

# Growing, learning, and connecting: Deciphering the complex relationship between government customer concentration and firm performance

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## Abstract

The interplay between a firm's customer portfolio and the firm's performance presents a theoretical conundrum that challenges traditional supply chains. In particular, the role of government customer concentration—how extensively a firm incorporates government entities as part of its customer base—emerges as a pivotal factor with the potential to both bolster and burden firm performance. Analyzing 3,643 firm-year observations from the U.S. Federal Procurement Data System-Next Generation, Compustat, and FactSet Revere reveals an inverse U-shaped relationship between government customer concentration and firm performance. Excessive or insufficient government customer concentration adversely impacts performance, suggesting that a strategic balance is essential. Firm size, absorptive capacity, and network embeddedness are crucial in navigating this complex relationship, guiding a firm toward optimizing its government customer portfolio. This research advances the discourse on customer base management, underscoring the essential strategic considerations for firms interacting with government buyers.

## KEYWORDS

absorptive capacity, customer base, customer portfolio management, government customer concentration, network embeddedness

## INTRODUCTION

Navigating the complexities of the vast government procurement sector, which accounts for significant annual spending in the United States, presents both opportunities and challenges for suppliers. Governments, as the largest purchasers, provide suppliers with potentially stable revenue streams (Quiroga et al., 2021). However, the differing priorities and objectives of government buyers and private sector suppliers often lead to mismatches that

can negatively affect supplier performance. A logistics equipment manufacturer highlighted these challenges to the author team during an interview and sought research-backed evidence to gain deeper insight into how to effectively manage government buyers:

“[T]here was a much more work-together type of atmosphere when dealing with a private distributor because they want to sell; they need our product to make money. Turning it around to where the government is

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going to use it, they really had no financial skin in the game for what we are providing.”

Clearly, suppliers must meticulously strategize as they navigate the delicate equilibrium between the advantages and disadvantages associated with incorporating government buyers into their customer portfolios (Eckerd & Girth, 2017; Wu et al., 2014). Although diversifying the customer base through government contracting can create an additional revenue source, the disparities between government buyers and private sector suppliers that arise from their divergent objectives, strategic considerations, and operational priorities can pose challenges in establishing a common ground and aligning interests (Nagle, 1992). Examining this through the lens of information processing theory reveals that the hierarchical structure of government contracting can present unique obstacles to buyer–supplier information sharing and processing, which are crucial for supplier performance (McCue & Pitzer, 2000; Miller, 1956; Rogers et al., 1999).

Building upon insights from prior literature on supply and customer bases (Akın Ateş et al., 2022; Choi & Krause, 2006; Irvine et al., 2016), we posit that *government customer concentration*, defined as the extent to which a supplier incorporates government buyers into its customer base, plays a pivotal role in shaping the balance of benefits and disadvantages to the supplier, as evidenced by supplier performance. Recognizing the importance of government customer concentration is essential (Na, 2020) as it not only sheds light on the diversification within a firm’s customer base but also provides valuable insights into the strategic management of its customer portfolio, particularly with the inclusion of government buyers (Brown et al., 2007; Johnson & Selnes, 2004; Na, 2020).

Integrating the theories of customer portfolio management and information processing, we argue that government customer concentration reflects a supplier’s need to align its customer portfolio management strategies with efficient information processing. Specifically, a firm faces challenges when it has either too many or too few government customers, and the firm consequently struggles to maintain a sufficiently diverse customer portfolio or efficiently manage the information processing of an excessively complex portfolio. To test this relationship, we hypothesize that there is an inverse U-shaped relationship between government customer concentration and firm performance. That is, an optimal balance enables strategic diversification and risk mitigation while ensuring that the supplier is poised to navigate the unique challenges posed by government buyers (Brown et al., 2007; Johnson & Selnes, 2005; Yan et al., 2015). We

argue that government customer concentration generates diversification, thus fortifying revenue stability and resilience. However, an overemphasis on government customer concentration will hinder the benefits of diversification owing to the challenges of managing and processing the information from government buyers, resulting in an inverse U-shaped relationship with firm performance.

Undoubtedly, there exist highly successful firms dedicated to government contracting. Hence, we explore the intricate supplier factors that underscore the success of government customer concentration by probing the roles of firm size, absorptive capacity, and supply chain network embeddedness as moderators of the relationship between government customer concentration and firm performance (Bellamy et al., 2014; Ferdows, 2006; Gaimon & Ramachandran, 2021; Kim, 2017). The selection of firm size, absorptive capacity, and supply chain network embeddedness as moderators is grounded in their identified significance in shaping the buyer–supplier relationship and their potential to influence various aspects of the supply chain dynamics and organizational performance. Therefore, our research question is as follows: *How does government customer concentration influence supplier firm performance, considering factors such as supplier firm size, absorptive capacity, and network embeddedness?*

We examine government customer concentration using robust empirical methods and panel data consolidated from the Federal Procurement Data System-Next Generation (FPDS-NG), Compustat, and FactSet Revere (Culot et al., 2023). By focusing on publicly traded companies in key sectors (NAICS 31 to 49), we capture supplier performance through various metrics using two-stage least squares (2SLS) fixed-effects regression analysis to address potential endogeneity issues (Elking et al., 2017; Ketokivi & McIntosh, 2017; Kim, 2017). The research team conducted semi-structured qualitative interviews to triangulate the research findings.

The multifaceted findings of this research enhance both the theoretical and practical understandings of government contracting within the supply chain management (SCM) domain. First, exploring government customer concentration illuminates the complexity of managing government buyers within a firm’s customer portfolio, which offers a novel and comprehensive perspective on the customer base literature (Choi & Krause, 2006; Johnson & Selnes, 2004). Government contracting provides an alternative revenue source but concurrently introduces a potential information processing burden for the supplier. Our research indicates that although this offers an additional financial avenue, suppliers should strategically manage government customer

concentration to harness the benefits while circumventing an added layer of complexity that they would otherwise need to navigate (Drake et al., 2004).

Second, the discovery of a curvilinear relationship between government customer concentration and firm performance brings forth a critical theoretical framework encapsulating the dual nature of the benefits and costs associated with government buyers (Brown et al., 2007; Yan et al., 2015). This insight paves the way for suppliers to refine their engagement with government buyers, leading to a more efficient procurement process. Third, the identification of firm size, absorptive capacity, and network embeddedness as mitigating factors adds depth to the understanding of government contracting and allows for the development of nuanced strategies to enhance firm performance (Bellamy et al., 2014; Ferdows, 2006; Gaimon & Ramachandran, 2021; Kim, 2014). Collectively, these findings not only expand the theoretical landscape but also equip practitioners and government procurement officials with actionable insights to tackle the unique challenges posed by supplying to governments.

## THEORETICAL BACKGROUND AND LITERATURE REVIEW

### Government customer concentration

The existing literature on government contracting in SCM highlights the importance of contract design, risk and stakeholder management, policy implementation, and political connections (Eckerd & Girth, 2017; Tate et al., 2010; Wu et al., 2014). Nevertheless, there is a need to explore the management of government buyers from a customer portfolio perspective. For example, Eckerd and Girth (2017) analyzed more than 240,000 public sector buyer–supplier contracts and revealed the importance of contract design in risk management strategies. In a different institutional context, Wu et al. (2014) probed how Chinese suppliers react to energy efficiency initiatives driven by buyers and the government. Their research illuminated the various categories of initiatives based on suppliers' ownership characteristics and alignment with stakeholders' values. Similarly, Shen et al. (2023) unveiled the negative association between political ties and operational efficiency in Chinese private firms and found variations based on regional factors and industry competitiveness.

In a comprehensive exploration of the effect of government customer concentration on firms' operations, Falcone et al. (2023) uncovered nuanced patterns of influence. Although government contracts buoy short-

term financial health, they can impede long-term sustainability. Moreover, the strategic placement and connections within a firm's network are critical for optimizing gains from these contracts. Our article builds upon these insights to unravel the layered concept of government customer concentration from the vantage point of customer portfolio management. We propose a refined analysis that distinguishes how the concentration of government clientele affects a firm's overall customer base and guides the strategic oversight of these government relationships.<sup>1</sup>

Government customer concentration represents the degree to which a firm prioritizes conducting business with government agencies compared to firms in the private sector. It extends the concept of customer base concentration that focuses on a firm's reliance on a limited number of customers for revenue (e.g., Kim, 2017; Patatoukas, 2012), while government customer concentration scrutinizes the concentration of government agencies as customers. In this research, we adopt a relational perspective and measure government customer concentration quantitatively as the ratio of the total number of government agencies with which a firm contracts to the firm's total number of customers.

Government customer concentration assesses how firms prioritize government relationships within their customer portfolios. Governments, as the primary procurers globally, forge pivotal ties with suppliers, offering long-term contracts and stable revenue streams, as noted by Falcone et al. (2023) and Eckerd and Girth (2017). These associations are not merely financial but also encompass often-overlooked non-financial dimensions. Delving into these dynamics allows managers to grasp the intricate facets of strategic decision-making and planning across the firm's customer base.

Government contracting, which markedly differs from private transactions, substantially influences firm performance. Information processing theory posits the crucial role of information processing in decision-making and contract management (Rogers et al., 1999). Engaging with government entities entails complex information processing due to bureaucratic intricacies and the imperatives of transparency and accountability (Rustiarini et al., 2019; Tukamuhabwa, 2012). Furthermore, Falcone et al. (2023) highlighted the information asymmetry in such contracts, with government agencies possessing broad data and suppliers bringing specialized acumen.

<sup>1</sup>Additional details regarding the comparison between this current paper and Falcone et al. (2023) can be found in Supporting Information S1.

## Theories of customer portfolio management and information processing

Combining the theories of customer portfolio management and information processing (Johnson & Selnes, 2004, 2005; Miller, 1956; Rogers et al., 1999), we explore the influence of government customer concentration from two angles. First, the theory of customer portfolio management provides a foundation by advocating that analyzing customers and strategically allocating resources will maximize a supplier's performance (Johnson & Selnes, 2004; McAlister & Sinha, 2021). Second, this theory is relevant to government customer concentration because it emphasizes the need to diversify and balance customer portfolios to improve firm performance (Johnson & Selnes, 2005). This theoretical angle resonates with contemporary SCM literature investigating customer base complexity (Choi & Krause, 2006; Lu & Shang, 2017; Sharma et al., 2020).

Examining government customer concentration through the lens of information processing reveals that engaging in government contracts introduces heightened complexity in information processing. This primarily stems from the distinctive regulations and procedural intricacies associated with including government buyers in the customer portfolio (Falcone et al., 2023). Consequently, managing the customer base becomes more intricate. Moreover, the nature of the information required for government contracts may differ significantly from that needed in private-sector transactions. Government contracts may necessitate detailed documentation, compliance reports, and extensive data sharing to meet regulatory standards, which may impact the supplier's performance (Drake et al., 2004).

Integrating the perspectives of customer portfolio management and information processing clarifies that suppliers should strategically manage their mix of government and private sector buyers (Choi & Krause, 2006; Johnson & Selnes, 2004; McKone-Sweet & Lee, 2009). Indeed, prior research has shown that maintaining a balance between government and private sector buyers' influence leads to effective resource allocation and enhanced performance outcomes (Wu et al., 2014). Therefore, a research model is required to help firms determine the optimal level of government customer concentration, maximize performance outcomes, and navigate diverse customer base complexities.

The unique challenges and benefits illuminated by the theories of customer portfolio management and information sharing imply that the relationship between government customer concentration and firm performance may not be linear. In the subsequent section, we discuss

the possibility of an inverse U-shaped relationship (Lind & Mehlum, 2010) where moderate levels of government customer concentration lead to the most favorable firm performance. Conversely, extremely high and low concentrations could result in suboptimal outcomes. Thus, this research serves as a novel exploration of the multifaceted dynamics of government customer concentration, offering a nuanced understanding that solves the existing dilemmas in the literature.

## HYPOTHESIS DEVELOPMENT

### Government customer concentration and firm performance

In exploring the intricate relationship between government customer concentration and firm performance, we hypothesize that an inverse U-shaped pattern exists. At low levels of government customer concentration, firms face reduced exposure to government contracts, limiting their capacity to diversify their customer base and address the risks associated with an over-reliance on private sector buyers (Grover & Dresner, 2022; Kim, 2017; Van Weele & Van Raaij, 2014). Simultaneously, this restriction from accessing the benefits of government contracts curtails revenue streams and growth prospects (Handfield et al., 2015). Consequently, firms with low government customer concentration struggle to reach optimal performance levels.

At the opposite end of the spectrum, firms with exceptionally high government customer concentration confront distinctive performance challenges, particularly in overcoming formidable information processing hurdles. As previous studies have emphasized, firms encounter difficulties in managing a varied customer portfolio and ensuring efficient information processing (Drake et al., 2004). We anticipate these challenges to be compounded further when firms have high government customer concentration. For example, the bureaucratic procedures, formal regulations, and stringent accountability measures associated with government contracts can impose operational burdens (Falcone et al., 2023), leading to deliberative slowdowns in sharing and processing buyer-supplier information. The specific requirements set by government buyers exert additional information interpretation pressure, which has been shown to cause operational inefficiencies and diminished operational flexibility (Harland et al., 2019). Consequently, firms with high government customer concentration will likely experience diminishing returns in their overall performance due to these intricate information processing challenges.



Conversely, we argue that firms with moderate government customer concentration will find a favorable balance that enhances firm performance. By leveraging moderate concentration, firms can diversify their customer base and gain advantages from the stability of government contracts (Johnson & Selnes, 2005; Yan et al., 2015). By maintaining a mix of private sector and government buyers, firms with moderate government customer concentration can also navigate customer characteristics without too much information processing burden. Furthermore, moderate government customer concentration grants a firm more flexibility in its decision-making and superior political connections and strategic resource allocation (Grover & Dresner, 2022). Firms operating with balanced portfolios with moderate government customer concentration can mitigate the susceptibility to idiosyncratic partner demands (Yan et al., 2015). Consequently, firms with moderate government customer concentration stand poised to outperform compared to extreme or low government customer concentration, thereby achieving optimal performance levels.

In short, we anticipate the relationship between government customer concentration and firm performance to follow an inverse U-shaped pattern:

**Hypothesis 1. (H1):** There exists an inverse U-shaped relationship between government customer concentration and firm performance such that firm performance is the lowest at low and high levels of government customer concentration.

## Growing, learning, and connecting

### The moderating role of firm size

According to prior research, the effects of government customer concentration on firm performance are not homogeneous, making it imperative to explore a broad spectrum of firm-specific attributes that may influence this intricate relationship. Therefore, we examine the essential roles of firm-level attributes—increasing size (growing), absorptive capacity (learning), and network embeddedness (connecting)—as key condition boundaries that shape this complex relationship.

First, we argue that as a firm's size grows, the inverse U-shaped relationship between government customer concentration and firm performance flattens, resulting in a more linear, positive relationship. Specifically, with increased scale and resources, larger firms enjoy a competitive advantage in navigating the complexities of government contracting (Dang et al., 2018). Larger firms also

gain greater capital and resources, enabling them to establish stronger relationships with government agencies and manage bureaucratic procedures and regulations more effectively. Moreover, an increased size equips firms with internal flexibility, enabling them to leverage resources and knowledge in uncertain information processing environments (Beckman et al., 2004; Cao & Zhang, 2011).

In addition, larger firms tend to have an established reputation and brand recognition that will strengthen their influence with both government and private sector buyers (Welling & Kamann, 2001). Consequently, larger firms can position themselves to reap the benefits of government customer concentration without succumbing to the burdens of information processing complexity. In conclusion, as a firm's size increases, it gains the ability to leverage its resources and capabilities to manage government customer concentration effectively and navigate the complexities associated with having a diverse customer base. This leads to a moderation of the inverse U-shaped relationship, resulting in a flatter curve. Therefore, we hypothesize as follows:

**Hypothesis 2. (H2):** As a firm's size increases, the inverse U-shaped relationship between government customer concentration and firm performance will be mitigated, resulting in a flatter curve.

### The moderating role of absorptive capacity

The concept of absorptive capacity—that is, a firm's ability to acquire, assimilate, transform, and apply information to improve its performance (Cohen & Levinthal, 1990)—holds particular relevance in government contracting. Firms with higher absorptive capacity tend to be more innovative, drawing from a diverse range of experiences and investing in vast research and development (R&D) to enhance their products and services to meet government requirements (Cohen & Levinthal, 1990; Zahra & George, 2002). This ability to swiftly learn and adapt to government demands can lead to product quality improvement, reduced costs in new product development, and more efficient launches of innovative offerings.

Based on these understandings, we hypothesize that an increase in a firm's absorptive capacity flattens the inverse U-shaped relationship between government customer concentration and firm performance. First, absorptive capacity empowers firms to seize, assimilate, and transform information from various sources, including government buyers (Azadegan, 2011; Sáenz et al., 2014).

This ability enables firms to swiftly learn the specific demands, regulations, and procedures in government contracts and consequently align their operations, products, and strategies with government requirements (Dobrzykowski et al., 2015).

Second, higher absorptive capacity contributes to a deeper comprehension of the political shifts and policies that sway government buyers. The complex nature of government procurement, riddled with bureaucratic procedures, regulations, and accountability measures, demands that firms stay abreast of the ever-changing political landscape (Harland et al., 2019).

Finally, an enhanced absorptive capacity gives firms a stronger competitive edge (Ferdows, 2006; Gaimon & Ramachandran, 2021). Firms nurturing a learning-oriented environment tend to experiment with new ideas and technologies, adapting to the evolving needs of all customers, including government buyers. Thus, they position themselves to craft innovative solutions that tackle the unique demands of government contracts. Therefore, the interplay of absorptive capacity with government customer concentration sheds light on a multifaceted landscape where learning and adaptation are pivotal forces in shaping firm performance.

In short, firms with higher absorptive capacity can effectively navigate the complexities of government contracts and ultimately achieve better performance outcomes, leading to a flatter curve in the relationship between government customer concentration and firm performance:

**Hypothesis 3. (H3):** As a firm's absorptive capacity increases, the inverse U-shaped relationship between government customer concentration and firm performance will be mitigated, resulting in a flatter curve.

### The moderating role of network embeddedness

Network embeddedness, which signifies a firm's interconnectedness and integration within a broader network of suppliers, customers, and stakeholders, plays a vital role in the firm's strategic positioning (Bellamy et al., 2014). This concept illustrates the firm's central position and engagement within an exchange network that underscores the firm's connectivity and strategic interactions within the supply chain ecosystem (Kim & Zhu, 2018). For suppliers to government buyers, network embeddedness offers several advantages, including access to multitudinous resources, information, and expertise. Such accessibility facilitates problem-solving, knowledge-sharing, and collaborative product development (Pathak

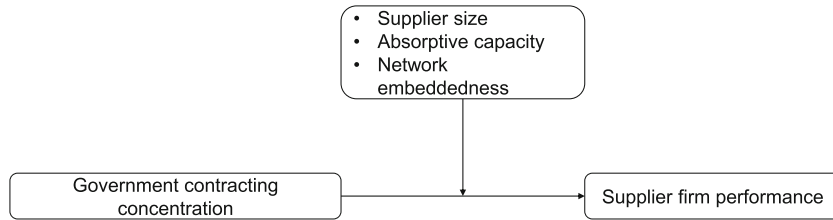
et al., 2014; Villena, 2019; Yildiz et al., 2016). Furthermore, network embeddedness enhances a firm's resilience and adaptability, enabling it to draw support from network partners to navigate uncertainties (Kleindorfer & Saad, 2005; Wagner & Buko, 2005). Ultimately, network embeddedness serves as a linchpin for leveraging the collective strength of supply chain relationships, which can enhance the benefits while alleviating the disadvantages of government contracting.

Specifically, we propose that increased network embeddedness plays a pivotal role in reshaping the relationship between government customer concentration and firm performance. That is, heightened network embeddedness mitigates the disadvantages associated with government customer concentration, resulting in a flattened inverse U-shaped relationship.

First, a well-integrated supply chain network provides a firm with increased flexibility to cater to the unique demands of government buyers (Kim, 2014). This interconnectedness facilitates access to specialized knowledge, alleviating the burden on the firm to fulfill distinctive government requests (Villena, 2019; Yildiz et al., 2016). Consequently, the negative impact of government customer concentration is alleviated. Second, a firm that is embedded within a supply chain can effectively orchestrate external resources and collaborations and thus adeptly navigate the complexities of government contracts (Kleindorfer & Saad, 2005; Pathak et al., 2014; Villena, 2019; Wagner & Buko, 2005; Yildiz et al., 2016). By leveraging the diverse strengths of supply chain partners, a firm gains a competitive edge in meeting government requirements. As the firm's network embeddedness increases, the previously hypothesized inverse U-shaped relationship between government customer concentration and firm performance will be tempered, resulting in a flatter curve.

Moreover, the positive impact of increased network embeddedness extends beyond flexibility and resource orchestration. Prior studies have shown that a well-embedded firm is better positioned to cultivate long-term collaborative relationships within the supply chain (Villena, 2019; Yildiz et al., 2016). These enduring partnerships foster trust and cooperation, creating a more stable and supportive environment for dealing with the information-sharing and processing uncertainties inherent in government contracting. Furthermore, as network embeddedness increases, the firm may gain access to a broader pool of potential partners and collaborators, thus diversifying the firm's supply chain portfolio and making the firm less susceptible to the fluctuations and uncertainties associated with government customer concentration.

In summary, network embeddedness serves to not only alleviate the challenges but also amplify the benefits



**FIGURE 1** The moderating effect of firm size.

associated with government customer concentration. Therefore, we hypothesize that the inverse U-shaped relationship between government customer concentration and firm performance will be flattened as network embeddedness increases:

**Hypothesis 4. (H4):** As a firm's network embeddedness increases, the inverse U-shaped relationship between government customer concentration and firm performance will be mitigated, resulting in a flatter curve.

Figure 1 demonstrates the complete conceptual model.

## METHODS

### Data collection and consolidation

Data were gathered from three different sources—namely, FPDS-NG, Compustat, and FactSet Revere—from the years 2010 to 2018. FPDS-NG is a publicly accessible database containing procurement records from all federal agencies as mandated by the Federal Acquisition Regulation (Federal Procurement Data System [FPDS], 2022). These data provide contract details, such as the contract value, number of bidders, and agency information. Compustat was used to acquire firms' financial and accounting performance data. FactSet Revere provides information on firms' supply chain relationships, encompassing buyers, suppliers, and alliance partners (Culot et al., 2023). This information is crucial for calculating a firm's network variables and determining its overall position within a supply chain network.

Compustat provided the master data to identify our sample. We specifically focused on publicly traded companies in the United States operating in the manufacturing, wholesale, retail, transportation, and warehousing sectors (NAICS 31 to 49), as these sectors encompass a significant portion of the businesses from which private sector and government agencies often require equipment, supplies, or logistical support. This sample pool ensured that the sampled firms aligned with our research

**TABLE 1** Sample distribution by industry sector.

NAICS	31–45 industry sectors	Total	Frequency
31–33	Manufacturing	2,440	67%
42	Wholesale	401	11%
44–45	Retail	473	13%
48–49	Transportation	329	9%
<b>Total</b>		<b>3,643</b>	<b>100</b>

objectives. Table 1 provides an overview of the sample distribution across these industry sectors based on their two-digit NAICS codes, and Table 2 outlines all variable definitions and operationalizations.

### Dependent variable

To capture the dependent variable (i.e., supplier firm performance) we utilized a one-year lagged return on assets ( $ROA_{t+1}$ ), determined by dividing a firm's net income by its total assets in  $t + 1$ . We lagged the dependent variable to capture any potential delayed effects of the independent variables on the dependent variable. To enable statistical analysis, we normalized  $ROA$  through a logarithmic transformation.  $ROA$  provides a comprehensive assessment of a firm's financial and operational performance, making it a widely used measure of firm performance in academic research (Elking et al., 2017; Kim, 2017). Specifically, a higher  $ROA$  suggests that the firm is more profitable and efficiently uses its assets to generate revenue, indicating effective management and operational processes.

### Independent variables

We used government customer concentration (*gov. customer concentration*) as the independent variable. *Gov. customer concentration* refers to the degree to which a firm is focused on conducting business with government agencies compared to other customers in the private sector, and we measured it by the ratio of the total number

TABLE 2 Operationalization of the variables.

Variable	Description	Data source	Calculation
$ROA_{t+1}$	Return on assets as a measure of firm performance	Compustat	Net income divided by total assets
Gov. customer concentration	The degree to which a firm is focused on conducting business with government agencies compared to other customers	FPDS-NG and FactSet	Total number of government customers (agencies) divided by total number of all customers
Firm size	Net assets	Compustat	Total assets minus total liabilities (logged)
Absorptive capacity	R&D intensity	Compustat	Firm research and development expenditures divided by sales per year
Network embeddedness	Eigenvector centrality	FactSet	$x_{it} = \frac{1}{\lambda} \sum_{j=1}^n a_{ijt} x_{jt}, i = 1, \dots, n$ <p><math>x_{it}</math> is the eigenvector centrality of firm <math>i</math> in year <math>t</math>; <math>\lambda</math> is the largest eigenvalue of the adjacency matrix; <math>n</math> is the number of nodes; <math>x_{jt}</math> is eigenvector centrality of partner firm <math>j</math> in year <math>t</math></p>
Contracting ratio	The proportion or percentage of a firm's total revenue that is attributed to government contracts	FPDS-NG and Compustat	The government customer concentration value divided by the total firm revenue
Set-aside contract	Small business, veteran owned, women owned, minority owned, or other eligible suppliers	FPDS-NG	Whether the supply firm qualifies for a set-aside contract; dummy variable with 1 if the firm qualifies for set-aside contract, and 0 otherwise
Market share	Market share	Compustat	Firm's sales divided by industry average sales with industry defined at the 2-digit NAICS level
Performance aspiration	The performance level of a firm compared to the industry average	Compustat	Firm return on assets minus industry average return on assets
Available slack	Resources that are readily available within a firm	Compustat	Current assets minus inventories, then divided by current liabilities
Potential slack	Future resources that could be leveraged in a firm	Compustat	Total long-term debt divided by total firm assets
Recoverable slack	Non-liquid, relatively long-term resources within a firm	Compustat	Selling, administrative, and general expenses divided by total sales

of government agencies a firm has contracts with to the total number of customers. The value ranged from 0, indicating no government contract, to 1, indicating exclusive contracting with the government. A higher value of *gov. customer concentration* specifies a stronger relational connection between the firm and government customers, indicating a greater concentration of contracting with the government.

We captured *firm size*, as the firm moderator of interest, by firm net assets (Buzacott & Zhang, 2004; Dang et al., 2018). Specifically, we calculated net assets as total assets minus total liabilities, taking the working capital, manufacturing equipment, and facilities into

consideration. Given the asset-intensive nature of the sample, using net assets as a measure of company size is more suitable than variables such as revenue, employee count, or market capitalization. We log-transformed the net assets for a normal distribution to ensure statistical robustness in the analyses.

We measured *absorptive capacity* as firm R&D intensity, calculated using firm R&D expenditures divided by sales. *Absorptive capacity* is a key indicator of a firm's learning capability that includes the process of creating, retaining, and transferring knowledge, especially when facing challenges from government customers (Argote & Hora, 2017; Bellamy et al., 2014). More specifically, a



firm's investment in R&D mirrors its *absorptive capacity* because greater R&D intensity depicts stronger internal knowledge (Cohen & Levinthal, 1990).

We captured *network embeddedness*, also known as the network centralization of a firm within the supply network (Choi & Kim, 2008), by the widely used eigenvector centrality (Kim & Zhu, 2018). Eigenvector centrality enables a firm with "better partnering choices and establishes more stable partnerships" (Kim & Zhu, 2018, p. 10), indicating a firm's internal capability to deal with the undesirable consequences of depending heavily upon government customers. Specifically, we utilized all sample firms' buyer, supplier, and strategic alliance partner relationships to construct symmetric matrices for each year and computed the eigenvector centrality of each firm using R and its *igraph* package.

## Control variables

Following the guidance of Bernerth and Aguinis (2016) and Shiau et al. (2024), we controlled for several firm-level and contract-related variables while considering suggestions in prior literature regarding their potential influence on our proposed model. To account for firm-level factors, we included operational slack (available, potential, and recoverable slack) and market share as these variables directly pertain to a firm's internal operational dynamics (Bourgeois, 1981; Geiger & Cashen, 2002). *Available slack* measures the excess resources a firm possesses, *potential slack* gauges the capability to allocate resources for future strategic initiatives, and *recoverable slack* assesses the ability to recuperate resources in the face of adverse conditions. Specifically, *available slack* is current assets minus inventories divided by a firm's current liabilities (Geiger & Cashen, 2002). This element of slack represents the extent of a firm's readily available resources (Bourgeois, 1981). *Potential slack* is calculated using total long-term debt divided by total firm assets, demonstrating the firm's ability to secure resources using debt financing (Geiger & Cashen, 2002). *Recoverable slack* is operationalized as selling, administrative, and general expenses divided by total sales (Bourgeois, 1981) to capture the extent of the resources stored in the firm as excess costs that will be recovered when the firm experiences financial difficulty (Geiger & Cashen, 2002).

We included *performance aspiration*, calculated as the firm's ROA minus the industry average ROA, and *market share*, measured as the firm's sales divided by industry sales. *Performance aspiration* and *market share* offer an industry context wherein the firm can be influenced by

peers within the same industry. While *market share* is a key indicator of a firm's competitive position and its ability to attract and retain customers in a given market (Falcone et al., 2023), in the context of government customer concentration, controlling for a firm's *performance aspirations* becomes crucial as it helps to account for the motivational and strategic factors that may influence its strategy in including too many or too few government customers in its customer portfolio (Greve, 1998).

Regarding the contract-related factors, we controlled for the *contracting ratio* and *set-aside contracts*. *Contracting ratio* refers to the percentage of a firm's total revenue derived from government contracts. Firms with a larger contracting ratio may financially rely on government contracts and thus have distinctive characteristics, strategies, or operational dynamics compared to those with a lower contracting ratio. Controlling for the *contracting ratio* allows for accounting for these unobserved differences and focusing on the specific effects of other variables of interest. *Set-aside contract* is a dummy variable that indicates whether a firm is qualified for a *set-aside contract* or not. *Set-aside contracts* are the contracts awarded to small businesses, veteran-owned, women-owned, minority-owned, or other eligible suppliers (FPDS, 2022). Firms that were eligible for a *set-aside contract* were coded as 1, otherwise 0. Table 3 shows the correlation and descriptive statistics of all variables. The variance inflation factor (VIF) values for all variables varied from 1.01 to 2.24 with an average of 1.38, suggesting that multicollinearity was not a concern (O'Brien, 2007).

## Model specification, estimation, and endogeneity

The use of multiple data sources and control variables does not preclude endogeneity issues (Ketokivi & McIntosh, 2017; Radhakrishnan et al., 2014). Therefore, we tested our proposed model (equation 1) using 2SLS fixed-effects regression analysis including robust standard errors and year dummies. According to prior research, 2SLS fixed-effects regression analysis is employed when there is a need to address endogeneity concerns arising from omitted variables and reverse causality and to control for time-invariant unobserved factors in the data (Kim & Zhu, 2018). It is plausible to assume that government buyers exhibit a preference for firms that demonstrate improved financial performance, which introduces the potential for simultaneous relationships between the independent variable, government customer concentration, and the dependent variable, ROA. Hence, we employed 2SLS fixed-effects regression analysis.

TABLE 3 Correlations and descriptive statistics.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) ROA <sub>t+1</sub>	1.00											
(2) Gov. customer concentration	-0.09	1.00										
(3) firm size	0.35	0.05	1.00									
(4) absorptive capacity	0.31	-0.25	-0.32	1.00								
(5) network embeddedness	0.03	-0.23	0.12	0.09	1.00							
(6) contracting ratio	-0.13	0.19	0.29	-0.18	0.16	1.00						
(7) set-aside contract	-0.15	0.18	0.25	-0.13	0.09	0.53	1.00					
(8) market share	-0.13	0.06	0.46	-0.25	0.01	0.17	0.16	1.00				
(9) performance asp.	-0.33	0.01	0.33	-0.17	0.08	0.07	0.06	0.05	1.00			
(10) available slack	0.11	-0.02	-0.50	0.30	-0.03	-0.19	-0.17	-0.26	0.03	1.00		
(11) potential slack	-0.13	0.08	0.22	-0.17	-0.04	0.11	0.11	0.21	-0.02	-0.21	1.00	
(12) recoverable slack	0.33	-0.03	-0.44	0.47	0.01	-0.19	-0.12	-0.23	-0.36	0.22	-0.13	1.00
Mean	1.99	0.17	6.45	0.68	4.08	0.39	0.37	0.04	0.15	3.23	0.45	0.33
S.D.	1.41	0.12	2.43	0.26	2.98	0.30	0.48	0.01	0.01	2.38	0.95	0.25

Note: Correlations above |0.049| are significant at  $p < 0.05$ ; set-aside contract is a dummy variable with 1 = firm qualifies for set-aside contract, 0 = otherwise.

$$\begin{aligned}
 \text{Supplier ROA}_{it+1} = & \beta_0 + \beta_1 \text{gov.customer concentration}_{it} \\
 & + \beta_2 \text{gov.customer concentration}_{it}^2 \\
 & + \beta_3 \text{gov.customer concentration}_{it} \\
 & \times \text{firm size}_{it} \\
 & + \beta_4 \text{gov.customer concentration}_{it} \\
 & \times \text{absorptive capacity}_{it} \\
 & + \beta_5 \text{gov.customer concentration}_{it} \\
 & \times \text{network embeddedness}_{it} \\
 & + \beta_6 \text{gov.customer concentration}_{it}^2 \\
 & \times \text{firm size}_{it} \\
 & + \beta_7 \text{gov.customer concentration}_{it}^2 \\
 & \times \text{absorptive capacity}_{it} \\
 & + \beta_8 \text{gov.customer concentration}_{it}^2 \\
 & \times \text{network embeddedness}_{it} \\
 & + \beta_9 \text{firm size}_{it} \\
 & + \beta_{10} \text{absorptive capacity}_{it} \\
 & + \beta_{11} \text{network embeddedness}_{it} \\
 & + \beta_{12} \text{control variables}_{it} + \varepsilon_{it}
 \end{aligned} \tag{1}$$

To conduct 2SLS fixed-effects regression analysis, we first needed to identify and select instrumental variables. We also needed to estimate the relationship between the instrumental variables and the endogenous independent variable in the first stage of the 2SLS fixed-effects regression analysis (Ketokivi & McIntosh, 2017). This involved regressing the endogenous independent variable on the instrumental variables to determine their influence on the endogenous independent variable to effectively capture the variation in the endogenous independent variable that is explained by the instrumental variables.

Estimating this relationship in the first stage would allow for using the instrumental variables to predict the endogenous variable, providing an unbiased estimate of its effect on the dependent variable in the second stage of the 2SLS fixed-effects regression analysis.

We used two instrumental variables collected from FPDS-NG: *the number of offers received* and *industry government customer concentration*. The suitability of these two instrumental variables was shown in their conceptual correlation with the independent variable of interest (i.e., *gov. customer concentration*), but they are not directly associated with the dependent variable (ROA), thereby addressing endogeneity (Ketokivi & McIntosh, 2017; Radhakrishnan et al., 2014). Specifically, *the number of offers received* is the sum of the total count of bids received by a federal agency for a given year. In essence, *the number of offers received* reflects the attractiveness and competitiveness of the government contract bidding in general. *Industry contract concentration* draws on the Herfindahl–Hirschman index (Kim, 2017) and is calculated as the sum of the squaring of the firm's total number of government contracts divided by the industry's total number of government contracts (4-digit NAICS). Theoretically, these two instrumental variables correlate with the degree to which a firm is focused on conducting business with government agencies but are not directly correlated with firm performance. In other words, *the number of offers received* indicates the level of competition in government contracting, which can influence a firm's inclination to participate in such contracts.

TABLE 4 Results of the 2SLS fixed-effects regression analysis with ROA as the dependent variable.

Dependent variable	First-stage analysis						
	Gov. customer concentration	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Contracting ratio	-0.006 (0.03)	-0.001 (0.003)	-0.002 (0.001)	-0.002 (0.001)	-0.006*** (0.001)	-0.006*** (0.001)	-0.006*** (0.001)
Set-aside contract	0.011 (0.047)	0.006 (0.006)	0.006 (0.004)	0.006 (0.004)	0.013*** (0.002)	0.013*** (0.002)	0.013*** (0.002)
Market share	0.224 (0.461)	0.049 (0.037)	-0.013 (0.024)	-0.016 (0.024)	-0.028*** (0.008)	-0.027*** (0.008)	-0.029*** (0.008)
Available slack	-0.018 (0.015)	0.003* (0.002)	0.010*** (0.001)	0.010*** (0.001)	0.008*** (0.000)	0.008*** (0.000)	0.008*** (0.000)
Potential slack	-0.053 <sup>†</sup> (0.032)	-0.022*** (0.003)	-0.022*** (0.002)	-0.022*** (0.002)	-0.016*** (0.001)	-0.016*** (0.001)	-0.016*** (0.001)
Recoverable slack	-0.105 <sup>†</sup> (0.152)	-0.096*** (0.014)	-0.164*** (0.006)	-0.164*** (0.006)	-0.141*** (0.003)	-0.141*** (0.003)	-0.141*** (0.003)
Network embeddedness	0.455* (0.230)	2.516** (0.937)	1.583** (0.481)	1.535** (0.482)	2.834*** (0.227)	6.819*** (1.691)	4.753 (3.717)
Performance aspiration	-0.427*** (0.062)	0.031 (0.058)	0.086 <sup>†</sup> (0.048)	0.087 <sup>†</sup> (0.048)	0.103*** (0.016)	0.096*** (0.016)	0.099*** (0.016)
Firm size	-0.201*** (0.058)	0.018*** (0.005)	0.011*** (0.001)	0.002 (0.004)	0.011*** (0.000)	0.011*** (0.000)	0.014*** (0.003)
Absorptive capacity	-0.052*** (0.009)	0.036* (0.016)	0.158*** (0.011)	0.158*** (0.011)	0.771*** (0.145)	0.087*** (0.004)	0.977*** (0.194)
Number of offers received	0.071*** (0.018)	-	-	-	-	-	-
Industry contract concentration	0.083 <sup>†</sup> (0.050)	-	-	-	-	-	-
Gov. customer concentration		0.566** (0.197)	0.173** (0.053)	0.719* (0.304)	0.020** (0.005)	0.101* (0.049)	0.643*** (0.149)
Gov. customer concentration <sup>2</sup>		-0.168** (0.053)	-0.714* (0.304)	-0.141*** (0.003)	-0.099* (0.049)	-0.642*** (0.149)	-0.642*** (0.149)

TABLE 4 (Continued)

Dependent variable	First-stage analysis						
	Gov. customer concentration	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ROA <sub>t+1</sub>							
Gov. customer concentration * firm size				0.950* (0.390)			0.045* (0.018)
Gov. customer concentration <sup>2</sup> * firm size				0.087* (0.038)			0.048** (0.016)
Gov. customer concentration * absorptive capacity					0.176** (0.059)		0.317*** (0.077)
Gov. customer concentration <sup>2</sup> * absorptive capacity					1.085* (0.468)		2.281*** (0.606)
Gov. customer concentration * embeddedness						0.171 <sup>†</sup> (0.089)	0.161 (0.154)
Gov. customer concentration <sup>2</sup> * embeddedness						0.131 <sup>†</sup> (0.079)	0.143 (0.122)
Year dummies	Included	Included	Included	Included	Included	Included	Included
Constant	0.887* (0.419)	0.541** (0.188)	0.003 (0.003)	0.004 (0.003)	0.001* (0.001)	0.001* (0.001)	0.001* (0.001)
Observations	3,643	3,643	3,643	3,643	3,643	3,643	3,643
R <sup>2</sup>	0.282	0.173	0.190	0.200	0.217	0.377	0.292

Note: Standard errors in parentheses.

<sup>†</sup>p < 0.10.

\*p < 0.05.

\*\*p > 0.01.

\*\*\*p < 0.001.

*Industry contract concentration* gauges the extent to which an industry prioritizes government contracting. If a firm operates within an industry that heavily emphasizes government contracts, it can be expected to exhibit higher *government customer concentration*.

The results from the first-stage analysis are shown in the “first-stage analysis” column of Table 4 using *gov. customer concentration* as the dependent variable. Specifically, we regressed the independent variable, *gov. customer concentration*, on the two instrumental variables and all control variables. The results show the statistical suitability of both instrumental variables as *the number of offers received* has a positive relationship ( $\beta = 0.071$ ,  $p < 0.001$ ), while *industry contracting concentration* shows a marginal significant correlation ( $\beta = 0.083$ ,  $p = 0.09$ ).

Further instrumental tests were conducted, as shown in Table 5, to ensure the validity and robustness of the two selected instrumental variables (Ketokivi & McIntosh, 2017). We found statistically significant results for the Anderson–Rubin Wald test ( $\chi^2 = 18.394$ ,  $p < 0.001$ ) and Stock–Yogo test ( $\chi^2 = 19.923$ ,  $p < 0.001$ ), suggesting that the instrumental variables were exogenous and robust. Specifically, the Anderson–Rubin Wald test, also known as the overidentification test, evaluates the instrumental variables’ exogeneity by assessing the instrumental variables’ joint significance in the first-stage estimation. The result indicates the validity and appropriateness of the instrumental variables for addressing endogeneity. The Stock–Yogo test assesses whether the instrumental variables used are sufficiently strong to produce reliable estimates. A result of the Stock–Yogo test suggests that the instruments are strong and substantially impact the endogenous variable. Conversely, the Sargan test yielded a non-significant result ( $\chi^2 = 0.148$ ,  $p = 0.70$ ), indicating that the instrumental variables do not violate the overidentification restrictions and further confirming the robustness of the instrumental variables used in our analysis.

With the validity of the instrumental variables established, we obtained the predicted values of the independent variable using the *predict* command in Stata. We utilized these predicted values to generate the interaction terms in the subsequent stages of our analysis (Bellamy et al., 2014; Liu et al., 2016). Next, we focus on analyzing

the results of the main model, which examines the relationship between *gov. customer concentration* and firm *ROA* and the three proposed moderators.

## RESULTS

In our proposed theoretical model, *gov. customer concentration* has an inverse U-shaped relationship with firm *ROA*. Meanwhile, *firm size*, *absorptive capacity*, and *network embeddedness* moderate this inverse U-shaped relationship. Table 4 displays the results of the model testing. Model 1 in Table 4 serves as the base model, including the control variables and the direct effect of *gov. customer concentration* on firm *ROA*. The coefficient estimate for *gov. customer concentration* reveals a positive linear relationship with firm *ROA*. This finding remains consistent across all subsequent models (Models 2 to 6), providing a foundation for investigating the proposed curvilinear relationship between *gov. customer concentration* and firm *ROA*.

Model 2 in Table 4 introduces the squared term *gov. contracting concentration*<sup>2</sup> to test H1. This hypothesis states that government customer concentration has an inverse U-shaped relationship with firm *ROA* such that *ROA* will be the lowest at high and low levels of *gov. customer concentration*. The result of Model 2 provides support for H1 given that the squared term *gov. customer concentration*<sup>2</sup> is negative ( $\beta = -0.168$ ,  $p = 0.002$ ). Furthermore, we performed rigorous robustness checks on the inverse U-shaped relationship, in line with the procedure suggested by Haans et al. (2016). Detailed information regarding these checks can be found in the robustness checks section below.

Looking at the moderators, H2 to H4 posit that as *firm size* (H2), *absorptive capacity* (H3), or *network embeddedness* (H4) increases, a government supplier will perform better. In other words, we expected to see a flatter inverse U-shape as the moderators increase. These hypotheses are supported in Models 3 to 5 (see Table 4). In Model 3, the curvilinear interaction for *firm size* is positive as indicated by the coefficient of the term *gov. customer concentration*<sup>2</sup> \* *firm size* ( $\beta = 0.087$ ,  $p = 0.02$ ). This result suggests that as a supplier’s *size* grows, the inverse U-shaped *gov. customer concentration* and *ROA* will be alleviated, resulting in a flatter slope.

To demonstrate further insights into this moderating effect, a three-dimensional (3D) surface plot was created, as shown in Figure 2, including three variables: *gov. customer concentration* as the right abscissa (independent variable), *firm size* as the left abscissa (moderator), and *ROA* as the ordinate (dependent variable). The *ROA* surface plot changes as the values of the right abscissa and left abscissa change. When looking at *gov. customer*

TABLE 5 Instrument validation test.

Instrument validation test	$\chi^2$	p-value
Anderson–Rubin Wald	18.394	$p < 0.001$
Stock–Yogo	19.923	$p < 0.001$
Sargan statistic	0.148	0.701



FIGURE 2 The moderating effect of firm size.

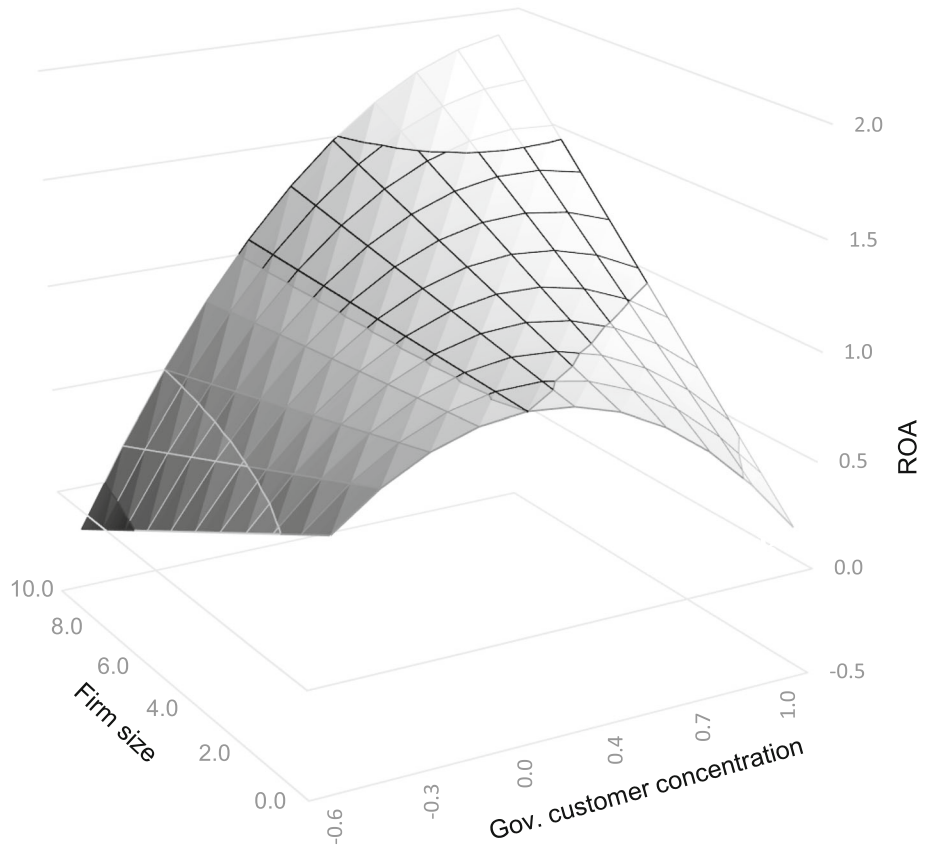
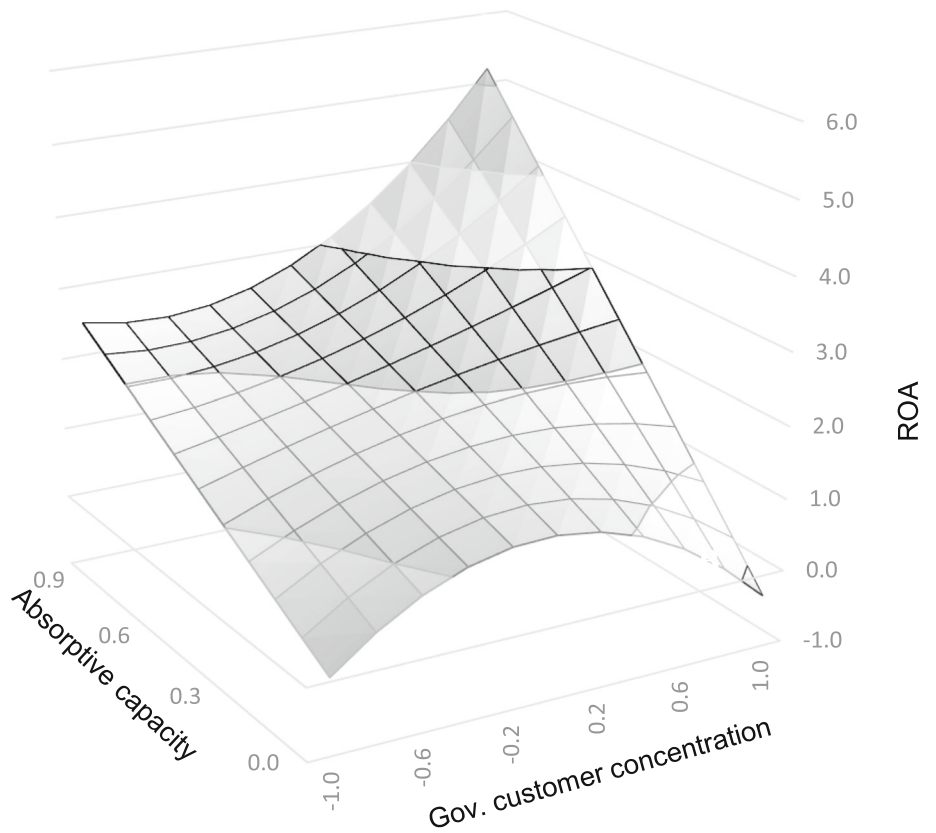


FIGURE 3 The moderating effect of absorptive capacity.



concentration and ROA, an inverse U-shape is shown as slope *AB*. Considering the moderator, when looking at *gov. customer concentration* and *firm size* together (left and right abscissae), the inverse U-shape flattens and approaches near upward linearity as shown by the far edge of the 3D surface (from *AB* to *CD*), suggesting that as the firm size increases, the inverse U-shaped relationship between *gov. customer concentration* and ROA flattens. Taken together, the 3D plot provides further support for H2.

The results of the moderating role of *absorptive capacity* are represented in Model 4 of Table 4. Figure 3 provides a visualization. The results support H3 as the coefficient of the interaction term *gov. customer concentration*<sup>2</sup> \* *absorptive capacity* shows a positive effect ( $\beta = 1.085, p = 0.02$ ). This suggests that as a firm gains stronger *absorptive capacity*, the inverse U-shaped relationship between *gov. customer concentration* and ROA will be mitigated, resulting in a flatter shape. Figure 3 provides a 3D visualization of this moderating effect. The plot supports our hypothesis as the curvilinear line *AB* becomes flatter while transforming to line *CD* as *absorptive capacity* increases. In fact, the 3D plot shows a phenomenon that Haans et al. (2016) termed “shape-flipping curves.” This phenomenon is not hypothesized in our

model; however, we suggest that this observed flipping effect merits future research attention.

Lastly, the results of the moderating role of *network embeddedness* are shown in Model 5, depicted in Figure 4. The results marginally support H4 as the coefficient of the interaction term *gov. customer concentration*<sup>2</sup> \* *embeddedness* shows a positive and marginally significant effect ( $\beta = 0.131, p = 0.09$ ). This suggests that as a firm gains greater *network embeddedness*, the inverse U-shaped relationship between *gov. customer concentration* and ROA will be mitigated, resulting in a flatter shape. Figure 4 provides a 3D visualization of this moderating effect, supporting our hypothesis that the curvilinear line *AB* becomes flatter while transforming to line *CD* as *network embeddedness* increases.

Model 6 of Table 4 shows the complete model with the independent variable, moderators, and all interaction terms. Consistent with the main results, we again see an inverse U-shaped relationship between *gov. customer concentration* and ROA ( $\beta = -0.642, p < 0.001$ ). In addition, *firm size* and *absorptive capacity* are positive and significant moderators ( $\beta = 0.048, p = 0.003$ ;  $\beta = 2.281, p < 0.001$ , respectively). However, the moderating role of *network embeddedness* is no longer significant. Taken together, the results largely support the proposed model

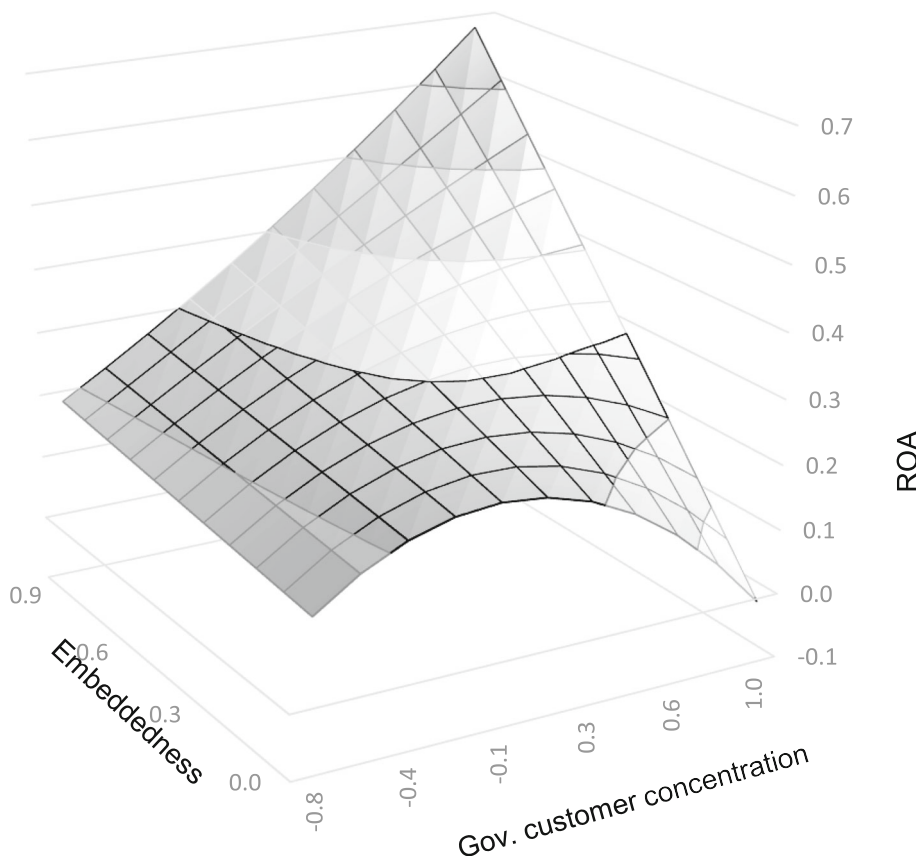


FIGURE 4 The moderating effect of network embeddedness.

TABLE 6 Robustness check using only manufacturing firms.

DV: ROA <sub>t+1</sub>	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Contract ratio	-0.002 (0.001)	-0.003 <sup>†</sup> (0.001)	-0.003 <sup>†</sup> (0.001)	-0.003 <sup>†</sup> (0.001)	-0.003 <sup>†</sup> (0.001)	-0.006*** (0.001)
Set-aside contract	0.010** (0.004)	0.010* (0.004)	0.010* (0.004)	0.010* (0.004)	0.009* (0.004)	0.015*** (0.002)
Market share	-0.038 <sup>†</sup> (0.021)	-0.039 <sup>†</sup> (0.021)	-0.041 <sup>†</sup> (0.021)	-0.039 <sup>†</sup> (0.021)	-0.039 <sup>†</sup> (0.021)	-0.040*** (0.008)
Available slack	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.009*** (0.000)
Potential slack	-0.021*** (0.002)	-0.022*** (0.002)	-0.022*** (0.002)	-0.022*** (0.002)	-0.022*** (0.002)	-0.016*** (0.001)
Recoverable slack	-0.176*** (0.006)	-0.177*** (0.006)	-0.177*** (0.006)	-0.177*** (0.006)	-0.177*** (0.006)	-0.149*** (0.003)
Network embeddedness	2.241*** (0.486)	2.177*** (0.486)	2.131*** (0.487)	2.178*** (0.486)	1.316** (4.272)	6.178 <sup>†</sup> (3.751)
Performance aspiration	0.111* (0.047)	0.115* (0.047)	0.116* (0.047)	0.113* (0.047)	0.116* (0.047)	0.109*** (0.015)
Firm size	0.012*** (0.001)	0.012*** (0.001)	0.004 (0.004)	0.012*** (0.001)	0.012*** (0.001)	0.015*** (0.003)
Absorptive capacity	0.181*** (0.010)	0.180*** (0.010)	0.180*** (0.010)	1.045** (0.340)	0.180*** (0.010)	0.933*** (0.196)
Gov. customer concentration	0.004 <sup>†</sup> (0.002)	0.177** (0.054)	0.693* (0.307)	0.131 (0.080)	0.156 (0.113)	0.638*** (0.149)
Gov. customer concentration <sup>2</sup>		-0.171** (0.054)	-0.687* (0.307)	-0.084* (0.038)	-0.150 (0.113)	-0.636*** (0.149)
Gov. customer concentration * firm size			0.093* (0.040)			0.041* (0.018)
Gov. customer concentration <sup>2</sup> * firm size			0.084* (0.038)			0.044** (0.016)
Gov. customer concentration * absorptive capacity				2.655 <sup>†</sup> (1.464)		3.019*** (0.781)
Gov. customer concentration <sup>2</sup> * absorptive capacity				3.604 <sup>†</sup> (2.122)		2.189*** (0.612)
Gov. customer concentration * embeddedness					1.789 (1.182)	2.107 (1.559)
Gov. customer concentration <sup>2</sup> * embeddedness					2.501 (1.853)	1.812 (1.235)
Year dummies	Included	Included	Included	Included	Included	Included
Constant	0.003 (0.002)	0.004 (0.002)	0.004 (0.002)	0.004 (0.002)	0.004 (0.002)	0.001* (0.001)
Observations	2,440	2,440	2,440	2,440	2,440	2,440
R <sup>2</sup>	0.145	0.146	0.146	0.147	0.147	0.232

Note: Standard errors in parentheses.

<sup>†</sup> $p < 0.10$ .

\* $p < 0.05$ .

\*\* $p < 0.01$ .

\*\*\* $p < 0.001$ .

with the exception of network embeddedness as the moderator.

## Robustness checks

To ensure the credibility of the inverse U-shaped relationship, we conducted a comprehensive multi-step robustness check, adhering to the approach outlined by Haans et al. (2016). The initial step of the robustness check involved confirming a significant and negative coefficient for the squared term of the independent variable before introducing any moderation terms. Our statistical analyses and the results presented above demonstrate that the squared term of the independent variable is both significant and negative, providing fundamental support for the existence of the inverse U-shaped relationship.

Furthermore, by utilizing the *margin* command in Stata, we validated that the slopes of the inverse U-shaped relationship's left and right sides are significantly steep, as indicated by the minimum and maximum values of the independent variable. Specifically, in the context of an inverse U-shaped relationship, we anticipated that  $\beta_1X + 2\beta_2X_L$  would be significant and positive. At the same time,  $\beta_1X + 2\beta_2X_H$  would be significant and negative, with  $X_L$  and  $X_H$  representing the minimum and maximum values of the independent variable (i.e., *gov. customer concentration*), respectively. Our margin tests provide supporting evidence for this assertion.

In addition, we calculated the turning point ( $-\beta_1/2\beta_2$ ) and ensured that it would stay within the data range of the independent variable. Specifically, we obtained a turning point of 0.515 (i.e.,  $-0.173/2(-0.168)$ ), suggesting that the turning point is within the range of *gov. customer concentration* (0–1).

Haans et al. (2016) also offered guidance on examining the moderating effect in nonlinear relationships; that is when positing a flattened moderating effect, a positive and significant coefficient for the interaction term ( $\beta_4$ ) should be observed. Specifically, the coefficient of the interaction term of the squared independent variable and moderator should be positive and significant. The results of Models 3 to 5 in Table 4 support this notion. When combined with Figures 2–4, the robustness checks reinforce our conclusion that a reverse U-shaped relationship exists between *gov. customer concentration* and *ROA*. Moreover, as *firm size*, *absorptive capacity*, and *network embeddedness* increase, this reverse U-shaped relationship is alleviated.

We performed additional analyses focusing on the manufacturing industry (NAICS codes 31–33) and utilizing an alternative firm performance measure, Tobin's

Q. The findings are presented in Tables 6 and 7, and they align with the results of the primary analysis. Specifically, in both tables, we first present the base model (Model 1) including all control variables. We introduced *gov. customer concentration*<sup>2</sup> to examine the presence of an inverse U-shaped relationship. Models 2 to 6 in both tables demonstrate consistent results indicating an inverse U-shaped relationship between *gov. customer concentration* and *firm performance*.

Intriguingly, our findings remained consistent when we employed Tobin's Q as an alternative measure of *firm performance* (Table 7) compared with the main model utilizing *ROA*. Previous studies have revealed the conflicting effects of the total number of government contracts on short- and long-term firm performance (*ROA* and Tobin's Q, respectively), suggesting that while an increase in the number of government contracts is associated with a rise in short-term performance, it leads to a decline in long-term performance (Falcone et al., 2023). Our study, focusing on government customer concentration from a customer portfolio perspective, reveals a nonlinear impact on both *ROA* and Tobin's Q. This highlights the complexity of understanding government contracting. By emphasizing the nuanced nature of managing government customers within a firm's portfolio, our results underscore that the conventional wisdom regarding a mere increase in the number of government contracts does not fully capture the intricate dynamics of government customer concentration and its implications for various performance metrics.

## Deepening our understanding with qualitative perspectives

To deepen the robustness and intricacy of our investigation, the research team undertook qualitative interviews to complement our archival data findings. These semi-structured interviews permitted a flexible and nuanced examination of government contracting, thereby enhancing the qualitative depth and context of our quantitative insights. Unlike the more rigid structure of quantitative methods, these interviews provided a valuable layer of reassurance, bolstering the credibility of our existing findings. The semi-structured design fostered open-ended conversations, enriching our comprehension of the multifaceted nature of government customer concentration and its effects on firm performance.

Following theoretical sampling guidelines, we concurrently collected, coded, and analyzed the data to develop, refine, and/or elaborate on the theory as it emerged (Belk, 1989). Data collection ceased upon

TABLE 7 Results of the 2SLS fixed-effects regression analysis with Tobin's Q as the dependent variable.

DV: Tobin's Q <sub>t+1</sub>	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Contract ratio	-0.121*** (0.014)	-0.114*** (0.014)	-0.112*** (0.014)	-0.114*** (0.014)	-0.113*** (0.014)	-0.148*** (0.006)
Set-aside contract	0.243*** (0.039)	0.232*** (0.039)	0.232*** (0.039)	0.232*** (0.039)	0.232*** (0.039)	0.169*** (0.018)
Market share	-0.384 <sup>†</sup> (0.214)	-0.394 <sup>†</sup> (0.214)	-0.392 <sup>†</sup> (0.214)	-0.393 <sup>†</sup> (0.214)	-0.391 <sup>†</sup> (0.214)	-0.747*** (0.080)
Available slack	0.066*** (0.006)	0.065*** (0.006)	0.064*** (0.006)	0.065*** (0.006)	0.065*** (0.006)	0.067*** (0.003)
Potential slack	-0.002 (0.019)	-0.003 (0.019)	-0.006 (0.019)	-0.004 (0.019)	-0.005 (0.019)	-0.028*** (0.008)
Recoverable slack	1.028*** (0.061)	1.015*** (0.061)	1.013*** (0.061)	1.015*** (0.061)	1.016*** (0.061)	1.218*** (0.026)
Network embeddedness	3.328*** (0.449)	3.423*** (0.4497)	3.435*** (0.497)	3.423*** (0.496)	4.695 (4.363)	1.557*** (0.388)
Performance aspiration	1.245** (0.476)	1.181* (0.476)	1.177* (0.475)	1.185* (0.476)	1.178* (0.475)	0.623*** (0.160)
Firm size	0.055*** (0.006)	0.061*** (0.006)	0.045 (0.038)	0.061*** (0.006)	0.062*** (0.006)	0.077* (0.032)
Absorptive capacity	0.890*** (0.106)	0.904*** (0.106)	0.907*** (0.106)	0.906*** (0.106)	1.826 (3.473)	0.381 (2.028)
Gov. customer concentration	0.070** (0.025)	2.638*** (0.553)	3.485 (3.139)	2.660** (0.820)	4.190*** (1.154)	13.920*** (1.545)
Gov. customer concentration <sup>2</sup>		-2.554*** (0.549)	-3.328*** (0.450)	-2.574** (0.818)	-4.102*** (1.152)	-13.895*** (1.545)
Gov. customer concentration * firm size			0.158*** (0.011)			1.676*** (0.187)
Gov. customer concentration <sup>2</sup> * firm size			0.087*** (0.004)			1.526*** (0.168)
Gov. customer concentration * absorptive capacity				5.248* (2.168)		12.941 (8.084)
Gov. customer concentration <sup>2</sup> * absorptive capacity				4.446* (1.893)		12.179 <sup>†</sup> (6.332)
Gov. customer concentration * network embeddedness					1.043 (1.496)	2.351 (1.613)
Gov. customer concentration <sup>2</sup> * network embeddedness					0.769 (1.208)	1.036 (1.277)
Constant	0.136*** (0.024)	0.149*** (0.025)	0.154*** (0.025)	0.150*** (0.025)	0.152*** (0.025)	0.040*** (0.006)
Observations	3,643	3,643	3,643	3,643	3,643	3,643
R <sup>2</sup>	0.310	0.390	0.390	0.391	0.390	0.392

Note: Standard errors in parentheses.

<sup>†</sup>p < 0.10.

\*p < 0.05.

\*\*p < 0.01.

\*\*\*p < 0.001.



reaching saturation (Glaser & Strauss, 1967). The final sample consisted of 15 decision-makers from 11 different firms engaging in government contracts. Table 8 details the sampling, participants, and organizations involved in government contracting, including CEOs, business owners, and upper-level managers. The diverse sample reflects a broad spectrum of factors, such as job tenure (ranging from 3 to 40+ years), job titles, responsibilities, firm size, and annual sales (approximately US\$3 million to US\$35+ billion). As displayed in the first column of Table 8, the participants predominantly represent manufacturers that supply aviation, industrial, pharmaceutical, or metal products to government entities. Table 9 contains the specific interview protocols.

The first several participating suppliers were identified using the snowballing technique through the logistics equipment manufacturer who inspired this research. Interviews were mainly conducted on-site and lasted from 40 to 90 minutes. Three of the 15 interviews were conducted online via recorded Zoom meetings due to the participants' scheduling challenges. The grand touring technique was used during the on-site interviews, meaning that interviews were conducted and recorded as the participants provided a tour of the manufacturing facilities to the research team. This approach enabled the participants to elaborate on their job responsibilities, the motivation behind government contracting, and the manufacturing procedures and features. This encouraged participants to think aloud and share their ideas, thoughts, and feelings in responding to the research team's gentle queries. Specifically, participants were asked to recall current or past personal experiences related to their involvement in government contracting.

Then the research team analyzed the first set of interview transcripts to compare their contents. During the comparing and contrasting process, the research team realized that the participants' stories converged on one contextual attribute: while they all emphasized the complexity of government contracting, they also highlighted varying motivations for engaging in such contracts, which determined a supplier's government customer concentration. Building on these preliminary insights, the research team interviewed representatives from more firms. This approach enabled emergent themes, guiding the researchers toward relevant existing theories to expand on.

The qualitative phase yielded three key understandings of government contracting that complement our research findings. First, suppliers are motivated by tangible and intangible benefits when contracting with the government, and these motivations determine their level of government customer concentration. In fact, contracting with the government is akin to receiving a

“legitimacy certification” ensuring a firm's status, image, and reputation, attracting future business and an even broader range of buyers. As a healthcare supplier (PM1) stated, “once you have a contract with CMS [Centers for Medicare and Medicaid Services], the second one goes far quicker. They immediately will look if you have one in place with no violations and immediately conclude that you're qualified because you're doing it.” Similarly, the owner of a metal parts company (MM) stated that “other government agencies reached out to us after seeing our product from our government buyer. It makes us very proud. We even included this on our company website.” While the tangible benefits, such as revenue and financial flows, are consistent with other types of contracting, the intangible benefits are unique to the government contracting context.

However, all participants described how challenging it was to fulfill the initial government contract and how a sense of confidence was achieved after successful fulfillment. This aligned with our research model in indicating that firm performance initially improves as government customer concentration increases but subsequently diminishes. “[W]e were ignorant prior to that [bidding on the contract] and then managed to get these contracts and were able to fulfill them, which was a bit of a surprise. If you can do that type of contract, then you could probably do other things too” (MM). “We even applied our government inspection system to the work that we do for a commercial line” (LM). This echoes prior literature distinguishing private buyers from government buyers (Falcone et al., 2023). Contracting with the government presents unique challenges as an inherent idiosyncratic buyer-supplier power imbalance exists. One participant complained:

[T]here was no negotiation with the government. It was take it or leave it, including price, terms, and conditions. On the provider side, most of us willingly said yes. On the vendor side, I was ready to walk away a couple of times. I mean, the price they required ... We've tried renegotiating three times and it barely covered our costs... So hard to deal with.

(PM2)

In the final analysis, examining successful suppliers unveiled several distinguishing factors shaped by specific supplier characteristics. The qualitative findings illuminate that supplier dependence effects vary across different contexts. Suppliers exhibiting growth in size, enhancement in absorptive capacity (learning), and expansion in network embeddedness (connecting) find

TABLE 8 Profile of participating firms and decision-makers.

Industry	Total participants	Description	Participant	Professional experience in leadership, operations, or related fields
Aviation and aerospace component manufacturing [AM1]	2	Manufacturer and service provider of control systems and control system components for aircraft engines, industrial engines and turbines, and power generation and mobile industrial equipment; ~7,000 employees; annual revenue of \$2.25 billion; 40 + locations in 13 countries.	Director, government contracts & compliance	Eight years of experience in the area; responsible for leading the contracts function for the company's defense & hydraulics business; direct oversight over business contract matters, including strategy, negotiation, drafting, review, approvals, interpretation, proposal support, order entry, and contract administration.
			Vice president, government customer concentration	Twenty-one years of experience in the area; responsible for leadership regarding government contractual matters, including adherence to contracts policy and associated objectives, business strategy, and compliance with applicable laws, including providing support for U.S. government contracts requirements under the Federal Acquisition Regulation (FAR) and defense Federal Acquisition Regulation Supplement (DFARS).
Aviation and aerospace components manufacturing [AM2]	2	Subsidiary of an aerospace and defense corporation; designs, develops, manufactures, markets, and services business jet aircraft; annual revenue of \$10 billion; 50 + locations throughout North America, Europe, the Middle East, and the Asia-Pacific region; ~13,000 employees	Government contracts manager	Seven years of experience in the area; manages the negotiation of terms and conditions, statements of work, contractor logistic support, site process audits, and pricing in accordance with FAR part 12 requirements.
			Procurement senior project manager	Eleven years of experience in the area; leads all purchasing, strategic sourcing, and supply chain management to provide support for internal customers supporting government contracts.

(Continues)

TABLE 8 (Continued)

Industry	Total participants	Description	Participant	Professional experience in leadership, operations, or related fields
Industrial products manufacturer [IM1]	1	Manufacturer of adhesives, abrasives, laminates, passive fire protection, dental and orthodontic products, electronic materials, medical products, car-care products, electronic circuits, and optical films; ~95,000 employees; annual revenue of \$35 billion; operations in 70 + countries.	Supply chain planning analyst	Three years of experience in the area; manages supply chain product flow to support government requirements; schedules procurement and manufacturing for a specified group of products and is a member of the government client team.
Information technology manufacturer and developer [IM2]	1	Software developer and computer hardware provider; >150,000 employees; annual revenue < \$160 million; operations worldwide.	Senior vice president, state local government	Three years of experience in the area; responsible for government contract sales for state and local clients, technical product and service support, market research, and analysis.
Industrial products manufacturer [IM3]	1	Distributor of critical components and security products; annual revenue of ~\$5 billion; ~80,000 employees; ~200 distribution facilities globally.	Director, customer service	Thirteen years of experience in the area; responsible for building and maintaining strong, long-lasting customer relationships, regular interaction with government agencies, after contract agreement.
Industrial products manufacturer [IM4]	1	Wholesale industrial supplier specializing in the distribution of maintenance, repair and operations (MRO) and power technology material; annual revenue of ~\$50 million; ~200 employees; four facilities in the United States.	Senior director of government sales and eCommerce	Eight years of experience in the area; directs sales, business development, and federal government contracts; manages P&L, eCommerce strategy, and export compliance.
Pharmaceutical manufacturing [PM1]	1	Healthcare manufacturer of medicines, pens, and needles; ~47,000 employees; annual revenue of \$21 billion; production facilities in eight countries.	Director of government pricing and compliance	Nine years of experience in the area; leads the analytical team in the development and implementation of programs to ensure government price submissions and procedures are compliant with all federal and state regulations.

TABLE 8 (Continued)

Industry	Total participants	Description	Participant	Professional experience in leadership, operations, or related fields
Pharmaceutical manufacturer and distributor [PM2]	2	Healthcare supply chain management solutions and medical supply distributor; annual revenue of \$20 billion; ~80,000 employees; global operations.	Project manager, government sales support	Fifteen years of experience in the area; manages projects for government account teams for sourcing new opportunities and assisting the bid and pricing process for government customer.
			Project manager, government solutions	Four years of experience in the area; leads projects related to government federal, state, and local solutions; customers and contracts, including federal supply schedules, communications, and reporting for government client.
Pharmaceutical manufacturer and distributor [PM3]	1	Medical supply manufacturer and distributor; annual revenue > \$200 million; ~50,000 employees; global operations.	CEO, cofounder of the company	Over 40 years of experience in the healthcare industry; actively interacts with government, particularly through healthcare equipment sales and installation in operation rooms and veteran hospitals, and provides other services to Medicare patients.
Logistics equipment manufacturer [LM]	1	Manufacturer of ratchet tie downs and stripes for trucks and other metal equipment used to secure inventories in transition; small and female-owned business; annual revenue of ~3 million; < 100 employees; global sourcing.	President, business owner	Over 40 years of experience in manufacturing logistics-relevant equipment; initiated interactions with government buyers through exhibitions, on-site visits, and personal interactions with government agents; witnessed the changes in government contracting over the decades, including digitalization, process improvement, and competition.
Metal parts manufacturer [MM]	1	Crafting small metal pieces used in camping tents, parachutes, tactical bags, military backpacks, etc.; annual revenue	CEO, business owner	Twenty-five years of experience in manufacturing small metal parts; contracted with government for a limited time (~3–

(Continues)

TABLE 8 (Continued)

Industry	Total participants	Description	Participant	Professional experience in leadership, operations, or related fields
		unknown; < 100 employees.		4 years); stopped contracting with government due to situation complexity.
Airlines, airports, and air services [as]	1	Passenger and freight airline; > 50,000 employees; annual revenue > \$18 billion.	Senior manager, Military & Federal Government	Five years of experience in the area; manages the government client account, including coordinating and leading the sales, marketing, operations, and supply chain account team.

TABLE 9 Interview protocol (see McCracken, 1988).

## Opening

- Introduction of interviewers and interviewees
- Background, title, responsibilities, and description of participants
- Overview of the purpose of the project
- Confidentiality assurance
- Permission to record

## Initial questions

- Describe your business operations in general.
- Describe the portion of your business that contracts with U.S. government agencies.
- Describe what it is like to contract/work with the government.

## Prompts

- What motivated your company to seek a contract with the government?
- What are the benefits and challenges?
- What have you learned from working with the government?
- Compare and contrast contracting with the government relative to working with a private business.
- To what level does your company rely on government customers?
- What role do you expect working with the government to play in your company's future?
- Has there been any indication that doing business with the government changed the perception of your company in the industry?
- Are there any additional benefits or challenges in working with the government beyond revenue?

## Floating prompts

- Can you provide examples of that?
- Can you tell a specific story about an experience of that?
- Can you elaborate on that?
- Can you describe how common (or rare) that situation is?

themselves empowered, and this diminishes the traditional buyer–supplier power imbalance. These standout features in superior suppliers meet our expectations, showcasing how suppliers mobilize their internal resources, derive insights from the business environment, and harness alternative resources through connections with other business partners.

For instance, participants from larger firms articulated how they set themselves apart as exceptional suppliers. They invest heavily in labor and other resources, aiming to fulfill contracts with greater efficiency. This emphasizes a proactive and strategic approach where suppliers not only respond to immediate contract demands but also innovate and adapt to create value and sustain long-term success. Thus, these findings paint a picture of the supplier's role beyond mere compliance, highlighting the importance of agility, resourcefulness, and strategic alignment with broader business goals: “Depending on the contract we get, sometimes we hire more people, buy more machines just to satisfy the contract” (AM1). In contrast, participants from smaller firms voiced the following:

We were so occupied, honestly, with solving our own problems, we had little time to even think about asking or trying to probe for other contracts, other—let's say—easy money or things coming down the pike that we could prepare for. So, this is just a reflection of the size of the business.

(MM)

The participants revealed that learning capability also plays an essential role in government contracting. For example, according to IM2, their firm planned to improve



innovativeness by adopting trendy technology: “We are looking at doing some things, like using AI to scan all our products so they are all dimensioned and we can speed up and be more accurate in our inspection of incoming products ... that kind of thing.”

Network embeddedness is the third prominent theme that participants consistently emphasized. They repeatedly used words and phrases such as “team,” “collaborators,” “we don’t go it alone,” and “looking for that ‘connector’ will help us” when referring to their connections with other firms in their business network. They emphasized the importance of their suppliers, third parties, non-profit organizations, associations, and other customers as resources to better manage the idiosyncratic challenges of serving government customers. For example, a participant commented, “other people we knew were in the business and had some familiarity with the bidding process, not necessarily for these types of products, but with the process in general. So, they were able to give me a heads-up on it” (LM).

Synthesizing quantitative insights with qualitative perspectives, our research delivers a thorough understanding of the complex dynamics surrounding government contracting. This approach advances a cohesive view by weaving the evidence to construct a nuanced understanding. Thus, our findings shed light on existing knowledge and pave the way for future explorations of government contracting.

## DISCUSSION

Our research emerged from an executive’s pursuit of research-backed evidence to gain deeper insights into how to effectively manage government buyers and achieve success as a government contractor. Indeed, incorporating government buyers into a firm’s customer base introduces a layer of complexity to the management landscape (Brown et al., 2007; Johnson & Selnes, 2005; Yan et al., 2015). On the one hand, government buyers present unique challenges due to their distinctive procurement processes, regulations, and bureaucratic procedures, which require specialized knowledge and coordination. However, this complexity also offers opportunities for businesses to tap into a stable and often substantial source of revenue, enhance market diversification, and strengthen their reputation through government affiliations. Balancing these intricacies while harnessing the benefits demands a strategic understanding of the dual nature of government contracting—a challenge that, when successfully navigated, can lead to improved overall firm performance and market positioning. Consequently, the following questions arise: What are the financial implications of government

customer concentration? More importantly, how do supplier factors, such as firm size, absorptive capacity, and network embeddedness, help suppliers thrive in government contracting?

This research explored these questions through archival data analyses using U.S. Federal purchasing and supply chain relationship records. Anchored in customer portfolio management theory and literature on customer base concentration, this research uncovered a curvilinear relationship between government customer concentration and firm performance, underscoring the dual nature of the benefits and costs associated with government buyers. In addition, the results reveal that suppliers’ capabilities to leverage their internal resources through (1) expanding in size, (2) actively learning, and (3) orchestrating alternative resources from network connections with other business partners can serve as remedies to alleviate the negative influence of government customer concentration (i.e., flattening the inverse U-shaped relationship). These results, complemented by our semi-structured interviews, offer a robust, multifaceted understanding of how government customer concentration impacts firm performance, thus enriching the discourse about this complex phenomenon.

## Theoretical implications

Our research contributes to advancing our knowledge in the SCM discipline with a specific focus on government customer concentration. First, this research contributes to customer portfolio management theory by incorporating information processing theory (McCue & Pitzer, 2000; Miller, 1956; Rogers et al., 1999). More precisely, the article sheds light on the advantages of engaging in business with the government and the complexities associated with handling information processing as government customer concentration intensifies. This contribution also echoes prior supply- and customer-base discourse. Our conceptual model provides a more comprehensive perspective on the customer base literature (Akin Ateş et al., 2022; Choi & Krause, 2006; Irvine et al., 2016). Navigating government procurement, which is characterized by its unique compliance standards, lengthy processes, and specific reporting requirements, presents distinctive operational hurdles (Falcone et al., 2023). Despite these complexities, government buyers can bring substantial benefits, such as long-term stability, consistent revenue streams, and enhanced credibility, through their association with government entities. Our theoretical framework, therefore, provides further insights into effectively handling government buyers as part of a firm’s customer portfolio.

Second, our results show a curvilinear relationship between government customer concentration and firm performance, highlighting the dual nature of the benefits and costs associated with government buyers. For government suppliers, it is clear that striking a balance is crucial as both excessive and insufficient levels of government customer concentration prove unfavorable for firms. Indeed, doing business with the government elicits divergent managerial perspectives (Brown et al., 2007; Yan et al., 2015). On the one hand, many managers recognize the potential advantages that government contracts can bring, such as steady revenue streams, enhanced brand visibility, and the opportunity to contribute to public projects. On the other hand, there is a prevailing apprehension about the complexities and costs involved in doing business with the government. This polarization calls for a sophisticated approach that acknowledges the potential gains and associated costs, steering firms toward informed decision-making when dealing with government buyers. The discovery of a curvilinear relationship between government customer concentration and firm performance in our research brings forth a critical theoretical framework that captures the dual nature of the benefits and costs associated with government buyers.

Extending the insights of Falcone et al. (2023), our research delved into the theoretical distinction between the financial and relational impacts of government contracts via customer portfolio theory. While Falcone et al. focused on the temporal effects of contract quantity on short- and long-term performance, we examined the nuanced implications of government customer concentration from a relationship portfolio perspective. This approach not only captured the financial repercussions, reflected in ROA and Tobin's Q, but also attended to the strategic, operational, and regulatory dimensions of these relationships. Our study advances the conversation by proposing that an optimal balance in government customer concentration, as evidenced by an inverse U-shaped relationship with firm performance, is more intricate than previously understood. We considered the full spectrum of a firm's engagement with government buyers and consequently provided a comprehensive framework for strategic customer portfolio management. This theoretical expansion is crucial for managers seeking to harness the benefits of government contracts while mitigating the associated risks and complexities.

Third, our findings shed light on a key facet: the extent to which firms can benefit from increased government customer concentration is contingent upon certain firm attributes. Specifically, firms that exhibit growing size, absorptive capacity, and network embeddedness are positioned to derive greater advantages as government

customer concentration intensifies. This nuanced understanding not only underscores the importance of strategic decision-making in government exchanges but also emphasizes the significance of specific firm characteristics in determining the outcomes of such engagement. In contrast to earlier studies that predominantly highlighted eigenvector centrality's importance as a structural characteristic within networks, our present research directs attention toward relational and connection perspectives. Importantly, our findings suggest that as firms grow in size and enhance their absorptive capacity, the moderating role of network embeddedness is no longer significant in the relationship between government customer concentration and firm performance. This finding underscores the critical importance for firms to prioritize aspects such as size and absorptive capacity over network embeddedness, particularly in the context of government customer concentration and firm performance. As indicated in the qualitative evidence, when firms grow in size, they often gain increased resources, capabilities, and market presence, which can enhance their resilience and competitiveness. Additionally, improving absorptive capacity enables firms to effectively acquire, assimilate, and utilize external knowledge and information, thereby enhancing their ability to adapt to changing environments and capitalize on opportunities.

## Managerial implications

Our research findings not only enrich the theoretical landscape of SCM but also equip practitioners with actionable knowledge to navigate the complexities of working with the government and achieving better performance outcomes. First, our research highlights the complex dynamics involved in supplying the government (Chan, 2003; Hawkins et al., 2011), shedding light on how leveraging the substantial buying power of government agencies can be both advantageous and challenging for suppliers in the private sectors (Quiroga et al., 2021). This insight is essential for managers seeking stable revenue streams from government contracts while acknowledging the need to navigate the unique complexities associated with such interactions.

Additionally, our research contributes by specifically investigating the impact of government customer concentration on firm performance. This framework provides managers with a comprehensive understanding of the potential effects of including government buyers within their customer portfolio (Johnson & Selnes, 2004). By identifying an inverse U-shaped relationship between government customer concentration and firm performance, our research offers managers a valuable

perspective on the potential trade-offs between the benefits and costs associated with government contracts.

Moreover, we identified supplier size, absorptive capacity, and network embeddedness as mitigating factors that alleviate the negative impact of government customer concentration and offered actionable insights for managers (Bellamy et al., 2014; Ferdows, 2006; Gaimon & Ramachandran, 2021; Kim, 2014). These findings, which are largely consistent with prior SCM literature, should enable managers to strategically address the challenges posed by government contracts. Specifically, we advise managers to prioritize internal growth regarding firm size, absorptive capacity, and network connections. Generally, managers should emphasize high-growth strategies over cash-flow generation when providing goods and services to governments. Among the growth strategies, expanding in size, such as through asset investment, appears to have the most significant impact as it helps to absorb and distribute the risks associated with resource uncertainty in high government dependence situations. Furthermore, if a supplier already has a wide network of business partners, it would be prudent to initially limit the number of government agencies it contracts with simultaneously. However, for those relying on the government for their financial performance, adopting a growth strategy that encompasses a diverse and well-connected supply chain portfolio can help to reduce uncertainty risks (Martin, 2022).

Overall, the insights into customer base management and the strategic management of government contracts derived from this research provide managers with practical guidance to enhance their supplier engagement with government buyers and develop effective strategies for managing their customer portfolio in the context of government procurement.

## Societal implications

Our results also indicate that government buyers can play a pivotal role in increasing awareness and enhancing societal benefits through specific actions. These actions may include implementing robust public awareness campaigns, fostering transparent communication channels, and actively engaging with the community through their supplier. Moreover, government buyers can promote initiatives that prioritize social and environmental considerations, and thus positively impact society. By incorporating sustainable practices, supporting local businesses, and prioritizing ethical procurement, government buyers can contribute significantly to the community's overall well-being. These actions are instrumental in cultivating a more informed and engaged public while fostering positive social and environmental outcomes.

Another avenue for understanding the impact of government customer concentration lies in government support for innovation and technology adoption among suppliers. The government can invest in innovative solutions and technological advancements that empower suppliers to build internal capabilities that minimize dependence risks and enhance overall performance. This strategic alignment can lead to a more resilient and responsive supplier ecosystem that is better equipped to navigate challenges while delivering value to society.

## Limitations and future research

We acknowledge several limitations in this research that present valuable paths for future research. First, our data collection centered on U.S. federal government customer concentration, including interviews and panel data. Future research could expand the scope to government customer concentration in different countries. Second, our research examined government customer concentration as an aggregated issue instead of exploring the relationship with different government agencies. Future research can involve an in-depth case study that delves into the intertwined relationships of a focal supplier that contracts with diverse agencies. Lastly, this research was limited to the pre-Covid-19 period, which can be a limitation. Governments function differently and have dramatically different expectations when facing a global disruption. Future research should consider investigating supplier dependence on government buyers during a major disruption.

## CONCLUSION

In conclusion, this research delves into the intricate landscape of government procurement, shedding light on the multifaceted interplay between firms and government buyers. This research uncovers the impact of government customer concentration on firm performance through a meticulous examination informed by customer portfolio management theory and customer base concentration literature. With the empirical analysis encompassing a substantial dataset, the research identified a nuanced inverse U-shaped relationship between the degree of government customer concentration and firm performance.

This research extends beyond academia to offer valuable insights with significant implications for both practitioners and policymakers. It contributes to enhancing the comprehension of customer base management specifically in the context of supplying the government. The

implications of this research ripple through various dimensions, from informing policy decisions that promote fair competition and economic growth to aiding businesses in optimizing their performance in government contracts.

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