The Role of Government Contracting in Corporate Environmental Policies*

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Abstract

This paper studies the relationship between government contracting and corporate environmental policies. Using a new data set of government contracts, I show that firms that supply government agencies engage in more emission-source reduction activities when government agencies increase their overall preference for "green" suppliers. Analyses using a public procurement reform in the European Union provide causal evidence. In addition, I document stronger effects when firms face greater uncertainty in climate policy and dependence on external financing. In general, the results illustrate the large financial incentives created by government contracting in stimulating firms' investments in environmentally friendly technologies and production methods.

KEYWORDS: Government Contracting, Environmental Policy, Pollution Abatement Investment

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1 Introduction

Over the last decade, the academic literature has highlighted the growing demand from investors and other stakeholders for corporations to adopt sustainable practices.[1] However, the adoption of environmentally-friendly technologies often entails significant costs. To meet the sustainability goals set forth in the Paris Climate Accord, it is estimated that corporations will need to invest approximately 6.9 trillion U.S. dollars in pollution abatement over the coming decades.[2]

Policymakers and academics thus face a dilemma of how to design optimal incentives for corporations to invest in sustainability. Prior academic research demonstrates that environmental regulations, such as pollution taxes, can be effective, but raising regulatory costs can be distortionary and crowd out firms for whom the cost of regulation is too high to bear (Jaffe et al. (1995); Becker and Henderson (2000); Greenstone (2002)). In this paper, I explore a new policy tool: government contracting. I hypothesize that government contracting can generate economically large effects on corporate investment in sustainability technologies when government agencies have more preference for green suppliers. That is, instead of imposing regulations and raising the cost of firms' operations, government contracting can provide strong positive financial incentives to firms.[3] To test this hypothesis, I obtain a new data set of government contracts from a data provider called TenderAlpha that identifies the extent to which government contracts integrate environmental criteria.[4]

The empirical analyses commence with baseline analyses aimed at investigating the impact of government contracting agencies' green preference on firms' pollution abatement investments.

[1] See Dyck et al. (2019) and Dai et al. (2021), for example.

[2] https://doi.org/10.1787/9789264273528-en

[3] Government contracts are massive and account for 12.6% of GDP by 2019 across OECD countries: https://www.oecd-ilibrary.org/sites/18dc0c2d-en/index.html?itemId=/content/component/18dc0c2d-en

[4] For instance, during the supplier selection process, government agencies may set limits on specific chemicals used in production or favor suppliers that demonstrate substantial efforts in pollution abatement. Contracts incorporating such environmental standards are referred to as "green contracts."

The data utilized for this purpose comprises comprehensive plant-chemical-year-level data obtained from the U.S. Environmental Protection Agency (EPA) Toxic Release Inventory (TRI) program. Additionally, data from the U.S. Energy Information Administration (EIA), which provides detailed information on plant-level pollution abatement expenditures among utility firms, is also employed.[5][6] The primary focus of this study is on firms' newly reported source reduction (pollution abatement) activities, which the EPA identifies as the most environmentally preferable waste management strategy.[7]

The results at the plant-chemical-year level demonstrate that firms significantly increase their source reduction activities in response to stronger green preferences in government contracting. This effect holds for both the level and change measures of green preference. Furthermore, the findings remain robust when controlling for output growth (as measured by the EPA's production ratio) and various fixed effects. Economically, a one-standard-deviation increase in the green preference of government contracting agencies is associated with a 7% increase in newly reported source reduction activities relative to the sample average. Additional analyses using plant-level data from the EIA show that firms also substantially increase their pollution abatement expenditures when government agencies express a stronger preference for green suppliers.

The analyses presented above are subject to potential endogeneity concerns, as firms that prioritize environmental sustainability may selectively collaborate with contracting agencies that have a stronger preference for green suppliers, thereby engaging in more eco-friendly practices. This could lead to a spurious correlation between the government's preference for green suppliers and

[5] I concentrate on U.S. firms due to the availability of environmental data.

[6] To isolate the effect of government green preferences on firms' environmental policies, I restrict the analysis to U.S. firms that had not previously won any green contracts. Additional analyses including firms with green contracts yield similar results.

[7] Toxic emissions are not the focus of this study because source reduction represents a broader and more proactive approach to pollution control, encompassing efforts to prevent pollution at the source rather than merely mitigating its effects.

firms' investments in pollution abatement. To establish causal evidence, I exploit the 2014 European Union public procurement reform (EU reform), which provides plausibly exogenous shocks to contracting agencies' green preferences. Specifically, on February 26, 2014, the Council of the European Union and the European Parliament enacted two public procurement directives that promote the integration of broader societal objectives, such as environmental protection and social responsibility, into the procurement process.

Leveraging the EU reform, I first demonstrate a significant increase in the green preferences of EU contracting agencies, both internally and relative to their U.S. counterparts, since 2014. Using a Difference-in-Differences (DiD) approach, I then show that firms with pre-existing contracting relationships with EU government agencies (treated firms) have increased their source reduction activities compared to control firms following the implementation of the reform. Dynamic timing analyses further reveal that firms adjust their environmental policies only after the reform, not prior to it. To ensure comparability between treated and control firms based on observable characteristics, I apply propensity score matching, which yields consistent results.

Next, I examine several potential mechanisms underlying the observed effects. Drawing from previous literature, I propose and test three distinct mechanisms. First, the significant financial returns and stable cash flows associated with government (green) contracts may serve as a catalyst, motivating firms to invest in pollution abatement technologies (for example, Huang et al. (2016)). Consistent with this mechanism, I find more pronounced effects when firms face higher climate policy uncertainty, which can reduce the expected financial returns of such investments, and when they are more dependent on external financing, making them more responsive to financial incentives provided by government contracting. Second, firms might pursue government green contracts as a way to differentiate themselves from competitors, especially in industries with intense competition (Flammer (2018)). However, the results do not support this mechanism. Instead, I find that firms in more concentrated industries are more likely to invest in pollution abatement. Third, firms may seek government green contracts to appeal to or signal their commitment to socially responsible institutional investors (Krueger et al. (2020)) or customers (Dai et al. (2021)). However, I find no evidence to support this hypothesis.

In addition to the primary analyses, I conduct several robustness checks to validate my findings. First, I rule out corporate customer influence—despite the 2014 EU Directive on mandatory ESG disclosures—as the results show that government customers, not corporate ones, drive firms' pollution abatement investments. Moreover, government customers are more effective in stimulating these investments, highlighting the unique role of public procurement in environmental improvements. I also assess the reform's broader impact, finding increased capital expenditures, R&D, and green patenting, alongside higher firm valuation, underscoring its dual benefits for sustainability and financial performance. Finally, alternative specifications confirm the robustness of the results.

This paper makes several key contributions. To the best of my knowledge, it is the first to systematically examine the relationship between government contracting and firms' investments in pollution abatement, thereby extending the literature on government procurement's influence on corporate performance and policy. Prior research has documented a range of benefits associated with government contracts, such as higher firm growth (Ferraz et al. (2015)), lower equity costs (Dhaliwal et al. (2016)), more stable cash flows (Huang et al. (2016)), and greater resilience during crises (Goldman (2020)). It has also shown that government contracting can shape corporate policies, including investment behavior (Hebous and Zimmermann (2021)) and climate disclosure practices (Even-Tov et al. (2025)). A closely related study by Flammer (2018) finds that firms enhance their CSR performance to better compete for government contracts, highlighting the strategic importance of social and environmental responsibility in public procurement. This paper builds on that insight by focusing specifically on green contracts—those that incorporate environmental criteria—and examining how these criteria serve as ex-ante policy signals that incentivize firms to adopt pollution abatement strategies. In doing so, the paper offers new evidence on how targeted procurement policies can promote corporate environmental initiatives.

This paper also makes a valuable contribution to the literature on corporate environmental policies. Recent research highlights the important role of corporate customers in shaping firms' environmental and social policies (e.g., Dai et al. (2021); Schiller (2022); Pankratz and Schiller (2022)). Building on this work, this paper emphasizes the government as a key customer that can strongly influence firms' adoption of costly environmental policies. The findings further suggest that government customers exert an even greater influence than corporate customers in driving these investments. Additionally, while previous studies have identified financial constraints as a potential barrier to environmental policy adoption (e.g., Xu and Kim (2022)), this paper suggests that government contracting might help mitigate these constraints by offering firms financial incentives.

Finally, this paper contributes to the literature on environmental regulation and has important policy implications. Specifically, it highlights the benefits of green public procurement (GPP) as a distinctive environmental policy tool. While pollution taxes (Brown et al. (2022)) and emission trading systems (Calel and Dechezleprêtre (2016)) drive companies to invest in pollution abatement by increasing the costs of pollution, GPP provides financial incentives that encourage firms to adopt eco-friendly technologies—an approach particularly valuable for firms facing financial constraints. Moreover, the study offers evidence of a novel spillover effect of the EU's green procurement policies on pollution abatement investments by U.S. firms. This spillover suggests that GPP not only influences firms within the EU but also extends its impact across borders, shaping corporate environmental practices globally.

2 Data and summary statistics

2.1 Government contract data

The government contract data utilized in this study is sourced from TenderAlpha, a provider of global procurement data pertaining to both general and green procurement. The dataset encompasses over 85 million contracts awarded across more than 40 countries worldwide.[8] Specifically, this paper focuses on government contracts awarded by U.S. and EU government contracting agencies between 2011 and 2019.

Each government contract contains essential information, including the names and locations of the contracting agencies and the awarded firms. Additionally, the contract award date, start and end dates, and the total dollar amount in U.S. currency are also included. The data also provides valuable supplementary information, such as an industry code that describes the purchased product or service and an ISIN for publicly listed firms, allowing for direct matching with financial databases like Compustat. This study employs green and general contracts to gauge the green preferences of government contracting agencies and general contracts to identify existing contracting relationships between firms and government agencies.

To ascertain whether a government contract qualifies as a green contract, TenderAlpha utilizes a proprietary 3-pillar flagging methodology. The first pillar involves identifying green contracts based on the industry code that describes the product or service procured by government con-

[8] `https://www.tenderalpha.com/`

tracting agencies. By analyzing these codes, the data provider can determine whether the purchased products or services are environmentally preferable, energy-efficient, or have a lesser or reduced impact on human health and the environment. The second pillar entails identifying green contracts by scrutinizing keywords in the tender documentation. The data provider searches for environmental-related keywords in various sections of the tender documentation, including the titles and sections, descriptions of the government contract, criteria for supplier selection or contract award, and other pertinent information. For instance, the keywords related to emission reduction include general terms such as "Emission," "Pollution," "Toxicity," and "Global Warming Potential," as well as specific toxic chemicals like "NOX" and "Sulfur Emissions."

The third methodology involves identifying green contracts through adherence to standards and regulations pertaining to environmental sustainability in procurement. The European Union (EU) has established EU green public procurement (GPP) criteria for each industry, facilitating voluntary adoption by government contracting agencies. In the United States, Federal Acquisition Regulation (FAR) clauses specify the specific requirements that suppliers must meet to comply with regulations. Numerous FAR clauses govern the procurement of environmentally sustainable products, although adherence to environment-related FAR regulations remains discretionary for government contracting agencies.

TenderAlpha's methodology possesses several noteworthy features that are relevant to the analyses presented in this paper. The 3-pillar flagging methodology employed by TenderAlpha to classify green contracts places particular emphasis on the use of keywords in tender documentation and regulations pertaining to environmental sustainability. In terms of keywords, TenderAlpha focuses on the criteria used for supplier selection and contract awards. By incorporating more environmental criteria into supplier selection, firms may be incentivized to invest in expensive pollution abatement technologies and reduce emissions. Additionally, regulations related to environmental sustainability followed by the data provider are given significant attention. Such regulations require firms to document their efforts and actions to conduct pollution abatement and reduce emissions throughout the production process. For instance, in the EU GPP criteria for the textiles industry, firms must demonstrate their resources, expertise, and procedures for chemical management and emission reduction.[9] Furthermore, there are detailed requirements stipulating that the total production of certain toxic chemicals cannot exceed a certain threshold. These requirements encourage firms to invest in costly pollution abatement technologies and reduce emissions. Finally, TenderAlpha considers the life cycle costing of Green Public Procurement, which encompasses the environmental impact of procured objects throughout their entire life cycle. This includes the stages of obtaining raw materials, fabrication, assembly, packaging, transportation, maintenance, and disposal. The concept of life cycle costing is particularly relevant when examining the policy spillover from the European Union to U.S. firms.

2.2 EPA environmental data

The U.S. Environmental Protection Agency (EPA) was established in 1970 amidst heightened concerns about environmental pollution, with the aim of consolidating federal research, monitoring, standard-setting, and enforcement activities into a single agency. The EPA's foundation for safeguarding the environment and public health is rooted in various laws and presidential executive orders. One such law is Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA), which led to the creation of the EPA's Toxic Release Inventory (TRI) Program. Under this program, all public and private entities are obligated to report chemical-level data if

[9] https://ec.europa.eu/environment/gpp/pdf/criteria/textiles_2017.pdf

their facility has a minimum of 10 full-time employees, operates in one of the 400 six-digit NAICS industries, and employs at least one of the more than 600 TRI-listed chemicals.

Although the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) data is self-reported, there is evidence to suggest that facilities do not widely misreport their emissions. First, the chemicals reported in TRI are all legal, and there are no penalties associated with high emissions. However, facilities that falsify information or fail to comply with TRI reporting requirements may be subject to criminal and civil penalties under Section 325(c). Second, EPA conducts regular audits of TRI reporting data, identifying forms that contain potential errors and requiring facilities to submit corrected reports. Finally, previous studies have found that irregularities in TRI data are more likely due to ignorance rather than malfeasance. For example, Brehm and Hamilton (1996) firms violating TRI reporting requirements tend to be small facilities that release or transfer small amounts of toxic chemicals to the environment, indicating that they may be unaware of TRI reporting requirements. Bui and Mayer (2003) also finds no systematic overestimation or underestimation in TRI data.

In this paper, data is extracted for all facilities (plants) in the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) database. Specifically, at each facility-chemical-year level, newly reported source reduction or pollution prevention activities (from the P2 Database) and total releases of each toxic chemical are obtained. Additionally, the production ratio is obtained, which is the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. According to the waste management hierarchy suggested by the EPA, plants are encouraged to first reduce or eliminate the use of toxic chemicals and the creation of chemical waste through source reduction or pollution prevention activities such as leak prevention and process modifications. As the EPA's most preferred waste management or pollution abatement method, source reduction activities are also highlighted as an essential outcome variable in this paper.

The process of matching EPA data with government contracts data involves a two-step methodology. Initially, a language-based text-matching algorithm is utilized to match firm names. This involves obtaining parent firm information of each reporting facility from the EPA TRI program and conducting a fuzzy match with parent firm names in EPA and contract awardee names in government contracts data. The resulting matches are then manually verified to ensure accuracy. To address potential discrepancies in firm names, common suffixes such as "Corp," "Inc," "LLC," and "COMPANY." are removed. In addition to the aforementioned fuzzy match, a match is also conducted using GVKEY, an identifier in the Compustat database. This involves conducting a similar fuzzy match between parent firm names in EPA and firm names in Compustat North America to obtain GVKEY for each EPA parent firm where possible. GVKEY is also obtained for each firm with ISIN number in government contracts data using the Compustat Snapshot Database. The resulting data is then merged to connect government contracts data with EPA data through GVKEY.

2.3 Other data

Firm names, identifiers, and characteristics are sourced from Compustat North America database. The U.S. Energy Information Administration (EIA) provides data on pollution abatement expenditures at the plant level and other relevant information. Institutional (13f) Holdings data is procured from Refinitiv. Corporate Environment, Social and Governance (ESG) rating data is sourced from Refinitiv Asset4. Supply chain relationship data is obtained from FactSet Revere.

2.4 Measures of government preference for green suppliers

In this subsection, measures of government preference for green suppliers are created and discussed. The government contract data introduced in Section 2.1 is utilized to define each government agency's preference for green suppliers as a percentage of the total dollar amount of government contracts containing environment criteria (*Pct Gov Green*). The measures are aggregated at the firm level using the equations below:

$$Pct\ Gov\ Green^{\text{Firm}}_{i,t} = \Sigma^{N}_{j=1} Weight_{i,j,t-1} \times Pct\ Gov\ Green_{j,t} \tag{1}$$

$$Weight_{i,j,t-1} = Total\ Dollar_{i,j,t-1} / \Sigma^{N}_{j=1} Total\ Dollar_{i,j,t-1} \tag{2}$$

$Pct\ Gov\ Green_{j,t}$ represents the preference for green suppliers by government contracting agency j in year t. The weight assigned for aggregation, denoted by ($Weight_{i,j,t-1}$) is determined by the total monetary value of general (non-green) contracts awarded by government contracting agency j to firm i in year t-1 ($Total\ Dollar_{i,j,t-1}$). This measure serves to gauge the relative significance or influence of each government contracting agency on the firm.

Additionally, I have devised several metrics to measure the extent of government preference for environmentally conscious suppliers. These metrics have been aggregated at the firm level using the same weighting techniques. To begin with, I have calculated the annual increase or variation in the government preference for green suppliers. This has been accomplished using the following equations:

$$\begin{aligned}Increase\ in\ Pct\ Gov\ Green_{j,t} = (log(1+Pct\ Gov\ Green_{j,t})-\\ log(1+Pct\ Gov\ Green_{j,t-1}))*1\{Pct\ Gov\ Green_{j,t} > Pct\ Gov\ Green_{j,t-1}\}\end{aligned} \tag{3}$$

$$Change\ in\ Pct\ Gov\ Green j,t = log(1+Pct\ Gov\ Green_{j,t}) - log(1+Pct\ Gov\ Green_{j,t-1}) \tag{4}$$

j denotes the government contracting agency, while t represents the year. The change measures of green preference are formulated as logarithmic changes in the current year's level of green preference in comparison to the previous year's level. It is pertinent to note that the variable *Increase in Pct Gov Green* only takes into account the instances where the government has exhibited a heightened preference for green suppliers. In contrast, *Change in Pct Gov Green* encompasses both scenarios of increased and unchanged green preference.

Finally, I aggregate these change measures to the firm level:

$$Increase\ in\ Pct\ Gov\ Green^{\text{Firm}}_{i,t} = \Sigma^{N}_{j=1} Weight_{i,j,t-1} \times Increase\ in\ Pct\ Gov\ Green_{j,t} \tag{5}$$

$$Change\ in\ Pct\ Gov\ Green^{\text{Firm}}_{i,t} = \Sigma^{N}_{j=1} Weight_{i,j,t-1} \times Change\ in\ Pct\ Gov\ Green_{j,t} \tag{6}$$

2.5 Summary statistics of main variables

This subsection presents a summary of the main variables shown in Table 1. The variables are winsorized at 1% and their respective number of observations, sample average, standard deviation, 25th percentile, sample median, and 75th percentile are presented. The first three variables are the count, inverse hyperbolic sine (IHS) transformation, and natural logarithm of the number of newly reported source reduction activities at each plant-chemical-year level. Additionally, a dummy variable, *1{Source Reduction}*, is included to indicate whether firms conduct any newly reported source reduction or pollution abatement activities at each plant-chemical-year level. The sample mean of this variable is 0.072, indicating that firms conduct newly reported source reduction activities in 7.2% of plant-chemical-year observations.

Another variable, *Production Ratio*, is defined as the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. It has a sample mean of 1.04 and a sample median of 1, suggesting that more than half of the sample has a constant production level relative to the previous year. *Pct Gov Green*^{Firm} measures the government agency's overall preference for green suppliers, as defined in Equation 1 and Equation 2. The sample mean of this variable is 0.048, indicating that, on average, 4.8% of government contracts integrate environmental requirements.

Two additional variables, *Increase in Pct Gov Green*^{Firm} and *Change in Pct Gov Green*^{Firm}, are included to capture changes in the government's preference for green suppliers. The former measures the increase in government agency's overall preference for green suppliers, while the latter captures both increases and non-increases in government preference. The sample mean of *Increase in Pct Gov Green*^{Firm} is 0.020 with a standard deviation of 0.078, while the sample mean of *Change in Pct Gov Green*^{Firm} is slightly lower with a higher standard deviation. This is expected as the latter variable considers both increases and non-increases in government preference for green suppliers.

3 Government green preference and firms' pollution abatement investments

3.1 Baseline analyses

In this subsection, I analyze how the green preferences of government contracting agencies affects firms' pollution abatement activities. The regression model of the most stringent specifications is as follows:

$$Y_{i,p,j,t} = \beta Pct\ Gov\ Green^{\text{Firm}}_{i,t-1} + \phi Production\ Ratio_{i,p,j,t} + \alpha_{p,j} + \alpha_{j,t} + \alpha_{k,t} + \alpha_{s,t} + \varepsilon_{i,p,j,t} \quad (7)$$

i indicates firm, p indicates facility (plant), j indicates chemical, t indicates the year, k indicates plant industry (6-digit NAICS level), and s indicates plant state. The unit of observation is at the plant-chemical-year level. The outcome variable $Y_{p,t,j}$ includes the number or indicator for newly reported source reduction activities taken from the U.S. EPA TRI program. *Pct Gov Green*^{Firm} represents the government preference for green suppliers aggregated at each firm-level, as defined in Equation 1 and Equation 2. As additional evidence, I also examine *Increase in Pct Gov Green*^{Firm} and *Change in Pct Gov Green*^{Firm}.

In the most stringent specifications, the production ratio at the plant-chemical-year level is controlled for, which is the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. Furthermore, plant-chemical joint fixed effects are added to control for time-invariant heterogeneity at the plant-chemical level. Chemical-year joint fixed effects are also included to control for time-varying trends in specific pollutants, such as production demands or regulations for a particular chemical. In the most stringent specification, the industry-year joint fixed effect is added to control for any time-varying heterogeneity at the industry level, such as industry shock or regulations, and the state-year joint fixed effect is included to control for state-level regulations.

I focus on the impact of green public procurement on firms' pollution abatement investments rather than directly on toxic emissions for several reasons. First, pollution abatement investments represent proactive measures taken by firms to reduce environmental harm at its source, aligning more closely with the policy objective of incentivizing sustainable production practices. In contrast, toxic emissions are an outcome influenced by multiple external factors, including overall production levels, industry-specific regulations, and economic cycles, making it more challenging to isolate the causal effect of green procurement. Second, pollution abatement investments reflect a firm's long-term commitment to environmental sustainability, as they often involve capital-intensive projects, technological upgrades, and process improvements that extend beyond short-term fluctuations in emissions. By focusing on these investments, this study provides a clearer picture of how government contracting influences corporate environmental strategies and the adoption of cleaner technologies.

The primary findings are presented in Table 2. The sample consists of 1,831 distinct firms, 10,524 distinct plants, and 421 distinct chemicals. The dependent variable is the inverse hyperbolic sine (IHS) transformation of the number of newly reported source reduction activities identified by the U.S. Environmental Protection Agency's Toxic Release Inventory (TRI) program at the plant-chemical-year level. I conduct the inverse hyperbolic sine transformation on this count variable because it is right-skewed and contains a variety of zero values. In Columns 1 to 3, the main variable of interest is the level of government preference for green suppliers, denoted as *Pct Gov Green*^{firm}. The results show that firms conduct more source reduction activities when government contracting agencies have higher green preferences for green suppliers, as indicated by the positive and statistically significant coefficient of *Pct Gov Green*^{firm} in Column 1, which holds when controlling for state-year joined fixed effect in Column 2 and production ratio in Column 3. The negative and statistically significant coefficient of *Production Ratio*$_t$ suggests that firms conduct fewer source reduction activities when the production level associated with toxic chemicals increases. The economic significance of the government preference for green suppliers is noteworthy, as a one standard deviation increase in *Pct Gov Green*^{firm} leads to a 0.52% (0.035*0.148) increase in the inverse hyperbolic sine transformation of the newly reported source reduction activities, representing 7.10% of its sample mean. In Columns 4 and 5, the analyses of change measures of government preference for green suppliers on firms' newly reported source reduction activities are presented. The results indicate that when government contracting agencies increase their green preference, contracting firms conduct more source reduction activities, as shown by the positive and statistically significant coefficient of *Increase in Pct Gov Green*$_{t-1}$ in Column 4, and similar results are obtained when examining the change measure of green preference in Column 5.

In order to further support the aforementioned findings, an investigation is conducted to determine whether firms increase their expenditures on pollution abatement in response to the heightened green preferences of their government contracting agencies. This is achieved by gathering plant-level data from the Environmental Information Agency (EIA), which offers comprehensive information on plants, including revenue and pollution abatement expenditures. The impact of government preference for green suppliers on the pollution abatement expenditures of plants is then examined, and the results are presented in Table 3. As EIA solely covers utility plants in the United States, the number of observations is somewhat reduced. Nevertheless, a positive and statistically significant correlation is discovered between government preference for green suppliers and plant-level abatement expenditures. The outcomes are demonstrated to be robust when utilizing various green preference measures and controlling for the previous year's plant-level total revenue.

The aforementioned analyses indicate that firms respond to government contracting agencies' green preference by undertaking more pollution abatement activities, specifically source reduction, at the plant-chemical-year level. These findings remain consistent even after accounting for production ratio and various rigorous fixed effects. Furthermore, the outcomes remain unchanged when examining both the level and change measures of government preference for green suppliers. Additionally, there is evidence to suggest that companies boost their pollution abatement expenditures in response to an increase in the government preference for green suppliers.

3.2 Causal evidence

The baseline analyses presented in Section 3.1 may be susceptible to endogeneity issues. For instance, firms that prioritize environmental sustainability may opt to partner with government contracting agencies with high green preference and, meanwhile, engage in eco-friendly practices. This could potentially account for the observed correlation between government preference for green suppliers and pollution abatement activities. To mitigate such concerns, I leverage the 2014 European Union (EU) public procurement reform as an exogenous shock to the green preferences of government contracting agencies in the EU, and examine its impact on subsequent changes in pollution abatement activities among treated firms.

On 26 February 2014, the Council of the European Union (EU) and the European Parliament jointly adopted two public procurement directives. EU member states were required to implement these directives into their national laws by April 2016.[10] The 2014 EU public procurement reform introduced several new aspects and objectives. Of particular significance is the strategic deployment of public procurement, which involves incorporating common societal objectives, such as environmental protection, social responsibility, climate change mitigation, and other environmental considerations, into the procurement process. Although not obligatory, it is reasonable to anticipate that European Union government contracting agencies will incorporate more environmental considerations and requirements into their procurement procedures following the 2014 EU public procurement reform.

The findings presented in Table 4 align with this expectation. The analyses are conducted at the government contracting agency-year level. In Columns 1 and 2, the green preference of government contracting agencies is operationalized as the percentage of total contract value that has green requirements. In Column 1, only government contracting agencies from the European Union are included. The variable *Post 2014* is a dummy variable indicating whether the year is on or after 2014. The results suggest that, on average, government contracting agencies from the European Union have increased their green preference by 5.0% since 2014. In Column 2, government contracting agencies from the United States are also included, and *EU Agency* is a dummy variable indicating whether the government contracting agency is from the European Union. The Difference-in-Differences analysis reveals that the increase in green preference of European Union government contracting agencies is 8.2% higher than that of U.S. government contracting agencies since 2014. When green preference is defined as the percentage of total number of contracts that have green requirements in Columns 3 and 4, similar results are obtained.

[10] https://ec.europa.eu/environment/gpp/eu_public_directives_en.htm

The subsequent step involves carrying out firm-level analyses to demonstrate that firms that have secured general government contracts from European Union government contracting agencies have been engaging in environmentally sustainable practices since the introduction of the 2014 EU public procurement reform. First, I identify firms in the EPA TRI program that have been awarded at least one government contract from EU government contracting agencies by the end of 2013. These firms are classified as treated firms, while those that have never been awarded any government contracts from European Union government contracting agencies during the sample period are classified as control firms. Both treated and control firms are based in the U.S. and are therefore not directly impacted by other contemporaneous EU policies and regulations. Subsequently, I assess treated and control firms' newly reported source reduction activities at the plant-chemical-year level from 2011 to 2019. Finally, I conduct a Difference-in-Differences analysis, and the regression model of the most stringent specifications is as follows:

$$Y_{p,j,t} = \beta Post\ 2014 \times Treat + \phi Production\ Ratio_{p,j,t} + \alpha_{p,j} + \alpha_{j,t} + \alpha_{k,t} + \alpha_{s,t} + \varepsilon_{p,j,t} \tag{8}$$

p indicates plant, j indicates chemical, t indicates the year, k indicates the industry of the plant (6-digit NAICS level), and s indicates the state of the plant. *Post 2014* is a dummy variable indicating whether the year is on or after 2014. *Treat* is a dummy variable indicating if the firm has been awarded a government contract from EU government contracting agencies by the year-end of 2013. The outcome variable $Y_{p,t,j}$ includes the number or indicator for newly reported source reduction activities identified by the U.S. EPA TRI program, as well as total releases or production waste of toxic chemicals. To account for potential confounding factors, the model controls for production ratio and a variety of fixed effects, including plant-chemical joint fixed effect, chemical-year joint fixed effect, and industry-year joint fixed effect. In the most stringent specification, the model further controls for state-year joint fixed effect.

Table 5 presents the main results. The dependent variable, *ihs(# Source Reduction)*, represents the inverse hyperbolic sine (IHS) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. Panel A presents the baseline analyses. In Column 1, the interaction term coefficient between *Post 2014* and *Treat* is statistically significant at 1%, indicating that treated firms conducted more source reduction activities than control firms after the 2014 EU public procurement reform. The economic magnitude is noteworthy, with a nearly 4% increase in newly reported source reduction activities among treated firms since 2014. The results remain consistent when controlling for production ratio in Column 2 and state-year joint fixed effect in Column 3.

In Panel B, the timing of alterations in source reduction activities is examined. Specifically, the dummy variable *Post 2014* is decomposed into year dummies, and the analyses are repeated. The dummy variable *1{year = 2012}* indicates whether the year is 2012, and other dummy variables are similarly defined. The findings reveal that treated firms conduct significantly more source reduction activities since 2014, but only after. In Column 2, the economic magnitude is 2.9% in 2014 and 3.3% in 2015. Although there is a slight decline in 2016, the economic magnitude has increased to 4.5% since 2017. In Panel A of Figure 1, this trend is visualized by plotting coefficients across different years.

In Panel C, I employ propensity score matching to ensure that the treated and control firms are comparable in terms of observable characteristics. Specifically, I estimate the propensity score for each firm based on the previous year's total dollar amount of contracts awarded, total firm-level toxic emissions, total firm assets, and profitability (Income Before Extraordinary Items (Compustat item *ib*) scaled by total firm assets). Next, I match each treated firm with up to three control firms that have the closest propensity score and are in the same industry (2-digit NAICS) as the treated firm. Finally, I retain source reduction activities reported by both the treated and control firms between 2011 and 2019 (three years before the reform announcement and three years after the effective year). Overall, the results are consistent with those obtained in Panel A.

The aforementioned analyses indicate that the 2014 reform in EU public procurement, which aimed to enhance the integration of environmental objectives into the procurement process, has resulted in a higher green preferences of government contracting agencies and a greater adoption of eco-friendly practices by affected firms. In particular, it has been observed that, subsequent to the reform, enterprises that have secured general government contracts from EU government contracting agencies are more likely to engage in pollution abatement activities than their control counterparts. These findings furnish compelling evidence that the government's proclivity for green suppliers can exert a substantial and affirmative influence on firms' investments in pollution abatement.

3.3 Mechanism tests

The aforementioned findings indicate that firms tend to undertake a greater number of pollution abatement investments as a response to the heightened green preferences of government contracting agencies. To further examine this phenomenon, I undertake a series of cross-sectional variation analyses aimed at identifying the underlying mechanisms. Drawing inspiration from prior research, I propose and test three distinct mechanisms.

First, it can be the large financial returns and stable cash flows provided by government (green) contracts that stimulate firms' investments in environmentally friendly technologies (e.g., Huang et al. (2016) and Goldman (2020)). To test this "financial incentive" mechanism, I investigate firms that face greater climate policy uncertainty and exhibit greater dependence on external financing. Second, winning government green contracts may enable firms to differentiate themselves from their industry peers, particularly in competitive industries ("differentiation" mechanism). To test this, I examine the industry competition of the firm. Prior research has demonstrated that competitive pressures can drive firms to take more pro-social actions to distinguish themselves from their competitors (Dupire and M'Zali (2018) and Flammer (2018)). Third, firms may seek to secure government green contracts in order to cater to or signal to their socially responsible institutional investors (Dyck et al. (2019)) or environmentally conscious customers (Dai et al. (2021)). This can be referred to as the "catering" mechanism. To investigate this, I examine firms' heterogeneity in terms of their share of socially responsible institutional investors or the green preferences of their customers.

The initial set of analyses pertains to climate policy uncertainty. As demonstrated in Berestycki et al. (2022), climate policy uncertainty hinders firms' investments in pollution abatement technologies by diminishing the financial returns associated with such investments. In the event that the government's preference for green suppliers motivates firms to engage in pollution abatement investments by providing financial incentives, it is anticipated that stronger responses will be observed among firms when they encounter higher levels of climate policy uncertainty. To test this expectation, I obtain the Climate Policy Uncertainty (CPU) Index on a monthly basis from Gavriilidis (2021) and conduct the sub-sample analyses. In order to construct the CPU Index, Gavriilidis (2021) searched for articles related to climate change and policy uncertainty in eight prominent U.S. newspapers. The CPU Index is calculated by scaling the number of relevant articles by the total number of articles, followed by standardization. The index is higher when there is greater climate policy uncertainty.[11]

Two sub-sample analyses are conducted based on the CPU Index. First, the original monthly CPU Index is converted to an annual level by computing the sample average. The impact of government preference for green suppliers on firms' pollution abatement investments during periods of high or low climate policy uncertainty is then examined and compared. Second, an estimated CPU Index is constructed at the state-year level to facilitate more detailed analyses. This involves regressing the state-month level Economic Policy Uncertainty (EPU) Index (Baker et al., 2016) on the monthly CPU Index to estimate the baseline relationship between climate policy uncertainty and economic policy uncertainty. The estimation is carried out on a rolling basis for each state year over the last ten years. Using the baseline estimation parameter, the monthly CPU Index is then converted to the state-month level and aggregated to the state-year level by computing the sample average.

The findings are presented in Panel A of Table 6. Columns 1 and 2 analyze years with high (above-median) and low (below-median) CPU indexes, while Columns 3 and 4 examine state years with high (above-median) and low (below-median) estimated CPU indexes. The results indicate that odd columns have more statistically and economically significant coefficients, suggesting that firms are more responsive to government preference for green suppliers when they face higher climate policy uncertainty. These outcomes imply that government contracting, by integrating environmental criteria, can generate financial returns for firms' investments in environmental technologies.

[11]Further details can be found in Gavriilidis (2021) or `https://www.policyuncertainty.com/climate_uncertainty.html`

The second set of analyses pertain to external financing dependence, with the findings presented in Panel B of Table 6. External financing dependence, or *Ext Finance Dep*, is defined as capital expenditures exceeding operating cash flows (Bai et al. (2020)). In Column 1, the positive and statistically significant coefficient indicates that firms requiring external financing are more likely to engage in pollution abatement investments in response to increased government preference for green suppliers. This suggests that the financial benefits of green contracts serve as a crucial motivator for firms. Moreover, the results suggest that government contracting may help alleviate the financial constraints that hinder corporate environmental policies (Xu and Kim (2022)).

To provide additional evidence, sub-sample analyses are conducted. Specifically, Columns 2 and 3 scrutinize the implied cost of capital, which is calculated using the 1-year ahead earnings forecasts scaled by the current stock price, in line with the methodology of Ng and Rezaee (2015). The findings reveal a more pronounced impact among firms with a higher cost of capital. This implies that government contracts have a greater significance for such firms in terms of generating cash flows and reducing their cost of capital.

Furthermore, Columns 4 and 5 assess industry concentration, as measured by the Herfindahl-Hirschman Index (HHI) based on firm revenue. The results demonstrate a more robust effect among firms operating in concentrated industries. This suggests that financially constrained firms tend to invest more in pollution abatement when they face less competition and have a greater likelihood of securing government contracts.

Finally, I examine alternative mechanisms and present the results in Table 6. The variable labeled as *Trait* denotes the firm characteristics used in the regression analysis, which are indicated by the column headings. In Column 1, I investigate the impact of firms' industry competition. Specifically, I have computed the Herfindahl–Hirschman index (HHI) for each industry-year, which is the sum of squared market shares of all firms in Compustat North America, with market share being calculated from firms' total revenue.[12] The variable *Trait* is a dummy variable indicating whether the firm is in an industry with a below-median Herfindahl–Hirschman index. The coefficient of the triple interaction term is negative and statistically significant, suggesting that firms operating in concentrated industries are more likely to undertake pollution abatement investments. This result contradicts the "differentiation" mechanism.

In Column 2, I investigate the institutional ownership of firms by socially responsible investors. Specifically, I obtain the institutional holdings from various investors through Refinitiv and proxy socially responsible (ESG) investors through pension funds and endowments (Dyck et al. (2019)). A dummy variable, *Trait*, is utilized to indicate whether a firm has an above-median share of ESG investors. The insignificant and negative coefficient suggests that there is no significant difference in pollution abatement investments between firms with low or high institutional ownership by socially responsible investors.

In Column 3, I examine the green preferences of corporate customers, as measured by their environmental performance. I obtain supply chain data from FactSet Revere, which provides the relationship between each customer and supplier with the start and end dates. Corporate customers' environmental performance is proxied by the equal-weighted environment score from Refinitiv Asset4. The dummy variable *Trait* is used again to indicate whether a firm's customers have above-median environmental performance. Despite the positive coefficient for the triple interaction term, it is not statistically significant. Overall, the results do not support the "catering" mechanism, as there is no consistent evidence demonstrating that firms seek government green contracts to cater to socially responsible investors or customers.

[12] In robustness checks, I have considered alternative definitions such as the C10 index (sum of market shares of top 10 firms in an industry) and obtained similar results.

Overall, the aforementioned findings indicate that government agencies' green preferences can effectively encourage companies to invest in pollution abatement initiatives through the provision of substantial financial incentives, such as monetary benefits and cash inflows. However, there is a lack of substantiation for the "differentiation" and "catering" mechanisms, which propose that firms aim to secure green contracts from governmental bodies in order to distinguish themselves from industry rivals or appeal to socially responsible investors or customers.

4 Additional evidence and robustness checks

4.1 Comparing government customers and corporate customers

The recent literature, as exemplified by Schiller (2022) and Dai et al. (2021), highlights the potential for corporate customers to influence the environmental and social (E&S) policies of upstream suppliers, particularly when the former possess greater bargaining power. In this subsection, I investigate the impact of corporate customers on firms' investment in pollution abatement technologies. This analysis serves two primary purposes. First, it helps to allay concerns that firms' investment in pollution abatement is primarily driven by corporate customers rather than government customers in the European Union (EU). To illustrate, the EU passed Directive 2014/95/EU in 2014, which mandates E&S reporting for all public firms within its jurisdiction. Previous research (Schiller (2022); Krueger et al. (2021)) has demonstrated that firms' E&S performance improves significantly following the implementation of mandatory ESG disclosure requirements, which can subsequently influence U.S. customers. Second, this investigation enables a comparison between the roles of government and corporate customers in motivating firms to engage in pollution abatement activities.

To discern the supply-chain relationship, I procure data from FactSet Revere, which furnishes the association between each customer and supplier, along with the commencement and termination dates. The results are presented in Table 7. In Column 1, I reiterate the analysis on government customers mandating that FactSet Revere encompasses firms with at least one corporate customer. *Has EU Gov Customer* is a binary variable indicating whether the firm has secured a government contract by the year-end of 2013. *Post 2014* is a binary variable indicating whether the year is on or after 2014. In Column 2, I regulate the customer's environmental performance, proxied by the equal-weighted Refinitiv Asset4 environment score. Despite a reduced number of observations relative to the analyses in Table 5, the outcomes still present affirmative and statistically significant coefficients of the interaction term between *Post 2014* and *Has EU Gov Customer*.

In Column 3, I employ a Difference-in-Differences approach to investigate whether corporate customers can incentivize firms to invest in pollution abatement technologies. Specifically, I utilize a dummy variable, denoted as *Has EU Corp Customer*, which indicates whether a firm has a public-listed EU corporate customer by the year-end of 2013. The interaction term between "Post 2014" and "Has EU Corp Customer" yields a positive and statistically significant coefficient, indicating that firms with EU corporate customers by the year-end of 2013 are more likely to engage in source reduction activities. This finding suggests that EU corporate customers are able to transmit their environmental policies to their U.S. suppliers, which is consistent with the research conducted by Schiller (2022). In Column 4, I introduce both interaction terms and compare their respective statistical and economic significance. The coefficient for the interaction term between *Post 2014* and *Has EU Gov Customer* remains positive and statistically significant, while the coefficient for the interaction term between *Post 2014* and *Has EU Corp Customer* becomes statistically insignificant. Furthermore, the magnitude of the government customer effect is nearly three times larger than that of the corporate customer effect.

The aforementioned analyses yield two key findings. First, the effect of the 2014 EU public procurement reform would not be confounded by the mandatory ESG disclosure requirement in the EU or the subsequent transmission of environmental policies from EU corporate customers to U.S. firms, with regards to U.S. firms' investment in pollution abatement technologies. Second, the impact of government customers on motivating firms to invest in pollution abatement technologies is statistically and economically more significant than that of corporate customers.

4.2 Corporate investment and firm valuation

In this subsection, I provide further evidence by analyzing corporate investment and firm valuation following the 2014 EU public procurement reform. If treated firms indeed increase their investments in pollution abatement technologies, I should observe a rise in their capital expenditures, R&D expenses, and the number of green patents. Additionally, I assess changes in firm valuation to determine whether the reform and the resulting increase in pollution abatement investments are beneficial for firms.

The results are presented in Table 8. Panel A reports the baseline analyses. In Column 1, the dependent variable is capital expenditures scaled by total firm assets. The coefficient for the interaction term *Post 2014*$\times$*Treat* is positive and statistically significant, indicating that treated firms have significantly increased their capital expenditures relative to control firms since the 2014 EU public procurement reform. The economic magnitude of this effect is notable: on average, treated firms experience a 0.24% increase in capital expenditures scaled by total firm assets, which corresponds to a 6% rise relative to the sample mean. In Column 2, the dependent variable is R&D

expenses scaled by total firm assets. Missing R&D expenses are coded as zero. The positive and statistically significant coefficient of *Post 2014*$\times$*Treat* suggests that treated firms have significantly increased their R&D expenditures relative to control firms following the reform. The economic magnitude is substantial, with treated firms increasing their R&D expenses by 0.49% of total firm assets on average, representing a 10.89% rise relative to the sample mean.

In Column 3, I examine firms' green patenting activities. Specifically, I follow Haščič and Migotto (2015) and Cohen et al. (2020) to identify patents related to climate change mitigation technologies and broader environmental technology categories (green patents). The dependent variable, *Green Patent*, measures the number of green patents filed, scaled by total firm assets. The positive and statistically significant coefficient of *Post 2014*$\times$*Treat* indicates that treated firms have generated more green patents since the 2014 reform, aligning with the observed increase in R&D expenditures. In Column 4, I analyze firm valuation using Tobin's Q as a proxy. The positive and statistically significant coefficient of *Post 2014*$\times$*Treat* suggests that firm valuation has increased, implying that the 2014 EU public procurement reform and the associated rise in pollution abatement investments have had a positive impact on firms.

Overall, the findings indicate that the 2014 EU public procurement reform has led to a significant increase in corporate investment in pollution abatement technologies, as evidenced by higher capital expenditures, R&D spending, and green patenting activity among treated firms. Furthermore, the increase in firm valuation suggests that these investments are not only aligned with regulatory and environmental goals but also yield financial benefits. These results highlight the role of public procurement policies in incentivizing corporate environmental responsibility while simultaneously enhancing firm value.

4.3 Alternative outcome variables and functional forms

In this subsection, I conduct robustness checks by examining alternative outcome variables and functional forms to ensure the validity of the main findings.

In Table 9, I reanalyze the results using alternative outcome variables. Panel A replicates the analyses presented in Table 2. In Columns 1 to 3, the natural logarithm of the number of newly reported source reduction activities serves as the dependent variable. In Columns 4 to 6, I use a binary indicator denoting whether firms engage in source reduction activities at the plant-chemical-year level. The findings consistently exhibit positive and statistically significant coefficients across different measures of source reduction activities, reinforcing the robustness of the primary results.

Panel B extends the robustness checks by repeating the analyses from Table 5, this time utilizing alternative outcome variables related to pollution abatement. Specifically, in Columns 1 and 2, the dependent variable is the natural logarithm of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. In Columns 3 and 4, I employ a binary indicator to denote whether any newly reported source reduction activity has been identified by the U.S. EPA TRI program at the plant-chemical-year level. The results show that the interaction term between *Post 2014* and *Treat* remains positively and significantly associated with the outcome variables, providing strong and consistent support for the main conclusions.

Furthermore, in Table 10, I conduct additional robustness checks by employing a fixed-effects Poisson model, which is appropriate given the count nature of the outcome variable (Hausman et al. (1984) and Cohn et al. (2022)). The findings remain robust and continue to support the main results, further reinforcing the validity and reliability of the empirical analysis. Overall, these robustness checks confirm that the observed effects persist across different model specifications and alternative measures, underscoring the robustness of the findings.

4.4 Non-linear terms of government preference for green suppliers

In this subsection, I aim to enhance the robustness of the study by investigating the non-linear relationships between government preference for green suppliers and the reported source reduction activities. To achieve this, I incorporate both the square and cubic terms of government preference into the regression models, allowing for a more comprehensive analysis of how varying levels of government preference might influence environmental outcomes.

The results, as shown in Table 11, utilize the inverse hyperbolic sine (IHS) transformation of the number of newly reported source reduction activities, as identified by the U.S. EPA TRI program at the plant-chemical-year level, as the dependent variable. Column 1 presents the level of government preference for green suppliers. After accounting for the square and cubic terms of government preference, the coefficient for $\textit{Pct Gov Green}^{firm}$ remains positive and statistically significant. Notably, the analysis reveals a negative coefficient for the square term and a positive coefficient for the cubic term. In Columns 2 and 3, I analyze the change measures of government preference for green suppliers, which yield similar findings. However, the statistical significance of the square and cubic terms is weaker in these columns compared to Column 1.

The economic implications of these results suggest that the relationship between government preference for green suppliers and the number of source reduction activities follows a non-linear pattern. The negative coefficient for the square term indicates that as government preference increases, its marginal effect on source reduction activities diminishes, pointing to a diminishing return to increased government preference at higher levels. However, the positive coefficient for the cubic term suggests that at even higher levels of government preference, the marginal impact begins to increase again, indicating that a sufficiently strong policy commitment could have an amplified effect on promoting environmental practices. This implies that while initial increases in government preference lead to greater positive impacts, there may be thresholds beyond which further increases may either become less effective or even produce enhanced returns, depending on the policy design.

In conclusion, these non-linear findings offer important economic insights into how government preference for green suppliers shapes industrial behavior. They suggest that policy interventions should consider the potential for diminishing returns at certain levels of government preference, while also recognizing the possibility of increasing effectiveness at higher levels. Understanding these dynamics can help policymakers design more efficient and targeted strategies for promoting sustainability in the industrial sector.

4.5 Rolling specifications to define contracting relationship

In the baseline analysis, the green preference of government contracting agencies is measured for year t-1, while the contracting relationship between firms and government agencies is defined for year t-2. In this subsection, I extend the definition of the contracting relationship to a rolling basis, as government contracts between firms and contracting agencies often span multiple years.

The results are presented in Table 12, with all specifications following the structure outlined in Table 2, except for variations in the timing definitions of the contracting relationships. Column 1 defines the contracting relationship between the firm and the government contracting agency from year t-3 to t-2. This implies that if a government contracting agency awarded general (non-green) contracts to a firm during this period, the firm's newly reported source reduction activities in year t would be examined as a potential response to the government contracting agency's green preference in year t-1. Column 2 defines the contracting relationship from year t-4 to t-2, Column 3 defines it from year t-5 to t-2, and Column 4 defines it from year t-6 to t-2. Across all specifications, the coefficients for $\textit{Pct Gov Green}_{t-1}^{Firm}$ remain positive and statistically significant at the 1% level. Furthermore, the economic magnitudes of these coefficients are consistent with those observed in Column 3 of Table 2.

These findings suggest that the baseline results are robust to alternative definitions of the timing of the contracting relationship between firms and government contracting agencies. The consistency of the positive and significant coefficients, even with changes in the temporal scope of government contracts, indicates that the relationship between government preference for green suppliers and firms' environmental actions is not sensitive to variations in the contract period. This reinforces the stability of the results and suggests that the green preference of government contracting agencies has a persistent and reliable effect on firms' environmental behavior, regardless of the specific years in which the contracting relationship is defined.

4.6 Alternative measures of government preference for green suppliers

In the baseline analyses, I measure the green preference of each government contracting agency by calculating the percentage of contracts containing green requirements relative to the total dollar amount of contracts. This percentage is then aggregated at the firm level using a value-weighted approach, where the weight corresponds to the total dollar amount of contracts awarded to each firm by each government contracting agency. In this subsection, I introduce alternative measures of green preference and investigate their effect on the newly reported source reduction activities.

The results are presented in Table 13, which displays various firm-level green preference measures. Column 1 shows the value-weighted green preference of each government contracting agency, defined as the percentage of the total number of contracts with green requirements. Column 2 presents the equal-weighted green preference, calculated as the percentage of the total dollar amount of contracts with green requirements. Column 3 displays the equal-weighted green preference, defined as the percentage of the total number of contracts with green requirements. Column 4 presents the green preference of the top government contracting agency, ranked by the total dollar amount awarded to each firm in the previous year. This measure of green preference is defined as the percentage of the total dollar amount of contracts with green requirements. Finally, Column 5 displays the green preference of the top government contracting agency, ranked by the total dollar amount awarded to each firm in the prior year, calculated as the percentage of the total number of contracts with green requirements.

The results in Table 13 consistently show positive and statistically significant coefficients across all columns. This demonstrates that the effect of government preference for green suppliers on corporate environmental practices remains robust across different methods of measuring green preference. These findings underscore the reliability of the relationship between government contracting agencies' green preferences and firms' environmental actions, regardless of how green preference is quantified. This suggests that the influence of government preferences is a persistent and significant factor driving firms' commitment to sustainability practices, whether measured by contract value or contract volume, and whether based on the overall or the top contracting agency.

5 Conclusion

This paper examines the influence of government contracting on corporate environmental policies. Using a new dataset of government contracts, I show that firms supplying government agencies are more likely to engage in emission-reduction activities and make pollution abatement investments when government agencies prioritize green suppliers. Additionally, I leverage the 2014 EU public procurement reform as an exogenous shock to the green preferences of government contracting bodies, providing causal evidence that government preferences for green suppliers can motivate firms to invest in costly pollution abatement technologies. Lastly, I conduct a series of cross-sectional analyses to explore the mechanisms driving this relationship, revealing that firms facing higher climate policy uncertainty and greater reliance on external financing are more inclined to invest in pollution abatement. Notably, I find no evidence that firms pursue green government contracts to differentiate themselves in competitive markets or to appease socially responsible stakeholders. Overall, these results underscore the substantial economic impact of government contracting in encouraging firms' investments in environmentally sustainable technologies and production practices.

This paper makes several key contributions. First, to the best of my knowledge, it is the first study to provide systematic evidence on the relationship between green public procurement and firms' investments in pollution abatement. This extends the existing literature on the impact of government contracting on corporate performance and policies. Second, it contributes to the corporate environmental policy literature by highlighting the significance of government customers' green preferences. Finally, the paper enriches the environmental regulation literature and offers important policy insights. Specifically, it demonstrates the effectiveness of green public procurement as an environmental policy tool and documents a spillover effect from the EU's green procurement policy on pollution abatement investments by U.S. firms.

At the same time, while this study highlights the benefits of green public procurement in encouraging corporate pollution abatement, it is important to acknowledge that embedding environmental objectives in government contracts may also involve certain costs (Brogaard et al. (2022)). Green procurement policies could influence bidding competition, procurement costs, project timelines, and administrative complexity. Additionally, they may contribute to some degree of market segmentation, where firms with lower emissions focus on government contracts while others cater more to corporate demand. Future research could explore these dynamics further, conducting a cost-benefit analysis to assess the overall effectiveness of green procurement as a policy tool. Examining its fiscal implications, competitive effects, and potential trade-offs would provide valuable insights into optimizing its design and implementation.

References

Bai, John, Douglas Fairhurst, and Matthew Serfling, 2020, Employment protection, investment, and firm growth, *The Review of Financial Studies* 33, 644–688.

Baker, Scott R, Nicholas Bloom, and Steven J Davis, 2016, Measuring economic policy uncertainty, *The Quarterly Journal of Economics* 131, 1593–1636.

Becker, Randy, and Vernon Henderson, 2000, Effects of air quality regulations on polluting industries, *Journal of Political Economy* 108, 379–421.

Berestycki, Clara, Stefano Carattini, Antoine Dechezleprêtre, and Tobias Kruse, 2022, Measuring and assessing the effects of climate policy uncertainty .

Brehm, John, and James T Hamilton, 1996, Noncompliance in environmental reporting: Are violators ignorant, or evasive, of the law?, *American Journal of Political Science* 444–477.

Brogaard, Jonathan, Nataliya Gerasimova, Daniel Kim, and Maximilian Rohrer, 2022, It's not easy being green, *Available at SSRN 4298702* .

Brown, James R, Gustav Martinsson, and Christian Thomann, 2022, Can environmental policy encourage technical change? emissions taxes and r&d investment in polluting firms, *The Review of Financial Studies* .

Bui, Linda TM, and Christopher J Mayer, 2003, Regulation and capitalization of environmental amenities: evidence from the toxic release inventory in massachusetts, *Review of Economics and Statistics* 85, 693–708.

Calel, Raphael, and Antoine Dechezleprêtre, 2016, Environmental policy and directed technological change: evidence from the european carbon market, *Review of Economics and Statistics* 98, 173–191.

Cohen, Lauren, Umit G Gurun, and Quoc H Nguyen, 2020, The esg-innovation disconnect: Evidence from green patenting, Technical report, National Bureau of Economic Research.

Cohn, Jonathan B, Zack Liu, and Malcolm I Wardlaw, 2022, Count (and count-like) data in finance, *Journal of Financial Economics* 146, 529–551.

Dai, Rui, Hao Liang, and Lilian Ng, 2021, Socially responsible corporate customers, *Journal of Financial Economics* 142, 598–626.

Dhaliwal, Dan, J Scott Judd, Matthew Serfling, and Sarah Shaikh, 2016, Customer concentration risk and the cost of equity capital, *Journal of Accounting and Economics* 61, 23–48.

Dupire, Marion, and Bouchra M'Zali, 2018, Csr strategies in response to competitive pressures, *Journal of Business Ethics* 148, 603–623.

Dyck, Alexander, Karl V Lins, Lukas Roth, and Hannes F Wagner, 2019, Do institutional investors drive corporate social responsibility? international evidence, *Journal of Financial Economics* 131, 693–714.

Even-Tov, Omri, Guoman She, Lynn Linghuan Wang, and Detian Yang, 2025, How government procurement shapes corporate climate disclosures, commitments, and actions, *Review of Accounting Studies* 1–47.

Ferraz, Claudio, Frederico Finan, and Dimitri Szerman, 2015, Procuring firm growth: the effects of government purchases on firm dynamics, Technical report, National Bureau of Economic Research.

Flammer, Caroline, 2018, Competing for government procurement contracts: The role of corporate social responsibility, *Strategic Management Journal* 39, 1299–1324.

Gavriilidis, Konstantinos, 2021, Measuring climate policy uncertainty, *Available at SSRN 3847388* .

Goldman, Jim, 2020, Government as customer of last resort: The stabilizing effects of government purchases on firms, *The Review of Financial Studies* 33, 610–643.

Greenstone, Michael, 2002, The impacts of environmental regulations on industrial activity: Evidence from the 1970 and 1977 clean air act amendments and the census of manufactures, *Journal of Political Economy* 110, 1175–1219.

Haščič, Ivan, and Mauro Migotto, 2015, Measuring environmental innovation using patent data .

Hausman, Jerry A, Bronwyn H Hall, and Zvi Griliches, 1984, Econometric models for count data with an application to the patents-r&d relationship.

Hebous, Shafik, and Tom Zimmermann, 2021, Can government demand stimulate private investment? evidence from us federal procurement, *Journal of Monetary Economics* 118, 178–194.

Huang, Henry He, Gerald J Lobo, Chong Wang, and Hong Xie, 2016, Customer concentration and corporate tax avoidance, *Journal of Banking & Finance* 72, 184–200.

Jaffe, Adam B, Steven R Peterson, Paul R Portney, and Robert N Stavins, 1995, Environmental regulation and the competitiveness of us manufacturing: what does the evidence tell us?, *Journal of Economic literature* 33, 132–163.

Krueger, Philipp, Zacharias Sautner, and Laura T Starks, 2020, The importance of climate risks for institutional investors, *The Review of Financial Studies* 33, 1067–1111.

Krueger, Philipp, Zacharias Sautner, Dragon Yongjun Tang, and Rui Zhong, 2021, The effects of mandatory esg disclosure around the world, *European Corporate Governance Institute–Finance Working Paper* 21–44.

Ng, Anthony C, and Zabihollah Rezaee, 2015, Business sustainability performance and cost of equity capital, *Journal of Corporate Finance* 34, 128–149.

Pankratz, Nora, and Christoph Schiller, 2022, Climate change and adaptation in global supply-chain networks, in *Proceedings of Paris December 2019 Finance Meeting EUROFIDAI-ESSEC, European Corporate Governance Institute–Finance Working Paper*, number 775.

Schiller, Christoph, 2022, Global supply-chain networks and corporate social responsibility, in *13th Annual Mid-Atlantic Research Conference in Finance (MARC) Paper*.

Xu, Qiping, and Taehyun Kim, 2022, Financial constraints and corporate environmental policies, *The Review of Financial Studies* 35, 576–635.

Figure 1: 2014 EU Public Procurement Reform and Pollution Abatement Investment

This figure shows the timing of changes in firms' pollution abatement activities around the 2014 EU Public Procurement Reform, which is represented by the grey area. Specifically, I regress the the inverse hyperbolic sine transformation of firms' newly reported source reduction activities on the interaction terms between *Treat* and a variety of year dummies. *1{year = t}* is a dummy variable indicating whether the year is t (2012, 2013, 2014, 2015, and 2016). *1{year >= 2017}* is a dummy variable indicating whether the year is since 2017. *Treat* is a dummy variable indicating if the firm has been awarded any government contract from EU government contracting agencies by the year-end of 2013.

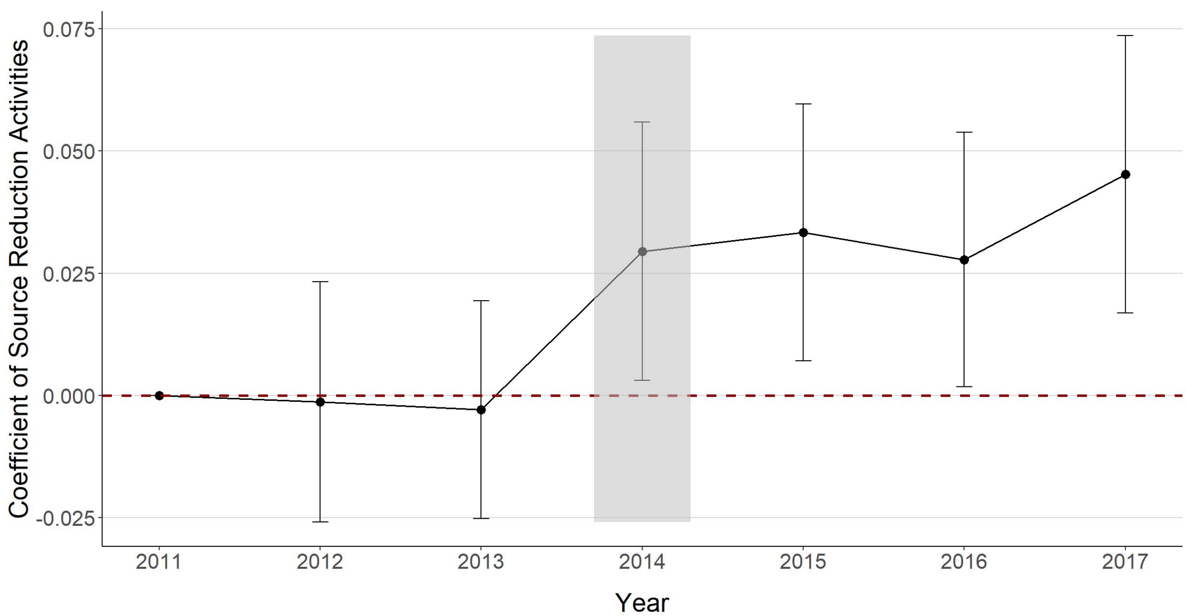

Table 1: Summary Statistics

This table presents the summary statistics of the main variables used in the analysis. The first part of the variables is at the plant-chemical-year level analyzed in Table 2. *# Source Reduction* is the number of newly reported source reduction activities. *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities. *log(1 + # Source Reduction)* is the natural logarithm of the number of newly reported source reduction activities. *1{Source Reduction}* is a dummy variable indicating whether there is any newly reported source reduction activity. *Production ratio* is taken from the EPA TRI program, which is defined as the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. The second part of the variables is at the firm-year level. *Pct Gov Green^{Firm}* is the government agency's preference for green suppliers aggregated at each firm-level, as defined in Equation 1 and Equation 2. *Increase in Pct Gov Green^{Firm}* is the increase in government agency's preference for green suppliers, as defined in Equation 3 and Equation 5. *Change in Pct Gov Green^{Firm}* is the change in government agency's preference for green suppliers, as defined in Equation 4 and Equation 6. The rest are financial variables analyzed in Table 8. *CAPX* represents firm capital expenditures scaled by total firm assets. *R&D* represents firm research and development (R&D) expenses scaled by total firm assets. If the R&D expenses are missing, they are coded as 0. *Green Patent* is the number of green patents filed scaled by total firm assets. *size* is the logarithm of total firm assets. *Tangibility* is Net Property, Plant, and Equipment scaled by total firm assets. *Profitability* is Income Before Extraordinary Items scaled by total firm assets. *Tobin's Q* is the market value of total firm assets scaled by the book value of total firm assets. *Book leverage* is the sum of Debt in Current Liabilities and Long-Term Debt scaled by total firm assets. *Cash holdings* is Cash and Short-Term Investments scaled by total firm assets. Each continuous variable is winsorized at 1% and shows the number of observations, sample average, standard deviation, 25th percentile, sample median, and 75th percentile.

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Plant-Chemical-Year Level						
# Source Reduction	210,833	0.090	0.343	0.000	0.000	0.000
ihs(# Source Reduction)	210833	0.073	0.272	0.000	0.000	0.000
log(1 + # Source Reduction)	210,833	0.057	0.210	0.000	0.000	0.000
1{Source Reduction}	210,833	0.072	0.258	0.000	0.000	0.000
Production Ratio	210,833	1.039	0.372	0.910	1.000	1.100
Firm-Year Level						
Pct Gov Green^{Firm}	9,063	0.048	0.148	0.002	0.005	0.024
Increase in Pct Gov Green^{Firm}	9,063	0.020	0.078	0.000	0.001	0.004
Change in Pct Gov Green^{Firm}	9,063	0.016	0.080	-0.001	0.000	0.004
CAPX	30,159	0.040	0.043	0.012	0.027	0.052
R&D	30,159	0.045	0.098	0.000	0.004	0.044
Green Patent	30,159	0.017	0.095	0.000	0.000	0.000
Size	30,159	7.198	2.988	5.153	7.104	9.043
Tangibility	30,159	0.207	0.190	0.059	0.152	0.299
Profitability	30,159	0.012	0.273	0.027	0.068	0.108
Tobin's Q	30,159	1.922	1.769	1.006	1.353	2.043
Book Leverage	30,159	0.230	0.222	0.047	0.192	0.338
Cash Holding	30,159	0.174	0.180	0.048	0.113	0.232

Table 2: Government Green Preference and Firms' Pollution Abatement Activities

This table presents the effect of government agencies' green preferences on firms' pollution abatement activities. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. In Column 1 to Column 3, *Pct Gov Green*^{Firm} measures government agency's preference for green suppliers, as defined in Equation 1 and Equation 2. In Column 4, *Increase in Pct Gov Green*^{Firm} is the increase in government agency's preference for green suppliers, as defined in Equation 3 and Equation 5. In Column 5, *Change in Pct Gov Green*^{Firm} is the change in government agency's preference for green suppliers, as defined in Equation 4 and Equation 6. *Production ratio* is taken from the EPA TRI program is defined as the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. The industry of each plant is defined at the 6-digit NAICS level. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$				
	(1)	(2)	(3)	(4)	(5)
Pct Gov Green$^{\text{Firm}}_{t-1}$	0.038***	0.037***	0.037***		
	(0.011)	(0.011)	(0.011)		
Increase in Pct Gov Green$^{\text{Firm}}_{t-1}$				0.067***	
				(0.021)	
Change in Pct Gov Green$^{\text{Firm}}_{t-1}$					0.063***
					(0.019)
Production Ratio$_t$			−0.009***	−0.009***	−0.009***
			(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes	Yes
State×Year FE?		Yes	Yes	Yes	Yes
Observations	210,833	210,833	210,833	210,833	210,833
Adjusted R^2	0.523	0.532	0.532	0.532	0.532

Table 3: Government Green Preference and Firms' Pollution Abatement Expenditures

This table presents the effect of government agencies' green preferences on firms' plant-level pollution abatement expenditures. The plant-level information is taken from U.S. Energy Information Administration (EIA). The outcome variable *ihs(Abatement Expenditure)* is the inverse hyperbolic sine (ihs) transformation of the plant-level pollution abatement expenditures. The main variables of interest are the level and change in government preference for green suppliers measures, which are defined in the same ways as in Table 2. *Total Revenue* is plant-level revenue taken from EIA. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(Abatement Expenditure)$_t$			
	(1)	(2)	(3)	(4)
Pct Gov Green$_{t-1}$	14.658**	14.855**		
	(6.660)	(6.723)		
Increase in Pct Gov Green$_{t-1}$			16.849***	
			(5.701)	
Change in Pct Gov Green$_{t-1}$				13.435**
				(6.728)
log(Total Revenue)$_{t-1}$		0.089	0.076	0.074
		(0.188)	(0.190)	(0.188)
Year FE?	Yes	Yes	Yes	Yes
Plant FE?	Yes	Yes	Yes	Yes
Observations	614	614	614	614
Adjusted R^2	0.841	0.841	0.840	0.841

Table 4: 2014 EU Public Procurement Reform and Preference for Green Suppliers

This table presents the effect of the 2014 EU public procurement reform on government agencies' preference for green suppliers in the European Union. The unit of observation is at the contracting agency-year level. In Columns 1 and 2, the preference for green suppliers is defined as the percentage of the total dollar amount of contracts classified as green contracts. In Columns 3 and 4, the preference for green suppliers is the percentage of the number of contracts classified as green contracts. In Column 1 and Column 3, the government contracting agencies are from European Union only. In Column 2 and Column 4, the government contracting agencies are from both European Union and the United States. *Post 2014* is a dummy variable indicating whether the year is on or after 2014. *EU Agency* is a dummy variable indicating if the government contracting agency is from European Union. Standard errors are clustered on the contracting agency level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	Pct Gov Green ($)		Pct Gov Green (#)	
	(1)	(2)	(3)	(4)
Post 2014	0.050***		0.034***	
	(0.003)		(0.002)	
Post 2014×EU Agency		0.082***		0.056***
		(0.005)		(0.005)
Contracting Agency FE?	Yes	Yes	Yes	Yes
Year FE?		Yes		Yes
Observations	106,900	110,282	106,900	110,282
Adjusted R^2	0.063	0.098	0.183	0.216

Table 5: 2014 EU Public Procurement Reform and Firms' Pollution Abatement Activities

Panel A: Baseline Analyses

This panel presents the effect of the 2014 EU public procurement reform on firms' pollution abatement activities. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. *Post 2014* is a dummy variable indicating whether the year is on or after 2014. *Treat* is a dummy variable indicating if the firm has been awarded any government procurement contract from EU government contracting agencies by the year-end of 2013. *Production ratio* is taken from the EPA TRI program and defined as the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. Other specifications follow Table 2. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$		
	(1)	(2)	(3)
Post 2014×Treat	0.039***	0.039***	0.038***
	(0.014)	(0.014)	(0.013)
Production Ratio$_t$		−0.008***	−0.008***
		(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes
State×Year FE?			Yes
Observations	237,531	237,531	237,531
Adjusted R^2	0.517	0.517	0.523

Panel B: Timing in Pollution Abatement Activities

This panel repeats the analyses in Panel A of Table 5 by examining the timing of the firm's pollution abatement activities. *1{year = t}* is a dummy variable indicating whether the year is t. *1{year >= 2017}* is a dummy variable indicating whether the year is since 2017. Other specifications follow Panel A of Table 5. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$	
	(1)	(2)
1{year = 2012}×Treat	−0.002	−0.001
	(0.016)	(0.015)
1{year = 2013}×Treat	−0.003	−0.003
	(0.014)	(0.014)
1{year = 2014}×Treat	0.028*	0.029*
	(0.017)	(0.016)
1{year = 2015}×Treat	0.033**	0.033**
	(0.017)	(0.016)
1{year = 2016}×Treat	0.030*	0.028*
	(0.017)	(0.016)
1{year >= 2017}×Treat	0.046**	0.045***
	(0.019)	(0.017)
Production Ratio$_t$	−0.008***	−0.007***
	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes
Chemical×Year FE?	Yes	Yes
Industry×Year FE?	Yes	Yes
State×Year FE?		Yes
Observations	237,531	237,531
Adjusted R^2	0.517	0.523

Panel C: Propensity Score Matching

This panel repeats the analysis in Panel A of Table 5 using propensity score matched samples. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. The propensity scores are estimated using the total dollar amount of government contracts awarded to the firm and total toxic releases, total assets, and profitability. Each treatment firm in year t-1 is matched to up to three control firms on year, 2-digit NAICS industry, and closest propensity score. Other variable definitions and specifications follow Panel A of Table 5. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$		
	1 Control Firm	2 Control Firms	3 Control Firms
	(1)	(2)	(3)
Post 2014×Treat	0.064^{**}	0.091^{***}	0.102^{***}
	(0.031)	(0.032)	(0.031)
Production Ratio$_t$	-0.009^{***}	-0.007^{**}	-0.006
	(0.003)	(0.004)	(0.004)
Plant×Chemical FE?	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes
Observations	38,373	58,600	70,443
Adjusted R^2	0.570	0.570	0.571

Table 6: Mechanism Tests

Panel A: Climate Policy Uncertainty

This panel presents the effect of government agencies' green preferences on firms' pollution abatement activities when firms face climate policy uncertainty. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. The monthly Climate Policy Uncertainty (CPU) Index is taken from Gavriilidis (2021). In Column 1 and Column 2, I convert the monthly CPU Index to the annual level by taking the sample average. "High" indicates years with above-median CPU Index. In Column 3 and Column 4, I regress the state-month level Economic Policy Uncertainty (EPU) Index (Baker, Bloom, and Davis (2016)) on the monthly CPU Index and calculate the estimated CPU Index at the state-year level. "High" indicates state years with above-median estimated CPU Index. Other specifications follow Table 2. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$			
	CPU Index		Estimated CPU Index	
	High	Low	High	Low
	(1)	(2)	(3)	(4)
Pct Gov Green$^{\text{Firm}}_{t-1}$	0.051***	−0.004	0.048**	0.022
	(0.018)	(0.025)	(0.022)	(0.015)
Production Ratio$_t$	−0.009**	−0.010*	−0.006*	−0.013***
	(0.004)	(0.005)	(0.003)	(0.004)
Plant×Chemical FE?	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes
Observations	106,243	104,590	115,673	93,661
Adjusted R^2	0.489	0.583	0.544	0.572

Panel B: External Financing Dependence

This panel presents the effect of government agencies' green preferences on firms' pollution abatement activities when firms face external financing dependence *Ext Finance Dep* (Bai, Fairhurst, and Serfling (2020)). Column 2 and Column 3 examine sub-sample analyses based on the implied cost of capital, which is calculated following Ng and Rezaee (2015). "High" indicates the above-median implied cost of capital. Column 4 and Column 5 examine sub-sample analyses based on industry concentration, which is calculated as the Herfindahl–Hirschman Index (HHI) based on firm revenue. "High" indicates the above-median Herfindahl–Hirschman Index (HHI). Other specifications follow Table 5. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$				
		Cost of Capital		Industry Concentration	
		High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)
Post 2014×Treat×Ext Finance Dep	0.103**	0.202**	−0.050	0.208*	0.066*
	(0.052)	(0.099)	(0.074)	(0.126)	(0.037)
Post 2014×Treat	0.030*	−0.012	0.092***	0.067***	0.005
	(0.016)	(0.024)	(0.034)	(0.022)	(0.024)
Post 2014×Ext Finance Dep	−0.036	−0.052***	0.051*	−0.039	−0.046**
	(0.023)	(0.020)	(0.029)	(0.036)	(0.023)
Treat×Ext Finance Dep	−0.072*	−0.143	0.068	−0.165	−0.063**
	(0.042)	(0.088)	(0.061)	(0.120)	(0.029)
Ext Finance Dep	0.037*	0.051***	−0.042	0.031	0.044**
	(0.019)	(0.019)	(0.028)	(0.029)	(0.019)
Production Ratio$_t$	−0.006**	−0.008**	−0.007	−0.006**	−0.006
	(0.003)	(0.003)	(0.004)	(0.003)	(0.005)
Facility×Chemical FE?	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes	Yes
Observations	168,243	83,984	60,163	93,206	75,037
Adjusted R^2	0.540	0.590	0.540	0.528	0.585

Panel C: Alternative Mechanisms

This panel tests alternative mechanisms of firms' pollution abatement investments in response to government preference for green suppliers. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. *Trait* indicates firm characteristics used in the regression analysis, which is labeled by the headlines of each column. In Column 1, *Trait* is a dummy variable indicating whether the firm is in a competitive industry, which has a below-median Herfindahl–Hirschman Index (HHI) based on firm revenue. In Column 2, *Trait* is a dummy variable indicating whether the firm has an above-median share of ESG investors, proxied by institutional ownership by pension funds and endowments. In Column 3, *Trait* is a dummy variable indicating whether the firm's customers have an above-median environmental score from Refinitiv Asset4. Other specifications follow Table 5. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$		
	Low Ind. HHI	High ESG IO	High Cust. Env.
	(1)	(2)	(3)
Post 2014×Treat×Trait	-0.085^{***}	-0.008	0.024
	(0.027)	(0.039)	(0.027)
Post 2014×Treat	0.077^{***}	0.037^{**}	0.023
	(0.017)	(0.017)	(0.021)
Post 2014×Trait	0.031	-0.003	-0.020
	(0.024)	(0.011)	(0.019)
Treat×Trait	0.025	-0.001	0.038
	(0.018)	(0.029)	(0.026)
Trait	-0.013	0.008	-0.003
	(0.018)	(0.011)	(0.017)
Production Ratio$_t$	-0.007^{***}	-0.004^{**}	-0.004^{**}
	(0.002)	(0.002)	(0.002)
Facility×Chemical FE?	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes
Observations	237,531	153,222	160,840
Adjusted R^2	0.523	0.540	0.528

Table 7: Government Customers and Corporate Customers

This table compares government customers' and corporate customers' roles in motivating firms to conduct pollution abatement activities. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. The sample comprises firms covered by FactSet Revere with at least one corporate customer. *Has EU Gov Customer* is a dummy variable indicating whether the firm has obtained a government procurement contract by the year-end of 2013. *Post 2014* is a dummy variable indicating whether the year is since 2014. *Customer Environment Score* is the equal-weighted Refinitiv Asset4 environment score of customer firms, and the supply chain relationship is identified from FactSet Revere. *Has EU Corp Customer* is a dummy variable indicating whether the firm has an EU corporate customer by the year-end of 2013. *Production ratio* is taken from the EPA TRI program and is defined as the current year's production or activity scaled by the previous year's production or activity in which the chemical is used. Other specifications follow Table 5. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$			
	(1)	(2)	(3)	(4)
Post 2014×Has EU Gov Customer	0.033***	0.032***		0.031***
	(0.009)	(0.009)		(0.009)
Post 2014×Has EU Corp Customer			0.017**	0.009
			(0.007)	(0.007)
Customer Environment Score$_{t-1}$		0.021		
		(0.022)		
Production Ratio$_t$	−0.005**	−0.004*	−0.005**	−0.005**
	(0.002)	(0.002)	(0.002)	(0.002)
Facility×Chemical FE?	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes
Observations	168,210	160,840	168,210	168,210
Adjusted R^2	0.530	0.529	0.530	0.530

Table 8: Corporate Investment and Firm Valuation

This table presents the effect of the 2014 EU public procurement reform on corporate investment and firm valuation. In Column 1, the outcome variable *CAPX* is a firm's capital expenditures scaled by total firm assets, multiplied by 100 to make the coefficients more visible. In Column 2, the outcome variable *R&D* is the firm's R&D expenses scaled by total firm assets, multiplied by 100 to make the coefficients more visible. In Column 3, the outcome variable *Green Patent* is the number of green patents filed scaled by total firm assets, and it is multiplied by 100 to make the coefficients more visible. In Column 4, the outcome variable *Tobin's Q* is proxied for firm value, which is the market value of total firm assets scaled by the book value of total firm assets. *Post 2014* is a dummy variable indicating whether the year is on or after 2014. *Treat* is a dummy variable indicating if the firm has been awarded any government procurement contract from EU government contracting agencies by the year-end of 2013. *Size* is the logarithm of total firm assets. *Tangibility* is Net Property, Plant, and Equipment scaled by total firm assets. *Profitability* is Income Before Extraordinary Items scaled by total firm assets. *Book leverage* is the sum of Debt in Current Liabilities and Long-Term Debt scaled by total firm assets. *Cash holdings* is Cash and Short-Term Investments scaled by total firm assets. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	$CAPX_t$	$R\&D_t$	Green $Patent_t$	Tobin's Q_t
	(1)	(2)	(3)	(4)
Post 2014×Treat	0.237^{**}	0.491^{***}	0.079^{**}	0.102^{***}
	(0.095)	(0.137)	(0.031)	(0.029)
$Size_{t-1}$	-1.040^{***}	-2.568^{***}	-0.061^{**}	-0.386^{***}
	(0.096)	(0.204)	(0.028)	(0.035)
$Tangibility_{t-1}$	0.419	1.032	−0.386	−0.287
	(0.843)	(1.060)	(0.314)	(0.232)
$Profitability_{t-1}$	0.970^{***}	-6.344^{***}	−0.134	−0.067
	(0.263)	(0.715)	(0.126)	(0.140)
Tobin's Q_{t-1}	0.308^{***}	0.404^{***}	0.010	0.347^{***}
	(0.035)	(0.090)	(0.013)	(0.022)
Book $Leverage_{t-1}$	-1.603^{***}	0.025	0.214	0.691^{***}
	(0.315)	(0.638)	(0.267)	(0.133)
Cash $Holding_{t-1}$	−0.089	-2.420^{***}	−0.507	0.202
	(0.387)	(0.882)	(0.329)	(0.144)
Year FE?	Yes	Yes	Yes	Yes
Firm FE?	Yes	Yes	Yes	Yes
Observations	30,159	30,159	30,159	27,985
Adjusted R^2	0.587	0.855	0.245	0.782

Table 9: Government Green Preference and Firms' Pollution Abatement Activities — Alternative Outcome Variables

Panel A: Baseline Analyses

This panel repeats the analysis in Table 2 using alternative outcome variables of pollution abatement. In Columns 1 to 3, the outcome variable is the natural logarithm of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. In Columns 4 to 6, the outcome variable is a dummy variable indicating whether there is any source reduction activity identified by the U.S. EPA TRI program at the plant-chemical-year level. Other variable definitions and specifications follow Table 2. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	$\log(1 + \text{\# Source Reduction})_t$			$1\{\text{Source Reduction}\}_t$		
	(1)	(2)	(3)	(4)	(5)	(6)
Pct Gov Green$^{\text{Firm}}_{t-1}$	0.027***			0.028***		
	(0.008)			(0.010)		
Increase in Pct Gov Green$^{\text{Firm}}_{t-1}$		0.048***			0.048***	
		(0.015)			(0.018)	
Change in Pct Gov Green$^{\text{Firm}}_{t-1}$			0.045***			0.045***
			(0.014)			(0.017)
Production Ratio$_t$	−0.007***	−0.007***	−0.007***	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	210,833	210,833	210,833	210,833	210,833	210,833
Adjusted R^2	0.517	0.517	0.517	0.495	0.495	0.495

Panel B: 2014 EU Public Procurement Reform

This panel repeats the analyses in Table 5 by examining alternative outcome variables of pollution abatement. In Columns 1 to 2, the outcome variable is the natural logarithm of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. In Columns 3 to 4, the outcome variable is a dummy variable indicating whether there is any newly reported source reduction activity identified by the U.S. EPA TRI program at the plant-chemical-year level. Other variable definitions and specifications follow Table 5. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	$\log(1 + \#\text{ Source Reduction})_t$		$1\{\text{Source Reduction}\}_t$	
	(1)	(2)	(3)	(4)
Post 2014×Treat	0.030***	0.030***	0.031***	0.030***
	(0.011)	(0.010)	(0.011)	(0.011)
Production Ratio_t	−0.006***	−0.006***	−0.008***	−0.007***
	(0.002)	(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes
State×Year FE?		Yes		Yes
Observations	237,531	237,531	237,531	237,531
Adjusted R^2	0.517	0.522	0.495	0.500

Table 10: Government Green Preference and Firms' Pollution Abatement Activities — Fixed-effect Poisson Model

This table repeats the analysis in Table 2 using the fixed-effect Poisson model. The outcome variable *# Source Reduction* is the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. Other variable definitions and specifications follow Table 2. Standard errors are clustered on the firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	# Source Reduction$_t$		
	(1)	(2)	(3)
Pct Gov Green$_{t-1}^{\text{Firm}}$	0.359**		
	(0.141)		
Increase in Pct Gov Green$_{t-1}^{\text{Firm}}$		0.564**	
		(0.247)	
Change in Pct Gov Green$_{t-1}^{\text{Firm}}$			0.555**
			(0.237)
Production Ratio$_t$	−0.135***	−0.136***	−0.136***
	(0.034)	(0.034)	(0.034)
Plant×Chemical FE?	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes
Observations	210,833	210,833	210,833

Table 11: Government Green Preference and Firms' Pollution Abatement Activities — Non-linear Relationship

This table repeats the analysis in Table 2 by controlling for the square and cubic terms of government preference for green suppliers. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. Other variable definitions and specifications follow Table 2. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$		
	(1)	(2)	(3)
Pct Gov Green$^{\text{Firm}}_{t-1}$	0.394***		
	(0.143)		
Pct Gov Green$^{\text{Firm}}_{t-1}$^2	−1.170**		
	(0.473)		
Pct Gov Green$^{\text{Firm}}_{t-1}$^3	0.864**		
	(0.366)		
Increase in Pct Gov Green$^{\text{Firm}}_{t-1}$		0.475**	
		(0.216)	
Increase in Pct Gov Green$^{\text{Firm}}_{t-1}$^2		−2.149*	
		(1.218)	
Increase in Pct Gov Green$^{\text{Firm}}_{t-1}$^3		2.611	
		(1.664)	
Change in Pct Gov Green$^{\text{Firm}}_{t-1}$			0.136**
			(0.066)
Change in Pct Gov Green$^{\text{Firm}}_{t-1}$^2			−0.393
			(0.509)
Change in Pct Gov Green$^{\text{Firm}}_{t-1}$^3			0.462
			(0.906)
Production Ratio$_t$	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes
Observations	210,833	210,833	210,833
Adjusted R^2	0.532	0.532	0.532

Table 12: Government Green Preference and Firms' Pollution Abatement Activities — Alternative Timing to Define Contracting Relationship

This table repeats the analysis in Table 2 by altering the timing to define the contracting relationship between any firm and government contracting agency. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. Column 1 defines the contracting relationship from year t-3 to t-2. In other words, if a government contracting agency awarded general (non-green) government contracts to firms from year t-3 to t-2, firms' pollution abatement activities would be examined in year t. A similar definition applies to other columns. Column 2 defines the contracting relationship from year t-4 to t-2. Column 3 defines the contracting relationship from year t-5 to t-2. Column 4 defines the contracting relationship from year t-6 to t-2. Other variable definitions and specifications follow Column 3 of Table 2. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$			
	Rolling 2 years	Rolling 3 years	Rolling 4 years	Rolling 5 years
	(1)	(2)	(3)	(4)
Pct Gov Green$^{\text{Firm}}_{t-1}$	0.037***	0.039***	0.037***	0.038***
	(0.014)	(0.014)	(0.013)	(0.013)
Production Ratio$_t$	−0.008***	−0.007***	−0.008***	−0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes
Observations	231,337	243,245	251,107	256,826
Adjusted R^2	0.538	0.535	0.533	0.532

Table 13: Government Green Preference and Firms' Pollution Abatement Activities — Alternative Preference Measures

This table repeats the analysis in Table 2 by using alternative methods to construct government agency's preference for green suppliers. The outcome variable *ihs(# Source Reduction)* is the inverse hyperbolic sine (ihs) transformation of the number of newly reported source reduction activities identified by the U.S. EPA TRI program at the plant-chemical-year level. The first headline indicates how the government agency's preference for green suppliers is calculated. "Number" indicates that the government agency's preference for green suppliers is defined as the percentage of the number of government contracts that are classified as green contracts. "Dollar" indicates that the government agency's preference for green suppliers is defined as the percentage of government contracts classified as green contracts in the total dollar amount. The second headline indicates the weighting methodology for aggregating each government contracting agency's green preference at the firm level. "Value Weighted" indicates that the aggregation is based on a value-weighted approach, and the weight is based on the total dollar amount each government contracting agency awarded to each firm in year t-2. "Equal Weighted" indicates that the aggregation is based on an equal-weighted approach. "Top Contracting Agency" indicates that the firm-level government preference for green suppliers measure is simply the green preference of the firm's top government contracting agency ranked by the total dollar amount awarded in year t-2. Other variable definitions and specifications follow Column 3 of Table 2. Standard errors are clustered on firm level. *, **, *** indicate statistical significance at the 10%, 5% and 1% level, respectively. All continuous variables are winsorized at 1% level.

	ihs(# Source Reduction)$_t$				
	Number	Dollar	Number	Dollar	Number
	Value Weighted	Dollar Equal	Weighted	Top Contracting	Agency
	(1)	(2)	(3)	(4)	(5)
Pct Gov Green$^{Firm}_{t-1}$	0.055**	0.033***	0.046**	0.031***	0.044**
	(0.022)	(0.012)	(0.018)	(0.011)	(0.021)
Production Ratio$_t$	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Plant×Chemical FE?	Yes	Yes	Yes	Yes	Yes
Chemical×Year FE?	Yes	Yes	Yes	Yes	Yes
Industry×Year FE?	Yes	Yes	Yes	Yes	Yes
State×Year FE?	Yes	Yes	Yes	Yes	Yes
Observations	210,833	210,833	210,833	210,833	210,833
Adjusted R^2	0.532	0.532	0.532	0.532	0.532