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The impact of preference programs in public procurement: Evidence from veteran set-asides

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The Impact of Preference Programs in Public Procurement: Evidence from Veteran Set-Asides*

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Abstract

Veteran-owned businesses are given preferential treatment in the allocation of procurement contracts from the U.S. Department of Veterans Affairs – currently the largest civilian federal agency in terms of procurement spending. We exploit a 2016 Supreme Court ruling that significantly increased the scope of these set-asides, to study the impacts of preference programs on both the targeted businesses and procurement outcomes. The policy change increased the share of contracts awarded to the target population, service-disabled veteran-owned small businesses, and led to significant entry of new vendors, including those who had previously failed to win contracts. New entrants were also more likely to win future contracts, and the policy led to an increase in survival for targeted firms. We find no evidence of relevant spillovers to awards by other federal agencies, no decline in competition for awards, and no deterioration of contract execution performance by vendors. These findings suggest that VA set-asides have successfully improved outcomes for the target population without imposing significant costs on the government.

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1 Introduction

Public procurement is often used as a tool to achieve distributional goals. In the United States, federal procurement explicitly aims to assist and increase the participation of small businesses,[1] and establishes minimum shares of contracting dollars that should be awarded to specific types of small firms.[2] On top of these minimum requirements, individual agencies may develop additional programs to foster the participation of disadvantaged firms. The most prominent example is the Department of Veteran Affairs (VA)'s Veterans First program enacted in 2006, which states that *all* contracts should be set aside for service-disabled veteran-owned small businesses (SDV), unless the contracting officer does not have *"a reasonable expectation that two or more small business concerns owned and controlled by veterans will submit offers and that the award can be made at a fair and reasonable price that offers best value to the United States.*"

In this paper, we study the effectiveness of procurement preference programs in improving outcomes for the targeted firms, as well as their impact on the agencies that implement them. We do so in the context of the VA's Veterans First program, using an exogenous expansion of the policy due to a Supreme Court ruling. In June 2016, the Supreme Court overturned two lower courts' rulings that had upheld a more restrictive application of the set-aside requirements by the VA. Using data on the universe of federal procurement contracts, we first show that, following the 2016 decision, contracts awarded to SDV firms increased starkly. We then use this policy variation to estimate the effect of the program on the outcomes of targeted SDV firms, as well as on contract outcomes for the government. As of 2023, the VA is currently the largest civilian federal agency in terms of procurement dollars,

[1] *"It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small-business concerns in order to preserve free competitive enterprise, to insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government [...] be placed with small-business enterprises, to insure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the overall economy of the Nation."* (15 USC 361).

[2] This includes targets for any small businesses, small disadvantaged businesses, women-owned small businesses, and service-disabled veteran-owned small businesses. For the specific agency-level goals, see `https://www.sba.gov/document/support-agency-contracting-goals`.

spending over $50 billion in FY2022.

Following the Supreme Court ruling, the share of VA contract dollars awarded to SDVs increased by one-third (from 16% in 2014-15 to 21.3% in 2017-18), and new SDVs almost tripled in number as a share of new entrants. This increase was concentrated within Purchase Order awards, a category that includes smaller, non-specialized contracts often sourced from commercial vendors (such as IT services and medical supplies). To estimate the impact of this expansion on SDV firms, we use a difference-in-differences strategy to study three policy-relevant outcomes. First, we test whether previously registered but unsuccessful firms were more likely to win a VA award after 2016. We estimate that pre-existing but unsuccessful SDVs – those registered in 2014 but with no observed awards – increased their likelihood of winning VA contracts by roughly 10 percentage points in the years following the policy change. Next, we test whether this expansion also allowed new entrants to grow faster than before. After registering as new vendors, SDVs were able to win their first award in a shorter time frame than other firms (by about 20 months). And while new SDV firms were already more likely to win subsequent awards before the policy expansion, their chances increased by another 10 percentage points afterward. Finally, we test whether the policy changed the likelihood of survival as a business, and find that the probability of survival to 2021 increased by up to 5 percentage points relative to non-veteran firms. Taken together, these results imply that the policy expansion was successful in helping to level the playing field for small businesses that previously faced barriers to winning.

We also investigate the effect of the policy on federal procurement outcomes. We first test whether new SDV entrants were also more likely to win awards from other federal agencies, but find no evidence of spillovers outside of the VA. This motivates an empirical strategy that uses non-VA agencies as a control group to estimate the impact of the policy on agency-level contract outcomes. In particular, we use synthetic control methods (Abadie and Gardeazabal, 2003; Alberto Abadie and Hainmueller, 2010; Abadie, 2021) to measure the effect of the program on the intensity of competition and execution performance of VA

contracts. Perhaps surprisingly, we find a large (though imprecise) *increase* in the number of bids received by VA contracts relative to a synthetic VA. This means that the increase in participation by new entrants and incumbent firms more than compensated for the negative effect of restricting competition to a narrower set of businesses. And while data limitations preclude us from measuring effects on award unit prices, we find no evidence that this expansion of awards to SDVs affected contract execution performance. Combining these findings with the positive impacts on targeted firms, our results suggest that the expansion of veteran set-asides generated substantial benefits for the targeted population, without any evidence of deteriorated outcomes for the government.

The existing literature analyzing the impact of preference programs has generally documented higher procurement costs that result from these policies. In the context of California's highway procurement auctions, Marion (2007) documents higher procurement costs when using preferences, and Marion (2009) estimates lower acquisition costs resulting from a policy change that prohibited the use of affirmative action. In the same setting, Krasnokutskaya and Seim (2011) use a structural model to show that accounting for endogenous entry magnifies the cost of preference programs. In contrast, Nakabayashi (2013) estimates that in the Japanese setting, set-asides for small businesses reduced procurement costs through increased participation and competition. And in a laboratory setting, Corns and Schotter (1999) estimate that optimally-chosen subsidies can improve both participation among minorities and cost-effectiveness. Additionally, Rosa (2019) shows that affiliation among bidders can also affect the efficiency of preference programs. In work most related to our setting, Cappelletti and Giuffrida (2022) estimate the impact of federal set-asides for small businesses, and find higher rates of participation but negative impacts on performance outcomes. While these papers all focus on large specialized acquisitions—namely, construction projects— our context studies the procurement of goods/services supplied by commercial vendors. Our paper provides an important contribution because procurement contracts for commercial products may face lower efficiency costs from preferential treatment than con-

tracts for large construction projects. Additionally, by studying a broader sample of goods and services, our sample may be more representative of the typical agency's procurement purchases, therefore increasing the external validity of our results.

While most studies have focused on the impact of preference programs on procurement costs, very few have studied the outcomes of the targeted population; importantly, preference programs may not result in uniform benefits to the target population. While Chatterji et al. (2014) estimate that black entrepreneurship increased in cities that enacted minority set-asides, Myers Jr. and Chan (1996) found that minority set-asides enacted in New Jersey failed to improve success rates for minority-owned businesses in winning contracts. Rosa (2023) also shows that diversity targets can still lead to inequities if contractors can discriminate within the targeted population. Studying a boom in VA construction procurement, Cappelletti and Giuffrida (2022) fail to find evidence that preferential treatment of SDVs enabled these firms to expand beyond their existing business scope. In terms of survival, Bates and Williams (1996) document a lower survival rate among firms that have a high reliance on government sales, while Cappelletti et al. (2023) found a positive effect on survival among Italian firms that narrowly win a procurement contract. And De Silva et al. (2012) identifies the competitive advantage of obtaining contracting experience early in life as a channel through which procurement increases new firm survival rates. We contribute to this literature by analyzing multiple firm-level outcomes for the targeted population, while exploiting a large exogenous change in the use of preferences in contracting.

The remainder of this paper is organized as follows. Section 2 provides background on how the VA's preference programs operate. Section 3 discusses our procurement data, and provides descriptive findings about the policy change. Section 4 presents our empirical analyses of the impacts on veteran-owned businesses, and Section 5 presents our empirical analyses of the impacts on federal procurement outcomes. Section 6 concludes.

2 Background

Preference programs in procurement take two main forms: bid subsidies and set-asides. Bid subsidies give qualified vendors a competitive advantage in open auctions, while set-asides restrict participation to only qualified vendors. Since 1988, there have been government-wide procurement goals for awards to small businesses, with the current goal at 23% of dollars awarded. Within the umbrella of small businesses, there are further procurement goals for targeted categories. There is a 3% goal for awards to service-disabled veteran-owned small businesses (SDVs), and other goals include 5% to women-owned small businesses, 5% to small disadvantaged businesses (including minority-owned), and 3% to HUBZone businesses. These awards are primarily allocated through small business set-asides, and are often facilitated by the Small Business Administration.[3]

The VA is currently the largest federal agency outside of the Department of Defense, in terms of federal procurement dollars. Its spending has risen steadily over the last decade, from less than $20 billion in initial awards in FY2010 to almost $50 billion by FY2022. In 2006, the creation of the Veterans First Contracting Program increased the preferences for veteran-owned small businesses for contracts originating from the VA. The agency follows a "rule of two" for procurement contracts, in which every contract must be set aside for service-disabled veteran-owned small businesses if there is a reasonable expectation that there would be at least two qualified businesses in that category. Within the hierarchy of VA set-asides, SDVs are given the topmost priority, and then non-disabled veteran-owned businesses after that. Thus in cases where two or more SDVs could be expected to bid, the set-aside would force the VA to only accept bids from SDV firms.

Prior to 2016, the VA interpreted this "rule of two" to not apply to Federal Supply Schedules (FSS), which are long-term contracts awarded by the General Services Administration (GSA), and that the VA (and all agencies) use to order commercial supplies and

[3]Small business designation is based on employment or revenue thresholds, and varies by industry. With the modal employment threshold at 500 employees, all but the largest firms would qualify as small businesses.

services at pre-determined prices. This allowed the VA to routinely order goods and services online under pre-negotiated prices, without having to solicit new contracts. We exploit the *Kingdomware v. United States* Supreme Court ruling on June 16, 2016 that prevented the VA from circumventing the "rule of two" by ordering directly from FSS vendors, causing the requirement to apply to *all* VA procurement actions. This should lead to a subsequent rise in the SDV share of regular award contracts for the goods and services that were previously ordered through FSS vendors.

The primary way contracting officers determine whether qualified businesses exist is through the pre-certification of vendors as SDVs, which is required for them to bid on these set-asides. In addition to meeting revenue thresholds to be considered a small business, becoming certified as an SDV requires at least fifty-one percent controlling ownership by a service-disabled veteran; we believe this requirement severely limits the ability for existing non-veteran owned firms to pass themselves off as an SDV.

Service-disabled refers to veterans receiving compensation from the VA for a service-connected disability. The VA's Disability Compensation (DC) program awards monthly benefits to veterans with one or more service-connected disabilities, and now compensates almost 30% of the veteran population.[4] It is important to note that there is no means-testing, and DC recipients are not restricted to the elderly. In FY2022, the most common age range of new recipients was between 20 and 30 years of age, and over 40 percent of all recipients are under the age of 55.[5] Thus, many service-disabled veterans are early in their working lives, and may benefit from the opportunity to start their own small businesses. Coile et al. (2021) finds that increases in DC benefit receipt lowered rates of overall employment, but increased the probability of self-employment among near-elderly veterans.

[4]Award determination is based on the number and severity of service-connected disabilities, and veterans receive a combined disability rating that ranges from 10% ($166/month in benefits) to 100% ($3757/month in benefits). The most common disabilities are ringing in the ears, limited knee movement, hearing loss, PTSD, and lower back pain or neck pain.

[5]VBA Annual Benefits Report, FY2022 `https://www.benefits.va.gov/REPORTS/abr/docs/2022-compensation.pdf`

3 Data

This project studies the universe of contracts awarded by the Federal Government from October 2008 through Dec 2020, obtained through the Federal Procurement Data System (FPDS). We focus on the initial action that obligates funding to each contract to identify the award date. In addition to the dollar amount obligated for each contract, we observe the funding agency, product category, and information on the selected firm, including any preferred statuses such as veteran-owned businesses.

We would like to identify all SDVs potentially in the running for contracts, but the FPDS dataset only includes contract winners. Thus we supplement the FPDS data with Veteran Certification Applications submitted to the Vets First Verification Program, from January 2014 to April 2021. This verification program is an important first step SDVs must take, as it provides the verification needed to qualify for set-asides. Applications include the DUNS number used to identify vendors, as well as the year in which the business was first established. There are approximately 23,000 unique businesses that applied and were approved over this period, although the actual number that went on to win contracts is significantly lower.

Our third source of data is the System of Award Management (SAM). SAM provides the list of registered firms that are allowed to compete for and receive government contracts. Firms are required to renew their registration every year, and they can be excluded from SAM if there is evidence of *"a lack of business honesty or integrity (...) based upon regulation, statute, executive order or other legal authority"*. We extract two snapshots of SAM per year from 2014 to 2021, and use this to create a panel of registered firms. This allows us to infer entry and exit from the federal procurement market by individual firms, which are identified by their DUNS number. To supplement our analysis with a broader measure of survival, we also utilize the Dun & Bradstreet Hoovers business directory, which can be matched to federal vendors using their DUNS number. We use a snapshot from August 2021, which allows us to identify firms still in business at the end of our sample period.

3.1 Descriptive Statistics

Figure 1 plots the distribution of VA award values for SDV and non-veteran businesses prior to the policy change, from 2011 to 2014. The four categories of award types are BPA calls, definitive contracts, delivery orders, and purchase orders. Delivery orders are the most common, and are the method through which FSS orders are placed. Purchase orders – used for one-off purchases under simplified acquisition procedures – are the second most common award type, and delivery and purchase orders together make up over 90 percent of the number of contract awards. Due to the pre-existing preferential treatment of service-disabled veterans, average contract values were already larger for SDVs than for non-veterans. The large majority of VA contracts are less than $1 million in value; we also verify all results are robust to dropping contracts greater than $1 million.

Table 1 reports summary statistics for this same sample. From 2011 to 2014, service-disabled veterans received the largest preference in the awarding of Definitive Contracts, which include long-term contracting arrangements and large purchases that exceed simplified acquisition thresholds. 38% of these awards went to SDVs, versus the 6-8% share in the other three award categories. But even within the subset of delivery and purchase orders, SDVs received larger awards on average; the mean contract value for SDVs was $189,490 versus $96,120 for non-veterans. While the majority of VA procurement is for medical products and services, these orders make up a much smaller share of SDV awards. Meanwhile, less specialized services such as administrative support and maintenance/repair are awarded to service-disabled veterans at higher rates than non-veterans. Appendix Figure A.1 breaks down the SDV-share of the largest categories of VA awards, and shows that after the policy change, the share of awards going to SDVs rose the most in the IT/Tech category. Meanwhile, construction awards were already dominated by SDVs and continue to be dominated by SDVs, whereas medical services were virtually unaffected.

3.2 2016 Policy Change

The June 2016 Supreme Court ruling, which prohibited procurement officers' use of federal supply schedules as a workaround to the "rule of two", could be predicted to affect certain award types more than others. Purchase orders, which can be viewed as the closest substitute to ordering through a FSS, should receive a boost in SDV awards if there was previously substantial scope for procurement officers to circumvent the "rule of two". We might also expect a rise in SDV awards in the delivery order category, if officers who had previously been ordering from non-SDV FSS's were now forced to switch to SDV vendors. Among these two categories, the raw FPDS contract data exhibits a clear rise in the share of contracts awarded to SDV vendors starting in the second half of 2016. Figure 2 shows growth in the share of contracts awarded to SDVs within both categories of awards, with the largest growth rate for purchase orders. Meanwhile, panel A of Appendix Figure A.2 shows only modest increases among the BPA call and definitive contract categories. Figure 3 plots the pattern in terms of dollar values of awards, and shows a similar increase in dollars awarded. SDV businesses went from receiving an average of $126 million in purchase orders annually in 2013–2015 to an average of $635 million annually in 2017–2019, a fivefold increase. On the other hand, the dollars awarded to non-SDV veterans fell slightly from an average of $50 million a year before 2016 to less than $30 million in 2019.

This significant growth in purchase and delivery orders indicates that the Supreme Court ruling clearly had bite in this dimension of contracting, although whether the original motivation of using the loophole was due to lower acquisition costs or a more simplified procedure is unclear. Furthermore, panel B of Appendix Figure A.2 shows that this pattern is not present for awards from other federal agencies besides the VA, which were unaffected by the ruling. To check for manipulation of SDV status, Appendix Figure A.3 graphs the number of vendors (identified by their DUNS number) that were observed switching to SDV status among vendors that first show up as non-SDV. Although there is a small bump in the year immediately following the policy change, the overall number of businesses who switch

are extremely low. Going forward our analyses will focus on purchase order and delivery order awards, as we utilize the expansion of SDV awards driven by the 2016 policy change to identify the impacts of greater preferences on outcomes for both SDVs and the Federal Government.

4 Impacts on Veteran-Owned Businesses

The previous section documents a significant increase in awards going to SDV businesses. We now study whether this generated entry of new businesses, as opposed to more frequent awards to existing vendors. We define new entrants as businesses new to winning any federal procurement contracts, and not necessarily young in establishment age. Figure 4 plots the share of VA awards going to new SDV vendors, relative to other new veteran-owned firms. There is a discontinuous jump in awards to new SDVs after June 2016, more than doubling the new SDV share of awards; this suggests that the policy change generated substantial new entry, and benefited both new entrants and incumbent firms. Furthermore, Figure A.4 shows that up until the middle of 2016, new VOSB and SDV vendors each made up around 7% of new-to-the-VA entrants annually. After the policy change, the share of new DUNS designated as an SDV jumped threefold to over 20%.

To quantify these benefits, we first test whether the rise in new entrants included SDV firms that were previously unsuccessful in winning contracts. Next, we estimate whether new entrants won contracts faster and were able to grow after the policy change. Finally, we provide evidence that the policy change also increased survival rates of targeted firms.

4.1 Impact on Previously Unsuccessful Firms

The new vendors identified in Figure 4 are businesses that have won their first procurement award; they are a combination of businesses new to VA procurement, as well as businesses that were previously bidding unsuccessfully. We estimate whether this policy

change allowed the previously unsuccessful vendors to finally win a contract. To identify this subset of pre-existing SDVs, we use businesses that had been previously certified through the Vets First Verification Program, which is a preliminary requirement for firms wishing to compete for VA set-asides. We restrict our sample to all verified SDVs that applied for certification between 2014 and 2015, were also registered in the SAM database in 2014, but had not yet won a federal contract prior to 2015 (specifically, from Oct 2008 to Dec 2014). This subgroup consists of 629 SDV businesses, of which 15 percent were established in 2014, and with an average age of 7 years by 2016. The chance of winning any contract during calendar year 2015 was 5.1 percent for this population of verified businesses; this rate then rose to 34 percent during the post-policy period of 2017-2020.

To estimate a difference-in-differences specification, we identify a control group of pre-existing non-SDV businesses that were also registered but had not yet been awarded a contract. We define these businesses as vendors who were registered in the SAM database in 2014, but not observed to have won any federal contracts prior to 2015. Because businesses are required to renew their registration every 12 months, vendors observed in the SAM database are a good proxy for active businesses. Veteran status is not reported in the SAM database, so we assume all DUNS not certified through Vets First are non-SDV businesses. This non-SDV subgroup consists of 18,239 businesses. This number is inflated because the SAM database also includes businesses that engage with the Federal Government for non-procurement purposes, and we cannot distinguish between them. However, we also verify that our results are robust to restricting to firms that only recently started registering in SAM (such as initial registration years of 2012, 2013, or 2014).

We estimate the following regression at the DUNS-by-half-year level, with the outcome of interest being an indicator for whether the business won a purchase order or delivery order award from the VA.

$$Award_{it} = \alpha_t + \sum_{t=2015}^{2020} \beta_t (time = t) * SDV_i + \gamma_i + \epsilon_{it} \tag{1}$$

Here i indexes DUNS and t indexes half-year, and the coefficients of interest comparing SDVs to non-SDV vendors are $\beta_{2016.5}$ to β_{2020}. The DD event study estimates are plotted in Figure 5, relative to an omitted period of 2016:Q1-Q2. We see a significant and sustained increase in the probability of winning an award for SDV businesses. After the 2016 policy change, SDVs that had been registered in 2014 were between 7-11 percentage points more likely to win a VA contract in any given half-year.

Because our application data begins in 2014 and the verification program only requires a renewal of certification every three years, we are not able to observe vendors that had certified prior to 2014 but were bidding unsuccessfully. Thus the actual pool of unsuccessful SDVs is likely double the size of what we observe, and those we do not observe may be incorrectly classified as a non-SDV business. This measurement error would tend to bias us against finding a treatment effect for our SDV sample.

To compare our estimated effect with already successful SDV firms, Figure A.5 plots estimates from Equation 1 for a sample of firms that *were* observed to have won a VA delivery order or purchase order award in 2014. Within this sample, SDVs were between 4-9 percentage points more likely to win another VA contract after the policy change; thus previously unsuccessful SDVs experienced a much larger treatment effect than previously successful SDVs. Relative to the sample means, the average treatment effects translate to 328% and 15.3% increases respectively.

4.2 Growth of New Entrants

We next investigate whether the new businesses that entered due to the policy change were able to experience faster growth in terms of winning subsequent contract awards. To identify the impact of the 2016 ruling, we employ a difference-in-differences methodology to compare new SDV entrants to non-veteran entrants before and after the policy change. Because the ruling specifically impacted new delivery order and purchase order awards, we restrict our sample to DUNS whose first award was one of those types (and use new entrants

in the other two award categories as a placebo test).

Using the SAM registration data, we can measure the time it takes (in months) for a vendor to win their first contract after initially registering in SAM. We restrict to firms that are matched to SAM, which requires us to begin our sample in 2014.[6] Prior to 2016, mean time to first award was 65 months for SDVs, 79 months for woman/minority-owned businesses, and 70 months for the rest.

We estimate the following regression which includes one observation per firm, as we only include the first VA award.

$$TimetoAward_{it} = \alpha_t + \sum_{t=2014}^{2020} \beta_t(time = t) * SDV_i + X_i'\delta + \epsilon_{it} \tag{2}$$

Here i indexes DUNS and t indexes half-year, and $\beta_{2016.5}$ to β_{2020}, estimate the impact to new SDV entrants after the 2016 policy change. To control for the characteristics of new entrants, X_i' includes an indicator for being a woman/minority-owned business, the log contract value of the initial award, awarding office fixed effects, major product group fixed effects, and 3-digit NAICS fixed effects.

Figure 6 plots the estimated coefficients on SDV status in Panel A, and a comparison for woman/minority-owned firms in Panel B. Immediately after the policy change, new SDVs won their first VA award 19 months faster than their counterparts prior to June 2016. The decline in time to first award remains relatively stable, and the pooled treatment effect post-2016 equals a decline of 17 months. Panel B shows that other disadvantaged small firms such as those that were owned by women or minorities experienced no decline in their time to first award, and Figure A.5 shows the absence of an effect for SDVs awarded their first BPA call or definitive contract (which were the award categories unaffected by the policy change). Thus, not only were awards to new SDV entrants increased after the policy change,

[6] Although our SAM database begins in 2014, initial registration dates extend as far back as 1997. Within our matched sample, only 17 firms won their first award before their recorded initial registration date.

but new entrants were also able to win their first award within a shorter time frame than before.

Next we measure contracting growth by following new entrants for up to 3 years post-entry, and measure whether they won any subsequent VA awards, as well as the total number and dollar value of their awards. To avoid leakage, firms that entered pre-2016 are only followed up until June 2016, as any awards after that date could be impacted by the policy change. We also test robustness to using a balanced panel of firms where we only include the entry cohorts that are observed a full 3 years; this would exclude cohorts right before the policy change, and cohorts right before the end of our sample period in 2020.

We estimate regression specifications of the following form, at the DUNS-by-half-year level, from 2010 to 2020 (with up to 5 observations per firm).

$$\begin{aligned} Y_{it} = \alpha_t + \sum_{k=1}^{5} \beta_k * SDV_i * (t > 2016) * (k \text{ periods since entry}) \\ + \sum_{k=1}^{5} \gamma_k SDV_i * (k \text{ periods since entry}) + Entrycohort_i + X_i'\delta + \epsilon_{it} \end{aligned} \tag{3}$$

Here i indexes DUNS and t indexes half-year, and the γ_1 to γ_5 measure the growth trajectory of new SDV entrants in the 5 half-year periods following entry. The difference-in-difference coefficients of interest, β_1 to β_5, estimate the differential impact to new SDV entrants that entered after the 2016 policy change. To control for the characteristics of new entrants, X_i' includes an indicator for being a woman/minority-owned business, the log contract value of the initial award, awarding office fixed effects, major product group fixed effects, and 3-digit NAICS fixed effects.

Pooled difference-in-difference estimates are reported in Table 2, while Figure 7 maps out the dynamic effect in the 5 half-years following entry. Column 2 of Table 2 shows that among new entrants whose first award was a purchase order, the SDV entrants were 9.8 percentage points more likely to win a subsequent award in the 3 years after entry. This advantage is doubled after the policy change, as now SDV entrants are an additional 9 percentage points

more likely to win a subsequent award. This effect is similar whether we use a balanced or unbalanced panel of cohorts (Column 2 versus Column 3). For new entrants whose first award was a delivery order, it is less straightforward to measure subsequent awards because by nature delivery orders are a repetitive arrangement. However, if we exclude future delivery orders from our outcome measure, we obtain estimates very similar to those for purchase order entrants.

Figure 7 plots the estimates corresponding to Equation 3, and the results show an immediate and stable impact of the policy change. In each of the five periods post-entry, SDV firms are roughly 10 percentage points more likely to win another award, and the policy change doubles these chances after 2016. Appendix Figure A.7 shows a similar pattern for delivery order entrants, after excluding future delivery order awards from the outcome measure. Meanwhile, Appendix Figure A.8 shows a clear lack of effect for BPA call and definite contracts, the two other types of awards that were not impacted by the 2016 policy change.

Turning to the intensive margin, Table 3 reports estimates for two outcomes conditional on winning an award in each half-year period: the log total number of awards, and the log total dollar value awarded. Among purchase order entrants, the policy change increased the total number of awards to SDVs by approximately 12 percent. This is about half of the effect that SDV status provides overall, and the magnitude of this effect is quite small relative to the baseline mean of 0.4, implying the average firm won 0.2 additional contracts per period. And although having SDV status increases the total dollar value of subsequent awards won, there is no evidence that the policy change had any additional impact on SDVs. These results are further confirmed in the dynamic effects estimated in Figure 8. Because both of these measures are conditional on winning, this suggests that the marginal SDV entrants helped by the policy change were below average ex-ante in terms of likelihood of winning and award size.

4.3 Survival

The next question we consider is whether the increase in preferences also improved vendors' chances of survival. For example, of the approximately 400 new SDV businesses that first won a VA contract in 2013, half failed to win another contract before the 2016 policy change was enacted. By increasing contract awards to target businesses, did the policy also increase firms' likelihood of survival?

To study this, we restrict our analysis to firms we observe winning VA contracts and estimate the effect of SDV status over time on survival until 2021. In order to generate our measure of survival, we match each DUNS number to a commercial business database maintained by Dun & Bradstreet. Survival is defined as whether a vendor can be matched to the August 2021 snapshot of the D&B Hoovers directory of businesses. The raw survival rates plotted in Figure 9 suggest that relative to non-veterans, SDV vendors were more likely to stay in business after the policy change. This reversal in trend seems especially significant if we might expect contracts to now be harder for non-veteran businesses to win, leading to positive selection for the non-veteran businesses we observe post-2016.[7]

To estimate a treatment effect after controlling for vendor characteristics, we estimate the following regression specification separately for every half-year period from 2012 to 2019.5:

$$Survive_i = \beta * SDV_i + X_i'\delta + \epsilon_i \tag{4}$$

Contract awards are aggregated to the half-year and DUNS level, and i indexes DUNS. The β's are our coefficients of interest, and the vector of controls X_i' includes the log number of contracts won, log of total contract value, firm's pseudo-age, an indicator for woman/minority-owned business, and fixed effects for awarding office, major product group,

[7]When matching vendors to the D&B database, we observed a large discontinuous drop off in match rates prior to August 2011, which suggests that D&B weeds out firms at the 10-year mark. To improve comparability, we begin our graph and survival analysis in 2012.

and 3-digit NAICS. Although we do not observe the age of the business, we can calculate a pseudo-age based on the number of years since we first observed them winning a contract.

Figure 10 plots the estimated coefficients on SDV status in Panel A, and a comparison for woman/minority-owned firms in Panel B. All else equal, SDV contractors in 2012 were 5-6 percentage points less likely to survive up to the present. This negative effect reversed in the years around the policy change, and by 2018, SDVs were slightly more likely to survive. Comparing the estimates in Panel A to those in Panel B provides further evidence of the existence of a treatment effect, as other disadvantaged businesses – that did not benefit from the policy change – did not experience any improvement in survival rates over this period.

5 Impacts on Federal Procurement

Having documented that the expanded use of preferences in VA awards benefited both incumbent and new-entrant SDVs, we now study the extent to which the policy affected the Federal Government. We proceed in two steps. First, we ask whether the ruling expanding VA policy also increased SDV's success in winning awards from other federal agencies. After finding no evidence of such spillovers, we then estimate the effects of the policy on two sets of contract outcomes –the extent of competition for awards and contract execution performance – using non-VA agencies as the basis for constructing a control group.

5.1 Spillovers to non-VA Agencies

We estimate whether the increase in preferences from the VA also led to spillovers to other federal agencies. Following the methodology in subsection 4.2, we identify businesses that were awarded their first federal contract from the VA, and estimate the likelihood of winning a contract from any other federal agency in the following three years. We use a difference-in-differences design to test whether SDV businesses experienced a change in spillovers after the 2016 policy change, relative to their non-veteran counterparts. We esti-

mate the following regression specification at the DUNS-by-half-year level from 2010 to 2020 (resulting in up to 6 observations per firm).

$$Spillover_{it} = \alpha_t + \beta * (t > 2016) * SDV_i + \gamma * SDV_i + Entrycohort_i + X_i'\delta + \epsilon_{it} \quad (5)$$

Here i indexes DUNS and t indexes half-year, and after controlling for time and cohort of entry fixed effects, β is our difference-in-differences coefficient of interest. To control for firm characteristics, X_i' includes the log contract value of the initial award, awarding office fixed effects, major product group fixed effects, and 3-digit NAICS fixed effects.

Table 4 reports the regression estimates, where the first three columns estimate an outcome that is equal to one if the firm wins any award from any non-VA agency, and the next columns estimate the log number of awards and log total dollars awarded, conditional on winning. At baseline, new SDV vendors are 6 percentage points more likely than other new vendors to win contracts from other agencies after being awarded a VA contract. However, the Post*SDV interaction is close to zero and not statistically significant, indicating no change in the likelihood of spillovers for new SDVs that entered after the policy change. The same is true for our intensive margin measures.

5.2 Competition and Performance

While we provide evidence that the policy indeed benefited the target population, an open question is how it affected contract outcomes for the Federal Government. We focus on two sets of outcomes: the extent of competition for awards, and contract execution performance.[8]

[8]Of course, another key relevant outcome is award price. However, we are unable to assess the impact on unit prices since the Federal Procurement Data System (FPDS) does not report price and quantity separately, only total award value. This limitation is shared with the procurement literature based on FPDS.

5.2.1 Methodology

We build on our results showing the absence of spillovers by using agencies other than the VA to build counterfactual procurement outcomes. First, focusing exclusively on purchase orders, we aggregate our contract data to the agency-by-half-year level and use the synthetic control method. We use the implementation by Arkhangelsky et al. (2021), which we briefly characterize below. For details, see Abadie and Gardeazabal (2003); Alberto Abadie and Hainmueller (2010); Abadie (2021).

Let $j = 1, ..., J$, denote federal agencies, where $j = 1$ corresponds to the VA. We observe outcomes Y_{jt}, where t denotes a half-year. The method searches for weights ω_j to construct the counterfactual VA outcome $\hat{Y}_{1t}^C = \sum_{j \neq 1} \omega_j \cdot Y_{jt}$, such that the counterfactual most closely resembles VA's pre-treatment values. These weights are nonnegative and sum up to one, and are such that they minimize a distance metric between Y_{1t} and $\hat{Y}_{1t}^C$, for $t \leq 2016$. The estimated treatment effect for a given period $t > 2016$ is simply the difference between the VA outcome and the counterfactual outcome, i.e., $\hat{\tau}_t = Y_{1t} - \hat{Y}_{1t}^C$, for $t > 2016$. A single average treatment on the treated (ATT) effect can be obtained as the average effect across $t > 2016$. Standard errors are obtained using a permutation method which sequentially reassigns the treatment to agencies in the control pool and estimates a distribution of "placebo effects".

Before estimating the effects on our outcomes of interest, we first verify that indeed the policy led to an increase in SDV set-asides and awards relative to non-VA agencies. As expected, Figure 11 shows that the VA saw a large increase in the use of SDV set-asides and the actual award to SDV firms, whereas the synthetic VA continues on a flat trend. Table 5 shows the estimated ATTs and implies that the policy led to a 12.77 percentage point increase in the use of SDV set-asides (column 1), and 23.31 percentage point increase in the share of awards to SDV businesses (column 2). These estimates are highly significant and very large in magnitude considering the low baselines (1.6% and 6.3%, respectively).

Appendix Table B.1 presents weights for the selected agencies in the control group for each specification we estimate. This shows, for instance, that the effect on SDV set-asides

relies on a synthetic control formed by the Department of Housing and Urban Development (59%), the National Science Foundation (18%), the Securities and Exchange Commission (17%), and the International Trade Commission (6%).

5.2.2 Extent of Competition

To measure the extent of competition for awards, we use the number of offers received in the solicitation of the procurement contract. Given how skewed this variable is – the majority of purchase orders only received a single offer – we also construct a dummy variable that takes the value of one if more than a single offer is received.

Before discussing the results, it is worth noting that the impact of the expanded preference policy on competition is ex-ante ambiguous. First, there is a negative direct effect since preferences restrict the set of businesses that can qualify for VA awards. However, this effect can be attenuated or even reversed if the policy increases entry into the procurement market and/or participation by incumbent firms. Indeed, results from the preceding section imply that this counterforce will be at play.

Figure 12 presents trends in the extent of competition for the VA and the synthetic VA. Panel A shows the average number of offers received, while Panel B shows the share of contracts that received multiple offers. In both cases, we see an apparent increase in the extent of competition for VA awards relative to the synthetic control. The point estimates for the ATT are substantial: column 3 in Table 5 shows that the policy led to 0.18 additional offers and an increase of 5.63 percentage points in the share of awards receiving multiple offers. These point estimates represent increases of 13% and 34% relative to the pre-policy mean for the VA. However, the coefficients are imprecise, and we are unable to reject null effects. At the very least, they suggest that SDV set-asides do not diminish competition, highlighting the role of entry and increased participation of targeted firms.

5.2.3 Contract Execution Performance

Finally, we investigate whether the extended use of preferences for SDV businesses resulted in changes in contract execution performance. We focus on two measures of performance, namely delays beyond the expected duration of the contract, and cost overruns above the base contract value.[9]

As with competition, the impact of the policy on execution performance is ex-ante uncertain. By changing the pool of eligible bidders, the effect on measured performance will depend on how the execution ability of these new vendors compares to those that were winning awards in the absence of preferences. Given that the previous alternative for many of these set-asides was the use of federal supply schedules, we might expect the policy to lead to less efficient execution. On the other hand, commercially available goods and services likely have less variation in execution quality compared to more complicated awards such as definitive contracts.

Figure 13 shows trends in delays and cost overruns for the VA and synthetic controls. Panel A plots the share of awards with delays within the scope of the original agreement, and Panel B the average cost overruns as a share of the initial budget. In both cases, there is no significant divergence between the trends in both groups following the 2016 ruling by the Supreme Court. The estimated ATTs are very small and statistically insignificant: Table 5 column 5 shows that the share of delayed contracts increases by one-hundredth of a percentage point, while column 6 implies that average cost overruns as a share of the initial budget *decrease* by 1.6 percentage points.

[9]These measures are commonly used in the public procurement literature (e.g. Decarolis, 2014; Kang and Miller, 2021; Carril, 2022; Carril et al., 2022), and they capture the extent of costly adaptation Bajari et al. (2014). Furthermore, using data from the *IT Dashboard*—a sample of large IT contracts for which quality is systematically measured—Carril (2022) shows that delays and overruns are positively correlated with more general contract quality assessments based on objective product and service characteristics.

5.2.4 Robustness checks

We finalize this section by conducting a series of robustness checks on our preferred specification. First, we show that the absence of evidence of a detriment in performance is quite robust across different measures of performance, including other ways to compute delays and overruns, as well as contract termination (see Appendix Table B.2). Second, we verify that all of our synthetic control estimates are robust to the inclusion of additional covariates in the creation of the synthetic VA, such as each agency's set-aside share and log(mean contract value) (see Appendix Figure A.9 and Table B.3). Finally, we test the sensitivity of our results to using a common set of weights to construct our synthetic VA, and these results are graphed in Appendix Figure A.10. Using the optimal weights assigned for the SDV share specification and holding these weights fixed for our other outcomes of interest still produces qualitatively similar results: relative to the synthetic control, VA awards become more competitive after the policy change, and do not experience a change in execution performance.

5.2.5 Summing up

Overall, this implies that we can reject the notion that increased access to federal procurement contracts by SDVs came at the cost of sacrificing competition or deteriorating execution performance for the VA. It is also important to note that the scope of the policy expansion, which affected the procurement of commercially available goods and services that could have previously been purchased through a FSS, likely contributed to the absence of impacts on performance. This suggests that relative to larger, more specialized acquisitions, purchase orders may be a more efficient sphere through which governments can increase preferences for disadvantaged businesses.

6 Conclusion

The Department of Veterans Affairs awards a large and growing share of civilian federal procurement contracts (over $30 billion annually since FY2020). However, the distribution of procurement awards is highly skewed; among both the VA and non-VA agencies, the majority of purchase order awards went to only the top 2 percent of vendors prior to 2016. While preference programs like the VA's set-asides for service-disabled veteran business owners is meant to level the playing field for disadvantaged firms, whether this fosters new entrepreneurship or simply increases the awards to existing qualified vendors is of great policy relevance.

We evaluate the effectiveness of the VA's SDV preference program in improving the outcomes of targeted businesses and find that the 2016 expansion in scope did, in fact, increase awards to vendors not previously contracting with the government. This included not only new businesses but also those previously unsuccessful in winning awards. Additionally, relative to their non-veteran counterparts, SDVs were more likely to survive until 2021.

On the other hand, this expansion did not result in spillovers to other non-VA agencies, and we find no negative impacts on the Federal Government: competition for awards did not decrease – and may have even increased given greater entry and survival – while contract execution performance did not change. These findings suggest the VA's use of SDV set-asides has been successful in improving outcomes for the target population, without imposing significant efficiency costs for the government. While purchase orders awarded by non-VA agencies became increasingly concentrated within the top vendors after 2016, concentration actually reversed for VA awards.

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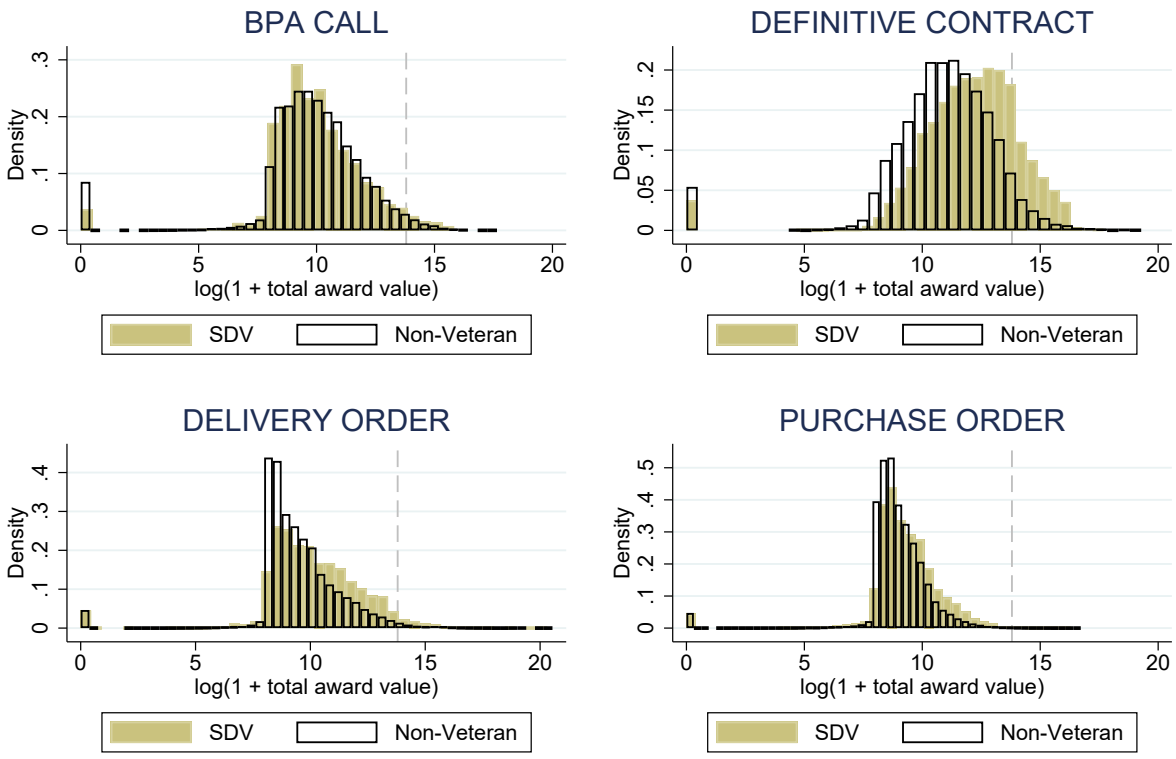
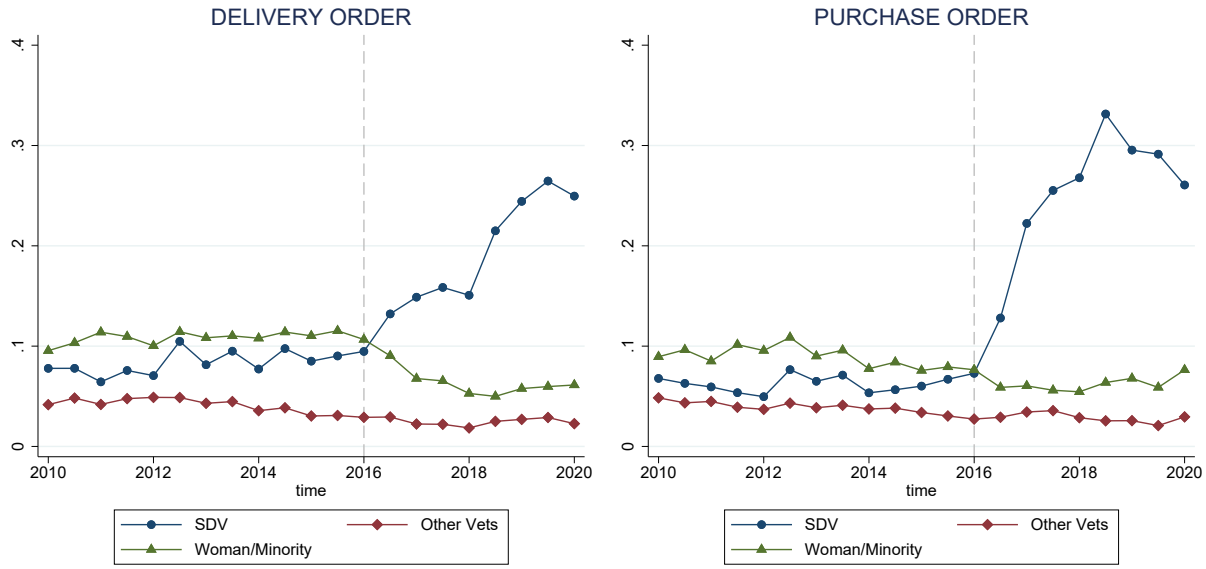
Figure 1: Distribution of Award Values, by Award Type (2011 - 2014)



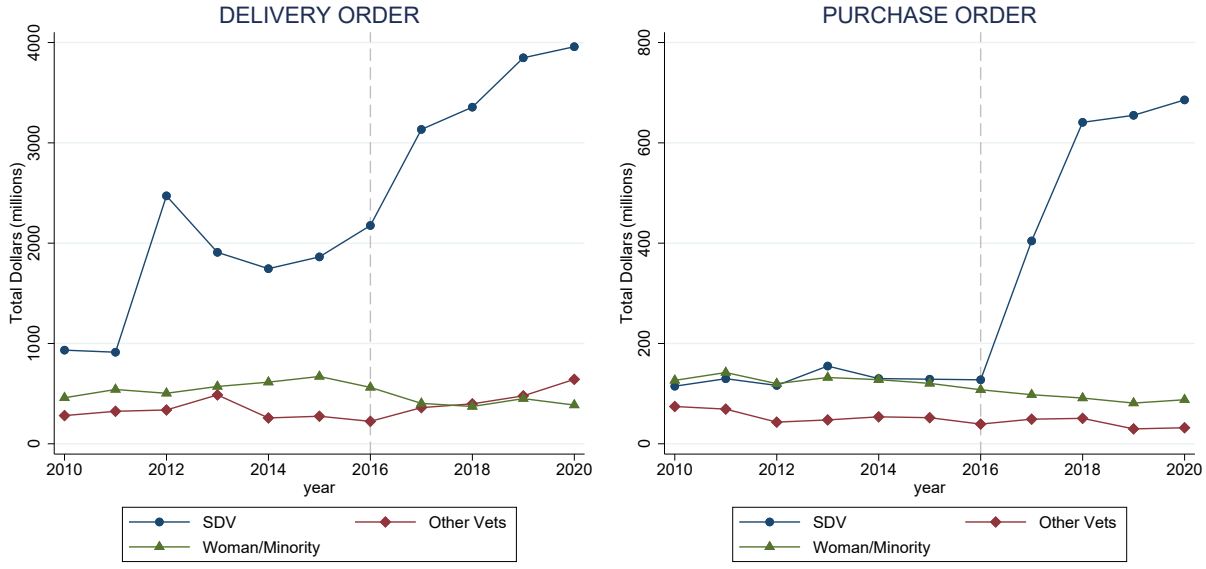
FPDS initial action contracts funded by VA from 2011 to 2014. Includes all contracts awarded by the VA to either an SDV or a non-veteran-owned business. Dashed line indicates threshold of $1 million value. Number of observations equals 24,574 for BPA, 18,649 for DC, 323,938 for DO, and 262,950 for PO.

Figure 2: Share of Contract Awards, by Award Type (2010 - 2020)



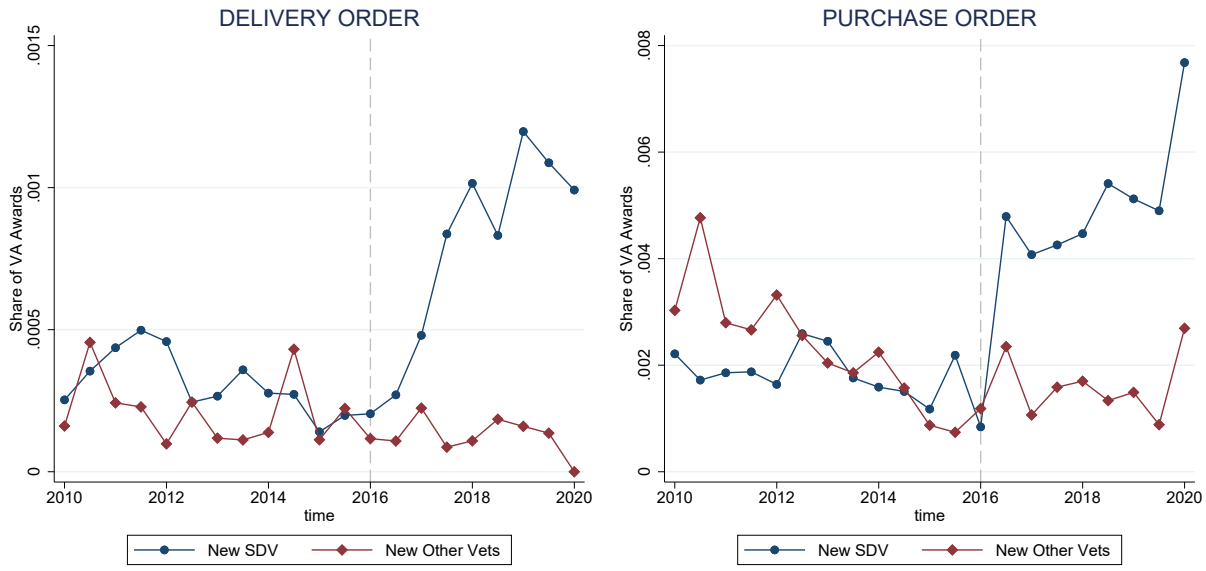
FPDS initial action contracts funded by VA from 2010 to 2020. Measures calculated for half-year intervals.

Figure 3: Dollar Value of Awards, by Award Type (2010 - 2020)



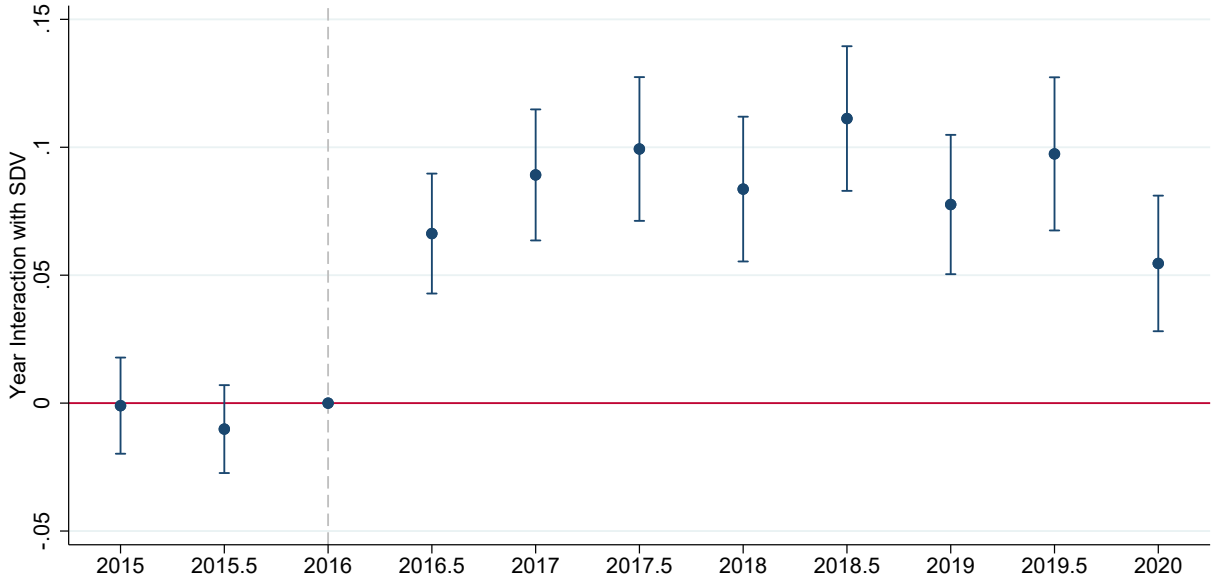
FPDS initial action contracts funded by VA from 2010 to 2020. Each year is measured from July of the previous year to June of the current.

Figure 4: Awards to New DUNS (2010 - 2020)



Source: FPDS contracts funded by VA, limited to delivery orders and purchase orders. A DUNS is defined as new the first month they win any procurement award.

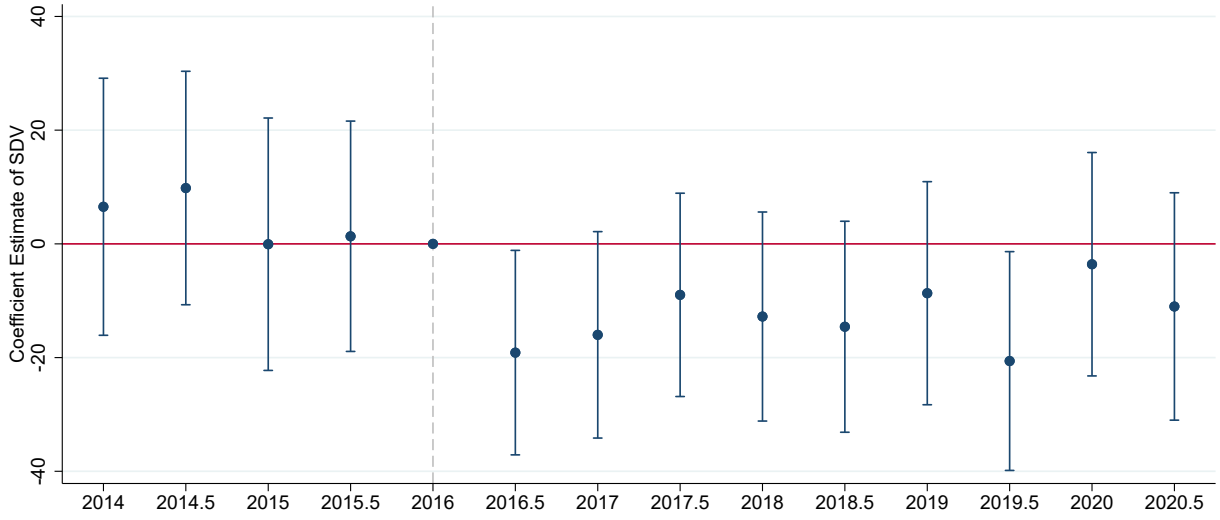
Figure 5: Probability of winning an award (2015 - 2020)



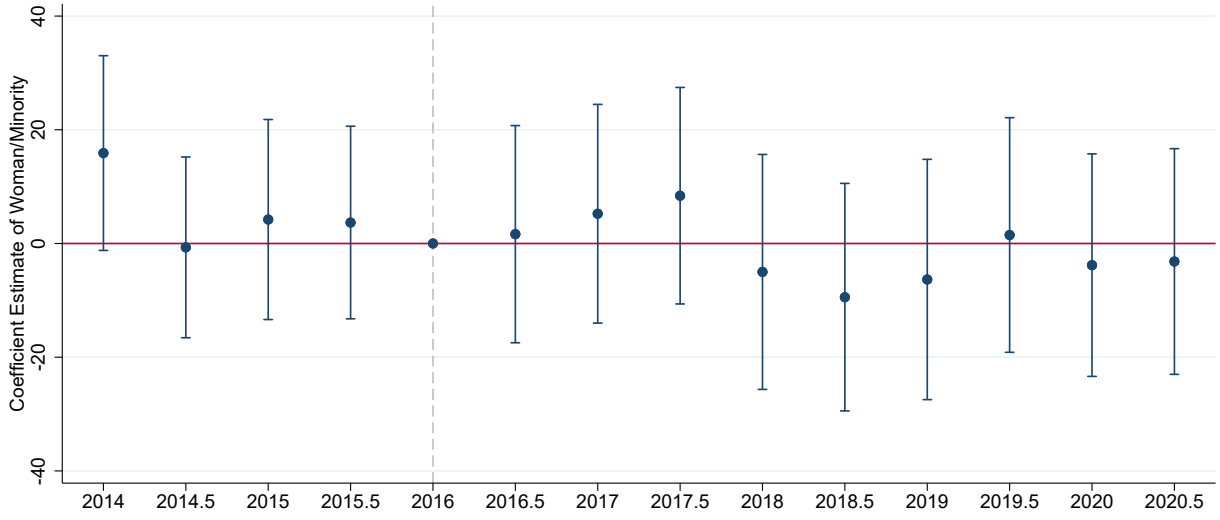
(N = 207,548) Includes 629 SDV businesses and 18,239 non-SDV businesses that were registered in 2014, but had not been awarded any federal contract prior to 2015. Observations at the DUNS-halfyear level. Regression estimates of the SDV*time interaction are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include time FEs and DUNS FEs.

Figure 6: Time to First Award (2014 - 2020)

A. Coefficient on SDV firms

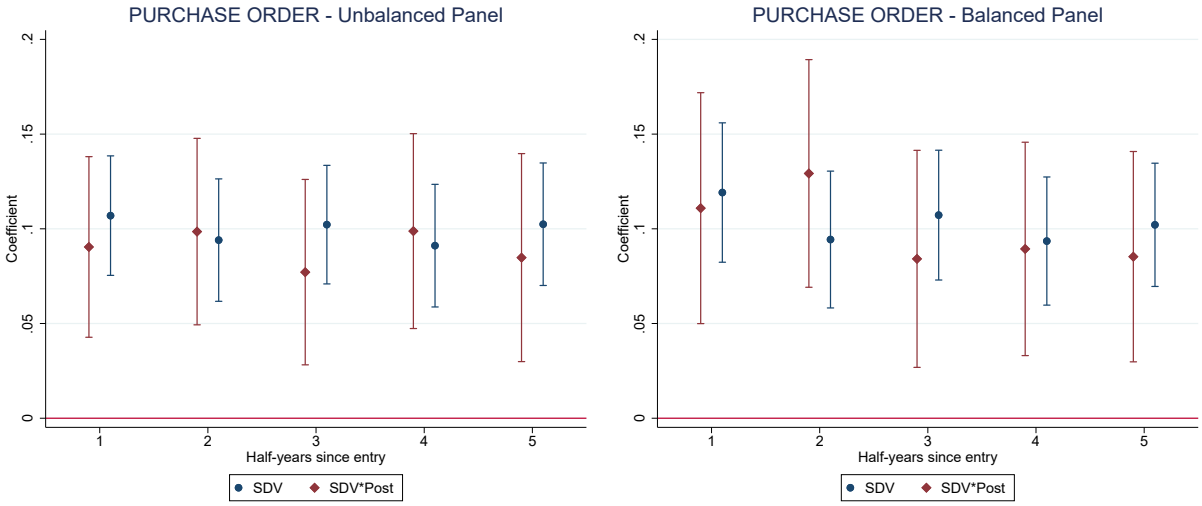


B. Coefficient on Woman/Minority-owned firms



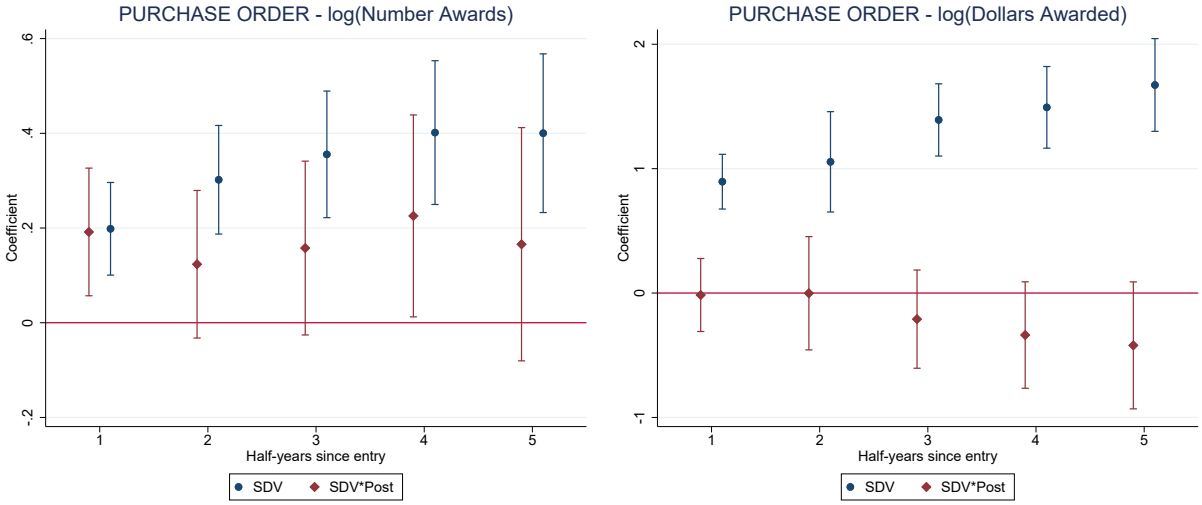
(N = 9,101) Each panel is estimated with a separate regression. Controls include log initial contract value, indicators for SDV and Woman/Minority, time FEs, awarding office FEs, product group FEs, and 3-digit NAICS FEs. Estimates are plotted with 95% confidence intervals using robust standard errors.

Figure 7: Growth of New Entrants (2010 - 2020)



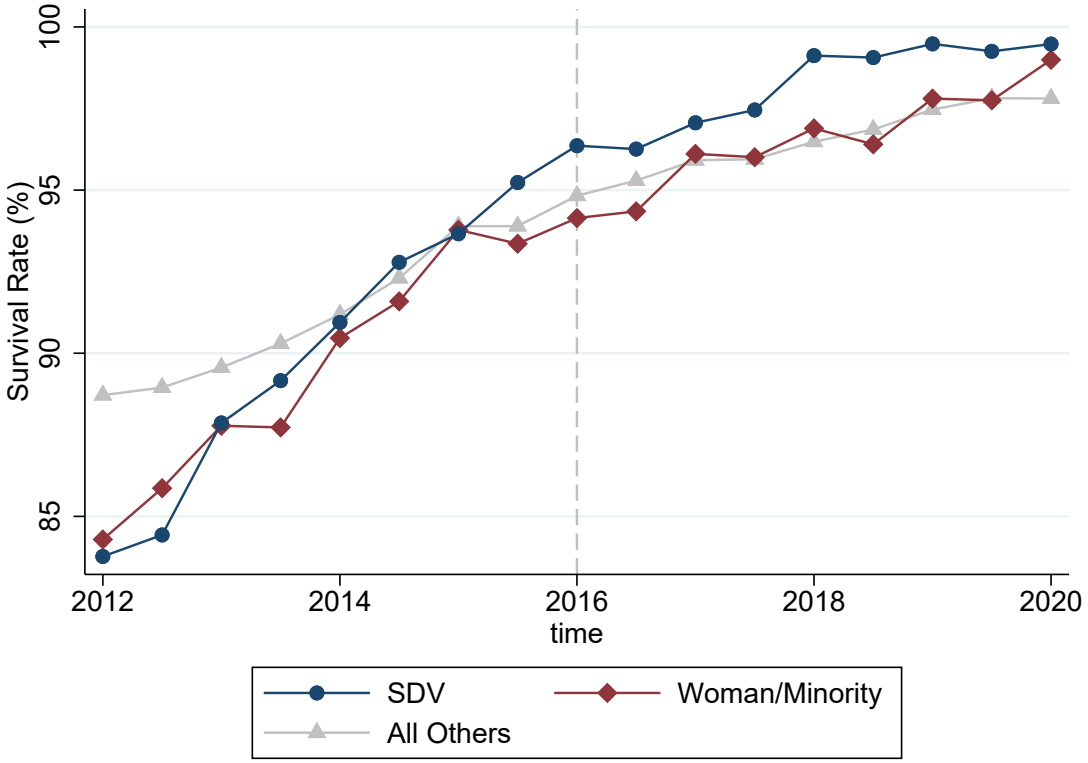
Outcome is indicator for winning an award, and mean values are 0.20 in both panels. Left panel is unbalanced (N = 98,893), while right panel restricts to cohorts with 3 years of post-entry observations (N = 82,870). Observations at the DUNS-halfyear level. Coefficient estimates are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include initial contract size, woman/minority indicator, age-by-time FEs, cohort FEs, product FEs, awarding office FEs, and NAICS-3 FEs.

Figure 8: Growth of New Entrants, Conditional on Winning Award (2010 - 2020)



(N = 20,229 and 19,629, respectively). Mean log(#) is 0.58 and mean log($) is 10.3. Observations at the DUNS-halfyear level. Coefficient estimates are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include initial contract size, woman/minority indicator, age-by-time FEs, cohort FEs, product FEs, awarding office FEs, and NAICS-3 FEs.

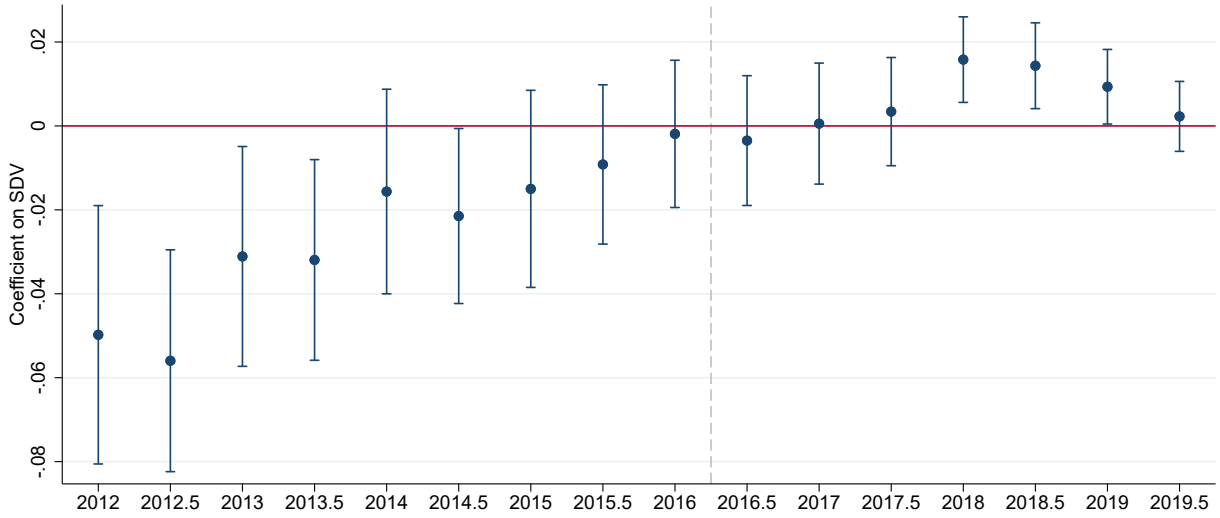
Figure 9: Likelihood of Survival (2012 - 2020)



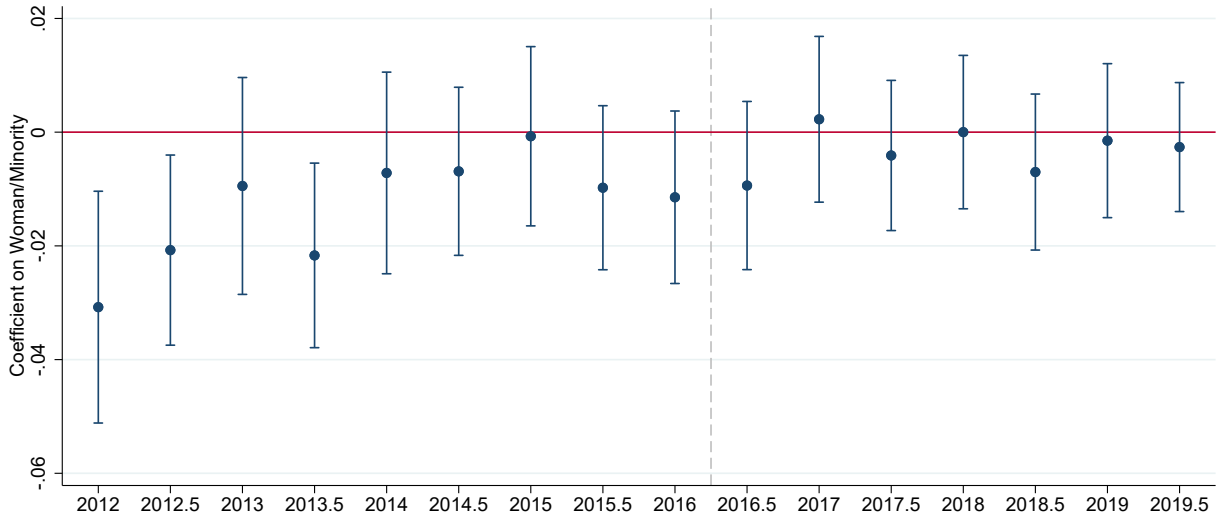
Restricted to vendors with a VA delivery order or purchase order award in each half-year. Survival is defined as being matched to the D&B business directory as of August 2021.

Figure 10: Probability of Survival to 2021 (2012 - 2020)

A. Coefficient on SDV firms



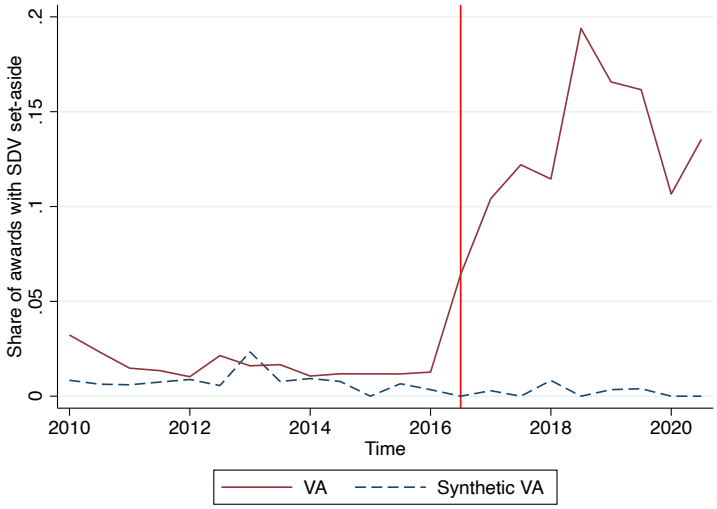
B. Coefficient on Woman/Minority-owned firms



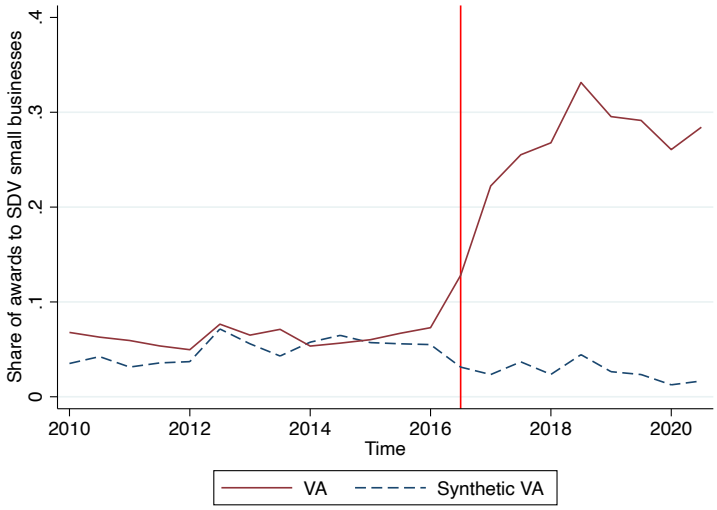
Each estimate is from a separate regression at the DUNS-by-halfyear level. Controls include number of contracts, total contract value, pseudo-age, indicators for SDV and woman/minority-owned, awarding office FEs, product group FEs, and 3-digit NAICS FEs. Estimates are plotted with 95% confidence intervals using robust standard errors.

Figure 11: SDV Set-Asides and Awards (2010-2020)

A. Use of Sevice-Disabled Veteran-Owned Set-Asides

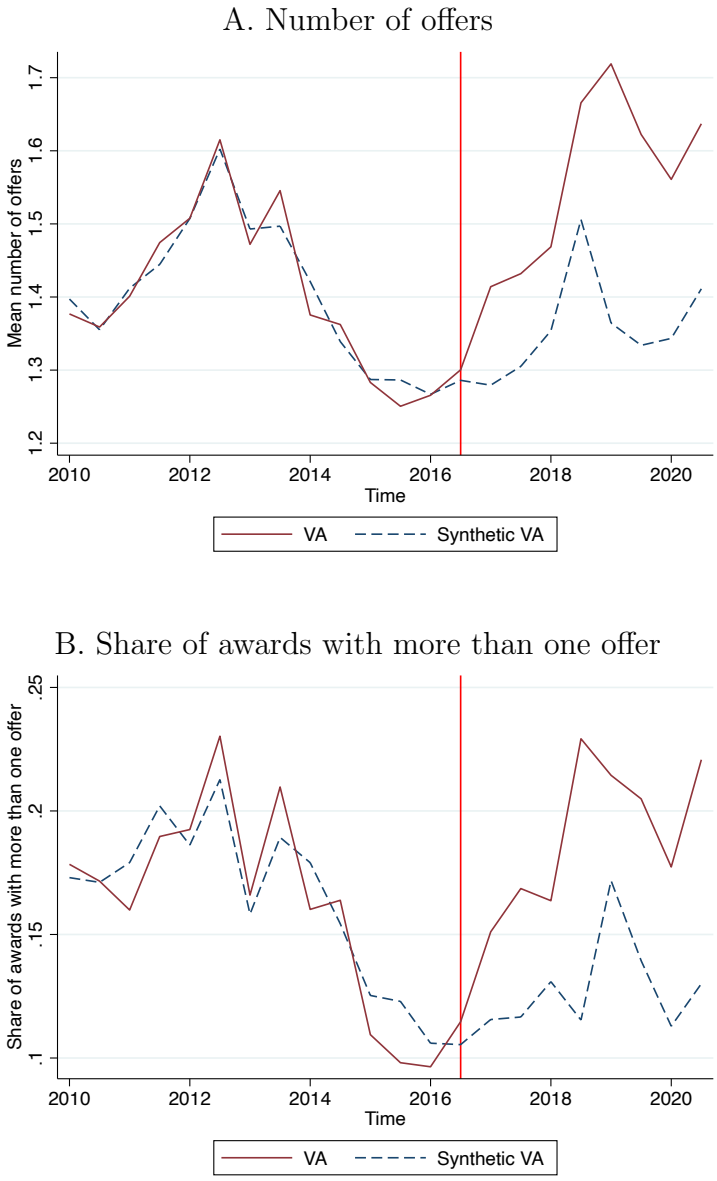


B. Awards to Sevice-Disabled Veteran-Owned Businesses



This figure shows trends in two outcome variables for the VA and a control group constructed using the synthetic control method. An observation is an agency by half-year. Panel A shows the share of awards that are set aside for SDV businesses. Panel B shows the share of contracts awarded to SDV businesses. The sample is restricted to purchase orders in the years 2010 through 2020. The synthetic VA is generated from a pool of 47 federal agencies. The full list of agencies and their weight in the synthetic control specifications is presented in Appendix Table B.1.

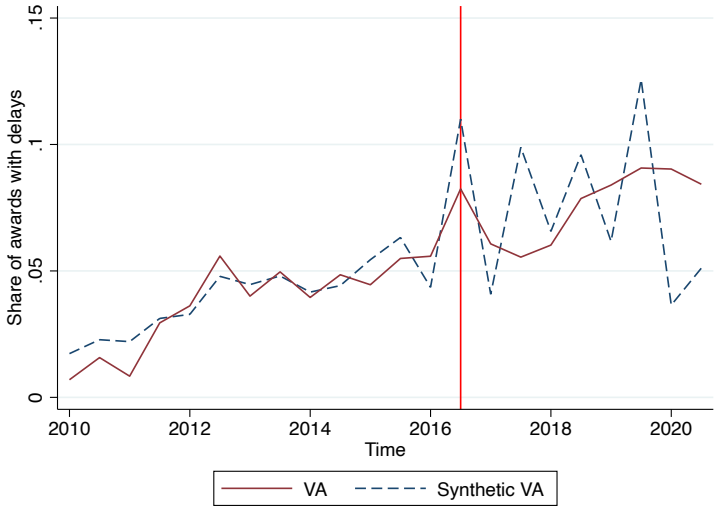
Figure 12: Competition for Awards (2010-2020)



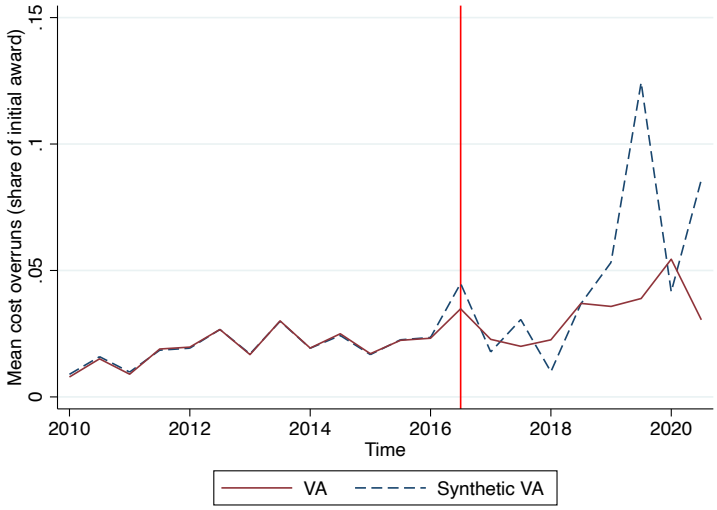
This figure shows trends in two outcome variables for the VA and a control group constructed using the synthetic control method. An observation is an agency by half-year. Panel A shows the average number of offers received. Panel B shows the share of awards where more than a single offer was received. The sample is restricted to purchase orders in the years 2010 through 2020. The synthetic VA is generated from a pool of 47 federal agencies. The full list of agencies and their weight in the synthetic control specifications is presented in Appendix Table B.1.

Figure 13: Delays and Cost Overruns (2010 - 2020)

A. Share of awards with within-scope delays (duration exceeding expected)



B. Average within-scope cost overruns (spending exceeding initial budget, in relative terms)



This figure shows trends in two outcome variables for the VA and a control group constructed using the synthetic control method. An observation is an agency by half-year. Panel A shows the share of contracts that experienced a delay, defined as modifications within the scope of the original contract resulting in an actual duration that is longer than originally expected. Panel B shows average cost overruns, defined as the difference between actual spending and originally expected spending, as a share of the initial budget. Like with delays, cost overruns are only considered if they arise due to modifications within the scope of the original contract. The sample is restricted to purchase orders in the years 2010 through 2020. The synthetic VA is generated from a pool of 47 federal agencies. The full list of agencies and their weight in the synthetic control specifications is presented in Appendix Table B.1.

Table 1: Summary Statistics Before Policy Change (2011-2014)

Percentage shares (%)	BPA Call	Definitive Contract	Delivery Order	Purchase Order
Contract value ($1000's)	131.91	626.41	158.97	19.74
SDV	7.43	38.25	8.40	6.03
Non-disabled vet	2.61	3.74	4.37	4.03
Woman-owned	11.11	5.37	8.64	5.77
Minority-owned	5.34	4.45	3.81	4.51
Observations	24,574	18,649	323,938	262,950

Restricting to Delivery and Purchase Orders

Percentage shares (%)	SDV	Non-disabled vet	Woman/Minority	All other
Contract value ($1000's)	189.49	63.48	47.21	96.12
Medical	40.67	54.19	55.73	68.28
Maintenance/Repair	11.45	4.98	3.50	5.15
IT/Tech	7.40	5.52	7.86	2.58
Prof/Admin services	4.11	3.25	3.88	1.95
Observations	43,064	24,743	59,979	459,102

Includes all initial action contracts funded by VA from 2011 through 2014. All rows except contract values are denoted in percentage shares. Top panel reports shares by award type, and bottom panel reports shares by small business ownership status. SDV denotes service-disabled veteran owned small business.

Table 2: Growth of New Entrants - Any Award (2010–2020)

	Purchase Order			Delivery Order			Delivery Order - Exclude future DOs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
post*SDV	0.0895***	0.0904***	0.0998***	-0.0721**	-0.0301	-0.0376	0.0918***	0.0982***	0.147***
	(0.0180)	(0.0183)	(0.0220)	(0.0362)	(0.0383)	(0.0518)	(0.0311)	(0.0333)	(0.0464)
SDV	0.0849***	0.100***	0.104***	0.164***	0.170***	0.182***	0.105***	0.0943***	0.0934***
	(0.0115)	(0.0118)	(0.0131)	(0.0220)	(0.0230)	(0.0255)	(0.0161)	(0.0166)	(0.0188)
initial size	0.0141***	0.0137***	0.0145***	0.0194***	0.0185***	0.0194***	-0.0000111	0.000928	0.00141
	(0.00112)	(0.00111)	(0.00127)	(0.00147)	(0.00155)	(0.00189)	(0.000738)	(0.000786)	(0.000964)
R^2	0.026	0.072	0.075	0.059	0.155	0.164	0.040	0.115	0.130
ymean	0.202	0.205	0.200	0.449	0.451	0.428	0.0533	0.0536	0.0576
Controls		X	X		X	X		X	X
Balanced			X			X			X
N	104569	98893	82870	26526	26380	21235	26526	26380	21235

Observations at DUNS-half-year level, and include entry cohort and time FEs. Columns 3, 6, and 9 are restricted to a balanced panel of cohorts that are observed for the full 3 years. Additional controls include woman/minority indicator, and FEs for major product group, awarding office, and 3-digit NAICS. In columns 7-9, we exclude any future delivery order awards from the outcome measure.
Standard errors clustered at firm level in parentheses ** $p < 0.05$, *** $p < 0.01$

Table 3: Growth of New Entrants - Intensive Margin (2010–2020)

	Purchase Order				Delivery Order - Excluding DO			
	log(# awards)		log(dollars)		log(# awards)		log(dollars)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
post*SDV	0.116***	0.166***	-0.0786	-0.0235	0.221	0.0475	0.287	0.338
	(0.0403)	(0.0529)	(0.0940)	(0.117)	(0.161)	(0.265)	(0.630)	(0.860)
SDV	0.242***	0.273***	0.849***	0.896***	0.0368	0.125	0.780***	0.926***
	(0.0295)	(0.0353)	(0.0743)	(0.0862)	(0.122)	(0.133)	(0.272)	(0.286)
initial size	0.00630***	0.00879***	0.528***	0.510***	0.0126	0.0203	0.154***	0.187***
	(0.00220)	(0.00285)	(0.0194)	(0.0228)	(0.0110)	(0.0144)	(0.0358)	(0.0499)
R^2	0.182	0.196	0.434	0.420	0.361	0.382	0.585	0.619
ymean	0.385	0.408	9.835	9.801	0.533	0.538	11.31	11.31
Controls	X	X	X	X	X	X	X	X
Balanced		X		X		X		X
N	44150	33083	42967	32290	1508	1283	1480	1263

Observations at DUNS-half-year level, and include entry cohort and time FEs. Even columns are restricted to a balanced panel of cohorts that are observed for the full 3 years. Additional controls include woman/minority indicator, and FEs for major product group, awarding office, and 3-digit NAICS. For Delivery Order, we exclude any future delivery order awards from the outcome measure. Standard errors clustered at firm level in parentheses *** $p < 0.01$

Table 4: Estimates of Spillovers (2010–2020)

	Any Award			log(# of awards)			log(dollars awarded)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
post*SDV	-0.000185	-0.0113	-0.0134	0.143	0.124	0.000495	-0.183	-0.222	-0.0872
	(0.0114)	(0.0115)	(0.0149)	(0.155)	(0.129)	(0.162)	(0.250)	(0.268)	(0.308)
SDV	0.0619***	0.0541***	0.0579***	0.0671	0.0443	0.102	0.900***	0.770***	0.789***
	(0.00783)	(0.00793)	(0.00905)	(0.0840)	(0.0818)	(0.0923)	(0.176)	(0.169)	(0.179)
initial size	0.00132***	0.00185***	0.00174***	0.0308***	0.0235***	0.0253***	0.164***	0.127***	0.128***
	(0.000387)	(0.000412)	(0.000532)	(0.00877)	(0.00828)	(0.00949)	(0.0281)	(0.0297)	(0.0325)
R^2	0.010	0.045	0.048	0.042	0.284	0.311	0.109	0.284	0.322
ymean	0.0337	0.0332	0.0342	0.472	0.491	0.481	10.19	10.24	10.20
Controls		X	X		X	X		X	X
Balanced			X			X			X
N	109398	104565	83856	3683	3426	2815	3539	3283	2703

Observations at DUNS-half-year level, and include entry cohort and time FEs. Columns 3, 6, and 9 are restricted to a balanced panel of cohorts that are observed for the full 3 years. Additional controls include FEs for major product group, awarding office, and 3-digit NAICS. Standard errors clustered at firm level in parentheses ** $p < 0.05$, *** $p < 0.01$

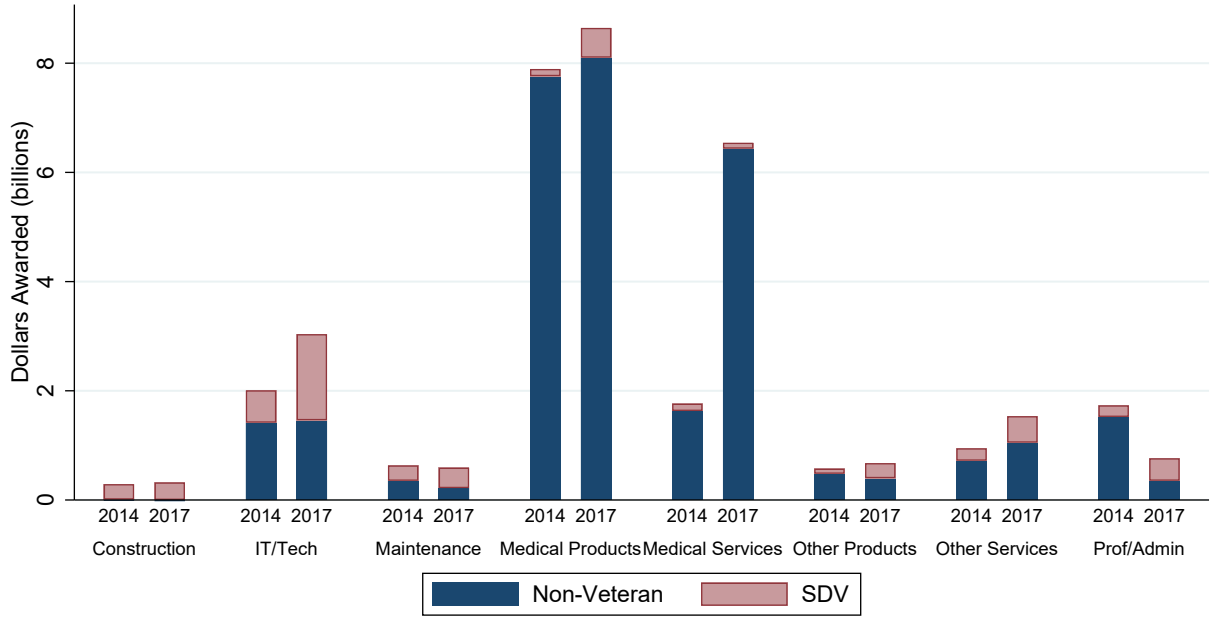
Table 5: Synthetic Control Estimates

	SDV Set-aside	SDV Award	No. of Offers	Multiple Offers	Delayed	Cost Overruns
	(1)	(2)	(3)	(4)	(5)	(6)
ATT	0.1277	0.2331	0.1819	0.0563	0.0001	-0.0165
(Std. Error)	(0.0056)	(0.0172)	(0.2571)	(0.0887)	(0.0292)	(0.0798)
Pre-2016 Mean D.V.	0.0159	0.0628	1.4068	0.1635	0.0374	0.0193
No. of Agencies	48	48	48	48	48	48
No. of Observations	1,056	1,056	1,056	1,056	1,056	1,056

Observations at agency-half-year level. ATTs are computed using Arkhangelsky et al. (2021)'s implementation of the synthetic control method, with no covariates. Standard errors are computed using permutation methods, generating 50 placebo estimates where the treatment is assigned randomly to agencies in the control pool.

Appendix: Additional Figures and Tables

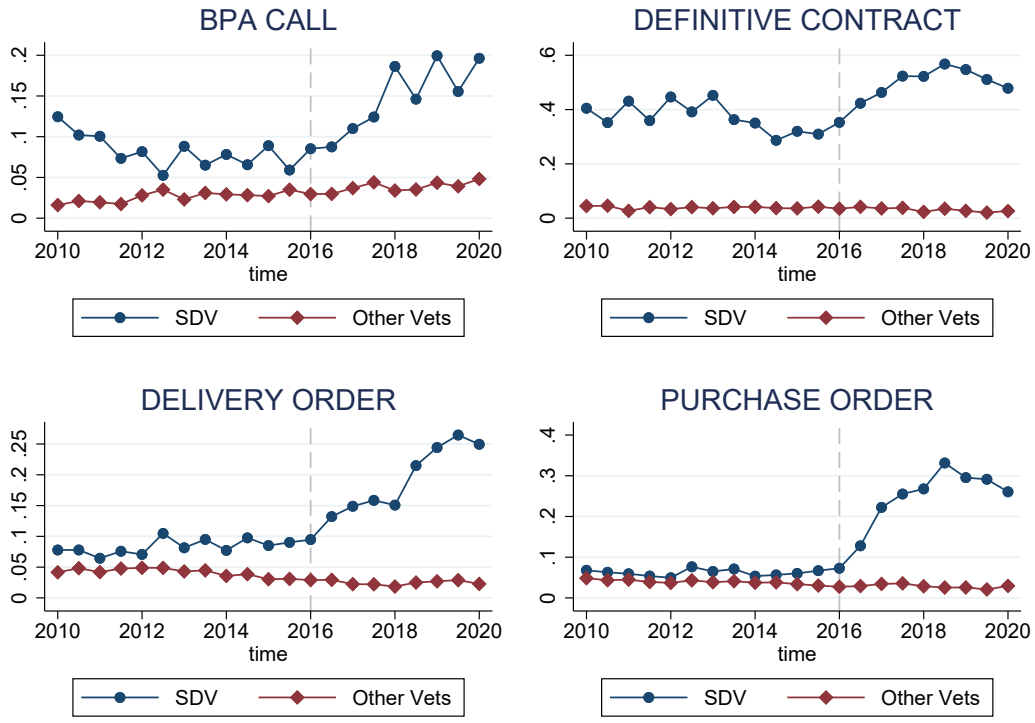
Figure A.1: Most Common Categories of VA awards



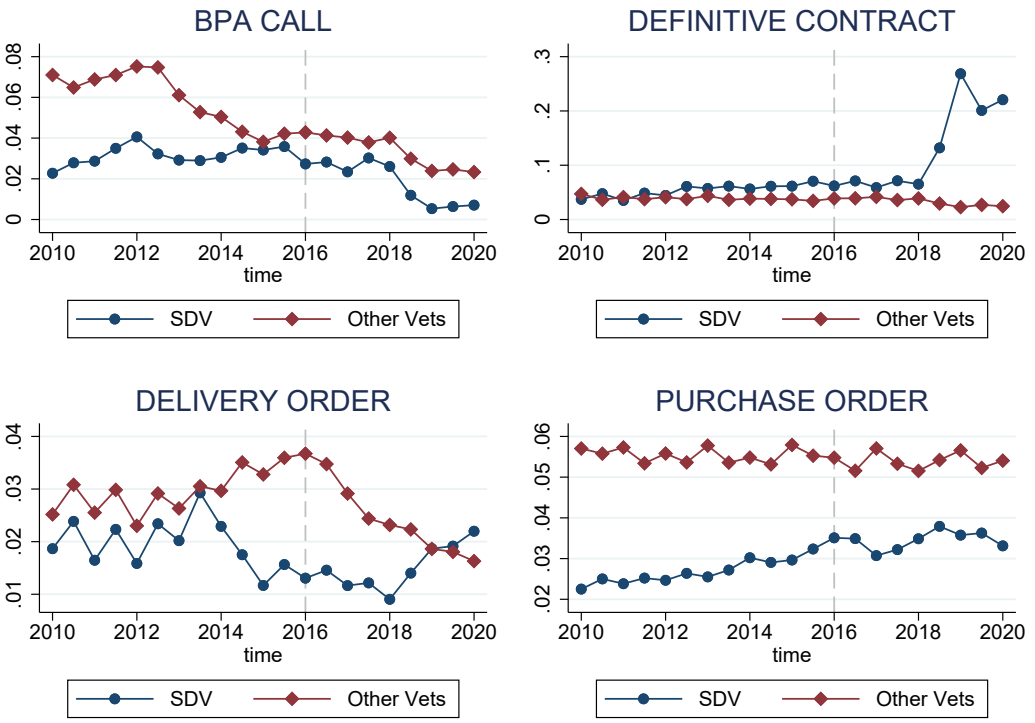
FPDS initial action contracts funded by VA in 2014 and 2017. Limited to Delivery Order and Purchase Order awards.

Figure A.2: Share of Contract Awards, by Award Type (2010 - 2020)

A. VA Awards

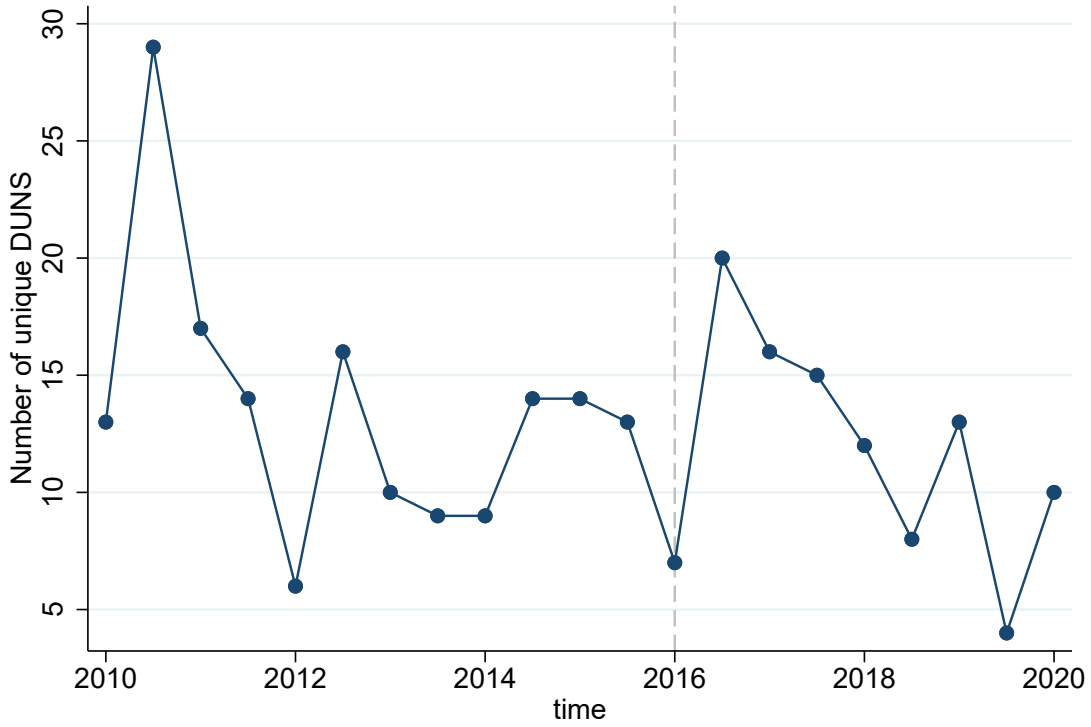


B. Non-VA Awards



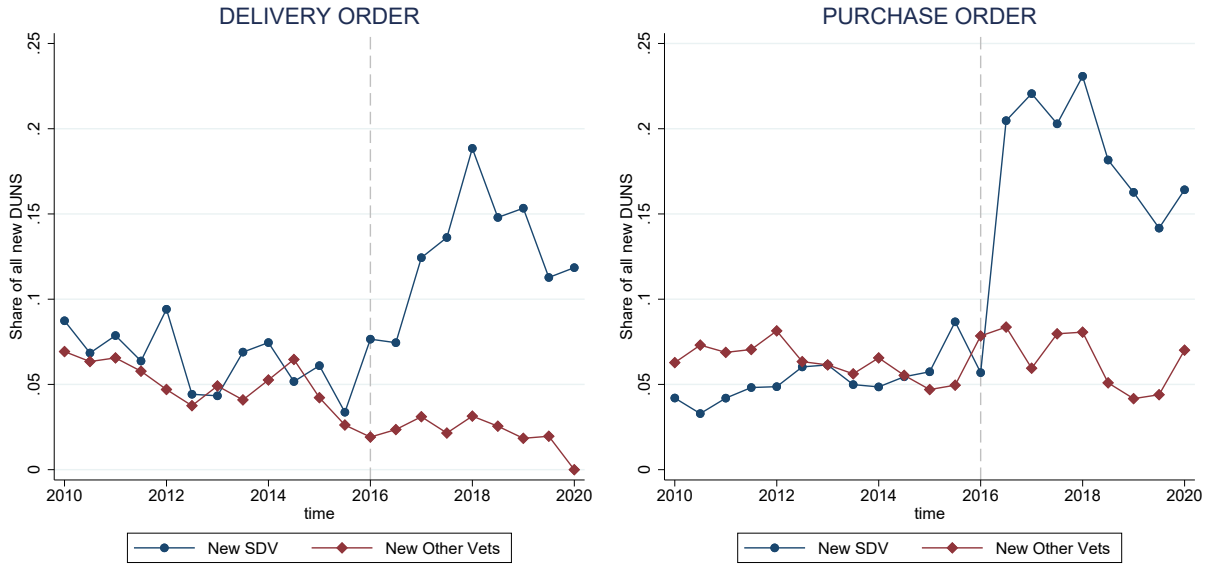
FPDS initial action contracts funded by VA from 2010 to 2020. Measures calculated for half-year intervals.

Figure A.3: Switchers to SDV Status (2010 - 2020)



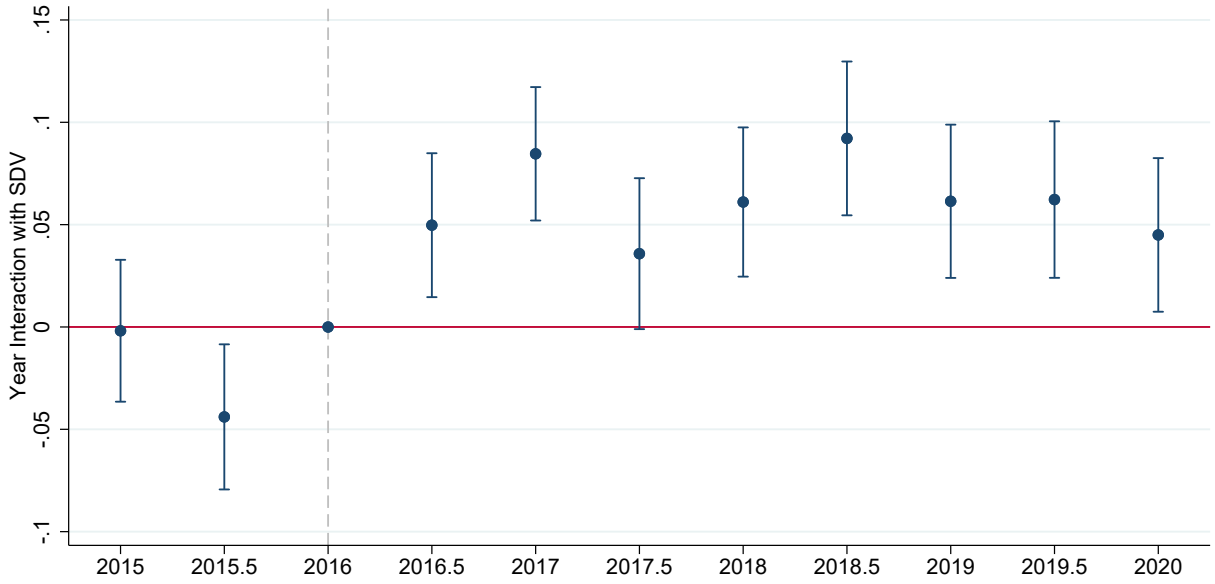
Total number of switchers = 269. Restricted to first-time switchers.

Figure A.4: Veteran Share of New Entrants (2010 - 2020)



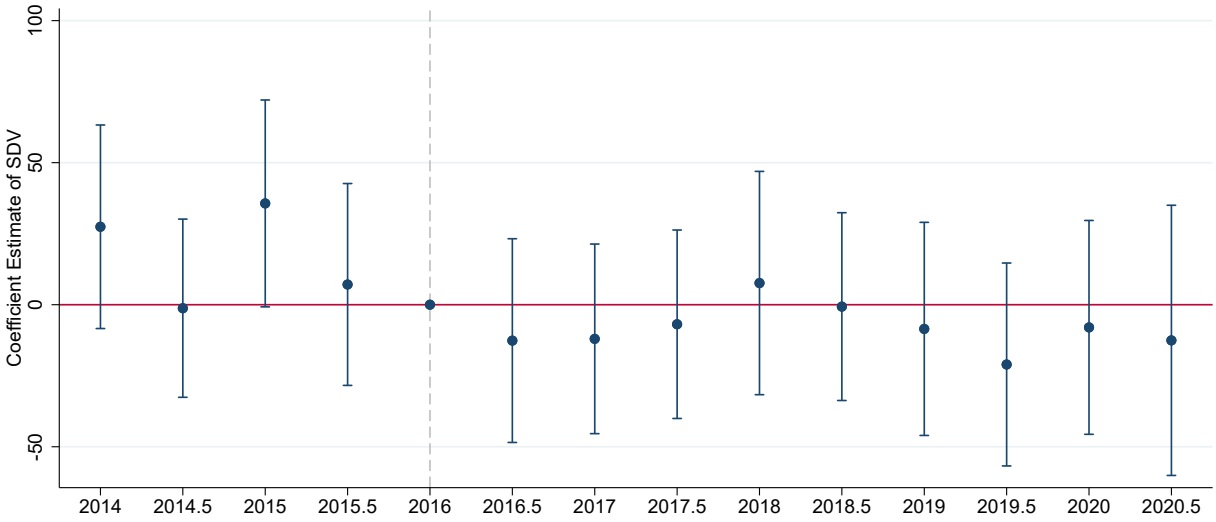
Source: FPDS contracts funded by VA, limited to delivery orders and purchase orders. A DUNS is defined as new the first month they win any procurement award.

Figure A.5: Probability of winning an award for existing firms (2015 - 2020)



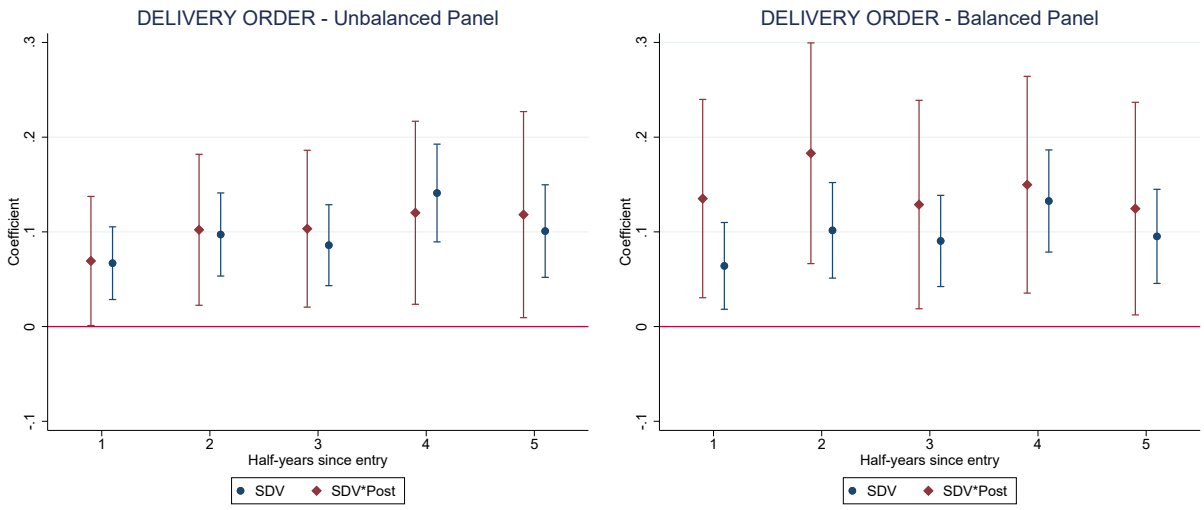
(N = 102,102) Includes 934 SDV businesses and 8,348 non-veteran businesses that were registered in 2014 and also won a federal contract in 2014. Observations at the DUNS-halfyear level. Regression estimates of the SDV*time interaction are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include time FEs and DUNS FEs.

Figure A.5: Time to First Award - BPA Call and Definitive Contracts (2014 - 2020)



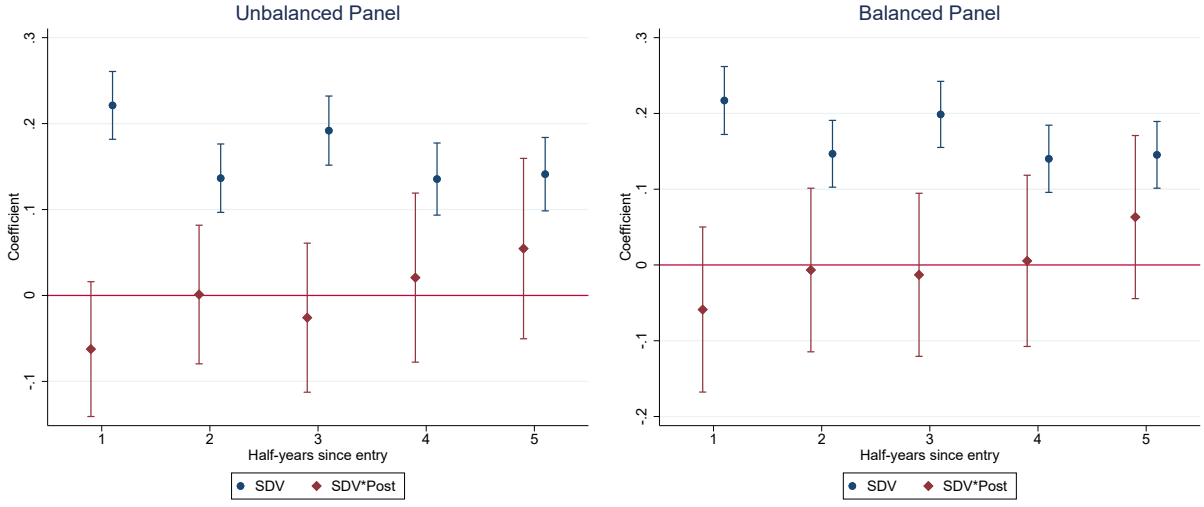
(N = 1,459) Each panel is estimated with a separate regression. Controls include log initial contract value, indicators for SDV and Woman/Minority, time FEs, awarding office FEs, major product group FEs, and 3-digit NAICS FEs. Estimates are plotted with 95% confidence intervals using robust standard errors.

Figure A.7: Delivery Order Entrants Excluding Future Delivery Orders (2010 - 2020)



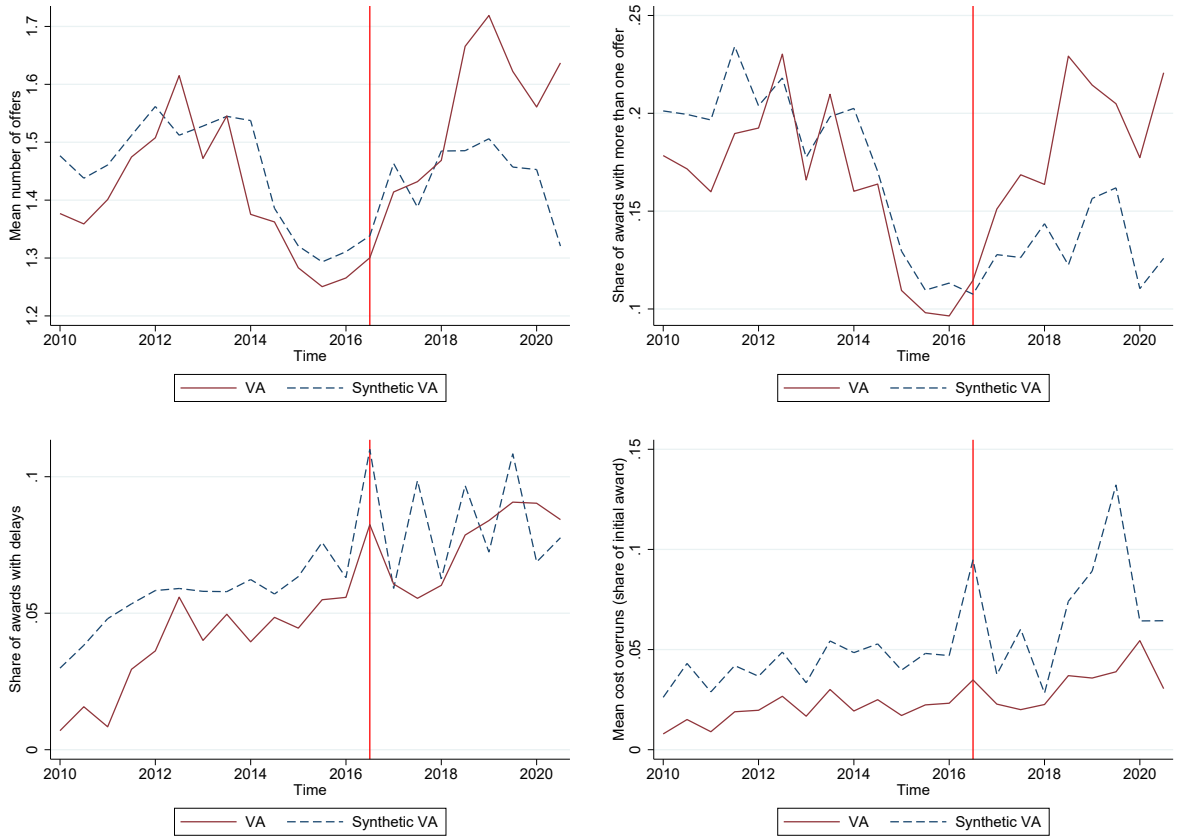
Outcome is indicator for winning an award, and sample excludes delivery order awards. Mean values are 0.05 and 0.06. Left panel is unbalanced (N = 26,377), while right panel restricts to cohorts with 3 years of post-entry observations (N = 21,230). Observations at the DUNS-halfyear level. Coefficient estimates are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include initial contract size, disadvantaged indicator, age-by-time FEs, cohort FEs, product FEs, awarding office FEs, and NAICS-3 FEs.

Figure A.8: New Entrants of BPA Call and Definitive Contracts (2010 - 2020)



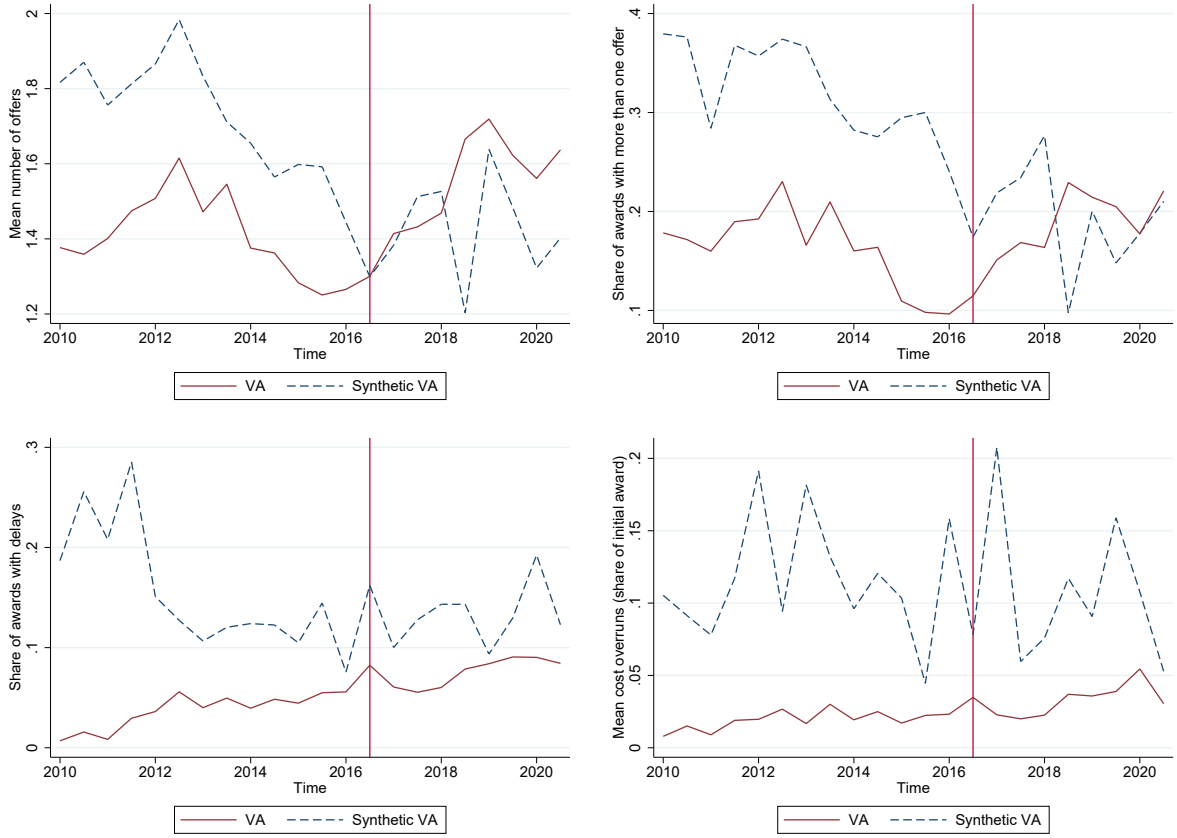
Outcome is indicator for winning an award, and mean values are 0.41 in both panels. Left panel is unbalanced (N = 19,248), while right panel restricts to cohorts with 3 years of post-entry observations (N = 16,290). Observations at the DUNS-halfyear level. Coefficient estimates are plotted with 95% confidence intervals, and standard errors clustered at the DUNS level. Controls include initial contract size, disadvantaged indicator, age-by-time FEs, cohort FEs, product FEs, awarding office FEs, and NAICS-3 FEs.

Figure A.9: Synthetic Control Outcomes Robust to Inclusion of Covariates (2010 - 2020)



This figure shows trends in two competition outcomes and two performance outcomes for the VA and a control group constructed using the synthetic control method. An observation is an agency by half-year. The sample is restricted to purchase orders in the years 2010 through 2020. The synthetic VA is generated from a pool of 47 federal agencies, and matches on the outcome variable, as well as the set-aside share and log(mean contract value).

Figure A.10: Synthetic Control Outcomes Robust to Common Set of Weights (2010 - 2020)



This figure shows trends in two competition outcomes and two performance outcomes for the VA and a control group constructed using the synthetic control method. An observation is an agency by half-year. The sample is restricted to purchase orders in the years 2010 through 2020. The synthetic VA uses a common set of weights across all outcomes, based on the optimal weights constructed for SDV set-aside share (6% for International Trade Commission, 18% for National Science Foundation, 17% for Securities and Exchange Commission, and 59% for Dept of Housing and Urban Development).

Table B.1: Synthetic Control Weights

Agency	Specification					
	SDV Set-aside	SDV Award	No. of Offers	Multiple Offers	Delayed	Cost Overruns
	(1)	(2)	(3)	(4)	(5)	(6)
Government Accountability Office	0.00	0.00	0.12	0.06	0.00	0.00
Department of Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
Department of Commerce	0.00	0.00	0.00	0.00	0.00	0.00
Department of the Interior	0.00	0.00	0.00	0.00	0.00	0.00
Department of Justice	0.00	0.00	0.00	0.00	0.00	0.00
Department of State	0.00	0.00	0.00	0.00	0.00	0.00
Department of the Treasury	0.00	0.00	0.00	0.00	0.00	0.00
Office of Personnel Management	0.00	0.00	0.04	0.03	0.04	0.03
Federal Communications Commission	0.00	0.00	0.00	0.00	0.00	0.00
Social Security Administration	0.00	0.00	0.08	0.00	0.00	0.00
Nuclear Regulatory Commission	0.00	0.00	0.00	0.00	0.00	0.02
International Trade Commission	0.06	0.00	0.00	0.00	0.00	0.00
Equal Employment Opportunity Commission	0.00	0.00	0.07	0.06	0.00	0.00
General Services Administration	0.00	0.81	0.00	0.00	0.10	0.12
National Science Foundation	0.18	0.00	0.02	0.00	0.00	0.01
Securities and Exchange Commission	0.17	0.00	0.16	0.13	0.00	0.03
Railroad Retirement Board	0.00	0.00	0.00	0.00	0.00	0.01
Consumer Product Safety Commission	0.00	0.00	0.00	0.00	0.00	0.00
Environmental Protection Agency	0.00	0.00	0.00	0.00	0.00	0.00
Department of Transportation	0.00	0.00	0.00	0.00	0.00	0.00
Department of Homeland Security	0.00	0.00	0.00	0.00	0.00	0.00
Agency for International Development	0.00	0.00	0.00	0.00	0.00	0.02
Small Business Administration	0.00	0.06	0.00	0.00	0.00	0.00
Department of Health and Human Services	0.00	0.00	0.00	0.00	0.00	0.00
National Aeronautics and Space Administration	0.00	0.00	0.00	0.00	0.00	0.00
Export-Import Bank of the US	0.00	0.00	0.32	0.21	0.01	0.02
Department of Housing and Urban Development	0.59	0.00	0.00	0.00	0.00	0.00
National Archives and Records Administration	0.00	0.00	0.00	0.00	0.00	0.00
Department of Energy	0.00	0.00	0.00	0.00	0.00	0.00
Department of Education	0.00	0.00	0.00	0.00	0.00	0.00
Department of Defense	0.00	0.00	0.00	0.00	0.00	0.00
Executive Office of the President	0.00	0.11	0.12	0.15	0.00	0.00
Peace Corps	0.00	0.00	0.00	0.00	0.00	0.01
Department of Labor	0.00	0.00	0.00	0.00	0.00	0.00
Pension Benefit Guaranty Corporation	0.00	0.00	0.02	0.00	0.00	0.00
Smithsonian Institution	0.00	0.00	0.00	0.26	0.51	0.00
National Gallery of Arts	0.00	0.00	0.00	0.00	0.05	0.00
Commodity Futures Trading Commission	0.00	0.00	0.00	0.00	0.00	0.00
Defense Nuclear Facilities Safety Board	0.00	0.00	0.00	0.00	0.00	0.00
Federal Election Commission	0.00	0.02	0.00	0.00	0.06	0.00
Merit Systems Protection Board	0.00	0.00	0.00	0.00	0.19	0.03
National Endowment for the Arts	0.00	0.00	0.00	0.00	0.00	0.00
National Labor Relations Board	0.00	0.00	0.00	0.00	0.00	0.00
National Transportation Safety Board	0.00	0.00	0.00	0.06	0.00	0.00
Corporation for National and Community Service	0.00	0.00	0.00	0.05	0.00	0.00
US Agency for Global Media	0.00	0.00	0.06	0.00	0.00	0.70
Court Services and Offender Supervision Agency	0.00	0.00	0.00	0.00	0.03	0.02

Observations at agency-half-year level. Table shows weights assigned to each agency in the construction of the synthetic VA, in each of the six specifications in Table 5. Weights are computed using Arkhangelsky et al. (2021)'s implementation of the synthetic control method, with no covariates.

Table B.2: Robustness of Synthetic Control Estimates on Performance

	Any Delay	Days Delayed	Relative Delays	Any Overrun	Cost Overruns (dollars)	Cost Overruns (relative to budget)	Terminated
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ATT	0.0001	-6.9514	-0.0315	0.0105	-1774.5539	-0.0165	-0.0044
(Std. Error)	(0.0292)	(30.9932)	(0.1071)	(0.0720)	(6702.5421)	(0.0798)	(0.0051)
Pre-2016 Mean D.V.	0.0374	6.2441	0.0611	0.2068	923.0660	0.0193	0.0020
No. of Agencies	48	48	48	48	48	48	48
No. of Observations	1,056	1,056	1,056	1,056	1,056	1,056	1,056

Observations at agency-half-year level. ATTs are computed using Arkhangelsky et al. (2021)'s implementation of the synthetic control method, with no covariates. Standard errors are computed using permutation methods, generating 50 placebo estimates where the treatment is assigned randomly to agencies in the control pool. Delays are defined as modifications within the scope of the original contract resulting in an actual duration that is longer than originally expected. In column 1, the dependent variable is the share of awards with any delay. In column 2, is the average days of delay. In column 3, is the average days of delay relative to the expected duration. Cost overruns are defined as differences between actual spending and originally expected spending, that arise due to modifications within the scope of the original contract. In column 4, the dependent variable is defined as the share of awards with any cost overrun. In column 5, is the average dollars of overrun. In column 6, is the average dollars of overrun as a share of the initial budget. Finally, in column 7 the dependent variable is the share of contracts that are terminated before completion.

Table B.3: Robustness of Synthetic Control Estimates to Inclusion of Covariates

	SDV Set-aside	SDV Award	No. of Offers	Multiple Offers	Delayed	Cost Overruns
	(1)	(2)	(3)	(4)	(5)	(6)
ATT	0.1246	0.1960	-0.0487	-0.0022	-0.0205	-0.0228
(Std. Error)	(0.0040)	(0.0160)	(0.2490)	(0.1738)	(0.0572)	(0.0916)
Pre-2016 Mean D.V.	0.0159	0.0628	1.4068	0.1635	0.0374	0.0193
No. of Agencies	48	48	48	48	48	48
No. of Observations	1,056	1,056	1,056	1,056	1,056	1,056

Observations at agency-half-year level. ATTs are computed using Arkhangelsky et al. (2021)'s implementation of the synthetic control method, matching on outcome variable, set-aside share, and log(mean contract value). Standard errors are computed using permutation methods, generating 50 placebo estimates where the treatment is assigned randomly to agencies in the control pool.