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Examining the Effects of Set Aside Policies on Competition and Growth for Small and Mid-Sized Suppliers[1]

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Abstract

We examine the federal small business set aside program and assess the impact of small business set asides on supplier competitiveness, program participation, and firm growth. We track the performance of over 700 small businesses over a 10-year period (FY2005–FY2014). We analyze firm-level characteristics and attributes of their federal contracting portfolios. Our exploratory study tests hypotheses to (a) determine whether there is a difference between firms that remain a small business throughout the 10-year period and those that transition to the middle market and become mid-sized firms, and (b) establish a framework for future study.

Our preliminary results show that there are differences between firms that remain a small business during the 10-year period and those that grow into the middle market. Firm attributes that differ include whether the business is woman-owned, the creditworthiness of the firm, firm efficiency, and the firm's number of corporate relationships. Federal portfolios are also different between the two groups. Firms that grow into the middle market on average have contracts in more agencies, across more product or service lines, and have more contract actions related to multi-award vehicles.

Introduction

Small firms benefit from set asides and other programs offered by the U.S. Small Business Administration (SBA). Alternatively, large companies have internal capacity, scale, and extensive past performance history to compete in the public procurement market by bringing financial, personnel, and political resources to bear to win and execute contracts. Mid-sized firms are essentially left out—they are too big to qualify for set asides, yet do not have parity with large firms against whom they are competing for procurements. Anecdotal

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evidence of this disparity exists (perhaps best underscored by the work of trade associations such as the Association for Corporate Growth, Mid-tier Advocacy, GTSC-Lion's Den, and the development of the bi-partisan Congressional Caucus for Middle Market Growth). However, there is a dearth of empirical evidence on both the structural barriers that exist for middle market firms and the effects of their competitive disadvantage. In the absence of empirical study, notions and rhetoric prevail. This study begins to clarify these claims by analyzing the contours of the competitive federal procurement market for small and mid-sized suppliers.

Inequities in the public procurement market are not an insignificant concern. The scale and scope of the federal procurement market is vast, with over 5,000 different types of products procured (Brown, 2013), and over $438 billion in contracts obligated in 2015 (accounting for approximately 2.5% of GDP). "Middle market" firms account for one-third of private sector GDP and one-third of U.S. jobs. (We use the National Center for the Middle Market definition of "middle market," firms with annual revenues between $10 million and $1 billion.) However, it remains unclear whether mid-sized firms are correspondingly represented in the federal procurement market. A recent study by the Center for Strategic & International Studies (CSIS) suggests the answer is no (Ellman, Morrow, and Sanders, 2011). The CSIS study found that mid-size market share of federal professional services contracts is shrinking. Mid-sized contractors claimed 40% of the total value of federal professional services contracts in 1995, but only 30% in 2009. During the same time period, large contractors have increased their market share from 41% to 48%, and small business market share increased from 19% to 22%. Understanding the barriers to competition, purported disparities, and structural policy effects that impede the middle market firms' ability to compete for federal contracts will have a significant impact on understanding their capacity to capture market share, grow business, and deliver value to federal agencies.

Our study of the supply-side of public procurement builds on extant literature undertaken to develop and test theories of the demand-side of public procurement. We examine the federal small business set aside program and assess the impact of small business set asides on supplier competitiveness, program participation, and firm growth. As there is little direct empirical evidence to draw upon in crafting the study, we test hypotheses to establish an agenda for future research in this exploratory study. Specifically, we ask whether there is a difference between firms that remain a small business throughout the 10-year period and those that transition to the middle market. To do this, we track the performance of over 700 small businesses over a 10-year period (FY2005–FY2014). We analyze firm-level characteristics and attributes of their federal contracting portfolios. The sample of firms is randomly selected and includes firms with contracts for products varying in complexity, from simple product procurements to more complex services contracts (e.g., IT systems).

We postulate that there are unique drivers for firms that grow into the middle market because the incentives are so strong to remain a small business, even if that means stymied growth. We expect that firms that successfully transition out of the small business market have unique ways of overcoming the "benefit cliff" they encounter as they grow. We consider whether current policies governing procurement hamper mid-sized firm competitiveness in the federal procurement market and dampen U.S. economic growth.

Our preliminary statistical tests reveal differences between firms that remain a small business during the 10-year period and those that grow into the middle market. Firm attributes that differ include whether the business is woman-owned, creditworthiness, firm efficiency, and the number of corporate relationships. Federal portfolios are also different between the two groups. Firms that grow into the middle market on average have contracts in more agencies and across more product or service lines, and have more contract actions related to multi-award vehicles.

Our paper proceeds as follows. First, we provide context for the study by describing the federal policy environment for small and mid-sized suppliers. We synthesize two lines of inquiry—contracting and external market dynamics—to build a framework for assessing the impact of inclusion policies and market conditions on small and mid-sized businesses and federal purchasing agencies. Second, we outline findings from the management and entrepreneurship literature on the growth drivers for small and mid-sized enterprises. Next, we introduce the research design of our broader research project, then present the data, measures, and method of this study. We then offer preliminary findings from our statistical analysis. We conclude by discussing potential alternatives to explain the findings and address wider implications of the study.

Set Aside Policies in Federal Procurement

We begin by considering initiating legislative action that established small business guidelines and the Small Business Administration (SBA). The first substantive guidance directed to federal agencies to contract with small businesses originated in the U.S. Senate in 1940 with the Special Committee to Study and Survey Problems of Small Business Enterprises, and in the U.S. House of Representatives in 1941 with the Select Committee on Small Business. The Committees were created to protect the interests of small business owners, recognizing the need for a thriving small business community for innovation, economic growth, and national security. The Small Business Act of 1953 explicitly stated that government prime contracts and subcontracts should be awarded to small business, and later the Small Business Act of 1958 created the SBA, an independent agency within the Executive branch. In 1975, the Congressional Committee on Small Business was made a permanent standing committee to, in part, oversee the SBA. The Senate followed suit in 1981 when it created the standing Committee on Small Business, which in 2001 was renamed the Committee on Small Business and Entrepreneurship (Office of Small Business Programs, n.d.; Senate Committee on Small Business & Entrepreneurship, n.d.; Small Business Committee, n.d.).

The SBA establishes overall and agency-specific procurement goals. One federal procurement goal is statutorily established as 23% of contract value of prime contracts for small businesses. There are goals within that subset, such as 5% of prime and subcontracts awarded to woman-owned small businesses and 5% of prime and subcontracts to small disadvantaged businesses, among others. Agencies biennially negotiate their targets with the Small Business Administration in order to meet government-wide goals. In FY17, goals ranged from 10% at the Department of Energy to 73% at SBA. Additionally, federal agencies set annual goals for subcontracts. For example, the Department of Defense's prime contract goal is 22% in FY17, but the subcontracting goal is 34%.

Small business procurement policies can be viewed as largely "policy ambivalent," perhaps best illustrated by preferences toward supporting small and mid-sized firms through aspirational, goal-oriented policies rather than enforcement (Kidalov & Snider, 2011). Current approaches to meet procurement goals rely heavily on administrative discretion, and yet as Snider, Kidalov, and Rendon (2013) found, discretion has been considerably reduced in recent years.

In practice, acquisition officials are asked to deliver contracts that meet best value, low cost, or other performance objectives, and to meet broader political objectives that can affect (constrain) eligible suppliers. Public sector contracts are not simply a tool to increase efficiency; they can also serve to promote other public values. Procurement policies that target specialized groups, such as small businesses, minority-owned, or women-owned firms, are designed to promote equity and representativeness. As with most government policies, unintended adverse effects can result in pursuit of overcoming market failures (Vining & Weimer, 2005). Whereas competition is a basic assumption underlying public sector procurement, procurement policy and regulation favoring small businesses restrict competition and contribute to weakly competitive procurements (Girth et al., 2012). When markets are constrained, purchasers have fewer choices to balance different, and sometimes competing, purchasing goals (Brown, Potoski, & Van Slyke, 2013; Johnston & Girth, 2012). Set aside policies can further constrain market competition to a narrow pool of suppliers and thereby limit the range of cost, quality, and delivery options for goods and services procured under said programs (Brown, 2007). Despite the prevalence and importance of inclusion policies in federal procurement, very little is known about the design or impact of these programs on purchasing agencies or the supplier market.

Growth Drivers: Small and Mid-Sized Businesses

Set asides and supplier diversity efforts are not limited to public procurements; rather, there are competitive advantages in the private market for diverse supplier representation (Richard, 2000). Small businesses have advantages over large firms in that they are more responsive and innovative, in part because they can be more swift and flexible (Dean et al., 1998). Yet as Dobbs and Hamilton's (2007) extensive review of the literature demonstrated, there is no single deterministic factor in predicting firm growth. They also concluded that scholarly understanding of growth for small and mid-sized enterprises is inadequate.

Research on the growth of small and medium-sized enterprises has focused on managerial strategies, leader characteristics, environmental factors, and firm attributes such as human resource, organizational, marketing, and financial capabilities (Barbero, Casillas, & Feldman, 2011; Dobbs & Hamilton, 2007). There are factors within each of these categories that have significant explanatory effects on small business growth. First, a number of studies cite the positive impact of the availability of resources and external financing on firm growth (Becchetti & Trovato, 2002). Lack of cash flow and access to external financing can hinder growth by limiting availability to manage operations and capturing strategic market opportunities (Carter & Van Auken, 2005; Locke, 2005). Younger firms also tend to experience more rapid growth (Lotti, Santarelli, & Vivarelli, 2003). While firm size, whether number of employees or revenues, is a measure of growth, it can also be a determinant of growth rates (Evans, 1987).

Owner motivation (and then lack of motivation to grow once the owner has reached sufficient income) can drive growth trajectories for small businesses (Robson & Bennett, 2000). Leadership characteristics are also a determinant of firm growth, culturally establishing a growth orientation (Barringer & Jones, 2004). Although as Smallbone, Leig, and North (1995) found, developing internal capacity to allow for strategic leadership is an important factor in small business growth. In addition to internal strategy, externally-facing actions such as developing collaborative relationships through trade associations, lobbying and other external alliances can precipitate growth (Robson & Bennett, 2000).

Finally, pursuing differentiation strategies appear to correlate to small business growth. Small businesses do this by actively managing their products and markets (Smallbone et al., 1995) and innovating to compete in markets with larger firms (O'Gorman, 2001). In sum, there are a number of factors that emerge in the management and entrepreneurship literature that predict small business growth. We assess a number of these factors in our study by testing differences among small businesses operating in the federal small business set aside market.

Data and Method

Research Design

We examine the performance of small businesses contracting with the federal government by randomly selecting 1,025 businesses that have taken advantage of the small business set aside program in 2005 (i.e., they have at least one contract action associated with a small business set aside prime contract). We stratify the sample such that 60% of contracts are Department of Defense (DoD) contracts to mirror federal spending. The sample includes firms with contracts for products and services varying in complexity, from simple product procurements to more complex services contracts such as IT systems.

The unit of analysis is firm-year. This permits us to analyze the annual performance of sampled firms over a 10-year period, and includes firm attributes and their federal contracting portfolio.

Our methodological approach is descriptive, as we begin to understand the differences between small businesses that strategically stay small and those that attempt to grow beyond the small business market. This research is our first step in a large research project aimed at disentangling the procurement environment for small and mid-sized suppliers.

Data

Data is gathered from two sources: Federal Procurement Data System-Next Generation (FPDS-NG) and Dun & Bradstreet. Contracts data for each of the sampled firms is compiled from FPDS-NG. Data on firm attributes is procured from Dun & Bradstreet. The unit of analysis is firm-year. Contracts data from FPDS-NG is aggregated to account for contract activity for each fiscal year. Dun & Bradstreet data is reported annually. The data sets are then merged by firm-year. The process for cleaning, coding, and merging the data sets is documented in the appendix.

Some of the firms that have contract actions categorized as a small business set asides in 2005 already “outgrew” their small business status. That is, they no longer self-certified as a small business by the SBA. (Firms self-certify through the SBA and their revenue and/or employee thresholds are reported on a three-year rolling average.) These firms are excluded from our present study.

The purpose of this analysis is to describe the difference between firms that were small businesses throughout the 10-year period, and those that outgrew their small business status at some point over that time period. Those that reverted back to small were excluded from this study. As such, this dataset includes 721 firms that started as small businesses in 2005 and remained small businesses through 2014, and 46 firms that started as a small business in 2005 but grew into the middle market at some point during the 10-year period. As observations are firm-year, we have a total of 7,670 observations in the dataset.

Measures

Our dependent variable, *small business*, is binary with 0 representing small businesses that started small in 2005 and stayed small through 2014 (n=7,210) and 1 representing firms that started small in 2005 and grew into the middle market at some point during the time period (n=460). Dun & Bradstreet retrieves data for this variable directly from the SBA.

Our independent variables include firm characteristics and federal contracting portfolio attributes, which are listed below. Descriptive statistics are found in Table 1.

Firm Characteristics

- *Credit rating*. Credit worthiness scored by Dun & Bradstreet analyst. 1=limited, 2=fair, 3=good, 4=high. Source: Dun & Bradstreet.
- *Minority ownership*. Indicates whether a minority owns a majority of the business. 1=minority-owned, 0=not minority-owned. Source: Dun & Bradstreet.
- *Woman ownership*. Indicates whether a woman owns a majority of the business. 1=woman-owned, 0=not woman-owned. Source: Dun & Bradstreet.
- *Firm age*. Contract year (2005–2014) less the year business started. Source: Dun & Bradstreet.
- *Lines of business*. Number of lines of businesses in which the organization is engaged. Source: Dun & Bradstreet.
- *Number of DUNS family members*. Number of corporate family relationships identified by Dun & Bradstreet. Source: Dun & Bradstreet.
- *Number of employees*. Total number of employees in the organization. Source: Dun & Bradstreet.
- *Annual Sales.* Total annual sales volume. Source: Dun & Bradstreet.
- *Efficiency*. Value to determine efficient use of labor resources. Derived by dividing total annual sales volume by the number of employees.

Federal Contracting Portfolio

- *Agency diversity*. Count of the number of federal agencies the firm has contracts with for a contract year. Source: FPDS-NG
- *NAICS diversity*. Count of the number of different NAICS the firm's contracts are specified for a contract year. NAICS are aggregated to the first two digits (e.g., naics53, naics54). Source: FPDS-NG
- *PSC diversity*. Count of the number of different PSCs the firm's contracts are specified for a contract year. PSCs are aggregated to the first two digits for products (e.g, psc70, psc71) and the first letter for services (e.g., psca, pscb). Source: FPDS-NG
- *Contract actions associated with IDV*. Number of contract actions that are associated with an indefinite delivery vehicle (IDV) for a contract year. Source: FPDS-NG

Table 1. Descriptive Statistics

Variable	Obs	Mean	St dev	Min	Max
Small business	7,670	0.599	0.237	0	1
Credit rating	4,942	2.463	0.687	1	4
Minority ownership	7,249	0.165	0.372	0	1
Woman ownership	7,249	0.264	0.442	0	1
Firm age	6,902	25.12	20.01	0	214
Lines of business	7,249	1.452	0.849	1	6
No. DUNS family (log)	7,249	0.228	0.797	0	8.62
No. of employees (log)	7,249	2.423	1.232	0	6.55
Annual sales (log)	7,249	13.46	2.442	0	19.2
Efficiency	7,249	7.032	4.087	0	21.5
Agency diversity	4,384	1.978	2.712	1	40
NAICS diversity	4,384	1.574	1.039	1	10
PSC diversity	4,384	2.450	2.727	1	24
Contract actions – IDV (log)	4,384	0.846	1.292	0	7.56

[1] Observations vary due to missing values.

Method of Analysis

As we are undertaking an exploratory study, we descriptively analyze two groups by performing difference of means tests across a number of theoretically relevant variables. Across all cases, *small business* is the dependent variable. We ask: Is there a difference between firms that remain a small business throughout the 10-year period and those that transition to the middle market? We use appropriate parametric and non-parametric testing (t-test and chi-square) based on the distribution of the independent variable.

Results

Hypothesis testing reveals that there are differences between the firms in our sample that remained small businesses and those that grew into the middle market. We find key differences in firm characteristics and in their federal contracting portfolio. The results of our analysis are reported in Table 2.

Among the firm characteristics we measure, we find that firms that outgrew the program and emerged into the middle market were less likely to be woman-owned firms; however there was no significant difference among firms that were minority-owned. For both women-owned and minority-owned firms, there are additional set aside goals that benefit these firms, potentially making the transition to the middle market even less attractive.

The firms that emerged into the middle market have lower average credit ratings. This is a curious finding, considering that small business growth is found to be tied to access to external findings, and creditworthiness is a key predictor. These firms are also markedly less efficient (4.86 logged) than the firms that remained small (7.48 logged), when we measure efficiency as a function of sales revenue and number of employees. There also might also be greater risk tolerance among the firms that emerge in to the middle market, as indicated by the slightly lower credit scores, and lower efficiency measures. Another explanation for lower efficiency measures is the investment in internal infrastructure to facilitate growth, which would in turn depress the efficiency measure we utilize. We find differences in annual sales and number of employees between the two samples, which is expected and serves as a validity check, as those are the factors that drive qualification for the SBA program.

The other striking difference between the two groups in the sample is the number of DUNS family members. Firms that grow into the middle market have a far higher average number of DUNS family members (1.78 logged) than those that remain a small business (0.12 logged). This likely indicates that some of the firms that emerge into the middle market have been acquired.

Analyzing features of the firms' federal contracting portfolios, we find that firms that grow into the middle market have greater agency diversity. That is, they have greater breadth across the federal government, operating on average in 2.77 different agencies as compared to firms remaining a small business which operated on average in 1.99 agencies. We also observe that firms that emerge into the middle market were more likely to have contracts classified in more NAICS codes (average of 1.89 compared to 1.55) and PSCs (average of 23.4 compared to 2.38) than those that remained a small business. This might mean that these firms engage in different functional areas, or that they are adept at navigating thresholds for varying NAICS codes in accordance with their SBA self-certification.

Firms that emerge into the middle market are also more likely to have a greater number of contract actions associated with multiple-award contracts. Firms emerging into the middle market have an average of 1.07 IDV-related contract actions compared to an average of 0.83 among small businesses (values are logged).

Table 2. Results of Statistical Tests

	Small business (0)			Outgrew (1)			
Variable	Obs	Mean	St er	Obs	Mean[1]	St er	t-stat
Credit rating[2]	4,593	2.47	0.10	349	2.35*	0.03	2.968
Minority ownership[2]	6,792	0.16	0.00	457	0.15	0.01	0.353
Woman ownership[2]	6,792	0.27	0.01	457	0.12*	0.02	7.235
Firm age	6.479	25.1	0.25	423	24.5	1.05	0.683
Lines of business	6,792	1.45	0.10	457	1.47	0.38	-0.513
No. DUNS family (log)	6,792	0.12	0.00	457	1.78*	0.11	-49.96
No. of employees (log)	6,792	2.34	0.14	457	3.55*	0.06	-2.017
Annual sales (log)	6,792	13.5	0.03	457	13.7*	0.22	-49.96
Efficiency (log)	6,792	7.48	0.49	445	4.86*	0.16	13.23
Agency diversity	4,070	1.91	0.04	314	2.77*	0.20	-5.391
NAICS diversity	4,070	1.55	0.02	314	1.89*	0.07	-5.741
PSC diversity	4,070	2.38	0.04	314	23.4*	0.21	-6.264
Contract actions – IDV (log)	4,070	0.83	0.02	314	1.07*	0.08	-3.161

[1] *p<0.00, Two-tailed tests

[2] *t*-test results reported are ease of reporting, chi-square analysis performed and results consistent with *t*-test

We have not included measures on competition in this analysis. We suspect that there will be differences among the two groups related to their competitive positioning in the federal market and their use of the small business set asides. We intend to include these measures in future studies.

Discussion

Our preliminary results yield interesting findings on the differences between the two groups of small businesses in this study. Small businesses that grow into the middle market are not just unique in their sales volume and number of employees, but also in financial and managerial aspects. Their federal contracting portfolios yield higher levels of activity in federal markets, across product lines, and in multiple-award contracts. These findings indicate further exploration is needed to discern the impact of each of these factors, among others, on emergence into the middle market. In this section, we explore some of the possible explanations for the patterns we observe. We also discuss future research opportunities in light of our exploratory study.

Our interest in this research lies in the intent of the small business set aside program and the practical implications of the constrained competitive environment. The vast majority of firms in our sample shelter in the small business set aside market. They fail to grow beyond the sales or employee thresholds in the product or service areas they have self-certified in. In most cases, firms in our sample elect to stay small. These firms recognize the value of the constrained federal market established for small businesses. Their clients also value their small business status, allowing for more desirable procurements as they help to achieve the agency's small business goals. In other cases, we suspect small businesses are unable to harness the resources, whether financial or managerial, to grow.

When firms make strategic decisions to stay small in order to retain small business status for federal procurements, they artificially constrain their growth in order to stay under the revenue or employee thresholds for specified NAICS. If the intent of federal policies to support small business is to encourage economic growth and innovation, then firm behavior does not necessarily align with these goals. The behavior, albeit rational on the small businesses' part, is an unintended consequence of creating markets and subsidizing subsets of industry.

To that end, there are 77 firms in our larger dataset that moved in and out of the small business market two or more times during the 10-year time period we studied (but that were not included in this study). These firms started as small businesses, grew into the middle market, and then re-certified as a small business after at least one year. We suspect there are also different attributes that drive this behavior among firms in this group and intend to explore this in future research. Yet this phenomenon reinforces questions about the behaviors of firms that are not able to thrive as they emerge into the middle market, and either intentionally constrain to fall meet small business thresholds in later years or fail to win contracts when competing outside of the set aside market.

In addition to the future work already identified, we plan to use interviews to qualitatively explore the varying strategic positioning by firms. In particular, to what extent do perverse incentives to curb growth impact broader economic growth? Interviews will also help us to identify other strategies not gleaned from these data that impede or support firm growth into the middle market.

Should some of these relationships hold as we apply more advanced econometric models to these data, several policy implications might bear out. These include strategies to support lasting transition to the middle market. While there is little drive to create additional set aside categories aimed to benefit mid-sized firms (particularly those at the lower threshold of the middle market), it remains a policy option to carve out a niche in the small business space to support mid-sized transition. There are also other ways the federal government could support suppliers in the middle that are neither large nor small. Creating federal supply schedules for mid-sized suppliers is one alternative that has been advanced by trade associations supporting mid-tier suppliers.

Another key issue for policymakers to consider is the way in which procurement policy and regulation treat federal suppliers. Procurement policy and Federal Acquisitions Regulation (FAR) recognize only two categories of suppliers: small business and not small. Small firms experience a significant "benefit cliff" as they grow out of the small business market. Treating mid-sized firms, particularly those at the lower threshold of the market, as large firms might be adversely affecting public value. On the one hand, a mid-sized firm may be leaner and be able to aggressively price proposals to compete with larger firms. On the other hand, mid-sized firms do not have robust internal resources or past-performance qualifications to technically compete for procurements, compared to large firms. Under this scenario, the government may be losing an opportunity to secure value by not actively seeking contracts with mid-sized firms. It is understood that small businesses are higher risk suppliers. Unlike large firms, their internal processes are immature, and resource shocks can have profound effects on a small enterprise and their clients. Large firms largely mitigate that risk, but can be costly. Mid-sized firms can be well suited to provide value at lower risk than small firms and lower cost than large. In either case, federal agencies are likely missing opportunities to secure value by treating all firms that are not small as large and not incentivizing contracting with mid-sized suppliers.

Conclusion

This study represents the first step in a broader research project on the effects of set aside policies on small and mid-sized federal suppliers. The findings reveal discernible patterns among firms that grow into the middle market after benefiting from small business set aside programs. Our preliminary results show that there are firm characteristics that might drive emergence into the middle market, to include whether the firm is woman-owned. Small businesses that grow into the middle market on average have lower credit scores and lower efficiency measures. There are also more formal corporate relationships—likely an indicator of acquisition—among firms that emerged in the middle market. Federal portfolios are also different between the two groups. Firms that grow into the middle market on average have contracts in more agencies, across more NAICS and PSCs. They also have a higher number of contract actions associated with IDVs.

The results raise questions for further study. Our next steps are to determine whether these patterns hold as we perform more advanced econometric analysis to predict membership in the two groups. Future research to include qualitative analysis is also warranted. As such, we are in the process of interviewing suppliers to determine their strategies for success, and federal government officials to obtain their perspectives on the small business set aside program and mid-sized suppliers.

Our study is a critical first step in capturing the structural dynamics involved in the design, implementation, and evaluation of competitive practices in federal agencies aimed at promoting small business participation and growth. For small and mid-sized businesses, our preliminary results provide empirical evidence of the differences between firms that have grown into the middle market and those that have not. The results are promising for informing the drivers of growth for small and mid-sized firms, and the strategies that enable successful firm development. The results also have implications for policy makers—if further analysis shows that middle market firms are, on balance, unable to compete in the federal procurement market, then agencies are likely missing critical opportunities to secure value.

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Appendix

Selection

Criteria for selection was whether a firm had a contract action in 2005 that was designated a small business contract. Of the 1,025 firms selected, 143 firms had outgrown small business status in the years preceding 2005 but still had active contracts that were initially awarded as small business contracts.

FPDS Aggregation

FPDS-NG reports all contract actions for unclassified contracts over $3,000 in value. We aggregated all contract actions for a given year for each firm so that we have the firm-year as the observation.

Missing Data

In some cases, contract actions reported in FPDS-NG were missing key data elements. We dropped contract actions from the analysis if they were missing the following information: contract pricing type, product or service code, principal NAICS code, or contracting agency. These contract actions were removed from the data set prior to aggregating the contract actions.

There were also instances where Dun & Bradstreet data was missing for a particular year. In cases where we were confident the firm continued to exist, we imputed the missing data using linear interpolation for continuous variables and modal imputation for nominal variables. Our imputation procedures were calculated for the unique firm. That is, if one year of Dun & Bradstreet data was missing, the other nine years of firm data was used to calculate the imputed values. There were other cases where we elected not to impute missing data because we were not confident the firm continued to exist. For those firm/year entries, we were either also missing corresponding contracts data for that year and/or we were missing contracts and Dun & Bradstreet data for years following, thus making it impossible to determine whether the firm was in business or not.

In no instance did we impute FPDS-NG data. In some cases, we have missing contracts data that do not allow for complete analysis of firm performance in the federal contracting market in a given year, which accounts for the variation in the number of observations across variables of interest.

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