipulation region. Furthermore, I estimate that 18.5 percent of the contracts within the manipulation region have been manipulated from above the threshold to below it. An estimate of the change in contract value among the population of manipulated contracts can be obtained from the expected distance of these contracts to the sole-source threshold. Doing so indicates that the average manipulated contract was adjusted downward in value by \$335 thousand, or 7.7 percent of the average contract value within the manipulation region.

6.1 Bunching by contract characteristics and outcomes

In Figure 9, I plot the distribution of the value of initial contract award near these thresholds for several subsets of the contract data. The contract value is centered around the relevant threshold for the year of contract award and product industry.[23] The figure then plots the fraction of contracts within bins of width \$50 thousand. In Panel (a), the contract value distribution is shown separately for favored vs. un-favored firms. This figure demonstrates a substantial degree of bunching for favored firms

To support the conclusion that the bunching in the value distribution is related to the sole-sourcing thresholds, in Panel (b) the distribution of contract values is plotted separately for sole-sourced contracts and other contracts awarded using less than full and open competition. From this figure, we see that there is substantial bunching in the value distribution of sole-sourced contracts, and little-to-no bunching of the value distribution of other awards with limited competition. This evidence makes apparent that the bunching in the contract value distribution arises from a desire to award sole-sourced contracts to favored firms, and that the value of the contract is adjusted to facilitate this.

Next, I connect the manipulation of contract values with the incentives of agencies to award contracts to small businesses. I do so along three dimensions – the timing of contract awards within year, the strengthening of incentives for agencies to meet the non-binding

[23] In Appendix Figure C2, I show the distribution of contract value separately by year to show that the bunching of the value distribution follows the threshold as it moves.

affirmative action goals after 2013, and finally the acceleration of awards toward the end of the year when small business awards are lagging behind the annual goal. In Panel (c) of Figure 9 I show the distribution of contract awards in the first quarter and the fourth quarter. Consistent with the results presented in section 5.2, agencies attempt to sole-source contracts from favored firms more late in the year than early. Contracts awarded in quarter one are nearly twice as likely to have a contract value within $50 thousand dollars of the threshold. Next, I examine the distribution of contract values by whether the contract was awarded prior to 2013. Starting in this year, the success of agencies in meeting the small business contracting goals was included in the performance reviews of agency managers. Panel (d) presents the results, demonstrating that awards within $50 thousand dollars of the threshold were more likely post-2013 than before.

In Figure 10, I present evidence linking the desire to sole-source contracts from favored firms with the agency's need to catch-up to its annual goal. I begin by estimating the regression specification

$$y_{ijt} = \beta_0 + \sum_k \beta_k I[V_{ijt} \in bin_k] + \rho_t + \gamma_j + \epsilon_{ijt} \tag{19}$$

The coefficient β_k represents the average value of outcome y_{ijt} for contracts whose value lies within bin k, where i, j, and t represent contract, agency, and year, respectively. Bins are $150 thousand wide between in a $3 million band around the the sole-source threshold, with additional indicators for being more than $1.5 million below and above this band. Finally, an indicator for being exactly at the threshold is also included. The regression also includes agency, year, and fiscal week fixed effects.

The first outcome considered is the log achievement gap measure introduced in section 5.4, estimated for contracts awarded in the fourth quarter. In Figure 10, these coefficients, and their confidence intervals, are plotted separately for pre- and post-2013 time periods. In the pre-2013 period shown in panel (a), there is little difference in the achievement gap across contracts of different sizes, suggesting that prior to 2013 there is not differential selection into sole-sourcing based on the need to award more contracts to small businesses. Panel (b) presents the results for the time period after the policy change. In contrast to the pre-period, there is a large positive coefficient for contract values exactly equal to the sole-source threshold. Agencies awarding contracts exactly at that threshold were 4.0 percentage points farther from meeting their small business goal than contracts farther away from the threshold

(p=0.053).[24]

Finally, I perform a similar exercise to examine distortions resulting from this bunching. How do agencies alter contracts to meet the threshold? In Figure 11, I examine the share of the contract value that is comprised of options. Manipulation of contracts with an option is likely less costly than adjusting the good being purchased. This figure presents the results of estimating equation (19), with the outcome being the option share. For contracts with a total value equal to the threshold, the share of the value comprised by options are 58 percentage points higher than the omitted category (contracts with values more than $1.5 million below the threshold, for which the use of options is rare) and 15 percentage points more than the adjacent bin above the threshold. This result points toward a selection effect. Reducing the use of future options is a straightforward way to lower the contract value but is only feasible for contracts that use options. Therefore, the set of contracts whose value has been manipulated below the threshold are a selected sample of contracts that make more intensive use of options.

7 Conclusion

In this paper, I document that the small business contracting goals exhibit a ratchet effect, where the goal assigned to an agency is increasing in the prior year's awards. Consistent with a model of contracting decisions where agencies must make award decisions early in the year under uncertainty about small business awards later in the year, I find that awards to small businesses increase substantially towards the end of the year. Agencies attempt to catch-up when behind the goal, but only after a 2013 change that sharpened manager incentives. The resulting distortions can be seen along several dimensions. Set-asides are used more intensively later in the year, contract values are adjusted downward to meet sole-source thresholds, and options, which don't count toward satisfying the current year's goal, are used less intensively. Furthermore, small businesses are unable to adjust entry in response. The magnitude of these effects are potentially significant, in light of the scale of federal procurement and given the 23 percent federal goal for small business participation.

What policy options might the government have that would limit the ratchet effect while still asking more of agencies who are better able to contract with small business? The model suggests that the within year uncertainty about small business awards can lead to a fear

[24]The reference group in this regression are contracts more than $1.5 million below the sole-source threshold.

of overshooting, where agencies are more conservative in their awards early in the year. Weakening the correlation between current year awards and next year's goal would lessen this worry. This could be accomplished by basing future goals on a longer average of prior years. Alternatively, a more immutable criteria could be used to set future agency goals, such as the expected small business awards based on the small business representation in the industries from which the agency has historically contracted.

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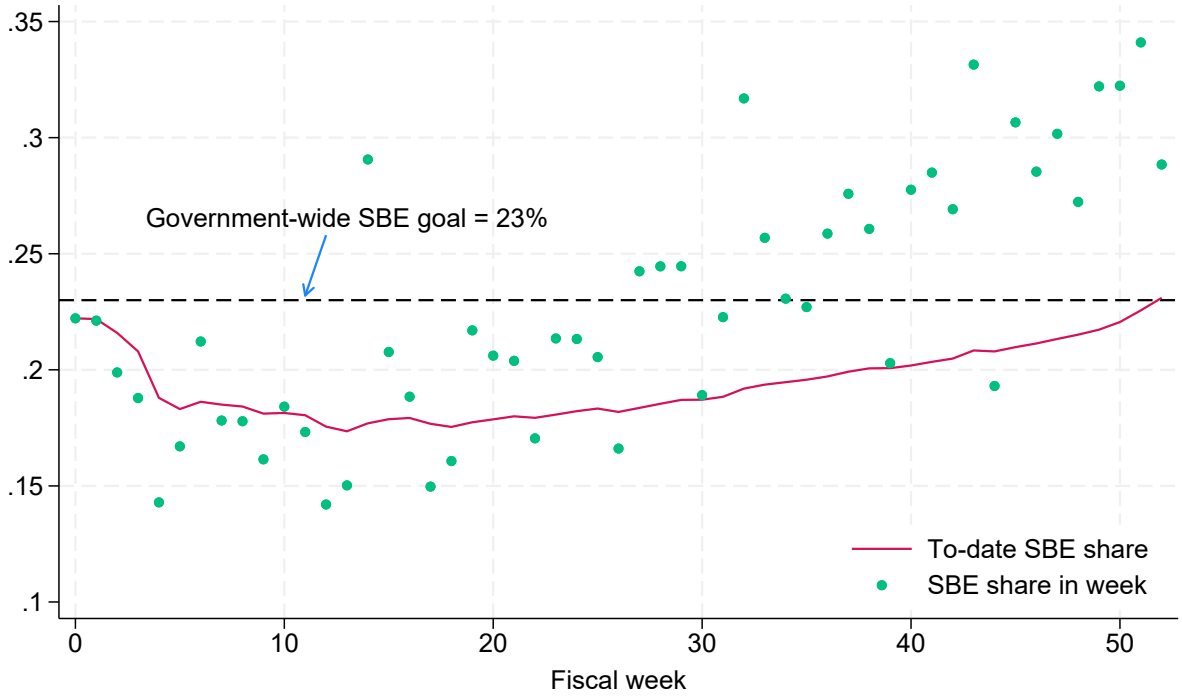
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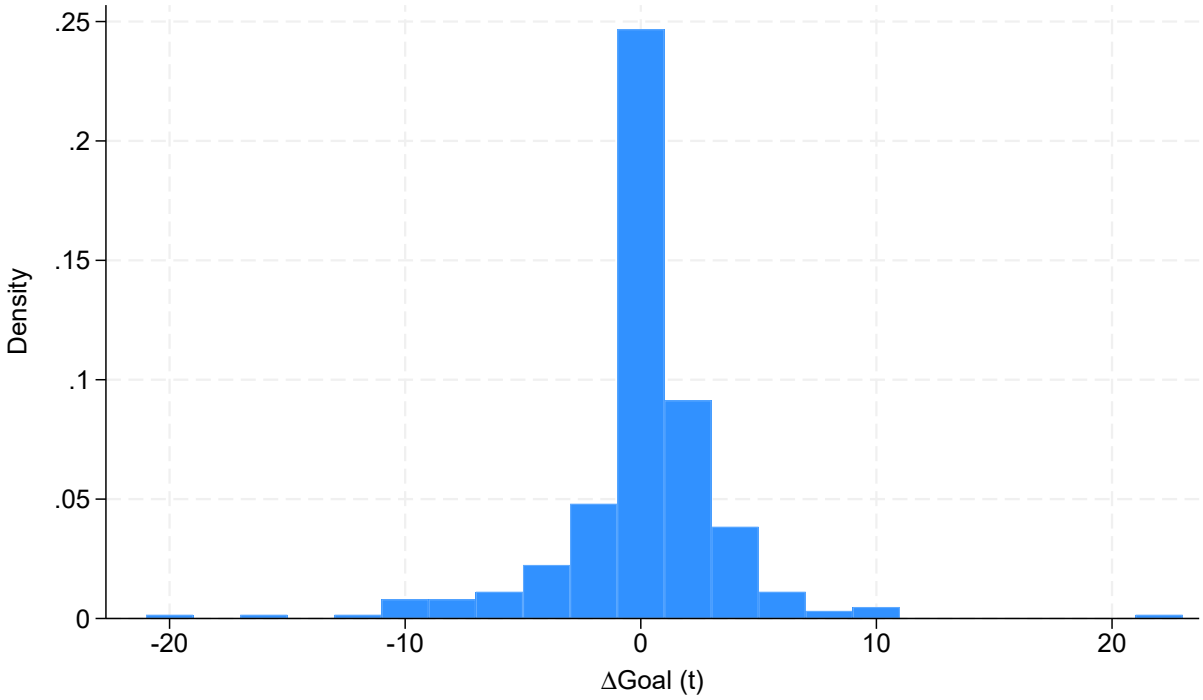
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Figure 1: Small businesses' share of procurement dollars, cumulative and by week



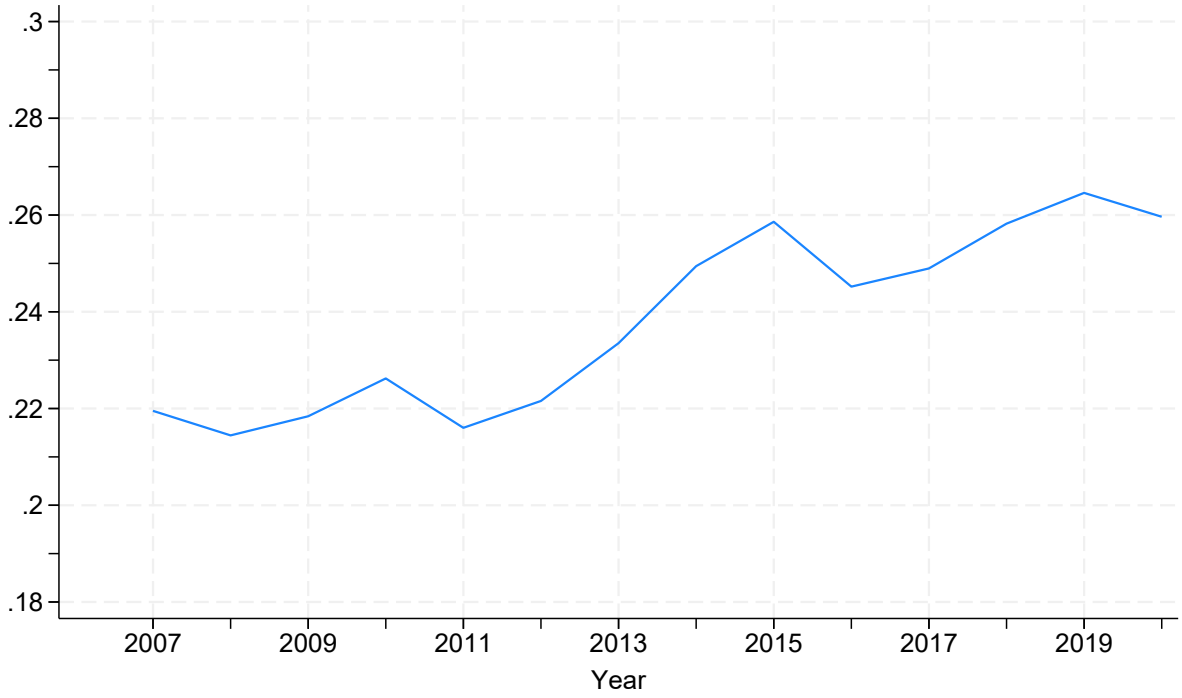
Notes: The unit of observation is a fiscal week from 2008-2020. The SBE share is the fraction of dollars awarded to small businesses in that fiscal week. The to-date SBE share is the portion of dollars awarded as of that week across all agencies.

Figure 2: Distribution of changes of agency small business goals



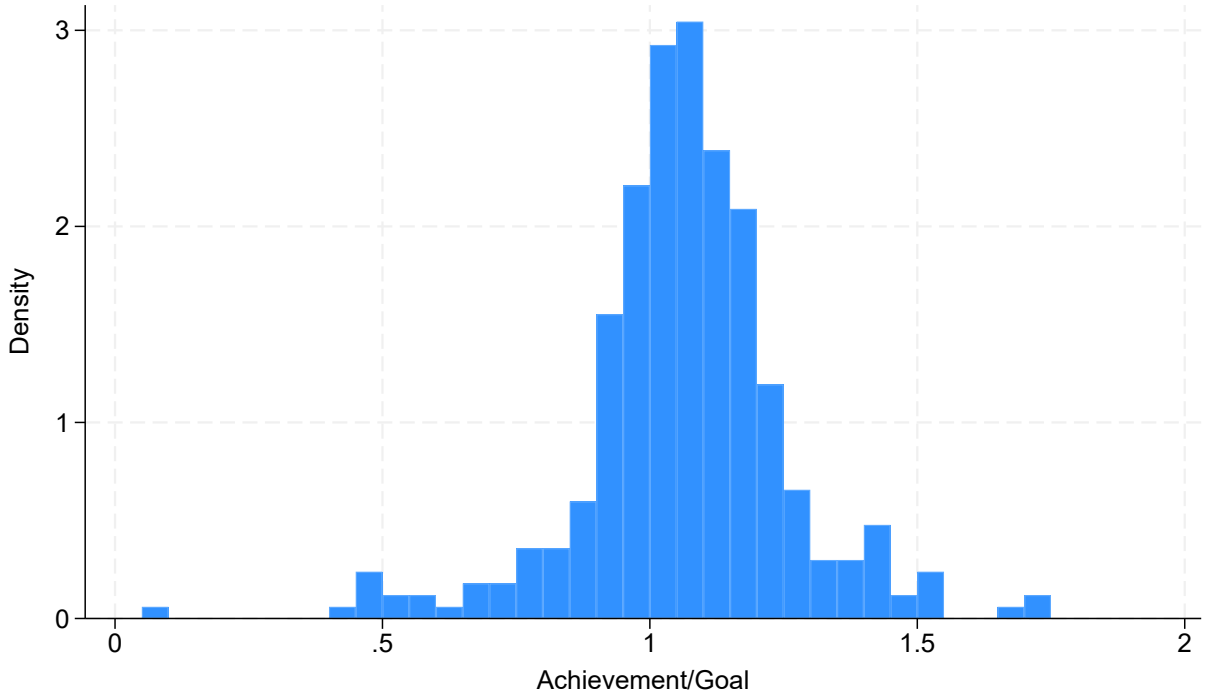
Notes: A histogram of the yearly first difference in agency SBE goals from 2007-2020.

Figure 3: Federal small business awards by year



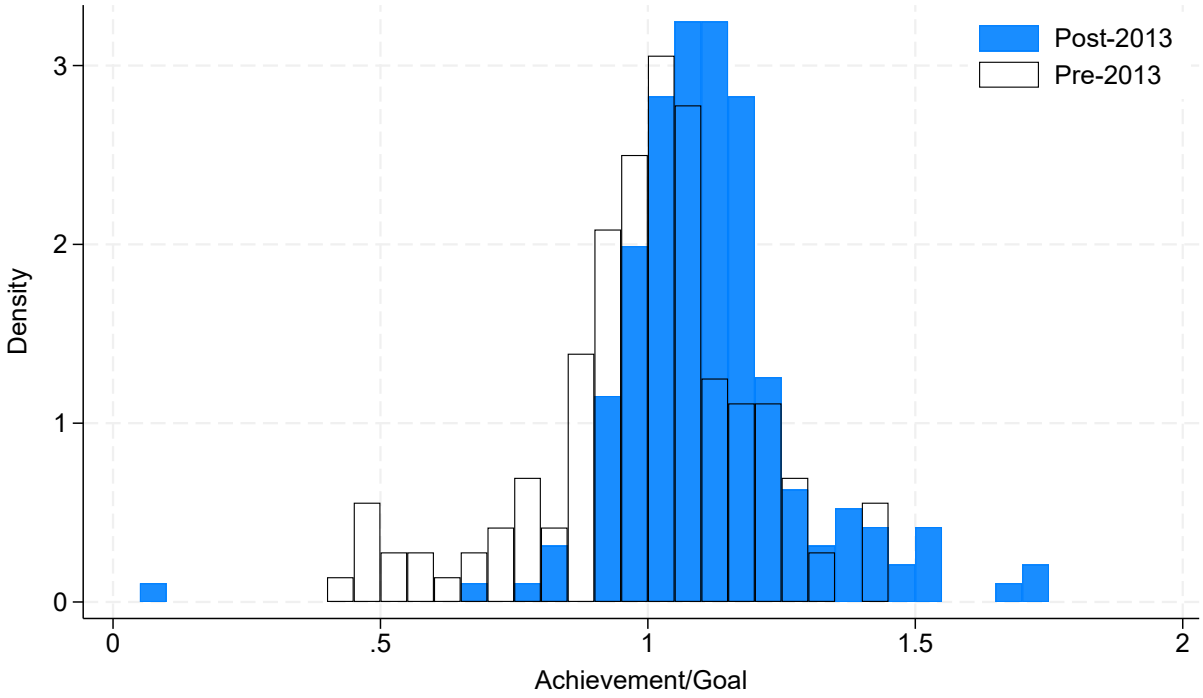
Notes: The overall share of federal procurement dollars awarded to small businesses by year.

Figure 4: Small businesses' share of procurement dollars relative to agency goal



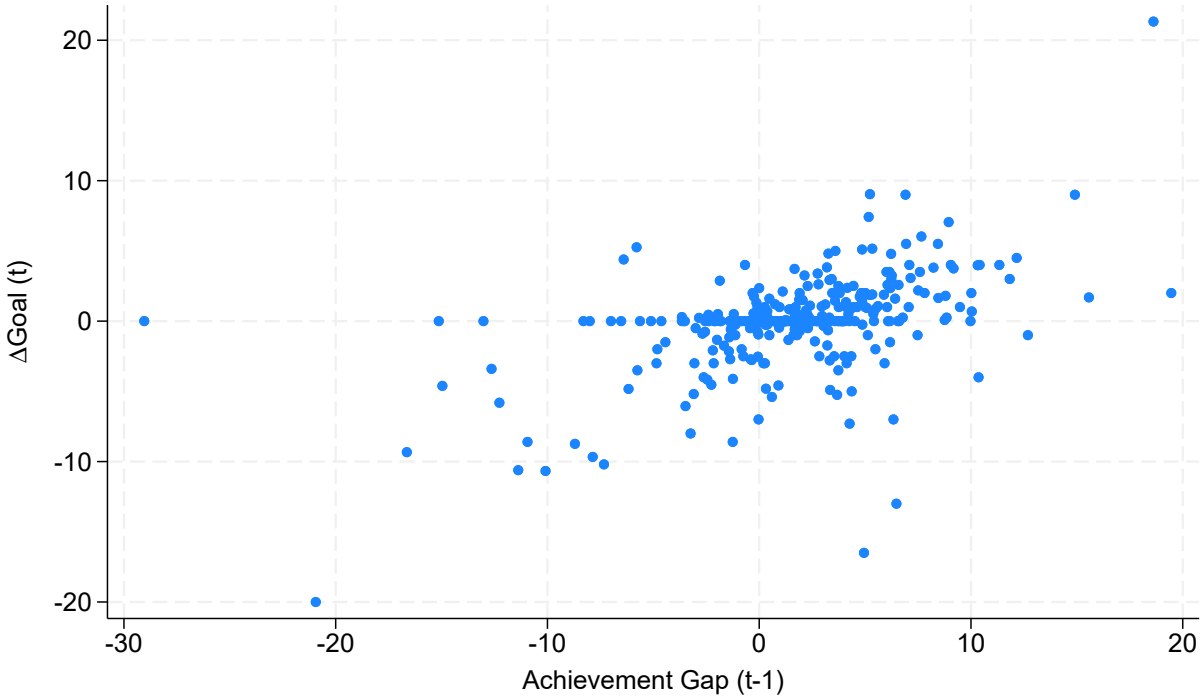
Notes: A histogram of the ratio of small business share of agency procurement awards in dollars. The unit of observation is an agency-year between 2007 and 2020.

Figure 5: Small businesses' share of procurement dollars relative to agency goal



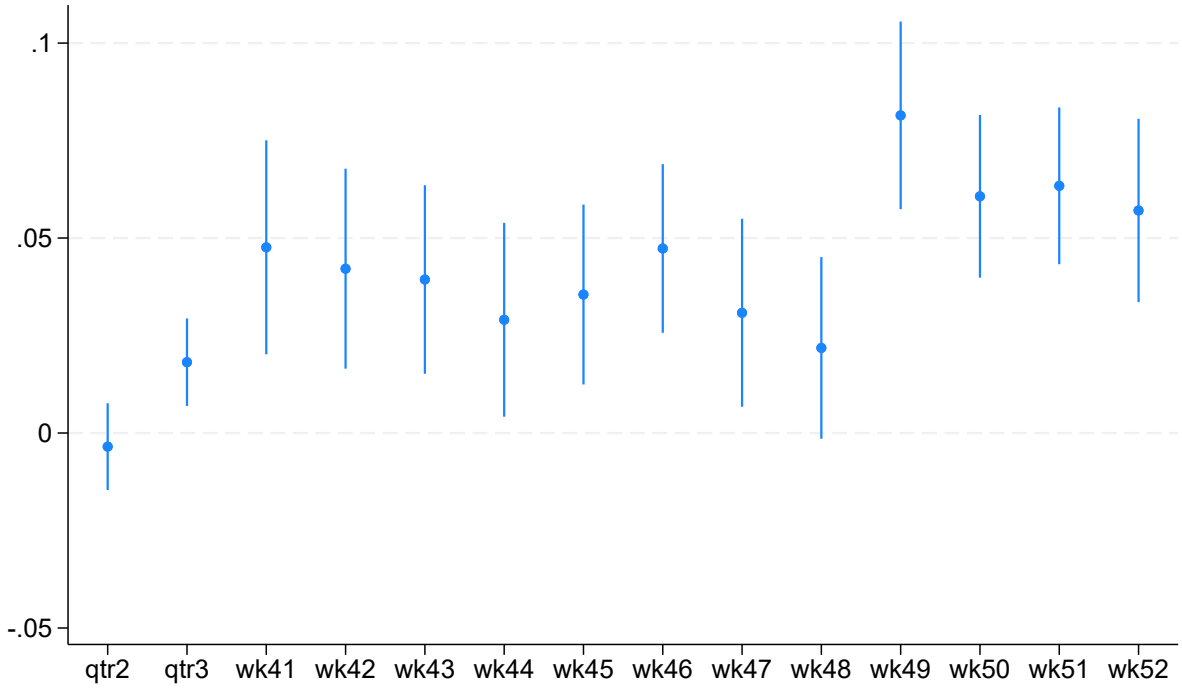
Notes: A histogram of the ratio of small business share of agency procurement awards in dollars. The unit of observation is an agency-year between 2007 and 2020.

Figure 6: Change in agency small business goals and prior achievement



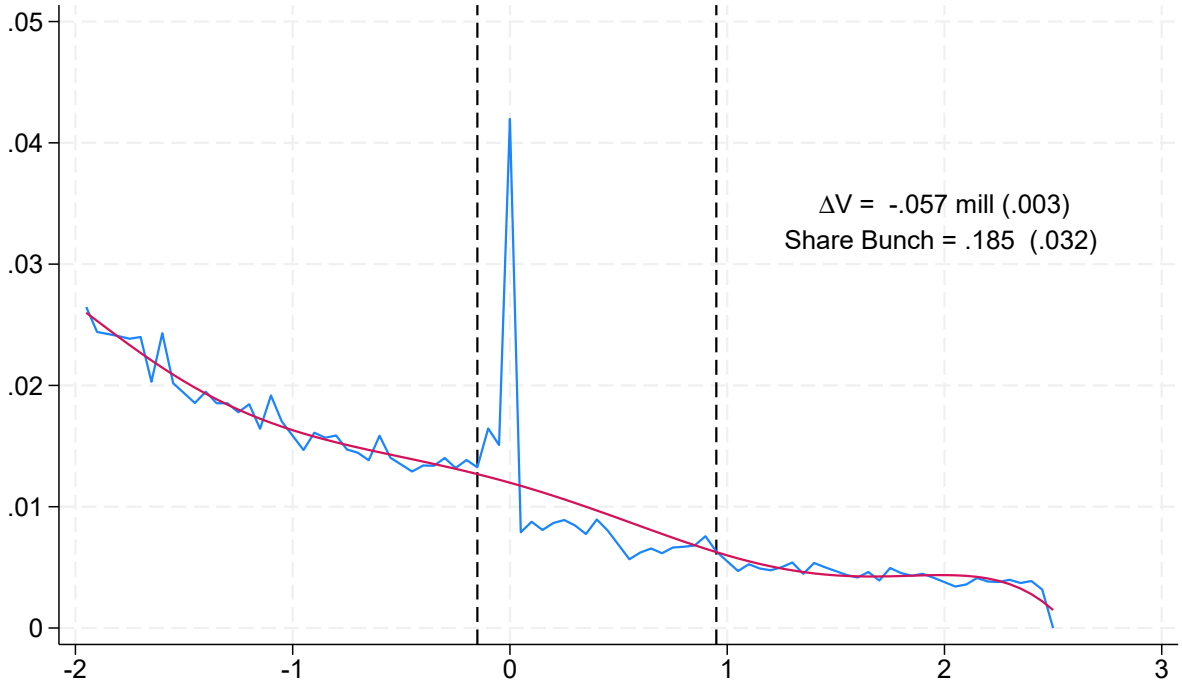
Notes: The unit of observation is an agency-year. The year-over-year change in the agency small business goal is plotted against the gap between small business award share and the agency goal in the prior year.

Figure 7: Fiscal week coefficients from small business share specification



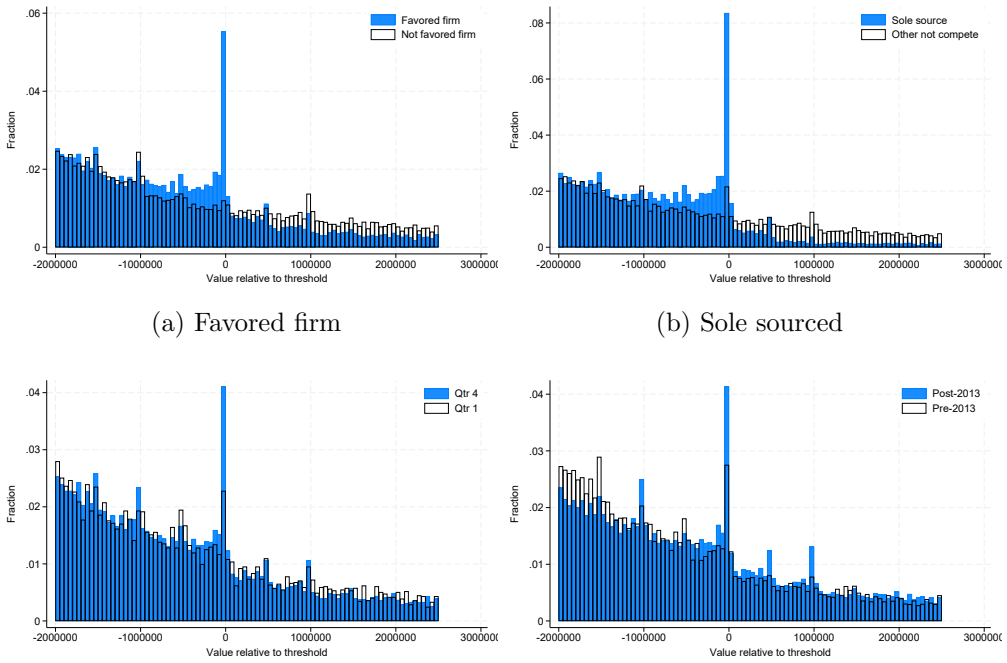
Notes: This figure plots the coefficients from an identical regression specification as shown in Table 2 column (5), but with the fourth fiscal quarter divided into weeks.

Figure 8: Bunching around sole-source threshold



Notes: This shows the empirical distribution of contract values around the sole-source threshold and the estimated counterfactual distribution without manipulation.

Figure 9: Distribution of contract value relative to sole-sourced threshold



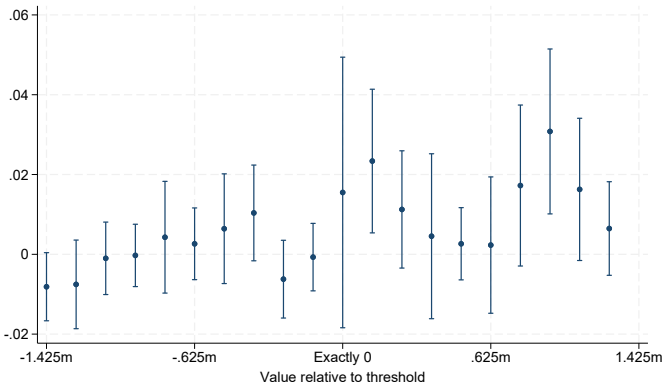
(a) Favored firm

(b) Sole sourced

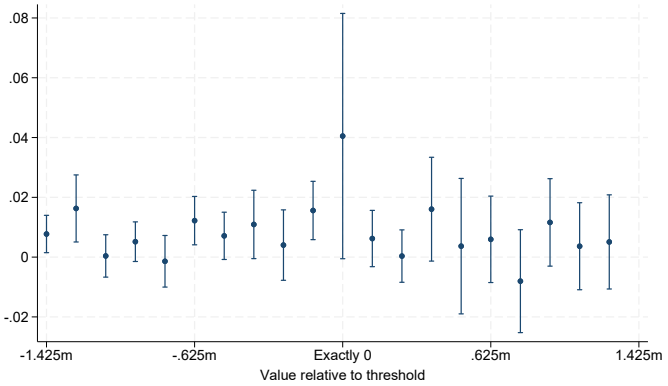
(c) Qtr 1 vs qtr 4

(d) Pre-post 2013

Figure 10: Sharp bunching and Q4 achievement gap



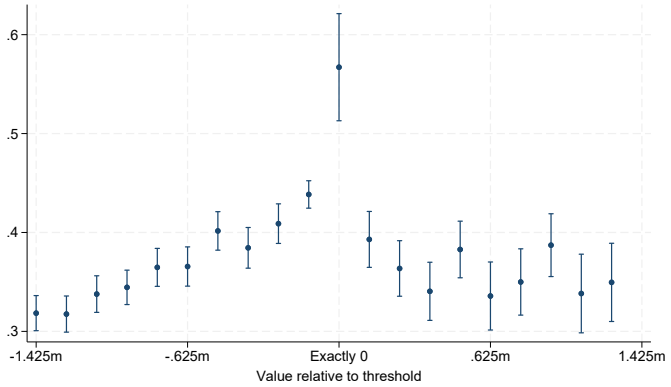
(a) Pre-2013



(b) Post-2013

Notes: This figure plots the coefficients of a regression of the log achievement gap on dummies for bins of contract sizes relative to the sole-source threshold, including an indicator for a contract value precisely equal to the threshold. The specification also includes agency and year effects.

Figure 11: Sharp bunching and option share



Notes: This figure plots the coefficients of a regression of the option share of contract value on dummies for bins of contract sizes relative to the sole-source threshold, including an indicator for a contract value precisely equal to the threshold. The specification also includes agency and year effects.

Table 1: Change in small business goals of federal agencies and prior achievement

	(1)	(2)	(3)	(4)	(5)	(6)
Lag (SBE % - Goal)	0.33***	0.41***	0.34***	0.34***	0.38***	0.42***
	(0.033)	(0.051)	(0.033)	(0.033)	(0.038)	(0.041)
Lag (SBE % - Goal) X Post-2013		-0.087				
		(0.089)				
Post-2013		-1.31***				
		(0.30)				
Agency share of federal procurement			1.06***			
			(0.34)			
Lag (SBE % - Goal) X Agency share			-0.30*			
			(0.15)			
Dept. of Defense				0.58***		
				(0.17)		
Lag (SBE % - Goal) X DoD				-0.27***		
				(0.033)		
Year effects					X	X
Agency Effects						X
Observations	312	312	312	312	312	312
R-Squared	0.26	0.29	0.26	0.26	0.35	0.39

Standard errors clustered by agency are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-year. The dependent variable is the year-over-year change in the agency small business procurement goal.

Table 2: Small business share at the agency-week level

	(1)	(2)	(3)	(4)	(5)	(6)
Set aside share						0.81***
						(0.020)
SBE not competitive award share						0.56***
						(0.058)
Fiscal quarter 2	-0.0014	-0.0016	-0.0015	-0.0025	-0.00019	-0.0051
	(0.0062)	(0.0062)	(0.0062)	(0.0060)	(0.0058)	(0.0050)
Fiscal quarter 3	0.020***	0.020***	0.020***	0.017***	0.022***	0.0055
	(0.0064)	(0.0064)	(0.0064)	(0.0062)	(0.0059)	(0.0046)
Fiscal quarter 4	0.049***	0.049***	0.049***	0.043***	0.049***	0.018***
	(0.0062)	(0.0062)	(0.0062)	(0.0060)	(0.0064)	(0.0047)
Region						
Northeast				0.049	0.058	0.014
				(0.039)	(0.039)	(0.028)
Midwest				0.17***	0.18***	0.057*
				(0.041)	(0.041)	(0.030)
South				0.22***	0.21***	0.11***
				(0.030)	(0.030)	(0.022)
West				0.14***	0.14***	0.078***
				(0.034)	(0.034)	(0.026)
Industry						
Construction				0.19***	0.18***	0.026
				(0.043)	(0.043)	(0.033)
Manufacturing				-0.049*	-0.058**	-0.017
				(0.026)	(0.026)	(0.017)
Wholesale				0.49***	0.47***	0.063
				(0.15)	(0.14)	(0.12)
Retail				-0.12	-0.13	-0.10*
				(0.10)	(0.10)	(0.058)
Transportation				-0.047	-0.057	-0.069
				(0.067)	(0.066)	(0.050)
Information				0.027	0.012	0.016
				(0.043)	(0.043)	(0.029)
Services				-0.045	-0.034	-0.069***
				(0.039)	(0.038)	(0.025)
Transaction size						
$10k-$100k					-0.038	-0.035
					(0.038)	(0.027)
$100k-$250k					0.019	0.096*
					(0.065)	(0.058)
$250k-$1 mill.					0.038	-0.066
					(0.069)	(0.060)
> $1 mill.					-0.71***	-0.27***
					(0.14)	(0.097)
Agency effects	Yes	Yes	No	No	No	No
Year effects	No	Yes	No	No	No	No
Agency*year effects	No	No	Yes	Yes	Yes	Yes
Observations	14806	14806	14806	14806	14806	14806
R-Squared	0.24	0.25	0.28	0.31	0.32	0.61

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week.

Table 3: Set-aside share at the agency-week level

	(1)	(2)	(3)	(4)	(5)
Fiscal quarter 2	0.0044	0.0042	0.0045	0.0047	0.0049
	(0.0047)	(0.0047)	(0.0047)	(0.0045)	(0.0044)
Fiscal quarter 3	0.017***	0.017***	0.018***	0.017***	0.018***
	(0.0047)	(0.0047)	(0.0046)	(0.0045)	(0.0045)
Fiscal quarter 4	0.035***	0.035***	0.035***	0.034***	0.034***
	(0.0044)	(0.0044)	(0.0043)	(0.0043)	(0.0048)
Region					
Northeast				0.027	0.033
				(0.030)	(0.030)
Midwest				0.098***	0.10***
				(0.033)	(0.033)
South				0.11***	0.10***
				(0.026)	(0.026)
West				0.054*	0.056*
				(0.030)	(0.030)
Industry					
Construction				0.19***	0.19***
				(0.043)	(0.043)
Manufacturing				-0.051***	-0.056***
				(0.019)	(0.019)
Wholesale				0.35***	0.34***
				(0.13)	(0.13)
Retail				-0.054	-0.057
				(0.060)	(0.059)
Transportation				0.019	0.015
				(0.040)	(0.040)
Information				-0.021	-0.030
				(0.032)	(0.032)
Services				0.024	0.031
				(0.025)	(0.025)
Transaction size					
\$10k-\$100k					0.0010
					(0.032)
\$100k-\$250k					-0.069
					(0.045)
\$250k-\$1 mill.					0.18***
					(0.056)
> \$1 mill.					-0.46***
					(0.079)
Agency effects	Yes	Yes	No	No	No
Year effects	No	Yes	No	No	No
Agency*year effects	No	No	Yes	Yes	Yes
Observations	14806	14806	14806	14806	14806
R-Squared	0.16	0.23	0.28	0.30	0.30

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week. The dependent variable is the share of contract dollars set-aside for small businesses.

Table 4: Small business award share and agency-specific goal elasticity

	(1) All agencies	(2) Goal elast. < median	(3) Goal elast. > median
Fiscal qtr 2	-0.00068	-0.012	0.0098
	(0.0058)	(0.0095)	(0.0066)
Fiscal qtr 3	0.021***	0.022**	0.020***
	(0.0060)	(0.0099)	(0.0066)
Fiscal qtr 4	0.048***	0.034***	0.064***
	(0.0064)	(0.010)	(0.0075)
Qtr 2 X Agency goal coeff.	0.038**		
	(0.019)		
Qtr 3 X Agency goal coeff.	0.015		
	(0.018)		
Qtr 4 X Agency goal coeff.	0.063***		
	(0.017)		
Observations	14806	7400	7406
R-Squared	0.32	0.33	0.29

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week. The dependent variable is the share of contract dollars awarded to small businesses by the agency in that week. The agency-specific goal elasticity is the estimated β_i from the regression $\Delta ln(g_{it}) = \beta_0 + \sum_i \beta_i \Delta ln(s_{i,t-1}) + BX_{it} + \epsilon_{it}$, the year-over-year change in the log goal regressed on the lagged change in the percent of agency contract collars awarded to small businesses, interacted with agency dummy variables. Each specification includes agency*year effects and controls for share of contracts awarded by region, industry, and transaction size.

Table 5: Small business awards and pace relative to goal

	SBE share			Set aside share		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All years						
Achievement gap*(Fiscal weeks 47-52)	0.14***	0.16***	0.11***	0.053**	0.053**	0.016
	(0.034)	(0.034)	(0.033)	(0.024)	(0.025)	(0.023)
Achievement gap*(Fiscal weeks 41-46)	0.084***	0.10***	0.072**	0.023	0.018	-0.00064
	(0.031)	(0.026)	(0.030)	(0.019)	(0.018)	(0.019)
Achievement gap*(Fiscal weeks 26-40)	0.077***	0.069***	0.090***	0.019*	0.020*	0.021
	(0.017)	(0.014)	(0.022)	(0.011)	(0.011)	(0.015)
Achievement gap	0.0073	0.0030	0.0086	0.0046	0.0053	0.0093
	(0.0067)	(0.0063)	(0.0072)	(0.0049)	(0.0048)	(0.0059)
Region, industry, and size controls	No	Yes	Yes	No	Yes	Yes
Agency*year effects	Yes	Yes	Yes	Yes	Yes	Yes
Agency*week effects	No	No	Yes	No	No	Yes
Observations	14699	14699	14695	14699	14699	14695
R-Squared	0.29	0.32	0.41	0.29	0.31	0.38
Panel B: 2008-2012						
Achievement gap*(Fiscal weeks 47-52)	0.061*	0.12***	0.052	-0.0023	-0.0022	-0.037
	(0.037)	(0.039)	(0.043)	(0.029)	(0.028)	(0.034)
Achievement gap*(Fiscal weeks 41-46)	0.038	0.10***	0.064	-0.0059	-0.0046	-0.014
	(0.036)	(0.032)	(0.049)	(0.021)	(0.019)	(0.034)
Achievement gap*(Fiscal weeks 26-40)	0.060***	0.065***	0.090***	0.0047	0.0026	0.0091
	(0.022)	(0.017)	(0.028)	(0.013)	(0.012)	(0.017)
Achievement gap	0.0079	0.0068	0.021*	0.0072	0.010	0.023***
	(0.012)	(0.012)	(0.012)	(0.0069)	(0.0067)	(0.0084)
Region, industry, and size controls	No	Yes	Yes	No	Yes	Yes
Agency*year effects	Yes	Yes	Yes	Yes	Yes	Yes
Agency*week effects	No	No	Yes	No	No	Yes
Observations	6133	6133	6129	6133	6133	6129
R-Squared	0.30	0.33	0.50	0.29	0.33	0.48
Panel C: 2013-2019						
Achievement gap*(Fiscal weeks 47-52)	0.25***	0.23***	0.26***	0.12***	0.12***	0.074*
	(0.053)	(0.049)	(0.055)	(0.036)	(0.037)	(0.044)
Achievement gap*(Fiscal weeks 41-46)	0.13***	0.11***	0.10**	0.063**	0.052*	0.013
	(0.047)	(0.040)	(0.042)	(0.031)	(0.031)	(0.034)
Achievement gap*(Fiscal weeks 26-40)	0.092***	0.075***	0.11***	0.029*	0.031*	0.017
	(0.025)	(0.022)	(0.040)	(0.017)	(0.018)	(0.028)
Achievement gap	0.0068	0.00042	-0.0012	0.0029	0.0022	-0.00024
	(0.0075)	(0.0071)	(0.010)	(0.0067)	(0.0067)	(0.0085)
Region, industry, and size controls	No	Yes	Yes	No	Yes	Yes
Agency*year effects	Yes	Yes	Yes	Yes	Yes	Yes
Agency*week effects	No	No	Yes	No	No	Yes
Observations	8566	8566	8560	8566	8566	8560
R-Squared	0.29	0.31	0.46	0.27	0.30	0.42

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week. Panels A includes all years. Panels B and C split the sample into pre- and post-2013 time periods. The achievement gap is the log difference between the small business share achieved by the agency as of the end of the prior fiscal week and the agency's small business prime contracting goal for the year.

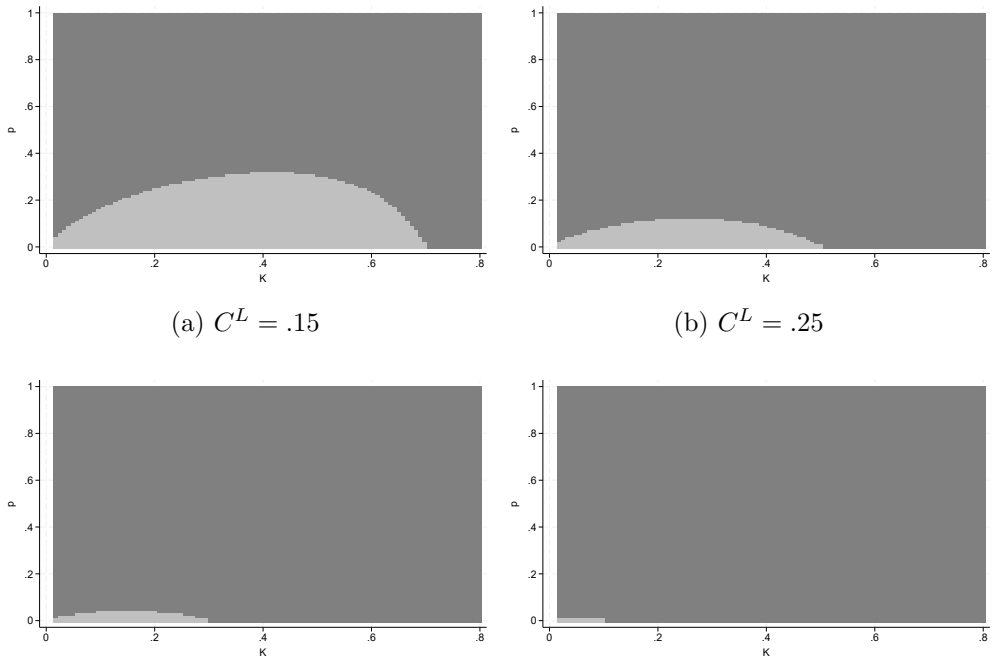
Table 6: Number of bids by contract

	(1)	(2)	(3)	(4)
Month 1 X Set aside	0.055*	0.035	0.029	0.059
	(0.033)	(0.040)	(0.041)	(0.049)
Month 2 X Set aside	-0.021	0.044	0.043	0.077*
	(0.032)	(0.040)	(0.040)	(0.043)
Month 3 X Set aside	-0.037	-0.047	-0.051	-0.032
	(0.035)	(0.050)	(0.050)	(0.056)
Month 5 X Set aside	-0.040	-0.044	-0.046	-0.051
	(0.030)	(0.047)	(0.047)	(0.048)
Month 6 X Set aside	-0.040	-0.053	-0.060	-0.054
	(0.034)	(0.042)	(0.042)	(0.042)
Month 7 X Set aside	-0.038	-0.062	-0.067	-0.056
	(0.039)	(0.049)	(0.049)	(0.050)
Month 8 X Set aside	-0.048	-0.050	-0.061	-0.059
	(0.036)	(0.046)	(0.047)	(0.046)
Month 9 X Set aside	-0.022	-0.027	-0.038	-0.033
	(0.026)	(0.038)	(0.038)	(0.038)
Month 10 X Set aside	-0.091***	-0.090**	-0.097**	-0.095**
	(0.032)	(0.045)	(0.046)	(0.046)
Month 11 X Set aside	-0.11***	-0.077**	-0.084**	-0.079**
	(0.028)	(0.036)	(0.036)	(0.036)
Month 12 X Set aside	-0.23***	-0.23***	-0.24***	-0.23***
	(0.024)	(0.032)	(0.033)	(0.033)
Set aside	-0.21***	-0.24***	-0.23***	-0.23***
	(0.035)	(0.038)	(0.038)	(0.038)
SB leave-out award share				-0.29***
				(0.11)
SB award share prior 3 months				-0.25**
				(0.11)
Share not competed			-0.38***	-0.51***
			(0.10)	(0.12)
Observations	149214	78825	78825	77386
R-Squared	0.25	0.30	0.30	0.30

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is a contract. The dependent variable is the number of bids, winsorized at 5 percent. The sample is limited to definitive contracts. The specifications in columns (2)-(4) include only contracts valued greater than $250k. Months 1-12 refer to calendar months. The share not competed is the portion of agency contracts not subject to competition within the month. SB leave-out award share is the fraction of contracts within the month awarded to small businesses by the agency, excluding own-contract. The SB award share prior 3 months is the share of contracts contracts in the three months prior awarded by the agency to small businesses. Each specification includes agency, year, product, and industry effects, and controls for indicators for the $100k-wide bins for the value of the contract.

A Model calibration

Figure A1: Sign of $E[s_2] - E[s_1]$ by parameter values



(a) $C^L = .15$ (b) $C^L = .25$

(c) $C^L = .35$ (d) $C^L = .45$

Notes: Dark grey indicates parameter space where $E[s_2] > E[s_1]$ for different values of C^L. Small business cost C^S is a random variable distributed $U[0, 1]$.

B Details of excess bunching estimation

The K-fold validation procedure described in Diamond and Persson (2016) is used to obtain the width of the manipulation region and the order of the polynomial. The data is randomly drawn into five 20% subsamples. A grid search is conducted over a set of candidate values for v^{*+}, v^{*-}, and k. For each combination of parameters, non-linear least squares is used to estimate the parameters β_k on four of the subsamples, and the estimated parameters are then used to form predicted values in the left out 20% sample. This is repeated for each of the five sub-samples of the data. The selected combination of v^{*+}, v^{*-}, and k is the one that minimize the sum of the mean-squared error across the five sub-samples, restricted to the parameter set that leave the mass within the manipulation region statistically indistinguishable between f_0 and $\hat{f}_1$. Using this selection, the parameters β_k are estimated using non-linear least squares on the full sample outside of the manipulation region.

C Supplementary results

Table C1: Agency small business goal and share of federal procurement

	2009		2019	
	Goal	Agency % share	Goal	Agency % share
Int'l Development	19.6	.23	12.5	1.09
Deparment of Agriculture	49.88	1.2	57	1.49
Department of Commerce	46.67	.75	39	1.13
Department of Defense	22.24	68.65	21.8	62.79
Department of Education	12.8	.33	29	.55
Department of Energy	5.87	7.03	11.65	5.63
Health and Human Services	19	4.26	21.5	5.33
Department of Homeland Security	31.9	3.27	33	3.64
Department of Housing and Urban Development	66.33	.19	28	.3
Department of Interior	55.49	.66	50	.63
Department of Justice	36.81	1.74	31	1.6
Department of Labor	33.42	.44	37.5	.41
Department of State	37	.68	24	1.83
Department of Transportation	37	.43	31.73	1.3
Department of the Treasury	29.39	.48	38.5	.94
Department of Veterans Affairs	28.71	3.3	29.6	5.55
Environmental Protection Agency	39.81	.45	39.9	.31
General Services Administration	35.74	1.68	30	1.13
NASA	15.35	3.32	16	3.52
National Science Foundation	28.26	.07	13.5	.1
Nuclear Regulatory Commission	36.71	.05	38	.03
Office of Personnel Management	28.94	.36	25.8	.19
Small Business Administration	67.05	.02	71	.03
Social Security Administration	32.53	.28	30	.36

Table C2: Agency-week share awarded to small business non-competitively

	(1)	(2)	(3)	(4)	(5)
Fiscal quarter 2	0.000063	0.000068	0.0000053	0.00014	0.0017
	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0017)
Fiscal quarter 3	-0.00016	-0.00015	-0.00024	0.00012	0.0030
	(0.0016)	(0.0016)	(0.0016)	(0.0016)	(0.0018)
Fiscal quarter 4	0.0024	0.0024	0.0024	0.0030	0.0067***
	(0.0017)	(0.0017)	(0.0017)	(0.0019)	(0.0023)
Region					
Northeast				0.030***	0.031***
				(0.0088)	(0.0087)
Midwest				0.067***	0.069***
				(0.016)	(0.016)
South				0.035***	0.033***
				(0.0082)	(0.0082)
West				0.032***	0.032***
				(0.0097)	(0.0097)
Industry					
Construction				0.0013	-0.0019
				(0.010)	(0.010)
Manufacturing				0.0093	0.0069
				(0.0089)	(0.0090)
Wholesale				0.24***	0.23***
				(0.076)	(0.076)
Retail				0.034	0.031
				(0.023)	(0.022)
Transportation				0.0041	0.0014
				(0.0088)	(0.0086)
Information				0.040*	0.037*
				(0.020)	(0.020)
Services				0.015*	0.016*
				(0.0086)	(0.0085)
Transaction size					
$10k-$100k					-0.0066
					(0.014)
$100k-$250k					-0.038
					(0.025)
$250k-$1 mill.					-0.080***
					(0.025)
> $1 mill.					-0.13***
					(0.022)
Agency effects	Yes	Yes	No	No	No
Year effects	No	Yes	No	No	No
Agency*year effects	No	No	Yes	Yes	Yes
Observations	14806	14806	14806	14806	14806
R-Squared	0.047	0.052	0.086	0.11	0.12

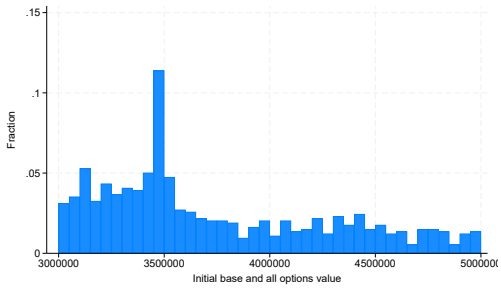
Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week. The dependent variable is the share of contract dollars awarded to small businesses. Remain share is the share of rest-of-year contract dollars the agency would need to award to small businesses to exactly meet its goal. Both are winsorized at 5 percent.

Table C3: Small business utilization by federal agencies, alternate specifications

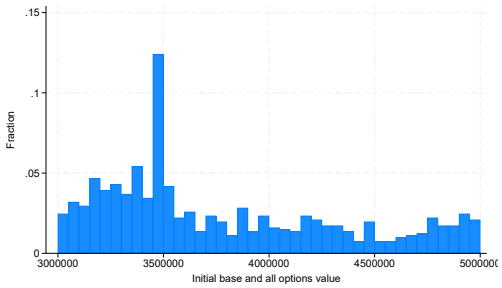
	SBE share		Set aside share	
	(1)	(2)	(3)	(4)
Panel A: Base specifications, weighted by agency size				
Fiscal quarter 2	0.0040	0.0038	0.0021	0.0014
	(0.0063)	(0.0051)	(0.0041)	(0.0033)
Fiscal quarter 3	0.035***	0.033***	0.024***	0.022***
	(0.0068)	(0.0058)	(0.0040)	(0.0038)
Fiscal quarter 4	0.092***	0.089***	0.063***	0.057***
	(0.011)	(0.0059)	(0.0094)	(0.0048)
Region, industry, and size controls	No	Yes	No	Yes
Observations	14806	14806	14806	14806
R-Squared	0.51	0.58	0.46	0.55
Panel B: All federal agencies, weighted by agency size				
Fiscal quarter 2	0.00051	0.0017	-0.00084	0.000095
	(0.0059)	(0.0056)	(0.0037)	(0.0037)
Fiscal quarter 3	0.031***	0.031***	0.021***	0.020***
	(0.0064)	(0.0062)	(0.0037)	(0.0042)
Fiscal quarter 4	0.088***	0.086***	0.060***	0.055***
	(0.010)	(0.0060)	(0.0089)	(0.0047)
Region, industry, and size controls	No	Yes	No	Yes
Observations	39054	39054	39054	39054
R-Squared	0.48	0.54	0.43	0.52
Panel C: Base specifications, new awards				
Fiscal quarter 2	0.011	0.0097	0.020***	0.018***
	(0.0067)	(0.0062)	(0.0052)	(0.0050)
Fiscal quarter 3	0.052***	0.048***	0.051***	0.043***
	(0.0067)	(0.0064)	(0.0060)	(0.0059)
Fiscal quarter 4	0.062***	0.058***	0.060***	0.050***
	(0.0068)	(0.0068)	(0.0053)	(0.0054)
Region, industry, and size controls	No	Yes	No	Yes
Observations	14708	14708	14708	14708
R-Squared	0.27	0.29	0.31	0.34

Standard errors clustered by agency-year are in parentheses.
*,**,*** denote significance at the 10%, 5%, and 1% level, respectively.
The unit of observation is an agency-week. Each specification includes agency*year fixed effects. Panels A and B weight observations by the average number of contracts by agency across all years. The sample in panel C includes new contract awards and not modifications to existing awards.

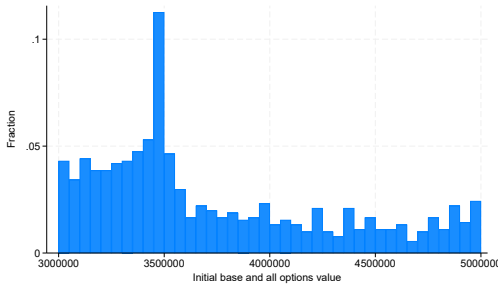
Figure C2: Distribution of contract value by year, non-manufacturing



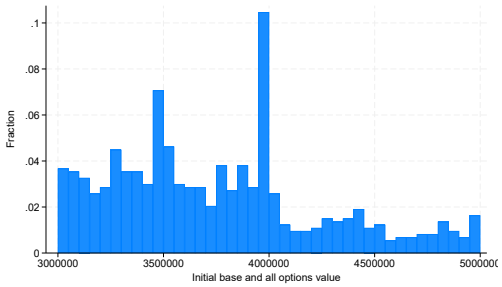
(a) 2008



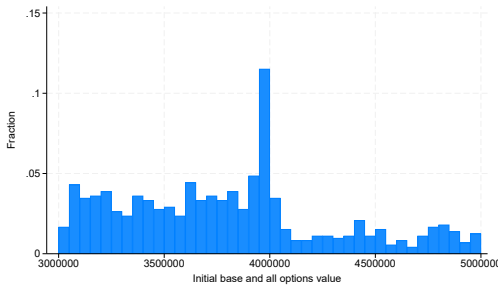
(b) 2009



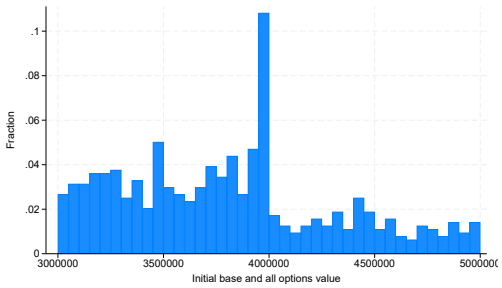
(c) 2010



(d) 2011



(e) 2012



(f) 2013