It's not easy being green*

Jonathan Brogaard† Nataliya Gerasimova‡ Daniel Kim§
Maximilian Rohrer¶

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Abstract

This paper measures the cost of greening the economy from the customer's perspective using nearly six million US federal procurement contracts from 2007 to 2024. Green contracts are on average 18 to 43 percent more expensive than comparable non-green contracts. Accounting for endogeneity with a Bartik instrument yields an even higher cost premium. The premium increases with public concern about climate change, declines with experience, and rises with regulatory complexity. Green contracts also involve greater administrative effort, including more modifications and delays. Overall, the green transition imposes substantial but partly transitory costs shaped by public sentiment, learning, and regulation.

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†David Eccles School of Business, University of Utah, Email: `Brogaardj@eccles.utah.edu`; Webpage: `https://brogaard.utah.edu`

‡Department of Finance, BI Norwegian Business School, Email: `Nataliya.Gerasimova@bi.no`; Webpage: `https://sites.google.com/site/gerasimovanataliya`

§Department of Finance, University of Waterloo, Email: `daniel.kim2@uwaterloo.ca`; Webpage: `https://sites.google.com/view/danielsangkim/home`

¶Department of Finance, Norwegian School of Economics, Email: `maximilian.rohrer@nhh.no`; Webpage: `https://www.maxrohrer.com`

1 Introduction

It's not easy being green. As governments, firms, and societies strive to transition to a more sustainable economy (IPCC, 2023), the costs of this change are borne by a wide range of stakeholders. Understanding how these costs are distributed is essential to make informed societal decisions about the green transition. While much of the existing research emphasizes the impact on investors, relatively little is known about the costs incurred by customers. This paper addresses this gap by empirically estimating the green cost premium paid by customers and exploring its underlying economic drivers.

An ideal empirical approach would be to compare the prices of green products with those of comparable non-green alternatives. However, this strategy faces a key empirical challenge: reliable and consistent criteria for identifying green products are often unavailable.[1] Manufacturer-provided labels or certifications are susceptible to greenwashing, undermining their credibility (Wittreich, 2025). We overcome this challenge by studying the procurement contracts of the US federal government, the largest customer in the world.[2] These contracts feature clearly defined and standardized criteria for identifying green purchases. Specifically, the federal government uses a set of designated green clauses, including bio-based, energy-efficient, environmentally preferable, and recoverable material, codified under FAR 52.223-4 and FAR 52.223-9 in the Federal Acquisition Regulation (FAR), a consolidation

[1] This issue is highlighted in the first paragraph of Starks' presidential address Starks (2023), which underscores the broader ambiguity: "there is no clear consensus on the meaning of sustainable finance or the acronyms associated with it — ESG (environmental, social, and governance), SRI (socially or sustainably responsible investing), and CSR (corporate social responsibility). Lack of clarity on the meaning of these terms leads to misunderstandings about how they affect investors, corporations, and asset markets, which can make it difficult to interpret evidence on investment behavior and to design related regulations." Furthermore, sustainability rankings of firms vary across providers (Berg et al., 2022).

[2] Belo and Yu (2013) and Belo et al. (2013) explore the broader pricing implications of government spending.

of requirements from executive orders, laws, and other regulations that shape government contracting. These categories are consistently labeled and standardized across procurement contracts.[3] In addition, we observe the exact product type for each purchase, approximately 877 unique categories ranging from office supplies and plumbing equipment to military items such as guided missiles and ammunition, many of which are procured both with and without green clauses. This granularity allows us to compare green and non-green products while controlling for detailed product-level characteristics.

We find that customers effectively pay 18% to 43% more for green contracts compared to comparable non-green contracts.[4] After accounting for potential sources of downward bias, we estimate that this additional cost burden on customers, green premium, can be as high as 185%. We document the variation in the green cost premium across agencies and product types, driven in part by environmental characteristics and institutional experience with green procurement. Our findings indicate that a significant portion of the premium reflects the upfront investments needed to meet sustainability standards. Importantly, this added cost cannot be explained by differences in contract size or quality. Instead, it stems in part from regulatory burden and climate concerns, costs that are ultimately passed on to customers.

Federal procurement data are especially well suited to our research question for four additional reasons. First, federal agencies are required to prioritize green procurement when feasible. Second, the federal government is the largest single buyer in the US economy,

[3]Details on clauses can be found in the publicly accessible Federal Procurement Data System (FPDS) Data Dictionary:`https://www.fpds.gov/downloads/Version_1.5_specs/FPDS_DataDictionary_V1.5.pdf`

[4]A green contract is defined as one that includes at least one green clause. Throughout the paper, we use the term "green clause" to refer to green contract requirements. We treat this as synonymous with "sustainable clauses" and "sustainable procurement," consistent with the terminology used by the US government.

for example, spending $765 billion on procurement in fiscal year 2023 alone.[5] These purchases span millions of transactions across a wide array of products and services, from office supplies to advanced weapons systems, making our estimates highly generalizable. This advantage, combined with the relatively broad definition of green products in our setting, distinguishes our data from alternative sources such as the NielsenIQ Homescan Consumer Panel (NielsenIQ HCP) used in studies like Ferreira et al. (2025), which focus on narrowly defined green versus non-green goods (e.g., organic tomatoes versus conventional tomatoes) within grocery categories. This broader scope enhances the external validity of our estimates. Third, unlike many proprietary or incomplete private sector data sets, federal procurement data is publicly available and accessible, ensuring transparency and replicability. Finally, contract-level prices, our primary outcome, are determined through competitive bidding. Although our analysis focuses on government contracts, the breadth of purchases and the shared cost-minimization incentives among economic actors make our findings broadly relevant to both public and private sectors.

Our analysis is based on 5,772,981 unique federal contracts awarded between October 2007 and February 2024. The detailed product-level information enables us to include an extensive set of fixed effects that isolate variation in contract costs within agencies, states, and products. The benchmark specification incorporates fixed effects for set-aside codes to account for differences in business eligibility, product-year month interactions to capture time-varying shocks such as technological change or demand shifts, and agency-state-product interactions to ensure comparisons within the same organizational and geographic context. In addition, state-year month interactions absorb time-varying factors at the state level, such

[5] See `https://www.highergov.com/reports/765b-federal-gov-contract-awards-2023`

as political or policy changes. Under this specification, green contracts are on average 18% more expensive than comparable non-green contracts

However, this estimate may be biased because agencies retain discretion over when and how to implement green procurement despite the federal mandate. If green requirements entail higher costs, agencies may selectively apply them to products with lower expected cost premiums, creating potential endogeneity. We address this potential endogeneity concern by constructing a shift share (Bartik) instrument to estimate the relationship between green contracting and associated costs. Specifically, we first aggregate individual contracts, including both their total costs and green shares, to the agency-state-year level. We then instrument the share of green procurement for a given agency-state-year with the national share of green procurement by product type interacted with the agency's state level product mix. The estimates suggest that green contracts command a cost premium of approximately 185%.

Our findings suggest that greening the economy involves substantial costs. The estimated range of the green cost premium is consistent with both anecdotal and historical evidence. For illustration, we highlight a 50% premium for Volkswagen's electric Golf model and a 325% premium for a wooden fork at Walmart. To provide an example that is more representative for our data set, we also construct a proxy for a green cost premium for central air conditioners. This product category is covered by Energy Star initiative. We compute that the green cost premium ranges between 14.28% and 69.75%.[6]

[6]The FEMP (Federal Energy Management Program) computes that "the required ENERGY STAR-qualified residential central air conditioner saves money if priced no more than $394 (in 2021 dollars) above the less efficient model. The best available model saves up to $1,925."`https://www.energy.gov/femp/purchasing-energy-efficient-residential-central-air-conditioners` To construct our proxy, we use the lowest boundary of an average central air conditioner price in 2025 and convert it in 2021 dollars. `https://www.hvac.com/expert-advice/cost-of-a-new-central-air-conditioner/` We get $2,760 (in

Historical comparisons further support the plausibility of our estimates. For example, Bessen (2002) documents that the adoption of information technology between 1970 and 1980 doubled capital adjustment costs. In the energy sector, Lazard's Levelized Cost of Energy+ report compares costs across energy sources,[7] while McKinsey's Net-Zero Transition report projects that decarbonizing the energy sector by 2050 will increase consumer energy bills by 25% between 2020 and 2040.[8] These examples provide context and suggest that our estimated green cost premium is consistent with broader patterns in sustainability transitions.

In the second part of the paper, we investigate the underlying sources of the green cost premium. We begin by assessing whether public concern about climate change influences the green cost premium in federal procurement contracts, extending insights from financial markets (Ardia et al., 2022; Pastor et al., 2022; Seltzer et al., 2025) to government purchasing. We hypothesize that heightened public awareness, proxied by spikes in media attention following major environmental events, makes agencies more willing to pay higher prices for green products, while producers also charge more to hedge against uncertainty about future climate concern, which affects future demand. Using the Media Climate Change Concerns (MCCC) index (Ardia et al., 2022), we construct monthly measures of climate concern shocks and uncertainty. Regression results show that when climate concern shocks are high, the green cost premium rises from 15.2% to 21.0%, consistent with agencies' increased willingness to pay for environmental attributes. Similarly, during periods of high uncertainty, captured

2021 dollars) and use it as a non-green price. Finally, we divide ENERGY STAR qualified price and best available model price by the non-green price.

[7]See `https://www.lazard.com/research-insights/levelized-cost-of-energyplus/`

[8]See `https://www.mckinsey.com/capabilities/sustainability/our-insights/the-net-zero-transition-what-it-would-cost-what-it-could-bring?cid=netzero-pse-gaw-mst-mck-oth-2201`

by the conditional volatility of climate concerns estimated from an ARCH model, the premium increases from 10.9% to 28.5%. Together, these findings indicate that both elevated public attention and greater uncertainty about climate concerns raise the price government agencies pay for green products.

Second, we examine whether the green cost premium reflects large initial fixed costs associated with the early stages of the green transition. Prior studies (Foster and Rosenzweig, 2010; Gerarden et al., 2017; Meles and Ryan, 2022) show that adopting new technologies entails substantial upfront expenditures that may not recur, while theoretical models (e.g., Pastor et al., 2021; Gupta et al., 2025; Gupta and Starmans, 2025) similarly treat green costs as one-time investments. Consistent with this view, we find that the premium declines with greater experience: products and agencies that more frequently procure green goods face smaller premiums (15.7% vs. 36.2% across products; 8.5% vs. 16.4% across agencies). At the contract level, the premium decreases from 20.7% for first-time green contracts to 5.7% for subsequent ones and eventually disappears after roughly ten procurements within the same agency-product-state combination, suggesting that much of the green cost premium is transitory.

Last, we examine how the green cost premium varies with the strictness of green regulation and the resulting regulatory burden. Building on Parente and Prescott (1994), who identify regulatory constraints as a source of costly technology adoption, we test whether stricter green requirements increase procurement costs. Using five main green clauses (bio-based, energy efficient, environmentally preferable, FAR 52.223-4, and FAR 52.223-9), we find that each clause individually raises contract costs, with FAR 52.223-9 having the strongest effect. When all clauses are included together, most remain statistically significant, indicating that each adds distinct compliance costs. Redefining greenness by counting the number of green clauses yields a similar pattern: each additional clause raises costs by about 14.8 percent, suggesting that both the presence of green requirements and the complexity of compliance contribute to the premium. Additional analyses of contract performance outcomes show that green contracts require greater administrative effort. They are more likely to experience modifications, cost and time overruns, and longer completion times, though cancellations remain rare. Overall, stricter green regulations increase procurement costs and impose greater coordination and monitoring demands on both agencies and contractors.

Before concluding, we empirically rule out alternative explanations related to differences in quantity, quality, or firm characteristics. One might argue that the main results are driven by differences in product quantity. We aggregate individual contracts to the agency-state-year level. If green products are typically purchased in greater bulk than their non-green counterparts, this aggregation mitigates cost differences arising purely from quantity variation. We observe even higher green cost premium, when we aggregate the contracts. These results suggest that green products are procured in smaller quantities per contract, alleviating the concern that the green cost premium is driven by bulk purchasing of green products.

Second, product quality could be an omitted variable that influences the price and correlates with contract greenness.[9] We find that green contracts are associated with worse performance in these dimensions, which would, if anything, bias against finding a cost premium.

[9] We follow Brogaard et al. (2021) and use four contract performance metrics: number of modifications, cost overrun, time overrun, and whether the contract was canceled.

Finally, one may argue that green contracts are more expensive because firms with stronger political ties are more likely to obtain them. We include double interacted fixed effects between the primary state of performance and the year month variable to account for time varying shocks at the state level, such as changes in the political affiliation of local governments that may influence their propensity to overpay. To further mitigate the concern, we reestimate the main specification using subsamples of contracts awarded to firms that are unlikely to have strong political ties. We find that the green cost premium of similar magnitude still exists in the subsamples of smaller or less frequent contractors.

Taken together, this paper quantifies the costs of greening the economy.[10] Accordingly, we contribute to three related strands of literature.

First, we add to the related theoretical literature by providing an estimate of green cost premiums. Investors are willing to forgo some return for green causes. Theoretical explanations often have the following ingredients: Some investors voluntarily forgo returns for green causes (Pastor et al., 2021; Baker et al., 2022; Pedersen et al., 2021) and transitioning a firm from brown to green is costly (Pastor et al., 2021; Gupta et al., 2025; Gupta and Starmans, 2025).[11] We contribute by documenting green cost premium estimates. Our estimates can help researchers, regulators, and practitioners calibrate models related to greening the economy.

Second, we contribute to the literature on the direct costs and benefits of green transitions, or ESG/CSR in general, on a firm level.[12] Naaraayanan et al. (2021) document the net

[10] We do not assess whether the benefits outweigh these costs, as our analysis does not aim to identify changes in externalities. Such an assessment is challenging due to the lack of a well-defined set of potential externalities and the imprecision in measuring externality reductions at the product level.

[11] Lontzek et al. (2024) take a different approach, arguing that heterogeneous beliefs combined with long-run risk can produce similar pricing implications.

[12] See Gillan et al. (2021) for a comprehensive overview of the current state of the literature.

positive effects of environmental activism on pollution that cannot be explained by changes in production. Schiller (2018) and Dai et al. (2021) present evidence that socially responsible customers help generate better subsequent ESG/CSR in their suppliers with some benefits in operating performance, albeit primarily at the customer level. Edmans (2011, 2012) document the positive effects of employee satisfaction on stock market performance. Chiu et al. (2025), Klausmann et al. (2025), and Lel (2025) provide evidence that green products lead to an increase in firm value.[13] These papers are consistent with the argument presented in Edmans (2023b,a): investments in ESG/CSR are investments in intangible assets that create returns in the long term. Our paper challenges the conjecture that turning products green leads to better operational outcomes. In our setting, the government's sustainable actions are costly to the government and ultimately to taxpayers, at least in the short run. Not only is there an increase in costs, but there is also a decrease in quality.

Lastly, our paper contributes to the current policy debate around the government actively subsidizing the green transition. The federal government implements green restrictions in its procurement processes as a strategic measure to leverage its purchasing power for environmental sustainability.[14] To make informed decisions about sustainable procurement

[13] We differ from these papers due to our focus on cost/customers and the use of unambiguous sustainable labels and prices at the product level.

[14] On August 3, 2023, the US DOD, the General Services Administration (GSA), and the National Aeronautics and Space Administration (NASA) proposed to amend the Federal Acquisition Regulation (FAR). The "sustainable products and services procurement rule" requires agencies to "procure sustainable products and services ... to the maximum extent practicable." As the Biden administration put it, "[t]he Sustainable Products and Services procurement rule, a proposal through the Federal Acquisition Regulation (FAR) Council, strengthens existing sustainable products requirements by directing Federal buyers to purchase sustainable products and services to the maximum extent possible." Robin Carnahan, Administrator of the US General Services Administration, added that "[a]s the world's largest buyer, [the US] ha[s] a responsibility to lead by example and accelerate the move toward buying clean." https://bidenwhitehouse.archives.gov/ceq/news-updates/2023/08/01/biden-harris-administration-announces-plan-to-maximize-purchases-of-sustainable-products-and-services-as-part-of-the-presidents-investing-in-america-agenda/

practices, one needs to understand the economics of green cost premiums. Our finding that a significant portion of these additional costs gradually decreases is consistent with a strategic subsidy mechanism: the government effectively bridges the divide between initial investment and long-term sustainability.[15] In related work, Dupas (2014) documents in a randomized field experiment that short-run subsidies can have a positive long-run effect on adoption of health products.

The paper proceeds as follows. Section 2 describes institutional details and the data. Section 3 presents the main results. Section 4 studies the economics of green cost premiums and Section 5 concludes.

2 Institutional Details and Data

2.1 Institutional Details

We focus on government procurement contracts at the federal level. Federal procurement contracts are agreements between government agencies and businesses to obtain products and services for a negotiated price and over a negotiated period of time.

The process of awarding government contracts starts with a federal agency identifying a need for a purchase of a good or service. The agency decides the inclusion of a green clause,

[15] As such, we relate to the literature that analyzes the role of the government in firms' sustainability decisions. Hart and Zingales (2017) and Hsu et al. (2023) argue that governments are better positioned than private firms to handle ESG issues because of their ability to deal with market failures as well as the relevance of unpriced externalities. However, there is recent evidence that government can also have a negative effect on firms' ESG practices. For example, Bisetti et al. (2025) document a causal relationship between partisanship and firm pollution. Akey and Appel (2021) show the causal role of regulation, in particular limiting the scope of limited liability, on increasing firm pollution. Lastly, Duchin et al. (2025) provide some nuanced evidence. That is, firms that divest from pollutive plants are more likely to receive government contracts. However, aggregate pollution is unchanged because the pollutive plant is still in the supply chain, just under a different owner.

the degree and method by which the contract is competed, the form of pricing appropriate to the contract, and whether the contract is for a definitive quantity or some indefinite delivery vehicle (IDV). Then, a contracting officer of this agency posts a solicitation on the SAM.gov website. A solicitation announcement identifies what the agency wants to buy, provides instructions to potential contractors, identifies the source selection method to evaluate offers, and includes a deadline for the submission of bids or proposals. Firms then submit their offers for review by agency officers who evaluate them and make the final decision.

Using their position as the largest customer, the government tries to transform firms' ESG practices. According to the National Association of State Procurement Officials (NASPO), sustainable procurement is defined as "purchasing products or services that have a lesser or reduced negative effect or increased positive effect on human health and the ecological environment or social/economic well-being, when compared with competing products that serve the same purpose."[16] For example, the "Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability"[17] explicitly addressed this objective by writing that "Agencies shall reduce emissions, promote environmental stewardship, support resilient supply chains, drive innovation, and incentivize markets for sustainable products and services by prioritizing products that can be reused, refurbished, or recycled."[18]

To track agencies' progress in the implementation of sustainable procurement, the agencies are required to annually provide scorecards to the Office of Management and Budget

[16] https://www.naspo.org/research-and-innovation/sustainable-purchasing/

[17] https://bidenwhitehouse.archives.gov/briefing-room/presidential-actions/2021/12/08/executive-order-on-catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability/

[18] The order was revoked in January 2025. https://www.fedcenter.gov/programs/eo14057/

(OMB). For these OMB sustainability scorecards, the agencies select 5% of the applicable contract actions from the previous two calendar quarters and review those actions to show compliance with the sustainable product and service acquisition requirements. The agencies report the number and value of contracts that contain one of the five green clauses introduced by the FAR.[19] As an example, Figure 1 displays the scorecard that the Department of Energy reported for fiscal year 2020. According to this OMB scorecard for 2020, there are 1,626 contract actions with green clauses in the 2020 fiscal year.

Insert Figure 1

Practically, sustainable procurement is implemented by including terms or conditions, the so-called clauses, in contracts and their solicitation.[20]

For example, Best Practices Guide for Energy-Efficient Product Procurement lists three steps of acquiring energy efficient products.[21] First, contracting officers identify covered product categories and their efficiency requirements. The Department of Energy provides an interactive tool, the Paths to Energy Efficiency Requirements (PEER), that contracting officers could consult to get information about energy efficiency requirements and potential contract language for any product or service.[22]

Second, they incorporate these requirements including sustainable clauses into a solicitation and a contract. This guide also provides a summary of a solicitation in which the National Guard Bureau, the Department of the Army solicits installation of two packaged

[19] We thank Shab Fardanesh (Sustainable Acquisition Coordinator at the Department of Energy) for providing us this information.

[20] https://www.acquisition.gov/far/part-2

[21] https://www.energy.gov/sites/default/files/2024-01/femp-best-practices-guide-for-procurement-june-2023.pdf

[22] https://www.energy.gov/femp/articles/take-five-energy-efficiency-requirements-acquisition

air conditioner units at an Air Refueling Wing in Pennsylvania. "Besides including the FAR clause 52.223-15, the solicitation document included a number of components to help ensure that the Department of the Army would receive efficient products, such as: 1. Mentioning that the air conditioning units must be ENERGY STAR rated. 2. Clearly specifying Season Energy Efficiency Ratio (SEER) and Energy Efficient Ratio (EER) values that are equal to or greater than the minimum ENERGY STAR ratings for the air conditioning units."

Finally, they verify a delivery of compliant products and can require contractors to report how they comply with the efficiency requirements.

Exceptions are available to the acquisition requirements if a head of an agency finds in writing that: "No ENERGY STAR or FEMP-designated product is reasonably available that meets the functional requirements of the agency; or No ENERGY STAR or FEMP-designated product is cost effective over the life of the product taking energy cost savings into account."

Whether an individual contract contains a green clause is publicly available information. The FPDS Data Dictionary is a publicly accessible document that includes instructions to identify whether green clauses were included. The relevant field is 8L, "Recovered Materials/Sustainability." This field represents whether the green contract clauses FAR 52.223-4, FAR 52.223-9, bio-based, energy efficient, environmentally preferable, or their combinations are included in a contract. All of these labels are at the individual product level and are issued by different government agencies. For example, energy efficient products are identified by the ENERGY STAR Program or Federal Energy Management Program (FEMP),[23] while

[23] `https://www.acquisition.gov/far/part-23#FAR_23_103`

bio-based product classification is within the authority of the Department of Agriculture.[24] Table 1 provides an overview of these five clauses, their description, issuing agency, the date that each clause was first introduced to FPDS Data Dictionary, and the relevant legislation.

Insert Table 1

2.2 Data

We obtain the complete sample of procurement contracts between the US government and individual firms from the FPDS-NG, accessed through USAspending.[25] We focus on contracts with specified terms and conditions, the so-called definitive contracts (DCs). DCs allow us to assess how the inclusion of green clauses impacts cost and quality of stand-alone, one-time agreements with a single firm for the purchase of products or services under specified terms and conditions.[26] We limit the sample to contracts that are awarded competitively, which ensures that government contracts are valued at market prices. Additionally, we require that the contract be directly awarded to a firm, meaning the contract is not awarded to the parent company and is not part of a bundled project; that the contract be awarded and performed inside the US without any foreign funding; that the contractor be neither a government organization or a nonprofit; and that the contractor be registered in the US and not be foreign owned.

[24] https://www.acquisition.gov/far/part-52#FAR_52_223_1

[25] https://www.usaspending.gov/download_center/award_data_archive

[26] In contrast, IDVs are contracts with one or more firms, and at the time of contract award there is uncertainty about the quantity of products or services to be provided, the timing of delivery, or the scope of the agreement. This initial uncertainty might affect the tractability of the contract performance measures. DCs and IDVs each represent approximately half of the contract spending. https://news.bloomberglaw.com/federal-contracting/staffing-spending-trends-feed-appetite-for-high-value-contracts?context=search&index=9

Our main variable of interest are indicator variables equaling one if a green clause is included in a government contract. Figure 2 reports the absolute number of contracts per year that included green clauses from 2007 to 2024.[27] In 2007, the FAR takes a more active role in promoting sustainable contracts and their further monitoring (see, for example, FAR 23.703 and FAR 42.3). Three out of five green clauses, bio-based, energy efficient, and environmentally preferable, were introduced to the FPDS Data Dictionary in October 2011. Up to 2018, the federal agencies increasingly included sustainable criteria in their contracts. Subsequent to 2018, we observe a considerable drop in the use of sustainable contracts that coincides (given an initial lag) with the Trump presidency.[28] At the end of the sample, there is an increase of contracts that are environmentally preferable.

Insert Figure 2

In our main analysis, we designate a particular contract as green if it contains at least one of the five green clauses: bio-based, energy efficient, environmentally preferable, FAR 52.223-4, or FAR 52.223-9. Thus, it is informative to see how each individual clause relates to the others. Although some of the clauses seem to be correlated, they are not perfectly correlated, as shown in Table 2 Panel B. For instance, among contracts that contain energy efficient, 10.9% of the contracts contain bio-based, 9.1% contain environmentally preferable, 14.9% contain FAR 52.223-4, and 0% contain FAR 52.223-9. This implies that the energy efficient clause carries additional information that is not captured by the other four clauses,

[27] Please note that only around one month of data are available for 2024.

[28] There is some anecdotal evidence suggesting a link between this drop and actual actions by the Trump administration. Schooner and Speidel (2020) report that "the Trump administration revoked and replaced [executive orders (EO) by the Obama administration] with an EO that subordinated energy and environmental performance to "actions that reduce waste, cut costs, enhance the resilience of federal infrastructure and operations, and enable more effective accomplishment of [the government's] mission..." A specific example is the revoking of the Clean Power Plan within his first day of office (Heitz et al., 2023).

although the energy efficient clause is correlated with three of the other clauses.

To illustrate the breadth of contracting activity represented in our dataset, Figure 3 displays the number of contracts containing green clauses across the ten largest product and service categories, ranked by number of contracts. The top ten categories include office furniture; ADP software (a suite of solutions that automate and manage business processes, most commonly in human resources and payroll); maintenance, repair, or alteration; maintenance, repair, or alteration of family housing; office devices and accessories; electrical equipment and measuring instruments; construction of administrative and service buildings; custodial and janitorial services; maintenance and repair of miscellaneous equipment; and miscellaneous electrical and electronic components. Notably, two of the longest standing green clauses targeting construction, maintenance, and office related products apply directly to several of these categories, contributing to their disproportionately large share of green contracts (see Table 1).

Insert Figure 3

Table 2 Panel A provides summary statistics for the set of all contracts between 2001 and 2024. We winsorize all variables at .5% and 99.5%. The sample consists of 5,772,981 unique contracts, each worth $26.44 thousand initially on average, amounting to $152 billion. Of these contracts, 1.1% (3.4% if weighted in dollars) contain at least one green clause.

Insert Table 2

We report several contract statistics for the whole sample as well as subsamples of contracts with and without green clauses. The amount of the green contract in dollars as originally agreed upon, *federal action obligation*, is on average \$81.8 thousand and higher than for all contracts. The difference from the sample mean is partly driven by regulation. For example, the scope of the mandate that outlines the acquisition of items that have a designated green clause issued by the Environmental Protection Agency or the Department of Agriculture has a lower price bound of \$10,000. As this lower bound is not sharp, it depends on forward-looking assessment as well as backward-looking conditions, we do not limit our sample to contracts above \$10,000.[29] Given these differences between green contracts and the non-green contracts, adding controls and fixed effects in the main model is paramount.

The next six rows report the share of contracts that include at least one of the five different green clauses, as well as the share of contracts that include at least one clause. In the whole sample, 1.1% of all contracts have at least one green clause. As the average green contract is larger in dollar amount, the value-weighted share of green contracts is greater. Of the five individual clauses, FAR 52.223-4 is the most common prior to 2018, when the use of green clauses plummets. This is not unexpected, as this clause has been included since the beginning of the sample (see Figure 2) while other clauses (with the exception of FAR 52.223-9) have been explicitly recorded only after October 2010. After 2018, the more recent increase in green clauses is due to environmentally preferable contracts.

Next, we consider four measures of contract performance: number of modifications, cost overrun, time overrun, and whether the contract was canceled. These measures are inspired by Brogaard et al. (2021), who show that renegotiations and changes in contract terms are fairly common. *Number of modifications* is defined as the number of modifications recorded in the contract after the initial registration of the contract in FPDS-NG. *Cost overrun* is

[29] Our main results are unchanged if we impose a lower price bound of \$10,000.

defined as the log of final costs divided by initial costs (*federal action obligation*). *Time overrun* is defined as the log of the number of days between the final completion and the end date agreed on initially plus one. *Cancellation* is an indicator variable equaling one if the contract was canceled. Comparing those four measures of performance of green versus non-green contracts, we see differences in all four measures, and green contracts perform worse. However, to conclude that the performance of green contracts is worse, one would need to control for the amount, type, and other contract features such as the awarding agency.

3 The Cost of Going Green

This section presents the main result of the paper, namely estimating the cost impact of greening up individual products. We start with a naïve regression. Next, we present our identification strategy that uses Bartik instrument.

3.1 Ordinary Least Squares Specification

We start by investigating the contract-level correlations between the green contract requirements and the costs of a federal government contract. In particular, we estimate the following model:

$$Cost_{c,t} = \alpha + \beta \cdot Green_{c,t} + \text{FE} + \epsilon_{c,t} \tag{1}$$

$Cost_{c,t}$ is our main outcome variable, an item called "federal action obligation" in the

FPDS Data Dictionary. It is the log of the contract c's cost that is initially agreed upon at time t between the government and the contractor. $Green_{c,t}$ is our main regressor. $Green_{c,t}$ equals one if the contract c has any of the following five clauses: bio-based, energy efficient, environmentally preferable, FAR 52.223-4, or FAR 52.223-9. Otherwise, we define $Green_{c,t}$ to be 0. The main coefficient of interest, β, measures how much more expensive a contract becomes when it is required to be green. Standard errors are triple clustered at the agency, three-digit product and service code, and primary state of performance levels. This clustering accounts for potential correlation of residuals across contracts handled by the same agency, within similar product or service categories, and within the same geographic region, ensuring valid statistical inference. Table 3 presents the corresponding results.

Insert Table 3

To address potential confounding factors, we include an extensive set of fixed effects. The models reported in the subsequent columns introduce progressively more restrictive combinations of these effects. First, Model 1 includes five distinct sets of non-interacted fixed effects. The first set corresponds to the federal agencies awarding the contracts. Our data set includes 74 unique agencies (e.g., the Department of Agriculture and the Department of Defense). The second set of fixed effects captures the primary place of performance at the state level. Third, we include time fixed effects at the year-month level. Fourth, we control for three-digit product and service codes, encompassing 877 unique categories ranging from office supplies and plumbing equipment to military items such as guided missiles and ammunition. Finally, we include fixed effects for set-aside codes, which specify the types of businesses eligible to perform the contract. These codes cover 18 categories, including women- and veteran-owned small businesses. The estimates from Model 1 indicate that imposing green requirements increases contract costs by 42.9%.

The estimate from Model 1 may be biased by time-varying shocks at the product and service level. For instance, the green cost premium within certain product and service categories could fluctuate over time due to consumer demand or technological advancements. Moreover, for a more meaningful comparison, it is preferable to compare contracts within the same agency and state. To address these concerns, Model 2 introduces two sets of double-interacted fixed effects. The first interacts three-digit product and service codes with the year-month variable, while the second interacts agency with the primary state of performance. Fixed effects for set-aside codes are also included. The estimates from Model 2 indicate that imposing green requirements increases contract costs by 29.9%, which is substantially smaller than the corresponding estimate from Model 1.

Model 3 introduces a more restrictive set of fixed effects. Similar to Model 2, it includes a single fixed effect for set-aside codes and double-interacted fixed effects between three-digit product and service codes and year-month variable. In addition, to compare contracts within the same agency, state, and *additionally* product/service category, Model 3 incorporates triple-interacted fixed effects among agency, primary state of performance, and three-digit product and service codes. To further account for time varying shocks at the state level, such as changes in the political affiliation of local governments that may influence their propensity to overpay, we include double interacted fixed effects between the primary state of performance and the year month variable. The inclusion of these more restrictive fixed effects further attenuates the estimate: Model 3 indicates that imposing green requirements increases contract costs by 18%. Since the fixed effects structure in Model 3 accounts for the key confounding factors discussed above, we adopt the same specification in all subsequent analyses whenever feasible.

Now, let us turn to the economic magnitude by performing a back-of-the-envelope calculation. During fiscal year 2023, the federal government spent $765 billion procuring contracts.[30] During the last 12 months of the sample, 1.2% of contracts included any green clause, meaning that not imposing green restrictions would have saved taxpayers roughly $1.6 billion.[31]

3.2 Causality: Bartik Instrument

Although the preceding estimate is informative, it may be biased, as agencies retain discretion over when and how to implement green procurement, despite the federal mandate. If green requirements are more costly, agencies may selectively apply them to products with lower cost premiums, introducing potential endogeneity. This selection behavior is supported by three institutional features. First, agencies are required to meet portfolio-wide targets for green procurement, making it cost-effective to prioritize products with smaller associated premiums. Second, agencies may opt out of green procurement when costs are deemed prohibitive.[32] Third, agencies may not receive compliant bids when suppliers find green requirements too costly. Together, these factors suggest that green contracts are more likely to occur where cost premiums are relatively low, introducing a selection bias that would attenuate our estimates. Thus, any endogeneity in our setting likely biases the results

[30] See `https://www.highergov.com/reports/765b-federal-gov-contract-awards-2023`

[31] Assuming a green cost premium of 18%, greening up 1.2% amounts to the costs of $\$765 - \$765/\left(1 + (1.2\% \cdot 18\%)\right) = \$1.6$. Similarly, greening up 100% amounts to $117 billion.

[32] For example, Executive Order 14057, issued by President Joe Biden, directs federal agencies to prioritize the procurement of sustainable products but allows exceptions when such options are not reasonably priced.

downward.

To address endogeneity, we employ a Bartik instrument (Bartik, 1991; Blanchard and Katz, 1992; Goldsmith-Pinkham et al., 2020; Borusyak et al., 2022). In the canonical setting, local employment growth rates are instrumented using an interaction between local industry employment shares and national industry employment growth rates. In our context, we instrument the share of green contracts awarded by an agency in a given state and year using a corresponding Bartik instrument. To employ a Bartik instrument, we first write the specification as follows:

$$Cost_{a,s,y} = \alpha + \beta \cdot Green_{a,s,y} + FE + \epsilon_{a,s,y} \tag{2}$$

where $Cost_{a,s,y}$ is the main outcome variable. It is the log of money spent on government contracts by agency a in state s in year y. We aggregate the costs of all contracts c awarded by agency a in state s during year y, $Cost_{a,s,y} = \sum_{c \in \{a,s\}, t \in y} Cost_{c,t}$. Similarly, the main explanatory variable is the percentage of contracting dollars spent on green contracts by agency a in state s in year y, $Green_{a,s,y}$. Again, we aggregate individual contract information, $Green_{a,s,y} = \sum_{c \in \{a,s\}, t \in y} \frac{Cost_{c,t} \cdot Green_{c,t}}{Cost_{c,t}}$. In addition, we include two types of double-interacted fixed effects. We first impose awarding agency interacted with year fixed effect to address time-varying shocks at the agency level. Next, we impose awarding agency interacted with state fixed effect to be able to compare contracts within the agency and state.

Insert Table 4

Model 1 in Table 4 reports the results of estimating Equation (2). The estimates indicate that incorporating green clauses increases contract costs by 39.72%. This magnitude is substantially larger than the estimates reported in Table 3, suggesting that our earlier results likely represent conservative lower bounds. A more detailed interpretation of this estimate, particularly in the context of ruling out alternative channels, is provided in Subsection 4.4.

We now describe how we construct the instrument. In our context, we instrument the share of green contracts awarded by an agency in a given state and year, $Green_{a,s,y}$, using a corresponding Bartik instrument. The Bartik instrument is constructed as the interaction between the national share of green contracts per three-digit product and service code, $Green_{ps,y}$, and the share of products within each three-digit product and service code per agency, state, and year, $\omega_{ps,a,s,y}$:

$$B_{a,s,y} = \sum_{ps} Green_{ps,y} \cdot \omega_{ps,a,s,y} \tag{3}$$

To ensure that the national share of green contracts is not disproportionately influenced by a small number of agencies or sparsely procured products, we restrict our analysis to product and service codes with at least 25 sales per year from more than 20 unique agencies.

The identification assumption underlying our causal inference is that government-wide demand shocks are as good as randomly assigned across product and service categories. The government-wide product/service demand shock serves as a noisy estimate of latent quasi-experimental demand shocks, helping to address endogeneity concerns arising from latent differences across agencies, some of which were discussed earlier.

There are two ways to construct the national share of green contracts per three-digit product and service code, $Green_{ps,y}$. As used in Bartik (1991), we first define it as:

$$Green_{ps,y} = \sum_{s} Green_{ps,s,y} \cdot \omega_{ps,s,y} \tag{4}$$

Models 2 and 3 in Table 4 report the results. In Model 2, we report the first-stage regression. The coefficient is 69% and is highly statistically significant. The F-statistic is greater than 200. Model 3 reports the result of the second-stage; the coefficient is 285.51 and is highly statistically significant. These two estimates imply that the premium associated with green contracts is 197%. The premium estimate exceeds the "naive" estimate in Table 3, providing empirical support for a possible reverse causality.

Although the results of Models 2 and 3 are insightful, Borusyak et al. (2022) argue that the instrument constructed using Equation 4 may introduce a mechanical correlation between the regressor, $Green_{a,s,y}$, and the instrument. To mitigate this issue, we construct a leave-one-out instrument, where $Green_{ps,y}$ is defined as follows (Borusyak et al., 2022):

$$Green_{ps,y} = \sum_{s' \neq s} Green_{ps,s',y} \cdot \omega_{ps,s',y} \tag{5}$$

Models 4 and 5 in Table 4 report related results. In Model 4, we report the first-stage regression. The coefficient is 53% and is highly statistically significant. The F-statistic is greater than 200. Model 5 reports the result of the second-stage; the coefficient is 349.38 and highly statistically significant. These two estimates imply that the premium associated with green contracts is 185%. The premium estimate exceeds the "naive" estimate in Table 3, providing empirical support for a possible reverse causality.

4 Economics of Green Cost Premiums

In this section, we investigate the underlying sources of the green cost premium. We begin by showing that the premium is shaped by public climate concern and climate uncertainty. We then examine how the green cost premium varies across firms and product types, partly reflecting differences in environmental characteristics and experience with green procurement. This analysis indicates that a substantial portion of the green cost premium is transient. Next, we test whether green costs vary systematically with the degree of regulatory burden. Finally, we empirically rule out alternative explanations related to differences in quantity, quality, or political connections.

4.1 Climate Concerns and Climate Uncertainty

In this subsection, we present evidence that public concern about climate change influences the green cost premium in federal procurement contracts, mirroring the findings of Ardia et al. (2022) and Pastor et al. (2022) who document similar patterns in equity markets and Seltzer et al. (2025) who document similar patterns in bond markets. Specifically, we hypothesize that heightened public awareness of climate issues, such as that triggered by high profile environmental accidents, enables suppliers to charge higher prices for green products, as government agencies become more willing to pay a premium for environmental attributes during such periods. Moreover, we posit that producers charge higher prices to compensate for uncertainty about future public concern, which is a key determinant of future demand for their green products from both government and private customers.

To capture shifts in public sentiment about climate change, we use the Media Climate Change Concerns (MCCC) index of Ardia et al. (2022), constructed from articles in eight major US newspapers. The index, available from January 2003 and recently extended to 2025, measures the volume and tone of climate-related coverage. For each article, Ardia et al. (2022) compute a "concern" score as the product of (i) the fraction of words related to risk and (ii) the scaled difference between negative and positive words. These scores are aggregated to the monthly level across newspapers.

Using this index, we construct two related measures: (i) shocks to climate concerns and (ii) climate concern uncertainty. Following Ardia et al. (2022) and Pastor et al. (2022), we define shocks to climate concerns as the prediction errors from AR(1) models estimated on the monthly MCCC series. Specifically, to compute the shock in month t, we estimate an AR(1) model using the preceding 36 months of data (ending in month $t-1$) and define the shock as the difference between the realized MCCC value in month t and its predicted value. Figure 4 shows time series of climate concern shocks. As shown, there is enough variation over time, with a larger magnitude in the later part of our sample

Insert Figure 4

We then use this shock measure to estimate the following empirical specification:

$$Cost_{c,t} = \alpha + \beta_1 \cdot Green_{c,t} + \beta_2 \cdot HS_t \cdot Green_{c,t} + \text{FE} + \epsilon_{c,t} \tag{6}$$

where HS_t is an indicator variable equaling one if the shock in month t is above the median and zero otherwise. The median is calculated over a rolling window that spans from the initial observation date to the most recent one, excluding the current period. This design leverages the full historical data while preventing forward-looking bias. We intentionally omit HS_t as a control variable, since its effect is absorbed by the included time fixed effects. All other variables are defined as in Subsection 3.1. The estimation results are reported in Table 5.

Insert Table 5

Model 1 reports the corresponding estimates. When climate concern shocks are low, the green price premium is 15.2%. During periods of high climate concern shocks, the premium increases by statistically significantly 5.8 percentage points to 21.0%. The positive interaction coefficient supports the hypothesis that heightened public awareness of climate change, proxied by climate concern shocks, enables suppliers to charge higher prices for green products, as government agencies become more willing to pay a premium for environmental attributes during such periods.

Next, we construct and analyze climate concern uncertainty. Following Kim and Pouget (2025) and using the monthly data from Ardia et al. (2022), we estimate the conditional volatility of climate concerns using an ARCH(1) model, where volatility at time t depends on the previous month's shock. This measure captures uncertainty surrounding future climate concerns. As a robustness check, we also construct an alternative measure based on an ARCH(2) specification. Figure 4 plots the time series of climate concern uncertainty, revealing substantial temporal variation, with notably heightened volatility following the start of President Trump's first term.

We use this uncertainty measure to estimate the following empirical specification:

$$Cost_{c,t} = \alpha + \beta_1 \cdot Green_{c,t} + \beta_2 \cdot HU_t \cdot Green_{c,t} + \text{FE} + \epsilon_{c,t} \tag{7}$$

where HU_t is an indicator variable equaling one if the uncertainty in month t is above the median and zero otherwise. All other variables are defined as in Equation (6). The estimation results are reported in Table 5.

Model 2 presents the estimates based on the ARCH(1)-derived uncertainty measure. When climate concern uncertainty is low, the green price premium is 10.9%. During periods of high uncertainty, the premium increases by a statistically significant 17.6 percentage points to 28.5%. The positive interaction coefficient supports the hypothesis that producers demand higher prices to compensate for greater uncertainty about future public concern over climate change. As shown in Model 3, similar conclusions hold when using the ARCH(2)-based uncertainty measure.

4.2 Fixed Cost

This subsection examines variation in the green cost premium and tests whether the costs associated with greening products are initial fixed costs. As discussed in Foster and Rosenzweig (2010), Gerarden et al. (2017), and Meles and Ryan (2022), the adoption of new technologies usually involves large fixed costs at the beginning. It is easy to imagine such fixed costs in the context of the green transition. For example, although heat pumps are both cost efficient and environmentally friendly, their adoption rate was only 7 percent as of 2020. Meles and Ryan (2022) attribute this low adoption rate to substantial initial fixed costs, which include not only installation expenses but also the cost of learning about the new technology. Similarly, Gerarden et al. (2017) document that the adoption of energy efficient technologies tends to be limited, largely due to these upfront costs. Such large fixed costs at the outset suggest that a considerable portion of the green cost premium may not be recurring.

Building on this reasoning, theoretical models such as Pastor et al. (2021), Gupta et al. (2025), and Gupta and Starmans (2025) often treat green costs as a one time lump sum investment. However, in practice, this assumption may not always hold. Fixed costs in the green transition can be relatively small compared to ongoing variable expenditures, such as regular maintenance or compliance costs. We therefore empirically examine whether the green cost premium is indeed transient.

We provide two sets of related analyses. We first test whether the green cost premium decreases as the product or the procuring agency becomes more green. If the majority of the green cost premium incurs in the early stage of the green transition, we expect costs to decrease in the greenness of the product or of the procuring agency. We estimate the following model:

$$Cost_{c,t} = \alpha + \beta_1 \cdot Green_{c,t} + \beta_2 \cdot D_{c,t} + \beta_3 \cdot D_{c,t} \cdot Green_{c,t} + \text{FE} + \epsilon_{c,t} \tag{8}$$

where $D_{c,t}$ is an indicator variable equaling one if the contract is associated with a green product or green agency. Other variables are defined similarly as in Subsection 3.1. The estimation results are in Table 6.

Insert Table 6

In Model 1, we focus on the greenness of the three-digit product and service codes. $D_{c,t}$ equals one if the share of green products within a three-digit product and service code is above the cross-sectional median computed during the previous year. The degree of greenness varies significantly across 877 different product types. Our estimates suggest that imposing green restrictions increases the cost of brown products by 36.2%, while increasing the cost of green products by 15.7%. Products that are more frequently greened up may have markets that are more established and competitive, leading to lower greening-up costs.

Next, Model 2 studies how the cost of green contracts varies between different agencies. There are 74 unique agencies, all of which have different characteristics and goals. Consequently, the green share of procurement contracts can differ by agencies. A green (brown) agency is one that has offered a number of green contracts above (below) the median in the prior year. The model shows that imposing green restrictions increases brown agencies' prices by 16.4%, whereas green agencies' prices increase by only 8.5%. Agencies who frequently procure green products and services have experience in procuring environmentally friendly goods. As a result, they face lower marginal costs for adopting green practices compared to non-green agencies.

Now, we provide more direct evidence that some part of these costs is transient. We quantify how much the green cost premium decreases as experience accumulates. If costs are transient, we would expect them to decrease with repeated green transactions. We define

Contract Number, our main explanatory variable, as the number of times green contracts have been issued at the agency, three-digit product and service code, and state level up to the current contract.[33] The higher this number, the more green contracts have been awarded.

For this analysis, an apples-to-apples comparison is critical because the costs of brown contracts may also change during the same period for several reasons. As a result, we use a sample that consists of all green contracts and matched brown control contracts. For each green contract, we randomly with replacement select a control contract that is issued by the same agency, is within the same three-digit product and service code, awarded in the same state and during the same year. We first estimate the following model:

$$\begin{aligned} Cost_{c,t} &= \alpha + \beta_1 \cdot Green_{c,t} + \beta_2 \cdot FollowUp_{c,t} \\ &+ \beta_3 \cdot Green_{c,t} \cdot FollowUp_{c,t} + \text{FE} + \epsilon_{c,t} \end{aligned} \tag{9}$$

where $FollowUp_{c,t}$ is an indicator variable equaling one if the corresponding Contract Number is larger than 1 and is set to 0 otherwise. Including $FollowUp_{c,t}$ as a standalone variable is important because it accounts for potential differences in contract prices that stem from experience effects unrelated to a contract's green designation. If some share of the green cost premium is transient, we would expect a negative $\hat{\beta}_3$. Model 1 in Table 7 reports the results.

Insert Table 7

As indicated by β_1, the green cost premium is 20.7% for contracts that are green for the

[33] If multiple green contracts exist within the same cohort on the same action date, all the contracts are assigned the same contract number.

first time within a given agency, three-digit product and service code, and state. However, for subsequent green contracts with the same combination of three-digit product and service code and state, the estimated green cost premium declines to 5.7% ($= \beta_1 + \beta_3$). This provides direct evidence that a substantial portion of the initial green cost premium is transitory.

Next, we estimate an alternative model:

$$Cost_{c,t} = \alpha + \beta_1 \cdot Green_{c,t} + \beta_2 \cdot \{CN_{c,t} \in (1, 10]\} + \beta_3 \cdot \{CN_{c,t} \in (10+)\} \quad (10)$$
$$+\beta_4 \cdot Green_{c,t} \cdot \{CN_{c,t} \in (1, 10]\} + \beta_5 \cdot Green_{c,t} \cdot \{CN_{c,t} \in (10+)\} + \text{FE} + \epsilon_{c,t}$$

where $\{CN_{c,t} \in (1, 10]\}$ is an indicator variable equaling one if $Contract\ Number_{c,t}$ is between two and ten while $\{CN_{c,t} \in (10+)\}$ is an indicator variable equaling one if $Contract\ Number_{c,t}$ is greater than ten. Including $\{CN_{c,t} \in (1, 10]\}$ and $\{CN_{c,t} \in (10+)\}$ as standalone variables is important because it accounts for potential differences in contract prices that stem from experience effects unrelated to a contract's green designation. If some share of the green cost premium is transient, we would expect a negative $\hat{\beta}_4$ and/or a negative $\hat{\beta}_5$. Model 2 in Table 7 reports the results.

The green cost premium is 21.7% for contracts that are green for the first time within a given agency, three-digit product and service code and state. The green cost premium does not statistically significantly decrease even when up to 10 more contracts were procured within the same agency, three-digit product and service code and state as implied by β_4 that is not statistically different from 0. Only after the 10 contracts does the green cost premium get entirely wiped out.

4.3 Regulation Burden

In this subsection, we explore the heterogeneity in the premium associated with strictness of green regulation. The green transition in our empirical setup is encouraged by a set of federal-level regulations (see Subsection 2.1 for more details). Parente and Prescott (1994) point out regulatory constraints as one of the potential reasons behind costly technology adoption. The extent to which Parente and Prescott (1994)'s claim remains valid in the context of the green transition is unclear. The cost of the green transition includes various components. Green regulation may conceivably increase certain cost elements while decreasing others (e.g., reduced energy expenses stemming from the adoption of energy-efficient products). Therefore, we empirically examine whether there exists a positive correlation between the stringency of green regulations and the associated green cost premium.

We empirically test the prediction as follows. As explained in Subsection 3.1, our main regressor $Green_{c,t}$ equals one if the contract c has any of the following five clauses: bio-based, energy efficient, environmentally preferable, FAR 52.223-4, or FAR 52.223-9. In this subsection, we show how the results vary, if at all, if we deviate from this definition. We summarize our results in Table 8.

Insert Table 8

Models 1 through 5 define the regressor based on only one of the five categories mentioned. All five clauses have statistically significant positive impacts on the cost. Notably, FAR 52.223-9's cost sensitivity is the strongest and FAR 52.223-4's is the weakest.

Model 6 simultaneously includes all five clauses. Most of the clauses remain statistically significant. This is consistent with our observation that most of the clauses seem to carry new information even after controlling for the other clauses (Table 2 Panel B). One outlier is FAR 52.223-4: although FAR 52.223-4 individually carries a positive green cost premium (statistically significant) as shown in Model 4, its contribution to the green cost premium gets diminished when the other four clauses are included. This can be explained by the observation that FAR 52.223-4 is highly correlated with other green clauses, in particular with FAR 52.224-9: 100% of the FAR 52.223-9 contracts contain FAR 52.223-4 whereas only 36.7% of FAR 52.223-4 contracts contain FAR 52.223-9. Overall, the results imply that almost all clauses carry an individual green cost premium. Model 6, which includes all clauses jointly, supports this interpretation.

In Model 7, we use an alternative definition of greenness by counting the number of individual clauses. This additive measure has two related interpretations. First, it represents the complexity of requiring the contract to comply with multiple green clauses. Second, because we also include the $Green_{c,t}$ indicator variable in the specification, we can address whether the cost is associated with the extensive margin, whether or not a contract includes any green clause; and/or the intensive margin, the additive complexity component. Our results show that compliance with an additional green clause leads to a 14.8% increase in the cost, suggesting that each individual green clause is associated with a cost premium. Model 8 supports this view by using yet another transformation, individual indicator variables for the number of individual clauses.

Now, we provide more direct evidence of the regulatory and administrative demands associated with green procurement by examining the additional work required during contract execution. Specifically, we analyze detailed contract-level outcomes that capture administrative and procedural workload, including the number of modifications, cost overruns, time overruns, and cancellations. These outcomes shed light on the greater contractual complexity and oversight inherent in green procurement. Although they do not measure regulatory burden in an ex-ante sense, they reflect the ex-post administrative effort required to implement and monitor green contracts. To the extent that these challenges are anticipated at the contracting stage, they serve as a reasonable proxy for ex-ante regulatory burden. As noted by the Defense Acquisition University, contract modifications often arise from the "complex and evolving nature of government requirements," which necessitates ongoing monitoring and adjustment throughout the contract lifecycle.[34] This perspective suggests that green procurement may involve not only additional regulatory compliance but also greater coordination between the government and contractors during implementation.

To quantify this relationship, we estimate a model similar to Equation (1), substituting each of these performance-related outcomes as the dependent variable. Because our focus is on contract execution rather than initial selection, we control for key contractual characteristics such as total cost and maturity. Models (1) through (6) in Table 9 summarize the results.

Insert Table 9

The main takeaway from this analysis is that green contracts appear to impose greater effort and coordination on both firms and the government, as they tend to require more interactions between the two parties. Model 1 shows that green contracts are 2.6% more likely to undergo modifications. In Model 2, where the log number of modifications proxies for contract quality, green contracts exhibit approximately 9.7% more modifications. Model

[34]Defense Acquisition University (DAU), Contract Modifications and Changes, available at `https://www.dau.edu/acquipedia-article/contract-modifications-and-changes`.

3 examines cost overruns, measured as the log of final costs relative to initially agreed-upon costs, and finds that green contracts are, on average, 1.4% more expensive, corresponding to about 8% of the variable's standard deviation. Model 4 indicates that time overruns are 1.9% more likely for green projects, while Model 5, which uses the log of time overrun (measured as the log of days completed beyond the initially agreed date), suggests that green contracts take 2.3% longer to complete. Finally, Model 6 uses a cancellation indicator as a proxy for contract quality and finds no significant difference between green and non-green contracts. It is worth noting that cancellations are rare in our sample, occurring in only 0.34% of cases. Overall, these findings indicate that green contracts demand greater administrative and operational effort from both firms and the government, reflecting a meaningful regulatory burden.

4.4 Alternative Channels

In this subsection, we empirically rule out alternative explanations related to differences in quantity, quality, or political connections.

First, one might argue that the main results are driven by differences in product quantity. Green products could be purchased in larger bulk than non-green products, leading to higher contract-level costs and thus explaining the observed green cost premium. To address this concern, we draw on the analysis presented in Subsection 3.2. In Model 1 of Table 4, we aggregate individual contracts to the agency-state-year level. If green products are typically purchased in greater bulk than their non-green counterparts, this aggregation mitigates cost differences arising purely from quantity variation. Model 1 in Table 4 shows that imposing green clauses increases contract costs by 39.72%, a magnitude substantially larger than the estimates in Table 3. These results suggest that green products are procured in smaller quantities per contract, alleviating the concern that the green cost premium is driven by bulk purchasing of green products.

Second, one may argue that green contracts are more expensive because they are of higher quality. To address this concern, we draw on the same analysis presented earlier in the paper. Specifically, following Brogaard et al. (2021), we use the contract characteristics reported in Table 9 in Subsection 4.3 as proxies for contract quality. The results documented in Table 9 indicate that green contracts tend to be of *lower* quality, helping to rule out quality improvements as a plausible explanation for the observed cost increases.

Finally, one may argue that green contracts are more expensive because firms with stronger political ties are more likely to obtain them. As discussed in Subsection 3.1, the inclusion of double interacted fixed effects between the primary state of performance and the year month variable accounts for time varying shocks at the state level, such as changes in the political affiliation of local governments that may influence their propensity to overpay. However, this fixed effect does not fully address the concern. To further mitigate it, we reestimate our main specification in Equation (1) using subsamples of contracts awarded to firms that are unlikely to have strong political ties. In particular, we focus on contracts involving smaller or less frequent contractors. Evidence of a green cost premium within this group would suggest that political connections alone cannot explain the higher costs associated with green contracts. Table 10 presents the corresponding results.

Insert Table 10

Model 1 restricts the sample to firms classified under the small business set-aside code. Model 2 focuses on firms that have engaged in at most one procurement transaction per year with the government. Model 3 limits the sample to contracts with a total cost below \$5,000. The estimated green cost premiums from these models are 13.2%, 19.4%, and 17.9%, respectively. All three estimates are close to the main specification's result of 18.0%, reported in Table 3, easing concerns that firms' political ties are the primary drivers of the observed green cost premium.

5 Conclusion

This paper quantifies the costs of greening the economy from the customer's perspective by analyzing nearly six million federal procurement contracts. We find that environmentally sustainable products and services are substantially more expensive than comparable non-sustainable alternatives, with cost premiums ranging from 18 to 185 percent. These estimates suggest that the financial burden of the green transition is not limited to producers and investors but is also borne by customers, in this case, federal agencies and ultimately taxpayers.

Our analysis identifies three key economic mechanisms behind the green cost premium. First, the premium rises when public concern and uncertainty about climate change are elevated, suggesting that both demand-side willingness to pay and supply-side pricing power respond to shifts in climate sentiment. Second, the premium declines with greater experience among agencies and suppliers, consistent with large initial fixed costs that dissipate as organizations adapt to new environmental standards. Third, stricter green regulations and greater clause complexity impose measurable administrative and procedural burdens, reflected in more frequent contract modifications, cost overruns, and delays. Last, the premium cannot be explained by differences in product quantity, quality, or vendor characteristics, indicating that higher costs arise from the nature of green procurement itself.

Together, these findings highlight that while the green transition entails significant short-run costs, many of these costs are transitory and reflect the learning curve inherent in adopting new standards. Policymakers and practitioners should view the observed green cost premium as an investment phase rather than a permanent inefficiency. By facilitating institutional learning and streamlining regulatory processes, governments can help accelerate cost convergence between green and non-green products, ultimately making sustainable procurement both economically and environmentally viable in the long run.

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Department of Energy

FY 2020 OMB SCORECARD FOR EFFICIENT FEDERAL OPERATIONS/MANAGEMENT

GOAL ASSESSMENT	METRICS	PERFORMANCE RATING*	OTHER PROGRESS INDICATORS	
FACILITY ENERGY EFFICIENCY	Change in energy intensity (Btu/GSF) compared to FY 2003:	-38.9%	FY 2003: 222,627 Btu/GSF; FY 2019: 138,741 Btu/GSF; FY 2020: 136,014 Btu/GSF	
	Change in energy intensity (Btu/GSF) from prior year:	-2.0%	Average cost of energy per site-delivered million Btu:	$19.75
EFFICIENCY MEASURES/ INVESTMENT	EISA-covered facilities evaluated for efficiency opportunities:	99.9%	Implementation cost of ECMs identified for potential investment ($M):	$1,266.7
	Utilized performance contracting in FY 2020 to achieve energy, water, building modernization, infrastructure goals?	No	Direct investment in FY 2020 ($M):	$19.9
			ESPC and UESC investment in FY 2020 ($M):	$0.0
			Annual Btu saved per $1 of investment in 2020:	7,062
RENEWABLE ENERGY USE	Renewable electricity used (as a percentage of total electricity use):	21.2%	Renewable electricity + non-electric renewable energy used (as a percentage of total electricity use):	23.6%
WATER EFFICIENCY	Change in potable water intensity compared to FY 2007:	-34.3%	FY 2007: 68.3 Gal/GSF; FY 2019: 45.9 Gal/GSF; FY 2020: 44.9 Gal/GSF	
	Change in potable water intensity from prior year:	-2.2%	Cost of potable water per thousand gallons:	$4.04
HIGH PERFORMANCE SUSTAINABLE BUILDINGS	Percent of owned buildings (eligible) meeting the sustainability criteria:	13.8%	Buildings meeting sustainability criteria:	236
	Percentage point difference from prior year:	1.1	Total count of eligible buildings:	1,705
	Percent of GSF (eligible) meeting the sustainability criteria:	11.6%	GSF meeting sustainability criteria (thou.):	9,414
	Percentage point difference from prior year:	1.1	Total eligible GSF (thou.):	81,379
TRANSPORTATION/ FLEET MANAGEMENT	Change in petroleum fuel use in covered fleet compared to FY 2005:	-43.5%	Alternative fuel use as a percentage of total covered fleet fuel use:	22.8%
	Change in petroleum fuel use in covered fleet compared to prior year:	-9.5%	Percentage of covered AFV acquisitions (w/bonus credits):	202.4%
SUSTAINABLE ACQUISITION	Percentage point difference of sustainable contract actions from prior year:	-0.4	Number of applicable contract actions w/ sustainable clauses, FY20:	1,626
			Number of applicable contract actions w/ sustainable clauses, FY19:	1,553
	Percentage point difference of value of contracts with sustainable requirements from prior year:	0.1	Value of applicable contract actions w/ sustainable clauses, FY20:	$20,276.0M
			Value of applicable contract actions w/ sustainable clauses, FY19:	$18,758.0M
Change in Agency Scope 1 and 2 GHG emissions from 2008:		-51.9%		

*Due to the COVID-19 pandemic, the data as reported may appear anomalous and represent exogenous factors beyond the agency's control. The impact on agency performance has not been fully evaluated at this time.

Sources: Agency submitted data from Annual Energy Data Report, EISA 432 Compliance Tracking System, Federal Real Property Profile, Federal Automotive Statistical Tool, FPDS

Btu = British thermal units
GSF = Gross square foot (or feet)
MBtu = Million Btu
ESPC = Energy Savings Performance Contracts
UESC = Utility Energy Savings Contracts

ECM= efficiency/conservation measure
AFV = alternative fuel vehicle
FPDS = Federal Procurement Data System
GHG = greenhouse gas

Figure 1: Department of Energy OMB Scorecard for FY 2020

This figure displays the scorecard that the Department of Energy reported to the Office of Management and Budget for fiscal year 2020.

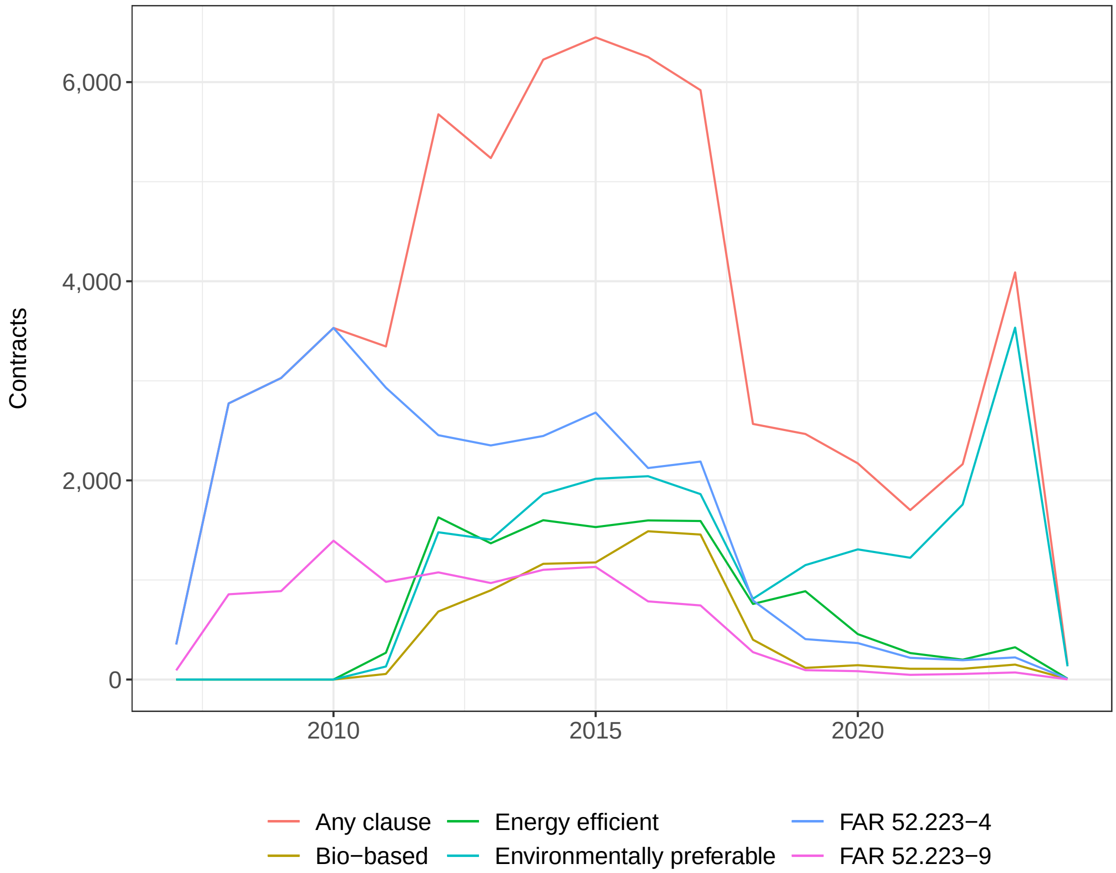

Figure 2: Number of contracts with green clauses
This figure displays a time-series variation in the number of green contracts. The x-axis depicts individual years. The y-axis reports the number of contracts that included a given green contracting clause.

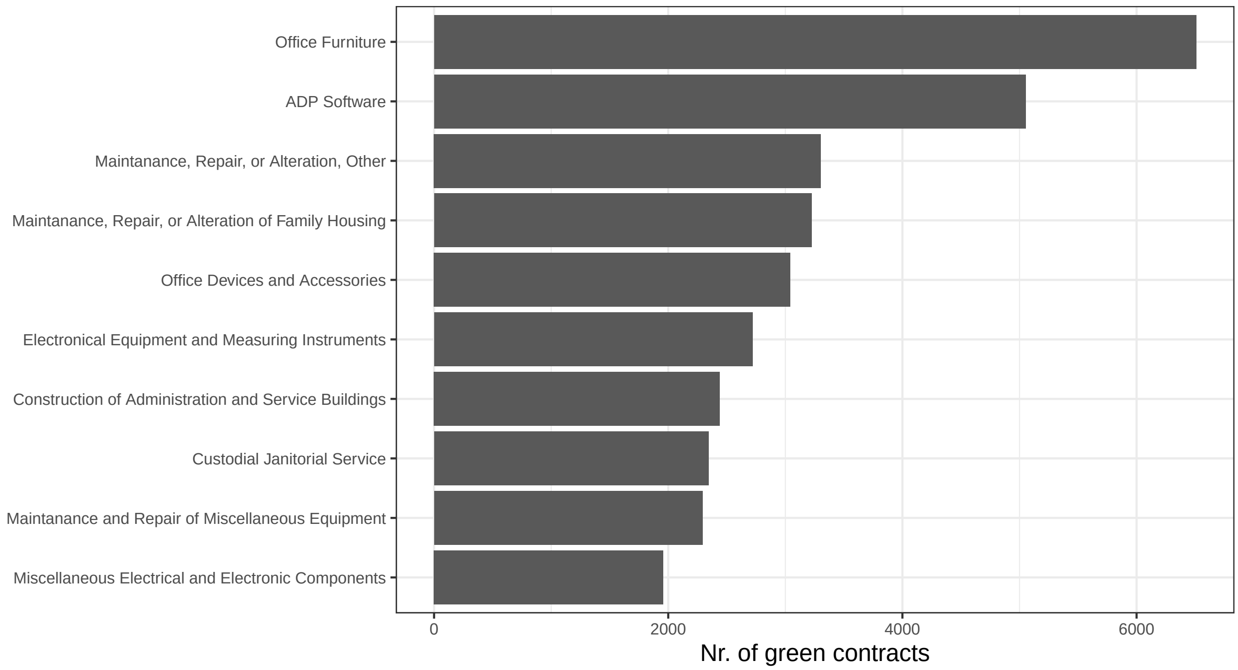

Figure 3: Product type heterogeneity
The panel presents the ten two-digit product and service groups with the highest number of green contracts within our sample.

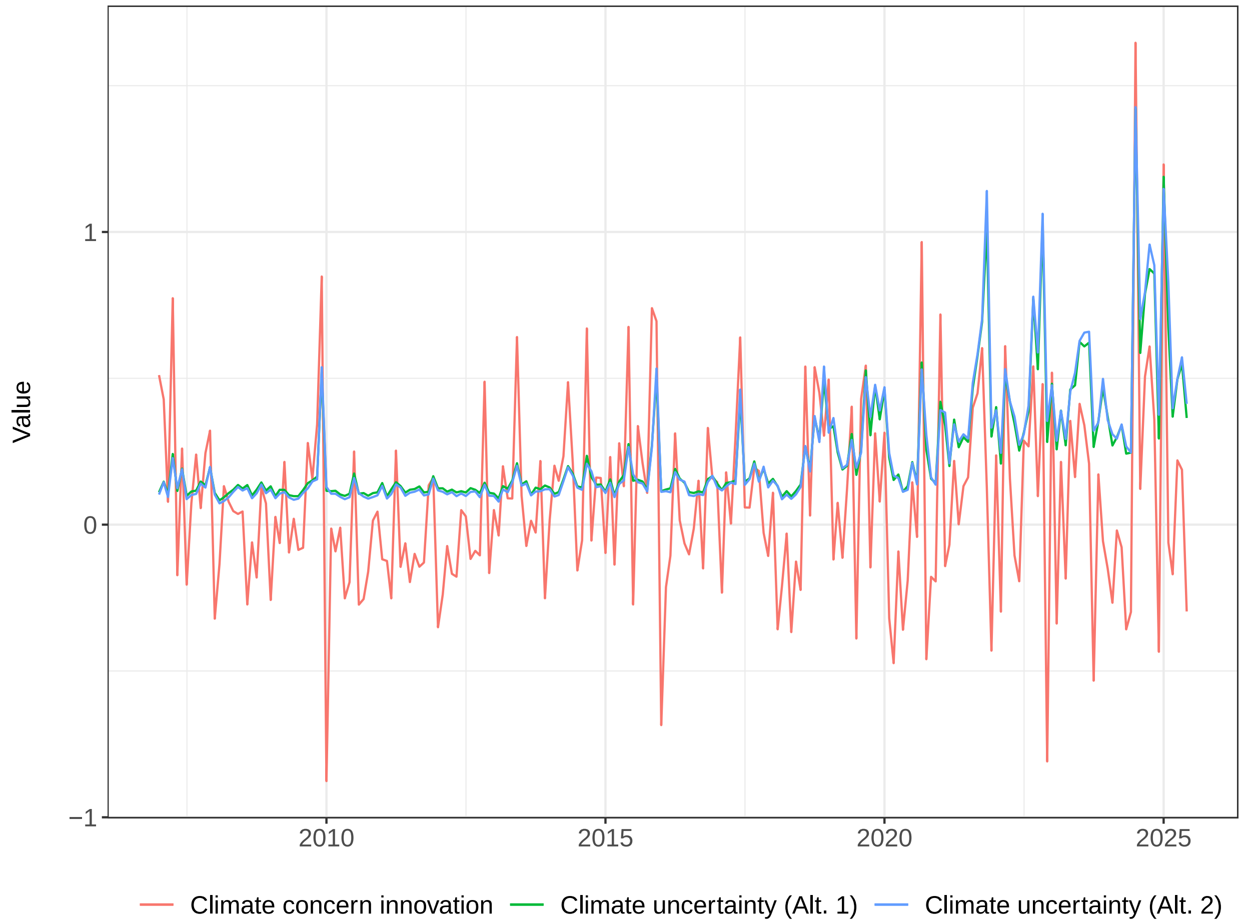

Figure 4: Climate uncertainty and climate concern

This figure shows time-series trend of climate concern innovation, climate uncertainty (Alt. 1) and climate uncertainty (Alt. 2). Climate concern is measured as prediction error from an AR(1) model estimated using the monthly MCCC index. Climate uncertainty (Alt. 1) is measured as the conditional volatility of climate concerns, estimated using an ARCH(1) model. Climate uncertainty (Alt. 2) is measured as the conditional volatility of climate concerns, estimated using an ARCH(2) model.

Table 1: Overview of five green clauses

We designate a particular contract as green if it contains at least one of the five green clauses: bio-based, energy efficient, environmentally preferable, FAR 52.223-4, or FAR 52.223-9. This table provides an overview of these five clauses. The first column shows the name of the clauses. The second column provides a description. The third column shows the issuing agency. The fourth column shows the date that the clause was first introduced to the FPDS Data Dictionary. The last column shows the related legislation and logos, if available

Name	Description	Issuing agency	First date	Legislation	
FAR 52.223-4	Recovered material certification: This certifies that the percentage of recovered materials content for EPA-designated items to be delivered or used in the performance of the contract will be at least the amount required by the applicable contract specifications or other contractual requirements	EPA	2005	Resource Conservation and Recovery Act of 1976	
FAR 52.223-9	Estimate of percentage of recovered material content for EPA-designated products: on completion of this contract, the contractor should estimate the percentage of the total recovered material content for the items delivered and/or used and submit this estimate to the agency	EPA	2005	Resource Conservation and Recovery Act of 1976	
Bio-based: FAR 52.223-1; FAR 52.223-2	This certifies that bio-based products (within categories of products listed by USDA) will comply with the applicable specifications or other contractual requirements.	USDA	October 2011	Farm Security and Rural Investment Act of 2002; Energy Policy Act of 2005	
Energy efficient: FAR 52.223-15 (FAR 52.223-23 since May 2024)	Identified by the ENERGY STAR Program or Federal Energy Management Program (FEMP).	EPA, Department of Energy	October 2011	National Energy Conservation Policy Act of 1978	
Environmentally preferable: FAR 52.223-10, 52.223-13, 52.223-14, 52.223-16, 52.223-17 (FAR 52.223-23 since May 2024)	This prescribes policies for acquiring environmentally preferable products and services. Includes EPEAT-registered, nontoxic, or less-toxic alternatives.	EPA	October 2011	Resource Conservation and Recovery Act; National Energy Conservation Policy Act; Pollution Prevention Act of 1990 ; Farm Security and Rural Investment Act of 2002	

Table 2: Summary statistics

This table provides summary statistics for government contracts. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Panel A reports summary statistics while Panel B reports the simultaneous use of different green clauses.

Panel A: Summary statistics

	All contracts			Green contracts		Non-green contracts	
	Mean	Std.Dev.	Obs.	Mean	Std.Dev.	Mean	Std.Dev.
Cost	26,436.19	104,906.96	5,772,981	81,765.90	229,714.40	25,814.95	102,478.32
Green contracts (in %)	1.11	10.48	5,772,981	100.00	0.00		
Bio-based contracts (in %)	0.14	3.71	5,772,981	12.40	32.96		
Energy efficient contracts (in %)	0.22	4.65	5,772,981	19.48	39.61		
Environmentally preferable (in %)	0.36	5.98	5,772,981	32.32	46.77		
FAR 52.223-4 (in %)	0.50	7.08	5,772,981	45.35	49.78		
FAR 52.223-9 (in %)	0.18	4.29	5,772,981	16.61	37.22		
Number of modifications	0.29	3.35	5,772,981	1.44	12.86	0.27	3.08
Cost overrun	0.01	0.16	5,772,981	0.05	0.27	0.01	0.16
Time overrun	0.33	1.27	5,772,981	0.90	2.01	0.32	1.25
Cancellation	0.00	0.00	5,772,981	0.00	0.00	0.00	0.00
Number of bids	4.01	3.98	5,772,981	3.10	2.95	4.02	3.99

Panel B: Simultaneous use of green clauses

	Observations	Share including green clause (%)				
	Number	Bio-based	Energy efficient	Environmentally preferable	FAR 52.223-4	FAR 52.223-9
All contracts	5,772,981	0.14	0.22	0.36	0.50	0.18
Bio-based contracts	7,950	100.00	17.12	18.75	29.27	0.00
Energy efficient contracts	12,488	10.90	100.00	9.07	14.85	0.00
Environmentally preferable	20,714	7.20	5.47	100.00	9.37	0.00
FAR 52.223-4	29,068	8.01	6.38	6.67	100.00	36.63
FAR 52.223-9	10,647	0.00	0.00	0.00	100.00	100.00

Table 3: Main regression — the costs of green contracts

This table examines the costs associated with green contract clauses. The dependent variable is the log of a contract's costs. The main independent variable is an indicator whether a contract includes at least one green clause. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:		log(cost)	
Model:	(1)	(2)	(3)
Variables			
Green	42.9***	29.9***	18.0***
	(4.4)	(2.4)	(1.7)
Fixed-effects			
Agency	Yes		
State	Yes		
Time	Yes		
Three-digit p&s code	Yes		
Set-aside code	Yes	Yes	Yes
Three-digit p&s code × time		Yes	Yes
Agency × state		Yes	
Agency × state × three-digit p&s code			Yes
State × time			Yes
Fit statistics			
Observations	5,772,981	5,772,981	5,772,981
Adjusted R^2	0.47	0.51	0.56

Table 4: Causality — Bartik instrument

This table examines the cost premium associated with green contract clauses on agency, state, and year level. The panel aggregates individual contracts to an agency-state-year level. The dependent variable is the total money spent on contracts. The main explanatory variables is the share of contracting dollars spent on green contracts. Models 2 and 4 report the first-stage of an IV regression using a Bartik instrument. The instrument is constructed by multiplying the national share of green contracts per three-digit product and service (p&s) code with the share of products within each three-digit product and service code per agency, state, and year. In Model 4, we employ a leave-out estimator following Borusyak et al. (2022). The raw sample of contracts considers all three-digit p&s codes that are traded at least 250 times by 25 agencies during any year. Coefficients are reported in percentages. Robust standard errors are clustered on state and agency, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	OLS	IV first-stage	IV second-stage	IV first-stage	IV second-stage
Dependent variables:	log(cost)	Green	log(cost)	Green	log(cost)
Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Green	39.72***		285.51***		349.37***
	(12.41)		(40.32)		(62.28)
Bartik instrument		0.69***			
		(0.11)			
Bartik instrument (leave out)				0.53***	
				(0.12)	
log(numberContracts)	1.03***	0.00	1.02***	0.00	1.01***
	(0.05)	(0.00)	(0.05)	(0.00)	(0.05)
Fixed-effects					
Agency × year	Yes	Yes	Yes	Yes	Yes
Agency × state	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	12,989	12,989	12,989	12,989	12,989
Adjusted R^2	0.82	0.28	0.79	0.27	0.78
F-statistics		445.6		245.4	

Table 5: Climate concern and climate uncertainty

This table examines the relationship between the green cost premium and climate concern or climate uncertainty. The dependent variable is the log of a contract's costs. The main independent variable is an indicator whether a contract includes at least one green clause. In Model (1), the main independent variable is interacted with a high-climate-concern indicator that equals one when the prediction error from an AR(1) model estimated using the monthly MCCC index is above its median. In Model (2), the main independent variable is interacted with a high-climate-uncertainty indicator that takes the value of one when the conditional volatility of climate concerns, estimated using an ARCH(1) model, is above the median. In Model (3), the main independent variable is interacted with a high-climate-uncertainty indicator that takes the value of one when the conditional volatility of climate concerns, estimated using an ARCH(2) model, is above the median. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Model 1 restricts the sample to firms classified under the small business set-aside code. Model 2 focuses on firms that have engaged in at most one procurement transaction per year with the government. Model 3 limits the sample to contracts with a total cost below $5,000. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:		log(cost)	
Model:	(1)	(2)	(3)
Variables			
Green	15.2***	10.9***	10.3***
	(1.9)	(1.9)	(2.0)
Green × High climate concern	5.8***		
	(1.7)		
Green × High uncertainty (Alt. 1)		17.6***	
		(2.5)	
Green × High uncertainty (Alt. 2)			19.1***
			(2.9)
Fixed-effects			
Agency × state × three-digit p&s code	Yes	Yes	Yes
Three-digit p&s code × time	Yes	Yes	Yes
Set-aside code	Yes	Yes	Yes
State × time	Yes	Yes	Yes
Fit statistics			
Observations	5,772,981	5,772,981	5,772,981
Adjusted R^2	0.56	0.56	0.56

Table 6: Cross-sectional variation

This table examines heterogeneity in the costs associated with green contract clauses. The dependent variable is the log of a contract's costs. The main independent variable is a indicator variable equaling one if a contract includes at least one green clause interacted with another indicator variable equaling one if the contract is associated with a green product or agency. A green product and an agency are defined as having a share of green contracts above the median in the prior year. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	log(cost)	
Model:	(1)	(2)
Variables		
Green	36.2***	16.4***
	(3.5)	(2.1)
Green × D(green product)	-20.5***	
	(3.9)	
D(green agency)		1.7
		(1.8)
Green × D(green agency)		-7.9**
		(3.6)
Fixed-effects		
Agency × state × three-digit p&s code	Yes	Yes
Three-digit p&s code × time	Yes	Yes
Set-aside code	Yes	Yes
State × time	Yes	Yes
Fit statistics		
Observations	5,703,871	4,384,543
Adjusted R^2	0.56	0.55

Table 7: Fixed costs

This table examines whether the costs associated with individual green contracts decrease over time. The dependent variable is the log of a contract's costs. Our main explanatory variable, the contract number, captures how many green contracts have been issued at the agency, three-digit product and service (p&s) code, and state level up to the current contract. The higher this number, the more similar green contracts have been awarded. The sample consists of all green contracts and a set of control contracts. For each green contract, we randomly with replacement select a control contract that is issued by the same agency, is within the same three-digit p&s code, awarded in the same state and during the same year. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	log(cost)	
Model:	(1)	(2)
Variables		
Green	20.7***	21.7***
	(5.2)	(5.4)
Follow-up contract	4.6	
	(5.5)	
Green × Follow-up contract	-15.0*	
	(8.0)	
Contract number (1,10]		-0.3
		(3.2)
Contract number (10+)		10.0
		(8.3)
Green × contract number (1,10]		-4.7
		(4.8)
Green × contract number (10+)		-31.0*
		(17.1)
Fixed-effects		
Agency × state × three-digit p&s code	Yes	Yes
Three-digit p&s code × time	Yes	Yes
Set-aside code	Yes	Yes
State × time	Yes	Yes
Fit statistics		
Observations	73,820	73,820
Adjusted R^2	0.04	0.04

Table 8: Individual clauses

This table examines the costs associated with individual green contract clauses. The dependent variable is the log of a contract's costs. The main independent variable is an indicator variable equaling one if a contract includes a given green clause: bio-based, energy efficient, environmentally preferable, FAR 52.223-4, or FAR 52.223-9. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable	log(cost)							
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Bio-based	24.0***					20.6***		
	(2.2)					(2.3)		
Energy efficient		19.0***				18.7***		
		(4.6)				(4.3)		
Environmentally preferable			25.2***			25.0***		
			(4.7)			(5.0)		
FAR 52.223-4				13.1***		-6.6**		
				(2.4)		(3.0)		
FAR 52.223-9					37.3***	45.5***		
					(2.5)	(3.9)		
Nr. of clauses							14.8***	
							(1.0)	
D(One clause)								11.9***
								(1.9)
D(Two or more clause)								38.5***
								(2.1)
Fixed-effects								
Three-digit p&s code × time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Agency × state × three-digit p&s code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Set-aside code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	5,772,981	5,772,981	5,772,981	5,772,981	5,772,981	5,772,981	5,772,981	5,772,981
Adjusted R^2	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56

Table 9: Contract details

This table examines the effect of green contract clauses on contract details. The dependent variables are log of number of modification, cost overrun, time overrun, and an indicator variable equaling one if the contract was canceled. The main independent variable is an indicator variable equaling one if a contract includes at least one green clause. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variables:	Modification > 0	log(modifications)	Cost overrun	Time overrun > 0	log(time overrun)	Cancellation
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Green	2.6***	9.7***	1.4***	1.9***	2.3***	0.0
	(0.3)	(0.9)	(0.2)	(0.3)	(0.6)	(0.0)
log(cost)	2.3***	7.5***	-0.1***	1.7***	2.1***	0.1***
	(0.1)	(0.2)	(0.0)	(0.0)	(0.1)	(0.0)
log(maturity)	2.7***	8.8***	1.1***	0.9***	3.7***	0.1***
	(0.1)	(0.2)	(0.0)	(0.1)	(0.2)	(0.0)
Fixed-effects						
Three-digit p&s code × time	Yes	Yes	Yes	Yes	Yes	Yes
Agency × state × three-digit p&s code	Yes	Yes	Yes	Yes	Yes	Yes
Set-aside code	Yes	Yes	Yes	Yes	Yes	Yes
State × time	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics						
Observations	5,772,981	741,318	5,772,981	5,772,981	389,730	5,772,981
Adjusted R^2	0.27	0.32	0.27	0.19	0.16	0.04

Table 10: Alternative story: Political ties

This table examines the relationship between the green cost premium and firms' political connections. The dependent variable is the log of a contract's costs. The main independent variable is an indicator whether a contract includes at least one green clause. The sample consists of all US government procurement contracts awarded competitively between October 2007 and February 2024. Coefficients are reported in percentages. Model 1 restricts the sample to firms classified under the small business set-aside code. Model 2 focuses on firms that have engaged in at most one procurement transaction per year with the government. Model 3 limits the sample to contracts with a total cost below $5,000. Robust standard errors are clustered on the interaction of agency × state × three-digit p&s code, and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	log(cost)		
Model:	(1)	(2)	(3)
Sample:	Small businesses set-aside	One-time firm	Costs $< 5,000$
Variables			
Green	13.2***	19.4***	17.9***
	(1.7)	(1.7)	(2.0)
Fixed-effects			
Agency × state × three-digit p&s code	Yes	Yes	Yes
Three-digit p&s code × time	Yes	Yes	Yes
Set-aside code	Yes	Yes	Yes
State × time	Yes	Yes	Yes
Fit statistics			
Observations	1,079,011	1,769,942	250,645
Adjusted R^2	0.52	0.56	0.09