SYMPOSIUM ARTICLE

Social equity in federal contracting during emergencies: A portfolio management perspective

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Abstract

While the U.S. federal government strives to advance social equity in government contracting through various policies to support small disadvantaged business enterprises (SDBEs), entry barriers persist. Drawing on federal government spending data from the initial response to the COVID-19 pandemic, this study estimates logistic and multinomial logistic regressions using portfolio management theory to understand what factors can favor SDBE participation in government contracts during the immediate response to emergencies and whether these factors differ when governments award strategic versus non-strategic contracts. The results show that governments do not necessarily have to reduce competition to favor SDBE participation in government contracts, as some of these suppliers can participate and win competitive procedures. Although non-SDBE suppliers were still more likely to be awarded contracts during the initial emergency response, SDBE suppliers were more likely to win procedures for strategic and important supplies.

Evidence for Practice
- Equity in federal contracting during emergency management is important because it helps to ensure that a diverse range of businesses, including those owned by women and minorities, have the opportunity to participate in the recovery and rebuilding efforts.
- Ensuring equity in federal contracting can also help to ensure that emergency recovery efforts are more effective and efficient, as a diverse group of contractors may bring a wider range of skills, expertise, and resources to bear on the recovery effort.
- We apply portfolio management theory to analyze how equity was ensured by the U.S. federal government during the COVID-19 emergency. We conclude that, during emergencies:
  - The federal government does not necessarily have to reduce competition to favor the participation of small disadvantaged businesses in government contracts.
- Small businesses and woman-owned enterprises are more likely to win federal contracts with low strategic importance, while minority and veteran-owned enterprises are preferred for contracts with high strategic importance.
- Women- and veteran-owned enterprises are more likely to win federal contracts that involve special environmental requirements.

INTRODUCTION

Recent events have exposed large inequities in our society [...] In this time of crisis, it's important that governments analyze all the systems they have at their disposal—including their procurement processes—to address the underlying issues that cause these disparities. (Scot Spencer, Associate Director of Local Policy for the Casey Foundation)

Social equity is a "foundational anchor" and a pillar of public administration (Blessett et al., 2019, p. 296). While classic public administration paradigms focused on efficiency and effectiveness, the new public administration approach focuses on understanding how various public services can enhance social equity (e.g., Gooden & Portillo, 2011; Guy & McCandless, 2012; Wooldridge & Gooden, 2009). Public services can be delivered through in-house provision, public-private partnerships, and, most of all, third-party contracts (Smith & Fernandez, 2010). Procurement and contracting of goods and services represent a significant percentage of overall annual government spending (e.g., Netherlands 45.8 percent, Japan 41.6 percent, Germany 35.3 percent, Canada 32.3 percent, UK 31.7 percent; OECD, 2021). While public values like efficiency and effectiveness frequently drive contracting decisions, it has become increasingly clear that government contracting can be an important tool for advancing social equity (Alkadry et al., 2019). By making social equity a foundational anchor and a pillar of procurement decisions, governments can implement ad-hoc initiatives that can ensure equal and fair small disadvantaged business enterprises (SDBE) participation in government contracts, which may spur financial prosperity and stability within minority communities and small disadvantaged businesses (Cepiku & Mastrodascio, 2021; Veronica et al., 2020). Throughout this article, "small disadvantaged business" refers to the comprehensive category of small, minority-owned, woman-owned, and veteran-owned business enterprises (SDBEs). Minority-, woman-, and veteran-owned business enterprises are defined as disadvantaged business enterprises (DBEs), while other small business enterprises are defined as SBEs. Formal definitions of these business categories are included in Appendix A.

The attention to social equity in governments has increased even more following the dramatic successions of emergencies (i.e., climate change events, COVID-19, Ukraine–Russia war) that have occurred in recent years. These emergencies have contributed to increasing inequalities in different ways (Rivera & Knox, 2022). In the United States, for example, COVID-19 caused disproportionate decreases of 41 percent, 32 percent, and 26 percent in the number of small businesses operated by Black, Latinx, and Asian owners, respectively; similarly, in Europe, more than 50 percent of small businesses do not know if they will still be in business after the next 2 years (McKinsey and Company, 2020). Female owners of small businesses saw a 35 percent higher probability of revenue loss and bankruptcy than male-owned businesses because women-owned businesses belong to industries that were most impacted by COVID-19 (Fairlie, 2020). Among the initiatives governments have adopted to soften such inequalities during emergencies is the availability of additional procurement funds and the design of supplier diversity programs to give SDBEs increased opportunities to obtain part of these funds by contracting

with government agencies (U.S. General Service Administration, 2021a). While social equity in government contracting should be supported under all circumstances, SDBE support becomes most important during emergencies. On the one hand, in emergencies, SDBEs become an important source to support state and federal government needs when the supply of strategic goods and services becomes critical. On the other hand, national regulations allow governments to relax some procurement rules and procedures to favor the inclusion of SDBEs, thus allowing public organizations to diversify their procurement strategies and involve these businesses more. However, while recent research suggests that governments tend to increase the number of contracts awarded to SDBEs during emergencies, especially during the initial response phase (Gereffi, 2020; Melnyk et al., 2021; Veronica et al., 2020), there is insufficient evidence on the specific factors that favor SDBE participation in government contracts and, as such, on how governments should diversify their emergency contracting strategies to involve a broader range of suppliers to obtain critical supplies and effectively respond to public emergencies.

In this regard, the COVID-19 pandemic represents an interesting unit of analysis. First, it was the most recent case of a global and widespread emergency during which emergency contract funds were released in different periods. Second, it was an emergency with severe implications for government procurement. During the COVID-19 pandemic, governments at all levels faced challenges procuring an unprecedented volume of goods and services while experiencing shortages of supplies and suppliers. Third, in these circumstances, governments modified consolidated procurement processes and policies to provide essential goods and to maintain the continuity of services to their communities. In Europe and the U.S., to increase contracting responsiveness, federal and state governments adopted several small business-friendly bidding procedures to favor contract awards to small businesses (Juergensen et al., 2020; Melnyk et al., 2021).

Based on these considerations, we aim to contribute to the literature by answering the following research questions:

1. What factors should governments consider to ensure social equity in procurement contracts during emergencies?
2. What strategies should governments follow to ensure social equity in procurement contracts during emergencies?

To answer these questions, we used federal data on emergency contracts awarded during the initial response to the COVID-19 emergency (the first wave of COVID-19 relief funds, from April 2020 to February 2021) and estimated logistic and multinomial logistic regression models to analyze what factors impacted the probability of

awarding emergency contracts to SDBEs. These models adopt a procurement portfolio perspective to better characterize how U.S. federal agencies prioritized social equity in contracting during the initial response to COVID-19. The procurement portfolio management theory (Kraljic, 1983) states that goods and services characterized by different strategic features require implementing different contracting strategies. While primarily used for the definition of procurement strategies in public organizations (Luzzini et al., 2012), this theoretical lens is less utilized for the definition of government procurement and contracting strategies; it primarily focuses on efficiency and market competition while disregarding social equity consideration (Tip et al., 2022).

This approach enables us to recommend what factors federal governments should consider ensuring fairness and equity in treating small and minority-owned businesses competing for federal contracts during emergencies (particularly during the initial response). Due to the magnitude of the COVID-19 emergency (in terms of dollars spent, number of contracts, number of awards, etc.), not only can our recommendations be easily adapted to other types of emergencies, but they can also become a point of reference to better embed equity considerations in contracting strategies for non-emergency federal contracts and also to a certain extent for contracts awarded by non-federal agencies.

THEORY

Social equity in public management

Social equity was introduced as a pillar and a core value of public administration in response to the critical inequities in society. Its introduction at the first Minnowbrook meeting in 1968 was normative, emphasizing a new focus for public administration, but this call to action has since motivated research and practice. Social equity is based on the idea that "each person is equal and has inalienable rights" (Guy & McCandless, 2012, S5), and it "implies a calculation of fairness, right, and justice" (Guy & McCandless, 2012, S6; Nalbandian, 1989). Svara and Brunet (2020) define social equity in practice as follows:

> Active commitment to fairness, justice, and equality in the formulation of public policy, distribution of public services, implementation of public policy, and management of all institutions serving the public directly or by contract. (p. 352)

This encompasses all public management operations and applies to access to procedural fairness and policy and service outcomes (Svara & Brunet, 2020). Social equity, in practice, intentionally considers "for whom government operates" (Norman-Major, 2011, p. 237).

To elevate and advance social equity, professional associations (e.g., the International City/County Management Association and the American Society for Public Administration) have also promoted social equity and inclusion strategies through their networks. This is also a central pillar of the United Nation's Sustainable Development Goals and U.S. President Joe Biden's agenda (Cepiku & Mastrodascio, 2021). Governments are now expected to be diverse, equitable, and inclusive and offer public services that are accessible to all groups (Cheng et al., 2022; McCandless et al., 2022; Veronica et al., 2020). The Biden Administration has explicitly asked federal agencies to review current policies and procedures and assess how they perpetuate historical entry barriers for people of color and underprivileged communities (Cepiku & Mastrodascio, 2021).

In their systematic review of social equity research in public management, Blessett et al. (2019) find that in public administration scholarship, social equity has primarily focused on representative bureaucracy in terms of gender, race/ethnicity, and the intersection of the two. Other topics covered include gender, race/ethnicity, age, and intersectionality outside the representative bureaucracy. Secondary topics include class, disability, veteran status, sexual orientation, political party, and equity in public policy. Diversity, inclusion, and organizational justice research emphasize social equity's central role (Pandey et al., 2022). With social equity at its core, diversity management promotes "equal opportunities among different groups of employees, promotes workforce representation, and enhances social and organizational justice" (Hoang et al., 2022, p. 537).

Recent research on social equity emphasizes that critical inequities still exist nationwide and asserts the need for greater emphasis on social equity research and intentional practice (Blessett et al., 2019; Pandey et al., 2022). This study responds to this call and contributes to the understanding of social equity in a particular government function area—procurement and contracting.

Role of procurement to achieve social equity

In public management, procurement represents a key policy area to achieve social equity objectives (Alkadry et al., 2019). Procurement in the public sector has typically been viewed as a basic administrative process involving contract management and the application of specific regulations (Patrucco et al., 2017; Trammell et al., 2020). In recent years, especially in response to the COVID-19 pandemic and economic crisis, it is evident that procurement plays a strategic role in the effective implementation of policy reforms (Patrucco et al., 2022). Research and practice have demonstrated that public procurement can be strategically utilized to improve value for money (e.g., Erridge and McIlroy, 2002; Loader, 2007; Reis & Cabral, 2015; Patrucco et al., 2017) and public value

(e.g., Erridge, 2007), increase market innovation (e.g., Edler & Georghiou, 2007), achieve social, economic, and environmental goals (e.g., Alkadry et al., 2019), and reduce unemployment and improve working conditions (e.g., Grandia & Meehan, 2017).

Among the policy areas where public sector procurement can contribute, we also have economic development and sustainability by contracting with SDBEs (Walker & Preuss, 2008). In recent years, governments worldwide have introduced several policies to enhance social equity and SDBE support through procurement and contracting (e.g., Hoekman & Taş, 2022; Selviaridis & Spring, 2022). In the U.S., equity in federal procurement was first established in 1953 with the introduction of the Small Business Administration. It was tasked with overseeing federal contracts and ensuring that small businesses were given fair and equal opportunities to bid on, win, and be awarded federal contracts (Mishra et al., 2016). Since then, the government's efforts to expand contracting opportunities to diverse suppliers have moved beyond small businesses, and today they have established formal goals through different diversity and equity programs targeting specific business categories, such as small business enterprises (SBEs), SDBEs, minority-owned business enterprises (MBEs), women-owned business enterprises (WBEs), veteran-owned business enterprises (VBEs), and disabled veteran–owned business enterprises (DVBEs) (U.S. Small Business Administration, 2021a; see also Appendix A). Through the Federal Acquisition Regulation, the U.S. government promotes contracting with SDBEs through programs like the Small Disadvantaged Business Certification Program, the Section 8(a) program, and HUBZone, so that these businesses can be more competitive in the market (Acquisition.Gov., 2022a). Every year, around 10 percent of federal procurement contracts are awarded to SDBEs (U.S. Small Business Administration, 2021a, 2021b). Recently, the Biden-Harris Administration has explicitly highlighted the benefits connected to the inclusion of equity in federal contracting (The White House, 2021a), and, with a recent executive order, they have increased the minimum wage for federal contractors and released the American Jobs Plan (Public Law No: 117:58) to support SBEs by increasing their access to federal contracts (The White House, 2021b). The U.S. General Services Administration has also released its official "Equity Action Plan" to advance equity in federal procurement decisions and to increase the share of contracts awarded to SDBEs by 50 percent by 2025 (U.S. General Services Administration, 2022).

Although this evidence shows that procurement is increasingly being used as a tool to increase diversity, equity, and inclusion in governments, existing studies offer limited recommendations regarding what factors governments should consider for the effective use of procurement and contracting to achieve strategic equity objectives (Ram et al., 2007; Ram & Smallbone, 2003;

Reis & Cabral, 2015; Riccucci, 2009; Smith & Fernandez, 2010; Fernandez, Malatesta & Smith, 2013).

Researchers have observed a general misalignment between procurement policy (strategic planning) and its implementation (strategic management) (Grandia & Meehan, 2017), which is essential for public value creation (Bryson & George, 2020; Plantinga et al., 2020). Therefore, there is a need for research to provide strategic recommendations on how, in practice, governments can support traditionally marginalized organizations in contracting with public agencies.

Ensuring social equity during emergencies

As outlined in the introduction, emergencies become an interesting unit of analysis for analyzing equity in government contracting. On the one hand, national regulation allows governments to increase procurement budgets and relax some procurement rules and procedures to speed up the procurement process and simplify it to deliver essential resources to recipients. For example, during emergencies, the Robert T. Stafford Disaster Relief and Emergency Act (commonly known as the Stafford Act, Public Law 93–288, as amended, 42 U.S.C. 5121 et seq) allows the President of the United States to declare a national state of emergency and activate the terms of the Stafford Act to enable an immediate and effective response to the emergency (FEMA, 2021). This regulation includes the easing of strict procurement rules (Abutabenjeh et al., 2021) and, combined with the Federal Acquisition Regulation valid during normal times, defines the conditions that procurement procedures should consider during times of nationally declared emergencies to ensure equitable distribution of funding and to avoid amplifying economic and racial disparities (Donahue & Joyce, 2001). On the other hand, when emergencies occur, SDBEs can become an essential resource to support state and federal governments' needs when the supply of strategic goods and services becomes critical (Open Contracting Partnership, 2020). This second aspect was particularly evident during the COVID-19 pandemic, when several SDBEs were ready to support the procurement needs of local, state, and federal governments, becoming a strategic government lever during the initial response to the emergency (Juergensen et al., 2020). It is estimated that over 18 percent of the COVID-19 emergency contracts were awarded to SDBEs. This is remarkable and should not remain an exception.

The economic crisis caused by the COVID-19 pandemic has created an urgent need for procurement reforms. Governments have recognized that "normal" processes and "business-as-usual" have left many SDBE suppliers vulnerable to health and economic shocks. Several SDBEs also became overly reliant on government contracts, dedicating a significant portion of their resources to their relationships with public organizations.

Once the world recovers from the pandemic with stricter rules, the livelihood of this business sector is likely to be affected adversely. Consequently, several government policies during and after the COVID-19 pandemic focused on improving social equity in contract awards (Wright & Merritt, 2020).

Therefore, studying procurement practices used during the recent COVID-19 emergency may provide governments with an opportunity to reflect on and learn how to better outline strategies for social equity, equality, and fairness in contracting practices during future emergencies as well as in regular times (Smith & Fernandez, 2010).

Portfolio management theory and social equity

To strategically incorporate social equity into contracting decisions during emergencies, governments may draw from the perspectives put forth by procurement portfolio management theory. Portfolio management models have been developed to classify goods and services and/or buyer–supplier relationships to determine the best procurement and contracting strategies to be adopted (Luzzini et al., 2012). They are based on the idea that supplier choice and procurement approaches vary according to the type of goods or services purchased (Tip et al., 2022). The following steps have been commonly identified in various procurement portfolio models: (1) classification of items to be procured using appropriate variables; (2) identification of the appropriate strategies to procure these items; and (3) development of a strategic plan to match the identified strategy with supplier relationships and contract management (Luzzini et al., 2012; Nellore & Soderquist, 2000).

The private supply chain management literature has proposed several models (Luzzini et al., 2012), with the Kraljic purchasing portfolio receiving the most attention. According to Kraljic (1983), procurement strategies for different items vary according to the "strategic importance of the purchase" and their level of "supply risk." While this model was originally designed for procurement in the private sector, the limited number of recent works that use a portfolio approach in the context of public procurement uses the Kraljic model (and these two dimensions) as the reference framework (Bhusiri et al., 2021; da Silva Lamenza et al., 2019; Ekström et al., 2021; Tip et al., 2022).

When discussing procurement strategies, the literature using portfolio management theory has solely focused on prioritizing efficiency and effectiveness without considering aspects, such as supplier diversity, equity, and inclusion, which become critical during emergencies. As recently argued by Tip et al. (2022), in this particular context, the portfolio management perspective can be simplified. As emergencies make supply markets even more volatile and risky, the level of "supply risks" of the purchase becomes less of a differentiating factor, thus being a dimension less relevant for consideration (Tip et al., 2022). As such, during emergencies, the question for governments becomes what factors need to be considered to incorporate social equity into their procurement and contracting strategies and how these strategies change for more or less strategically important purchases.

FEDERAL CONTRACTING DECISIONS AND SOCIAL EQUITY DURING EMERGENCY RESPONSES: RESEARCH SETTING AND HYPOTHESES

Our paper uses the COVID-19 pandemic as the research context of the most recent global emergency to better understand how contracting decisions should consider social equity for three reasons. First, the unprecedented shortage of supply and capacity for many goods and services during the pandemic provided additional opportunities for SDBE supplier organizations to conduct business with governments. Second, additional emergency management funding was made available at different levels of government, particularly at the federal level. Third, several governments introduced more flexible and inclusive procurement procedures to favor SDBEs' access to public contracts (Sadiq & Kessa, 2020). Regarding the FEMA national response framework for emergency management (FEMA, 2019), we are particularly interested in understanding how equity was considered during the initial response phase to the COVID-19 emergency, as it was in this phase that governments undertook immediate activities to provide emergency activities and where the support from and to SDBEs became more important. In addition, evidence found assessing this phase can be the starting point for informing future actions for mitigation and preparedness (Donahue & Joyce, 2001).

Our empirical setting includes the emergency contracts awarded by the U.S. federal government during the initial response to COVID-19. It is the world's largest purchaser of goods and services, with an annual budget of around $600 billion. In the last 2 years, it has dedicated over $336 billion to emergency contracts for services and suppliers related to the COVID-19 emergency. According to the latest data released by the U.S. Small Business Administration, while improvements have been made, SDBEs are underrepresented in their share of total federal procurement dollars, even in relation to their low rates of ownership in the general economy (U.S. Small Business Administration, 2020, 2021a). For these reasons, the current U.S. administration has made the increase in the percentage of contracts awarded to SDBEs a priority of its federal diversity, equity, and inclusion strategy (The White House, 2021b).

Understanding how this government considered diversity, equity, and inclusion in contracting out during the initial response to the COVID-19 pandemic is important to clarify how governments can better integrate social equity

in allocating procurement funds in response to future emergencies. It can also recommend reanalyzing their equity programs and decisions in other areas, such as different phases of emergency response (i.e., mitigation and preparedness) and/or during normal times (U.S. Library of Congress. Congressional Research Service, 2022).

To empirically explore this problem, we designed (and estimated) a research model that relies on four main hypotheses, which are discussed ahead.

Portfolio management theory

Extant procurement management literature has offered several portfolio management models characterized by different dimensions used to classify purchasing categories (see Gelderman & Van Weele, 2005; Luzzini et al., 2012 for a detailed overview). Among these, the "strategic importance of the purchases," defined as the extent to which a specific product or service is strategically important for the buying organization (e.g., in monetary terms; Kraljic, 1983), is the most common dimension included in these frameworks and is also regarded as the most objective measurement (Luzzini et al., 2012). In addition, this also becomes the most relevant aspect to consider during emergency management, which usually generates an increase in supply risk (Tip et al., 2022).

Distinguishing between contracts involving strategic and non-strategic goods or services becomes particularly interesting when analyzing how social equity aspects are considered in emergency contracting decisions. Strategically important items are typically critical and/or financially relevant goods or services for which procurement organizations seek to establish relationships with suppliers to ensure supply continuity and superior performance in several areas. This usually necessitates suppliers designing complex bids and documents to demonstrate their suitability for the contract and their ability to meet the expectations even under extenuating circumstances (Hoekman & Taş, 2022; Nkonge, 2013). This complexity can disadvantage SDBEs, which are organizations with fewer resources and capabilities and may have difficulty demonstrating their suitability to supply such critical emergency management items. Therefore, we hypothesize that:

> **H1.** During the initial response to emergencies, SDBE suppliers are more likely to be awarded contracts to supply items of low strategic importance.

Competition

The U.S. federal government has created several programs to help SDBEs secure federal contracts. Participating in these programs enables these organizations to qualify for exclusive set-asides contracts, partner with established contractors to win contracts, and/or receive business mentoring and education to better compete in federal contracting opportunities. The SDBE certification and Section 8(a) programs represent two attempts to institutionalize social equity in government procurement of goods and services (Collins & Gerber, 2008; Smith & Fernandez, 2010). Similarly, the government limits competition for certain contracts to small businesses to help maintain a level playing field for diverse suppliers. Such contracts are called "small business set-asides," and they help small businesses compete for and win federal contracts (Eckerd & Girth, 2017; U.S. General Service Administration, 2021b). While few set-asides are open to all small businesses, some of them are open only to those small businesses that also participate in some of the contracting assistance programs. These programs can also be used to award emergency contracts, and although their effectiveness has been questioned by previous research (e.g., Cullen, 2012; Denes, 1997; Reis & Cabral, 2015), their objective is to increase the chances of SDBE suppliers receiving contracts by reducing competition with large-scale businesses and creating more diverse supplier-friendly procurement procedures. Therefore, we hypothesize that:

> **H2.** During the initial response to emergencies, less competitive procedures improve the chances of SDBE suppliers receiving a contract.

Contract risks

Government procurement contracts can differ significantly depending on the price determination mechanism (Eckerd & Girth, 2017). The U.S. federal government awards fixed-price contracts for the supply of goods or services at a price that does not change based on the supplier's incurred costs (Flammer, 2018; Kim et al., 2016). The government prefers fixed-price contracts because they reduce administrative effort and expose suppliers to increasing performance costs. Consequently, all economic risks are borne by the supplier: if the costs of materials or other resources are higher than anticipated, the supplier's expected profits would be reduced. Suppliers may cut corners to ensure they earn the same profit, if not more, from the contract.

In cost-reimbursement contracts, the government reimburses the supplier for all allowable and reasonable costs incurred in performing the contract work, as well as additional fees. These arrangements are beneficial when contract performance uncertainties make it difficult to estimate costs ex-ante (Samuels, 2021), either due to a lack of knowledge of the work required to meet the contractual obligations or a lack of cost experience in performing work. There is minimal risk for suppliers in this case as unexpected costs/resources are reimbursed by

the government, which completely alleviates the contract's economic risk. Consequently, suppliers are not compelled to cut corners to complete projects while also trying to maintain a profit margin. In the U.S., according to FAR Section 16.301, cost-reimbursement contracts can be used when factors, such as price competition, price analysis, cost analysis, the type and complexity of the requirement, the urgency of the requirement, the performance period, and the length of the production run have been considered and when the supplier's accounting system is adequate for determining costs applicable to the contract.

Overall, fixed-price contracts provide both suppliers and governments more confidence in the contract since both parties know that various aspects of the contract, such as terms, service level, and value of the goods or services, are set and will not change (Berrios, 2006). Based on data published by usaspending.gov (USASpending, 2021),[1] fixed-price contracts were the most common contract typologies used by the U.S. federal government during COVID-19 and the most common type of emergency contract. These contracts reduce the possibilities of misinterpretation by either side and thus also help prevent unnecessary litigation and fines because there is a greater understanding regarding the duties of the supplier as well as the price of the contract. Consequently, because they are less complex to bid on and require fewer resources and competencies to manage during their duration, these types of contracts may favor SDBE supplier participation. Therefore, we hypothesize that:

> **H3.** During the initial response to emergencies, contracts with low economic risks (i.e., fixed-price contracts) increase the probability of awarding a contract to SDBE suppliers.

Environmental sustainability requirements

Governments can contribute to public sector sustainability goals by making procurement decisions that buy goods, services, and works with low environmental impact. "Green public procurement" can be a significant driver of innovation by incentivizing industries to develop environmentally friendly products and services (Prier et al., 2016). Green procurement can also save public authorities money, especially if we consider the total life-cycle costs of a contract rather than just the purchase price. An increasing body of literature (e.g., Gelderman et al., 2017; Walker & Brammer, 2009; Walker & Preuss, 2008) has recognized the role of diverse suppliers, especially small businesses, in contributing to public sector environmental goals. Evidence suggests that several SDBE suppliers pursue environmental initiatives and proactively address issues such as energy consumption or waste disposal, distinguishing them from larger, non-diverse companies (e.g., Jenkins, 2006). During

TABLE 1 Descriptive statistics of independent variables (total number of contracts = 38,352).

Variables	Number (%)
Strategic importance	
Low	7016 (18%)
High	31,336 (82%)
Solicitation	
Only one source	6242 (16%)
All others	32,110 (84%)
Sustainability	
No requirements included	35,552 (93%)
Requirements included	2800 (7%)
Government functions	
Closely associated and other functions	35,726 (93%)
Critical functions	2626 (7%)
Contract pricing	
Firm fixed price	32,394 (85%)
Firm fixed price with incentives	423 (1%)
Labor hours, sharing, time, and materials	840 (2%)
Cost reimbursement with no fees	448 (1%)
Cost reimbursement with fees and/or incentives	4247 (11%)
Types of set-aside	
Competitive	748 (2%)
No set-aside used	30,535 (80%)
Sole source	7069 (18%)
Place of performance	
Foreign country	3046 (8%)
United States	35,306 (92%)

emergencies, the federal government should utilize additional funds and contracts to synergistically obtain equity and environmental goals. As such, including special environmental requirements in the award procedures appears to be a factor in valorizing SDBE suppliers' investments and favoring their participation in government procurement procedures (U.S. Library of Congress. Congressional Research Service, 2022). Therefore, we hypothesize that:

> **H4.** During the initial response to emergencies, including special environmental requirements increases the probability of a contract being awarded to SDBE suppliers.

METHODS

We test the hypotheses using data from the federal government's official website for expenditures,[2] which tracks contracts from the federal government's response to the COVID-19 emergency. In the Coronavirus Aid, Relief, and Economic Security Act (CARES Act, Public Law 116-136, 2020), the United States Congress introduced and defined the concept of "covered funds" to specify

which supplemental appropriation spending related to the COVID-19 pandemic response should be tracked, audited, and published for transparency and accountability.[3] These funds are governed by the CARES Act 2020 and other supplemental legislation. Government spending funded by the COVID-19 emergency supplemental appropriations is tracked using the Disaster Emergency Fund Codes. The data, which has certain limitations, combines agency financial and contract data submitted monthly, beginning April 1, 2020.[4]

In line with the objective of the study, we consider contracts related to the first wave of federal government funds between April 2020 and February 2021 for our analysis (which can be considered the period of the initial response to COVID-19; additional funds were appropriated through the American Rescue Plan Act after March, 2021) (American Rescue Plan Act, 2021; Public Law No. 117-22021). We limited the sample to non-missing observations for our independent and dependent variables and obtained a final database of 38,352 usable contract awards. The primary characteristics of our independent variables are presented in Table 1. Additional descriptions of the dataset are presented in Appendix B (Table B1).

Independent variables

Strategic importance

Previous literature has typically considered the profit impact (Kraljic, 1983) to objectively measure the strategic importance of the various contracted items. In our study, owing to the non-profit nature of public organizations, we measure strategic importance by considering the impact of federal spending on each product or service on total spending in 2020 and 2021, in line with the approach used by recent literature (e.g., Montgomery et al., 2018; Padhi et al., 2012). To do this, we consider the "total obligated amount" of the contract using the North American Industry Classification System (NAICS[5]) item description, that is, the system-generated element containing the total of all amounts entered in the "Action Obligation" field for a specific PIID (Procurement Instrument Identifier) and agency. Following this process, we categorize all items with a higher-than-average impact on federal spending as having "high" strategic importance, while the remaining items are categorized as having "low" strategic importance. An illustration of this process and examples of the goods and services included in each group are presented in Appendix C (Table C1).

Level of competition

Three different variables are considered to measure the level of competition associated with the procedure (Smith & Fernandez, 2010).

First, we include the "number of offers," which represents the number of bids submitted by potential suppliers to win the contract (Eckerd & Girth, 2017). The greater the number of bids received, the fiercer the competition for the contract. This variable ranges from 1 to 700, but the distribution of values is right-skewed (very few large values). We apply a log transformation to reel these values into the center of the distribution (like a normal distribution).

Second, we consider the type of "solicitation procedure," which is measured in our data by eight different solicitation procedures (Brunjes, 2022). We recode it as an indicator variable that takes the value of 0 if the procedure is "non-competitive" (which includes the procedure "only one source") and the value of 1 if the procedure is "competitive" (which includes all the other procedures, such as "alternative sources," "negotiate proposal," "sealed bid," "simplified acquisition," "subject to multiple awards," and "two-step").

Last, we consider the "type of set-aside," which favors the participation of SDBEs (Eckerd & Girth, 2017). This is a categorical variable with "no set-aside" as a reference group, and the other two categories are:

- Competitive set-aside contracts—exclusively for small businesses.
- Sole source set-aside contracts—reserved for situations where only a single business can fulfill the contract requirements and contracts can be awarded without a competitive bidding process. However, in some cases, contracts may be posted publicly, and other potential suppliers may be allowed to bid on them.

Contract risk

To objectively measure contract risk, we consider the "type of contract pricing," theorizing that fixed-price contracts have lower risks for the buying organization whereas cost-reimbursement price contracts have higher risks (Acquisition.Gov, 2022b; Eckerd & Girth, 2017; Hiller & Tollison, 1978). Although the data contain 15 different types of pricing methods, this can be traced back to five groups that pose a growing risk to the federal government:

- Group 1: low economic risk, which includes all contracts with a firmly fixed-price mechanism.
- Group 2: medium-low economic risk, which includes all contracts with forms of fixed-price mechanisms with incentives (e.g., fixed-price award fee, fixed-price with redetermination, fixed-price with an economic price adjustment, fixed-price with a level of effort).
- Group 3: medium economic risk, which includes all contracts with fixed resource rate mechanisms, such as labor hours, time and materials, and cost-sharing.
- Group 4: medium-high economic risk, which includes all contracts with a cost-reimbursement and no-fee mechanism.

- Group 5: high economic risk, which includes all contracts with forms of cost-reimbursement mechanisms with incentives (e.g., cost-plus fixed-fee, cost-plus award fee, cost-plus incentive fee).

Environmental sustainability

To measure environmental sustainability requirements (Walker & Preuss, 2008), we include an indicator variable with the value 1 if the contract included a "recovered material sustainability clause" and 0 otherwise. This requirement specifies whether Recovered Material Certification and/or an Estimate of the Percentage of Recovered Material Content for EPA-Designated Products clauses are required for contract award consideration.

Supplier location

We also control for the supplier location (Ram & Smallbone, 2003) by adding an indicator variable that takes the value of 1 if the supplier is located in the U.S. and 0 if the supplier is located abroad.

Dependent variables

We use the variables in the data that characterize the contract recipients to operationalize the probability of awarding a contract to an SDBE supplier. The first dependent variable, which represents the probability of awarding the contract to an SDBE, is an indicator variable that takes the value of 1 if the contract was awarded to an SDBE supplier (irrespective of the type of diversity) and

0 otherwise (Model 1). The second dependent variable, which represents the probability of awarding the contract to an SBE, is an indicator that takes the value of 1 if the supplier is a small business and 0 otherwise (Model 2). The third dependent variable, which represents the probability of awarding the contract to a DBE, is a categorical variable accounting for non-diverse suppliers, DBEs (1); minority-owned suppliers, MBEs (2); women-owned suppliers, WBEs (3); and veteran-owned suppliers, VBEs (4) (Model 3). The reference group for this variable consists of non-DBE suppliers (1). Table 2 presents the descriptive statistics for the dependent variables.

The mathematical expressions of the regressions are as follows:

Model 1

$$SDBE_i = \beta_0 + \beta_1 \text{Strategic Importance} + \beta_2 \text{Types of solicitation procedures}_i + \beta_3 \text{Ln(Offers Received)}_i + \beta_4 \text{Set Aside}_i + \beta_5 \text{Contract Risk}_i + \beta_6 \text{Sustainability Clause}_i + \beta_7 \text{Location of supplier}_i + \gamma.$$

Model 2

$$SBE_i = \alpha_0 + \alpha_1 \text{Strategic Importance} + \alpha_2 \text{Types of solicitation procedures}_i + \alpha_3 \text{Ln(Offers Received)}_i + \alpha_4 \text{Set Aside}_i + \alpha_5 \text{Contract Risk}_i + \alpha_6 \text{Sustainability Clause}_i + \alpha_7 \text{Location of supplier}_i + \partial.$$

Model 3

$$DBE_i = \delta_0 + \delta_1 \text{Strategic Importance} + \delta_2 \text{Types of solicitation procedures}_i + \delta_3 \text{Ln(Offers Received)}_i + \delta_4 \text{Set Aside}_i + \delta_5 \text{Contract Risk}_i + \delta_6 \text{Sustainability Clause}_i + \delta_7 \text{Location of supplier}_i + \theta.$$

The linear probability model assumes that the probability varies linearly with the value of the independent variables, implying that the incremental effect of covariates is constant. To avoid this issue, we use the maximum likelihood (ML) method to estimate a non-linear model (logit model) (Wooldridge, 2020). Furthermore, we use a multinomial logistic model for our third dependent variable, DBE. It is an unordered categorical outcome: non-DBEs, MBEs, WBEs, and VBEs. To determine whether multinomial logistic regression is appropriate, we conduct the following three tests:

1. We conduct a likelihood ratio test for each independent variable and reject the hypothesis that the independent variables do not affect our results.
2. We test the Independence of Irrelevant Alternatives (IIA) assumption, which states that adding or removing alternative outcome categories does not affect the

TABLE 2 Summary statistics of the dependent variables.

Dependent variables	Number (%)
SDBE (Model 1)	
Non-SDBE	25,715 (67%)
SDBE	12,637 (33%)
SBE (Model 2)	
Non-SBE	18,116 (47%)
SBE	20,236 (53%)
DBE (Model 3)	
Non-DBE	25,715 (74%)
MBE-only	3291 (9%)
WBE-only	3170 (9%)
VBE-only	2674 (8%)

Abbreviations: DBE, disadvantaged business enterprise; MBE, minority-owned business enterprise; SBE, small business enterprise; SDBE, small disadvantaged business enterprise; VBE, veteran-owned business enterprise; WBE, woman-owned business enterprise.
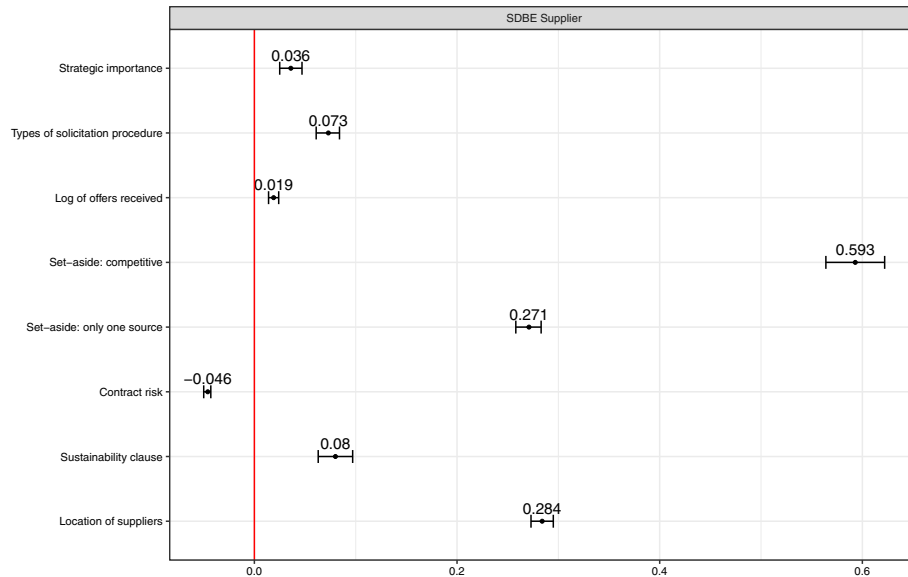
FIGURE 1 Average marginal effects from a logistic regression with 95% confidence intervals (Model 1).

odds of the remaining outcomes. According to the Hausman test, there are significant differences between our categories.

3. We use a Wald test to determine whether the independent variables distinguish between pairs of outcomes. We reject the null hypothesis that categories can be collapsed.

RESULTS

In these models, interpretations based on predicted probabilities are usually preferred for clarity. Therefore, we illustrate and discuss the average marginal effects. We report the log odds coefficients of our models in Appendix D (Tables D1 and D2).

Figure 1 shows the results of a logistic model in which the dependent variable is an indicator variable accounting for whether or not the contract is awarded to an SDBE supplier (Model 1). Model 1's estimation predicts that 30 percent of contracts will be awarded to SDBE suppliers, with covariates held constant at their means. The average marginal effects measure the instantaneous rate of change (small changes) for continuous variables. All coefficients are statistically significant at the 95 percent level. Contracting for high strategic importance items decreases the probability of awarding the contract to SDBE suppliers by 3.6 percentage points (pp, hereafter) compared to low strategic importance items. Since the offers received are in logarithmic form, a 1 percent increase in the number of offers received increases the probability of the contract being awarded to a diverse supplier by 0.019 pp. A one-unit increase in contract risk decreases the probability of the contract being awarded to an SDBE supplier by 4.6 pp. Marginal

effects for categorical variables measure a discrete change (e.g., moving from the base category to another category). Moving from non-competitive to competitive solicitation procedures increases the probability of awarding the contract to SDBE suppliers by 7.3 pp. The probability of awarding to an SDBE supplier increases by 59.3 pp when switching from no set-aside to a competitive approach and by 27.1 pp when switching to a single source set-aside. The inclusion of environmental sustainability requirements in the contract increases the probability of awarding the contract to SDBE suppliers by 8 pp, and location in the United States increases the probability of an SDBE receiving the contract by 28.4 pp.

Figure 2 shows the results of a logistic model in which the dependent variable is an indicator variable indicating whether or not the contract is awarded to an SBE supplier (Model 2). All coefficients are statistically significant at the 95 percent level. The model predicts that 67 percent of contracts will be awarded to SBE firms, holding the covariates at their mean. Contracting for high strategic importance items decreases the probability of awarding the contract to SBE suppliers by 3.5 pp compared to low strategic importance ones. Moving from non-competitive to competitive solicitation procedures increases the probability of awarding the contract to SBEs by 12.4 pp. The probability of awarding to an SBE supplier increases by 53.6 pp when switching from a no set-aside to a competitive approach and by 55.4 pp when switching to a single source set-aside. A 1 percent increase in the number of offers received increases the probability of the contract being awarded to an SBE by 0.024 pp. Furthermore, a one-unit increase in contract risk decreases the probability of the contract being awarded to SBEs by 5 pp. The inclusion of environmental sustainability requirements in the contract decreases the probability of awarding the
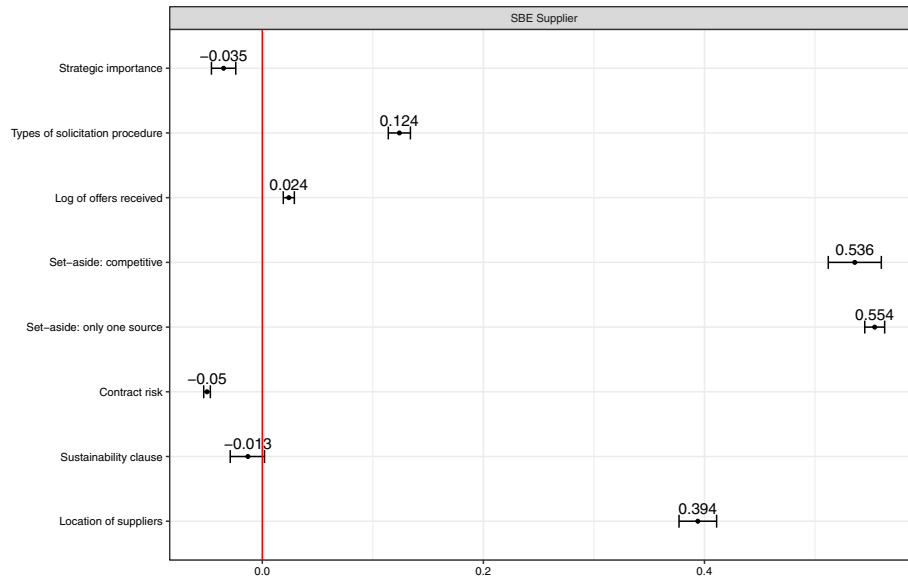
FIGURE 2 Average marginal effects from a logistic regression with 95% confidence intervals (Model 2).
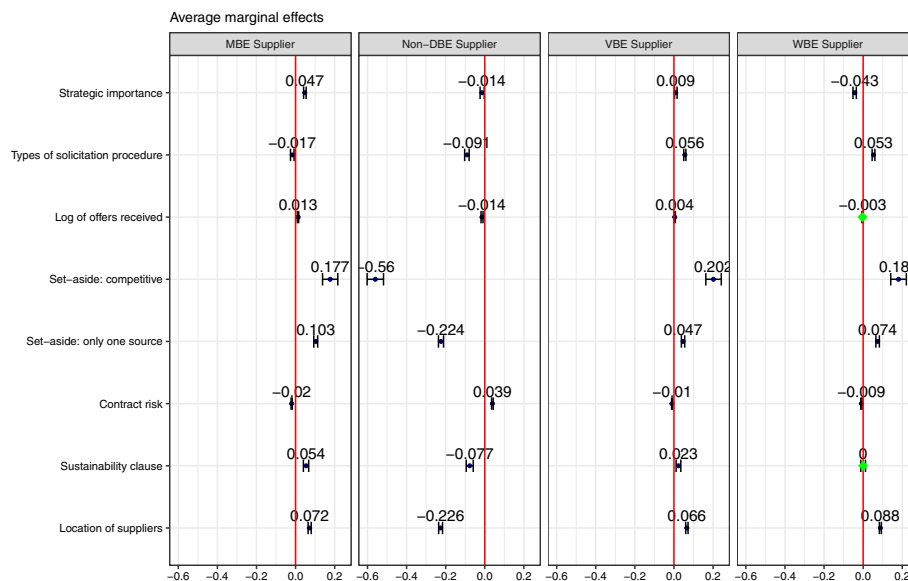

FIGURE 3 Average marginal effects from a multinomial logistic regression with 95% confidence intervals (Model 3). The green diamond shape coefficients are statistically insignificant at the 95% level. The coefficients are statistically significant at 95% level, except for the green diamond-shaped ones.

contract to an SBE by 1.3 pp. Finally, the supplier's location in the United States increases the probability of an SBE receiving the contract by 39.4 pp.

Only a few suppliers in our data are members of more than one diversity category (e.g., veteran-owned and women-owned companies). Given the low number of observations in these mixed categories, statistical inference is difficult. Thus, we limit the sample to suppliers who fall into only one diversity category.[6] In Figure 3, we

report the average marginal effects from Model 3 (multinomial logistic regression) for each category of our dependent variable: non-DBE, MBE, WBE, and VBE, as we did for Models 1 and 2.

The model predicts that 74 percent of contracts will be awarded to non-DBE suppliers, 9.4 percent to MBEs, 9.1 percent to WBEs, and 7.7 percent to VBEs, holding all covariates constant at their mean. Contracting for high strategic importance items increases the probability of

awarding to MBEs and VBEs by 4.7 and 0.9 pp, respectively. However, it decreases the likelihood of awarding the contract to non-DBE and WBE suppliers by 1.4 and 4.3 pp, respectively. Compared to non-competitive procedures, the competitive solicitation procedure decreases the probability of awarding the contract to non-DBE and MBE suppliers by 9.1 and 1.7 pp, respectively. In contrast, it increases the probability of awarding the contract to VBEs and WBEs by 5.6 and 5.3 pp, respectively. Moving from no set-aside to competitive set-aside increases the probability of awarding the contract to MBEs, VBEs, and WBEs by 17.7, 20.2, and 18.1 pp, respectively, while for non-DBE suppliers, the probability decreases by 56 pp. When a single source set-aside is used instead of no set-aside, the pattern is similar to when a competitive set-aside is used. It increases the probability of awarding the contract to MBEs, VBEs, and WBEs by 10.3, 4.7, and 7.4 pp, respectively. A 1 percent increase in the number of offers received decreases the probability of awarding the contract to non-DBE and WBE suppliers by 1.4 and 0.3 pp, respectively; however, the effect is statistically insignificant. Furthermore, it also increases the probability of awarding the contract to MBEs and VBEs by 1.3 and 1.4 pp, respectively. A one-unit increase in contract economic risk increases the probability of awarding the contract to non-DBE suppliers by 3.9 pp; however, it decreases the likelihood of awarding the contract to MBE, VBE, WBE, and non-DBE suppliers by 2, 1, 0.9, and 22.4 pp, respectively. The inclusion of environmental sustainability requirements in the contract decreases the probability of awarding the contract to the non-DBE supplier by 7.7 pp; it increases the probability of awarding the contract to WBEs and VBEs by 5.4 and 2.3 pp, respectively. However, environmental sustainability requirements have an insignificant effect on the probability of awarding the contract to WBEs. Finally, if the supplier is located in the U.S., the probability of awarding a contract to MBEs, VBEs, and WBEs increases by 7.2, 6.6, and 8.8 pp, respectively. However, it decreases the probability of awarding a contract to non-DBE suppliers by 22.6 pp.

DISCUSSION AND MAIN CONTRIBUTIONS OF THE STUDY

Table 3 summarizes the primary findings of our statistical analysis and allows us to answer our two research questions.

What factors should governments consider to ensure social equity in procurement contracts during emergencies?

Our results first show that during the initial response to the COVID-19 pandemic, non-SDBE suppliers still had a greater chance to win a federal contract than SDBE

suppliers—in line with the trends for non-emergency contracts. The tested models and hypotheses suggest factors governments should consider to further increase this probability.

First, in partial contrast to what was hypothesized in H1, some SDBE suppliers are favored when contracting for items of high strategic importance. In contrast, for SBEs and WBEs, the probability of winning a federal emergency contract decreases with the higher strategic importance of the purchased item; MBE and VBE suppliers had a better chance of winning federal contracts for more complex and strategic items. This result uniquely contributes to the definition of procurement strategies in government organizations using a portfolio management perspective (Tip et al., 2022). On one side, our analysis shows the ability of specific categories of suppliers to bid, compete, and win strategically important contracts; on the other, it also confirms the federal government's ability to design procedures that enable some categories of SDBEs to be competitive even for most strategic contracts during a period of crisis (Hoekman & Taş, 2022).

To provide further nuances to this result, we can consider how the other variables included in the model affected SDBE suppliers' likelihood of being awarded a federal emergency contract. In this regard, our hypothesis H2 is only partially confirmed. Based on our data, the only competition reduction variable that seems to positively impact the probability of winning a federal emergency contract for all the SDBE suppliers is set-asides, which increases the probability of winning federal contracts for SBEs, MBEs, WBEs, and VBEs. This result supports, in the context of emergency contracts, the effectiveness of set-asides in favoring SDBEs (e.g., Brunjes, 2022). Instead, contrary to previous findings (e.g., Smith & Fernandez, 2010), we find that a higher number of bidders increases the probability of winning a contract for SBEs, MBEs, and VBEs, while it only has a negative impact on WBE suppliers. This means that most SDBEs can face fierce competition, and government agencies should encourage high participation in emergency contracts (The White House, 2021a). In the context of social equity, this result complements the literature that considered the number of bidders as a proxy for better procurement procedures (e.g., Eckerd & Girth, 2017). Competitive solicitation procedures can also increase the likelihood of some types of SDBEs (i.e., WBE and VBE suppliers) winning emergency contracts while they negatively impact the probability for others (SBEs and MBEs). Overall, these results demonstrate that, during global emergencies, SDBEs have the potential ability to participate and win contracts, even with a high level of competition. These findings are beneficial from a federal government perspective, as they mean that SDBE suppliers do not necessarily need simplified procedures to win emergency contracts (which are usually more complex in their design and management; Collins & Gerber, 2008; Smith & Fernandez, 2010); government agencies can achieve equity in contract awards even when using competitive procedures, such as

T A B L E 3 Summary of findings (based on COVID-19 federal contract data).

During the initial response to emergencies	SBEs	MBEs	WBEs	VBEs
Overall probability of winning a federal contract	30%	9.4%	9.1%	7.7%
H1: Low strategically important items increase the probability of awarding a contract to SDBE suppliers	Supported	Failed to support	Supported	Failed to support
H2: Less competitive procedures increase the probability of awarding a contract to SDBE suppliers	• Low number of bidders: failed to support • Use of non-competitive solicitation procedures: failed to support • Use of set-asides: supported	• Low number of bidders: failed to support • Use of non-competitive solicitation procedures: failed to support • Use of set-asides: supported	• Low number of bidders: supported • Use of non-competitive solicitation procedures: supported • Use of set-asides: supported	• Low number of bidders: failed to support • Use of non-competitive solicitation procedures: supported • Use of set-asides: supported
H3: The use of contracts characterized by low economic risks increases the probability to award a contract to SDBE suppliers	Supported	Supported	Supported	Supported
H4: Including special environmental requirements increases the probability of awarding a contract to SDBE suppliers	Failed to support	Failed to support	Supported	Supported

Abbreviations: DBE, disadvantaged business enterprise; MBE, minority-owned business enterprise; SBE, small business enterprise; SDBE, small disadvantaged business enterprise; VBE, veteran-owned business enterprise; WBE, woman-owned business enterprise.

negotiated proposals, simplified acquisitions, and sealed bids. Therefore, as opposed to previous research (Cullen, 2012; Reis & Cabral, 2015), we cannot conclude that, during emergencies, higher competition is detrimental to SDBE suppliers' participation in federal contracting, as this is only true for specific sub-categories.

Instead, our data fully support hypothesis H3. During emergencies, the level of contract risk continues to be a factor of concern when dealing with SDBE awards, and contract typologies with higher risk for the government decrease the probability of SDBE suppliers winning emergency contracts. Our results, in the context of emergency management, confirm that contract awards for SDBEs continued to favor fixed-price contracts (e.g., Flammer, 2018; Kim et al., 2016). From a federal government perspective, this means avoiding cost-reimbursement pricing mechanisms if the objective is to increase social equity in contract awards (although cost-reimbursement contracts are indeed more flexible during uncertain times; Samuels, 2021).

Finally, hypothesis H4 is partially supported, as our results show that including special environmental requirements increases the probability of contract awarding only in the case of WBE and VBE suppliers but not for SBEs and MBEs. This represents an incentive, particularly for VBEs, which also have a higher probability of winning contracts for strategically important items, to invest more in developing sustainable competencies and products/services (e.g., Jenkins, 2006). This is also an opportunity for the federal government to achieve both social and sustainability objectives within the same contract award. Surprisingly, during emergencies, including environmental sustainability

requirements does not increase the probability of SBEs winning a contract, despite previous research (e.g., Prier et al., 2016) having recognized sustainability orientation as a key strength of small and medium organizations.

What portfolio strategies should governments follow to ensure social equity in procurement contracts during emergencies?

Based on the discussion of the research hypotheses, we note the types of strategies that the federal government should implement to achieve social equity in procurement and contracting during emergencies. These strategies are summarized in Figure 4.

As previously discussed, low strategically important items seem to favor the participation of SBE and WBE suppliers as a form of diversity. If federal government agencies want to pursue equity objectives for SBEs and maximize their chances of winning a contract, they can opt for competitive solicitation procedures, focus on using only one-source set-asides, use fixed-price contracts, and avoid including sustainability requirements. In contrast, the winning probability for WBEs is positively impacted by a low number of bidders, the use of non-competitive solicitation procedures, and the inclusion of sustainability requirements.

For items of high strategic importance, the federal government can attract higher participation from MBE and VBE suppliers. The strategy to increase MBEs'

		Low	High
Type of diversity	*VBEs*	Low probability for VBEs to win federal contracts during emergencies	VBEs' chances to win with… • High numbers of bidders • Non-competitive solicitation procedures • Presence of set-asides • Low economic risk contracts • Emphasis on sustainability requirements
	MBEs	Low probability for MBEs to win federal contracts during emergencies	MBEs' chances to win with… • High numbers of bidders • Competitive solicitation procedures • Presence of set-asides • Low economic risk contracts
	WBEs	WBEs' chances to win with… • Low numbers of bidders • Non-competitive solicitation procedures • Presence of set-asides • Low economic risk contracts • Emphasis on sustainability requirements	Low probability for WBEs to win federal contracts during emergencies
	SBEs	SBEs' chances to win with… • High numbers of bidders • Competitive solicitation procedures • Presence of set-asides • Low economic risk contracts	Low probability for SBEs to win federal contracts during emergencies
		Low	*High*
		Strategic Importance	

FIGURE 4 The portfolio perspective on social equity and federal contracting strategies during emergencies.

participation is similar to that discussed for SBEs. It includes the use of set-asides, the possibility of using non-competitive procedures, and the use of contracts with reduced economic risk for the government without sustainability requirements. The strategy to increase VBEs' participation, conversely, includes the use of non-competitive solicitation procedures in addition to the inclusion of sustainability requirements as part of the federal contracts.

These results are novel and enrich the discussion about how equity in government contracting should be ensured (Smith & Fernandez, 2010). They also advance the use of portfolio management theory in public procurement (Tip et al., 2022) and integrate diversity and equity considerations in procurement and contracting strategies, which previous theoretical and empirical applications had neglected (e.g., Bhusiri et al., 2021; da Silva Lamenza et al., 2019; Ekström et al., 2021; Luzzini et al., 2012).

Concluding remarks and possible developments: What is next for equity in Federal Government Contracting?

This study supports the call for action to advance equity and inclusion from a public management perspective in theory and practice (Cepiku & Mastrodascio, 2021; Rivera & Knox, 2022; Veronica et al., 2020) by focusing on how the federal government can ensure equity through contracting decisions during emergencies. To date, the literature has primarily focused on the benefits associated with increasing the participation of SDBEs in government contracting (e.g., Smith & Fernandez, 2010; Sordi et al., 2022), with little empirical evidence provided for how and what governments should do to favor diversity and inclusion in procurement under such circumstances. Using 38,352 pieces of U.S. federal contract data awarded during the initial response to the COVID-19 emergency, this study examines the probability of awarding a contract to a different

category of diverse suppliers and the variables that positively and negatively contribute to this probability.

The results, summarized in Table 3 and Figure 4, contribute to the public administration literature in three ways. First, this study extends the current emergency management literature focused on understanding how governments ensure equity in public management decisions, using COVID-19, the most recent global emergency, as the context (e.g., Wright & Merritt, 2020). Second, by providing insights into how federal organizations can use procurement and emergency contracting to achieve their broader diversity, equity, and inclusion objectives, we support previous literature (e.g., Patrucco et al., 2022; Plantinga et al., 2020) that promotes the role of procurement in strategic public management. Last, by using portfolio management theory, this study first shows the strategic application of portfolio models to the public context (so far underutilized; Tip et al., 2022). From a practical perspective, the results outline clear strategies that public managers and policymakers can implement to maximize the participation of SDBE suppliers in federal emergency contracts. These strategies can be differentiated based on the nature of the purchase and the type of diversity, thus offering public managers and policymakers different nuances to customize their approach to equity in contracting.

This study has some limitations. First, the secondary data used for the analysis have known limitations[7] that restrict the scope to measure certain variables, such as the level of competition and contract risk, for which previous literature has offered alternative computations. Future research could consider self-collected data (e.g., through a survey) or alternative data sources and use different approaches to measure the current variables and add new ones. Such data also limit the type of diversity that could be included in the analysis; for example, it was not possible to include any gender identity and/or sexual orientation diversity in our models, which is an aspect that future studies should consider. From a research setting perspective, our attention is focused on emergency contracts; thus, although our results can be considered a starting point for defining strategies for equity in contracting (also during business-as-usual times), future replication studies can first test the same models using non-emergency contracts. Connected to this, given the emergency management context, our study only considers one portfolio classification dimension (i.e., strategic importance); future studies using non-emergency contracts could extend our results by considering additional aspects such as the level of supply risk. Finally, given that we focus on federal-level spending decisions, future research can also assess decision-making behavior related to SDBEs using state- and/or local-level contracts (during emergencies and/or in standard times).

ACKNOWLEDGMENTS

ENDNOTES

1 See https://www.usaspending.gov/search/?hash=25e8378bc443646cf2b174d65218b2ca.

2 Spending data from the United States federal government's response to COVID-19 are drawn from https://www.usaspending.gov.

3 Summary of key health provisions from the Coronavirus Aid, Relief, and Economic Security Act: https://www.kff.org/coronavirus-covid-19/issue-brief/the-coronavirus-aid-relief-and-economic-security-act-summary-of-key-health-provisions/.

4 The unique identifier for each contract, agreement, or order can be found at https://www.fpds.gov/help/Procurement_Instrument_Identifier.htm.

5 The North American Industry Classification System (NAICS) is the standard used by federal statistical agencies to classify business establishments to collect, analyze, and publish statistical data related to the U.S. economy (https://www.census.gov/naics/).

6 Our results are robust (for non-diverse, minority, women, and veteran categories) when tested using a dependent variable with eight categories. However, we do not have enough observations for the mixed diversity categories (women and veterans, women and minorities, minorities and women, women-veterans and minorities). The results are available upon request.

7 To see federal contract data limitations, please consult https://www.usaspending.gov/data/data-limitations.pdf.

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APPENDIX A: SMALL DISADVANTAGED BUSINESS DEFINITIONS

Small Business Enterprise (SBE): A business independently owned, operated, and in accordance with the definitions and size standards established by the Small Business Administration, which vary by industry and revenues and are regulated by Title 13 Part 121 of the Electronic Code of Federal Regulations (https://www.ecfr.gov/current/title-13/chapter-I/part-121).

Minority-Owned Business Enterprise (MBE): A business that is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged and whose management and daily business operation are controlled by one or more such individuals. Groups considered minorities are Native Americans, Asia Pacific Americans, Asian Indian Americans, African Americans, and Hispanic Americans.

Woman-Owned Business Enterprise (WBE): A business that is at least 51 percent owned, controlled, and administered by a woman or women who are U.S. citizens.

Veteran-Owned Business Enterprise (VBE): A business that is at least 51 percent owned, controlled, and administered by a veteran who has served in the active military, naval, or air services and was discharged or released under conditions other than dishonorable. If the veteran has a service-connected disability of at least 10 percent certified by the U.S. Department of Veteran Affairs or the Department of Defense, then the business can be certified as Disabled Veteran Business Enterprise.

Disadvantaged Business Enterprise (DBE): A business that is classified in one (or more) of the categories of MBE, WBE, VBE, and DVBE but is not classified as an SBE.

Small Disadvantaged Business Enterprise (SDBE): A business that is classified as SBE and also in one (or more) of the categories of MBE, WBE, VBE, and DVBE.

APPENDIX B: ADDITIONAL DESCRIPTIVES

TABLE B1 Dataset descriptives.

Total number of suppliers awarded[a]	13,160
Total number of awarding agencies	33
Total number of contracts (i.e., number of awards)	40,079
Total award obligations funded by COVID-19 pandemic supplements	$34,759,420,752.89
Main funding agencies	
Department of Defense	$15,676,417,626.00
Department of Health and Human Services	$15,264,996,038.00
Small Business Administration	$1,094,532,284.00
Number of different items bought	254
Item classified with low strategic importance	180
Item classified with high strategic importance	74
Number of contracts awarded to SBE suppliers	22,509
Number of contracts awarded to DBE suppliers	15,024
Number of contracts awarded to U.S. suppliers	37,682
Number of contracts awarded to foreign suppliers	3057

[a]Suppliers received more than one award.

APPENDIX C: MEASURING STRATEGIC IMPORTANCE

The contract database covers 254 different types of goods and services purchased. These items were classified using the first level of the NAICS codes. To measure the strategic importance of each item, we considered the total amount of federal spending awarded for each good and service with a period of performance starting in 2020 or 2021, and we evaluated the impact on the average spending across all the items.

For example, for the category of goods "Scientific Research and Development Services," the total obligated federal spending was $11,775,179,898.28, while for "Postal Services," the federal spending was $38,895,407.51. As the average spending per item was calculated as $385,662,692.09, "Scientific Research and Development Services" was classified as a highly strategically important item, while "Postal Services" was a low strategically important item.

TABLE C1 Examples of items included in the two groups.

High strategic importance (*n* = 74)	Low strategic importance (*n* = 180)
• Aerospace product and parts manufacturing • Computer systems design and related services • Scientific research and development services • Pharmaceutical and medicine manufacturing • Architectural, engineering, and related services • Other food manufacturing • Nonresidential building construction • Ship and boat building	• Waste collection • Office furniture (including fixtures) • Educational support services • Specialized freight trucking • Other fabricated metal product manufacturing • Electronics and appliance stores • Support activities for water transportation • Electrical equipment manufacturing • Other telecommunications • Agencies, brokerages, and other insurance-related activities

As a result of this exercise, we classified 74 items as "high" and the remaining 180 as "low." The following table includes examples of goods and services included in each group.

APPENDIX D: RESULTS OF LOGISTIC ESTIMATIONS

TABLE D1 Log odds coefficients from a logistic estimation of Model 1 and Model 2.

Dependent variable	SDBE supplier (Model 1)	SBE supplier (Model 2)
Strategic importance	0.198*** (0.031)	−0.207*** (0.034)
Types of solicitation procedure	0.400*** (0.034)	0.751*** (0.033)
Log of offers received	0.103*** (0.013)	0.141*** (0.015)
Set-aside: competitive	3.101*** (0.131)	4.970*** (0.449)
Set-aside: only one source	1.248*** (0.028)	5.875*** (0.219)
Contract risk	−0.248*** (0.011)	−0.297*** (0.010)
Sustainability requirements	0.409*** (0.044)	−0.081* (0.048)
Location of supplier	2.281*** (0.090)	4.334*** (0.150)
Constant	−3.529*** (0.100)	−4.675*** (0.156)
Observations	38,352	38,352
Pseudo R^2	.126	.306
Akaike Information Criterion (AIC)	42,494.34	36,821.06
Bayesian Information Criterion (BIC)	42,571.33	36,898.05

Note: Significance levels: ***$p < .001$, **$p < .05$, *$p < .1$. Standard errors are in parentheses.

Abbreviations: SBE, small business enterprise; SDBE, small disadvantaged business enterprise.

TABLE D2 Log odds coefficients from the multinomial logistic estimation, Model 3.

Dependent variable DBE (base: Non-DBE supplier)	MBE supplier	WBE supplier	VBE supplier
Strategic importance	0.643*** (0.058)	−0.398*** (0.045)	0.156*** (0.055)
Types of solicitation procedure	0.008 (0.054)	0.941*** (0.074)	1.228*** (0.088)
Log of offers received	0.164*** (0.020)	−0.002 (0.022)	0.084*** (0.022)
Set-aside: competitive	2.668*** (0.158)	2.719*** (0.158)	2.903*** (0.153)
Set-aside: only one source	1.265*** (0.044)	1.089*** (0.044)	0.943*** (0.049)
Contract risk	−0.296*** (0.020)	−0.176*** (0.019)	0.206*** (0.020)
Sustainability requirements	0.631*** (0.062)	0.159*** (0.078)	0.425*** (0.075)
Location of supplier	1.722*** (0.138)	2.665*** (0.199)	2.061*** (0.162)
Constant	−4.409*** (0.156)	−5.177*** (0.214)	5.516*** (0.189)
Observations	34,850		
Pseudo R^2	.0822		
Akaike Information Criterion (AIC)	55,212.84		
Bayesian Information Criterion (BIC)	55,441.23		

Note: Significance levels: ***$p < .001$, **$p < .05$, *$p < .1$. Standard errors are in parentheses.

Abbreviations: DBE, disadvantaged business enterprise; MBE, minority-owned business enterprise; VBE, veteran-owned business enterprise; WBE, woman-owned business enterprise.

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