

# Evaluation of 8(a) Certified Firms

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REAL-TIME DATA-DRIVEN DECISION MAKING

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The statements, findings, and conclusions found in this study are those of the contractor and do not necessarily reflect the views of the United States Small Business Administration or the United States Government.

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# Glossary

Term	Definition
8(a)	The Minority Small Business and Capital Ownership Development Program provides participating small businesses with training, technical assistance, and contracting opportunities in the form of set-aside and sole-source awards.
AIT	American Indian Tribe
ANC	Alaska Native Corporation
BOA	Basic Ordering Agreement
CEM	Coarsened Exact Matching
FAR	Federal Acquisition Regulation
FPDS-NG	Federal Procurement Data System – Next Generation
FOUO	For Official Use Only
FFRDC	Federally Funded Research and Development Centers
FSS	Federal Supply Schedule
GPC	Government Purchase Card
GWAC	Government-Wide Acquisition Contract
HUBZone	Historically Underutilized Business Zone
IDC	Indefinite Delivery Contract
IDV	Indefinite Delivery Vehicle
OTA	Other Transaction Authority
NAICS	North American Industry Classification System
NHO	Native Hawaiian Organization
RDA	Robotic Data Automation
SAM	System for Award Management
SATT	Sample Average Treatment Effect on the Treated
SBA	U.S. Small Business Administration
SBGR	Small Business Goaling Report
VOSB	Veteran-Owned Small Business
WOSB	Women-Owned Small Business

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## Executive Summary

**Research Objective:** The 8(a) Business Development Program (8(a) Program) was established by Congress to improve the capacity of small businesses owned by the socially and economically disadvantaged members of society by creating a level playing field for providing goods and services to federal agencies and increasing the supply base of qualified businesses owned by such members of society. Commissioned by the U.S. Small Business Administration (SBA), this study conducted a rigorous program evaluation to assess the performance of the 8(a) program by examining the market for goods and services supplied by 8(a) businesses and those demanded by federal agencies as well as identifying factors that predict whether 8(a) businesses are successful in winning prime federal contracts during and after their time in the 8(a) program.

**Key Findings:** Examining the demand side of the market, the study found that there is overlap between the industries that federal agencies buy goods and services from and those in which 8(a) businesses operate. However, the results show that a change in spending in those industry sectors by federal agencies would largely not differentially affect contracting dollars to 8(a) businesses. Going beyond industry sectors, the study found that spending through certain Indefinite Delivery Vehicles (IDVs)<sup>1</sup> are likely to increase 8(a) dollars. Contracts through Basic Ordering Agreements (BOAs) have a very strong positive relationship with 8(a) dollars while those through Federal Supply Schedule (FSS) and Government-Wide Acquisition Contracts (GWACs) also have a positive, but less, strong relationship with 8(a) spending<sup>2</sup>. The strongest relationships of any agency procurement practices with 8(a) spending were identified with the use of 8(a) set-aside<sup>3</sup> and sole source vehicles. Spending through these vehicles have a very strong positive relationship with increasing 8(a) prime contracting dollars. While many 8(a) businesses have other SBA socioeconomic program designations such as Women-Owned Small Business (WOSB), Veteran-Owned Small Business (VOSB), and Historically Underutilized Business Zone (HUBZone) certification, the study observed a statistically significant relationship only between spending through VOSB set-

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1 The IDVs included in the analysis were Blank Purchase Agreements (BPAs), Basic Ordering Agreements (BOAs), (FSS), Government-Wide Acquisition Contracts (GWACs), and Other Indefinite Delivery Contracts (IDCs). The choice of IDVs included in the analysis were informed by prior research studies that evaluated SBA programs.

2 A 1 percentage point increase in small business eligible dollars obligated through BOAs is associated with a 96-percentage point increase in 8(a) dollars. A 1 percentage point increase in spending through FSS and GWACs is associated with a 14 and 17 percentage points increase in 8(a) dollars respectively.

3 8(a) set-aside refers to competitive acquisitions, where the acquisition strategy was a total 100 percent 8(a) set-aside competition.

aside and sole source vehicles with 8(a) dollars<sup>4</sup>. An increase in spending through VOSB set-aside and sole source vehicles would likely be associated with a decrease in 8(a) spending, implying a crowding out effect.

On the supply side of the market, the results show that 8(a) businesses that accept Government Purchase Cards (GPCs), those located in the Washington, D.C., metropolitan area, are part of a joint venture, have additional SBA socioeconomic program designations, and operate in the Construction sector as compared to Manufacturing have a higher likelihood of obtaining a prime federal contract. Of the 8(a) businesses that have been successful in obtaining a first prime federal contract, the ones likely to receive higher prime contracting dollars are those that have won more than one prime federal contract, have a higher concentration of federal earnings in their overall revenue, and have more 8(a) set-aside and sole source contracts. On the other hand, 8(a) businesses located in the Washington, D.C., metropolitan area and in most industries, other than Construction compared to Manufacturing, are likely to receive fewer prime contracting dollars.

Comparing the performance of businesses that joined the 8(a) program in fiscal year 2016<sup>5</sup> to a group of non-8(a) businesses statistically matched based on their characteristics, the study found that 8(a) businesses are 51 percentage points more likely to obtain a prime federal contract in the first 4 years after joining the program compared to the non-8(a) businesses. Moreover, the results show that businesses in the 8(a) program obtain prime federal contracts at a faster rate than non-8(a) businesses such that, 5.43 times the number of prime federal contracts are awarded to 8(a) businesses compared to similar non-8(a) businesses in the first 4 years of the program. The median time it takes for businesses to win their first prime federal contract after they joined the 8(a) program is 687.96 days or approximately 22 months.

Looking at how 8(a) businesses progress through the program, the study found that businesses in the transitional second stage of the program are likely to win contracts of higher value than 8(a) businesses in the first stage of the program. As businesses graduate from the 8(a) program, their revenue from prime federal contracts is likely to decrease in each

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4 During fiscal years 2014 through 2019, approximately 31 percent of 8(a) businesses were also WOSBs, 15 percent were VOSBs, and 12 percent were HUBZone certified.

5 While the period of the study is fiscal years 2014 through 2019, only businesses that joined the 8(a) program in 2016 were included in this analysis due to the technical complexities brought on by data limitations of tracking the performance of all businesses that joined the 8(a) program between 2014 and 2019. Businesses that joined the 8(a) program in 2016 were chosen for this analysis as they were the most recent cohort for whom data were available for each of the first four years in the developmental stage of the program.

of the first 5 years after leaving the program compared to businesses still in the 8(a) program<sup>6</sup>. This decrease is most likely driven by 8(a) businesses in the bottom quartile (25 percent) and those in the third quartile (51-75 percent) in terms of their federal revenue. On the other hand, the results show that 8(a) businesses are likely to experience an increase in their overall revenue in each of the first 5 years after leaving the program compared to businesses still in the 8(a) program. This increase is most likely driven by businesses in the top two quartiles (51-100 percent) in terms of overall revenue.

## Introduction

**Research Objective:** The 8(a) Program was established by Congress to assist businesses owned and controlled by socially and economically disadvantaged individuals by providing technical assistance designed to strengthen their ability to compete effectively in the U.S. economy. To help provide a level playing field for such small businesses, the government limits competition for certain contracts to businesses that participate in the 8(a) program. To assess the performance of the 8(a) program, the SBA requested a rigorous program evaluation to understand the market for goods and services demanded by federal agencies and those supplied by 8(a) businesses, as well as to examine the performance of 8(a) businesses in obtaining federal contracts as they progress from the initial development stage to the transitional stage of the program and how they fare once they graduate. The research design of the evaluation was guided by the following research questions:

- 1. Is there a relationship between the types of industries contracted to and agencies that award 8(a) contracts? What other factors predict whether federal agencies award 8(a) contracts?*
- 2. Are there any factors that predict federal contract awards for 8(a) firms (such as firm size, location, industry, age, prior contract awards, etc.)?*
- 3. What year of the program do 8(a) firms win their first federal government contract? Do they obtain federal contracts at a faster rate than non-8(a) firms?*
- 4. Do 8(a) firms win more federal contracts in the development stage or the transitional stage of the 8(a) program?*
- 5. When firms graduate from the 8(a) program, do they continue to win federal contracts?*
- 6. What is the success rate 1, 2, 3, 4, or 5 years after graduation from the 8(a) program?*

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<sup>6</sup> This finding does not account for incumbent prime federal contracts held by 8(a) businesses that may have continued after graduating from the program and likely contributed to their on-going revenue streams.

***Intended Audience:*** The primary audience for this study is the SBA and 8(a) program office staff, as well as contracting and program staff across the Federal Government. The goal of this study is to identify barriers that can be removed or levers that can be pushed to maintain a healthy supplier base of 8(a) businesses by increasing their competitiveness to receive prime federal contract awards during their time in the 8(a) program, ensure continued success of 8(a) businesses after they graduate from the 8(a) program, as well as to provide greater understanding of how to improve the match between the goods and services produced by 8(a) businesses and those demanded by federal agencies.

***Summary of Findings:*** After conducting retrospective bivariate and multivariate analyses by developing panel datasets created using federal contracting, business characteristics, and 8(a) portfolio information, the study found that there is overlap between goods and services demanded by federal agencies and those supplied by 8(a) businesses. The majority of prime contracting dollars are obligated to 8(a) businesses through 8(a) set-aside and sole source vehicles, and increased spending through certain IDVs may lead to an increased spending on 8(a) businesses. On the supply side, business characteristics associated with 8(a) businesses obtaining a contract include having additional SBA socioeconomic program designations, accepting government credit cards, and being part of a joint venture. The findings show that businesses that join the 8(a) program are 51 percentage points more likely to obtain a prime federal contract in the first 4 years after joining the program compared to non-8(a) businesses, and that they obtain prime contracts at a much faster rate than non-8(a) businesses. As 8(a) businesses progress from the developmental stage (first 4 years) of the program to the transitional stage (final 5 years), they obtain contracts of higher value. Once they graduate from the 8(a) program, businesses are likely to experience a decrease in the value of prime contracts they obtain, but they are likely to experience an increase in their overall revenue in each of the first 5 years after they graduate<sup>7</sup>.

***Outline of the Report:*** This final evaluation report begins by providing a brief description of the 8(a) program and presenting its logic model. The report then describes the research design of the study, presents a detailed discussion of its results, and outlines its limitations. The report concludes by summarizing the key findings and presenting the study's recommendation to improve the performance of the 8(a) program.

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<sup>7</sup> This finding does not account for incumbent prime federal contracts held by 8(a) businesses that may have continued after graduating from the program and contributed to their on-going revenue streams.



# Overview of the 8(a) Program

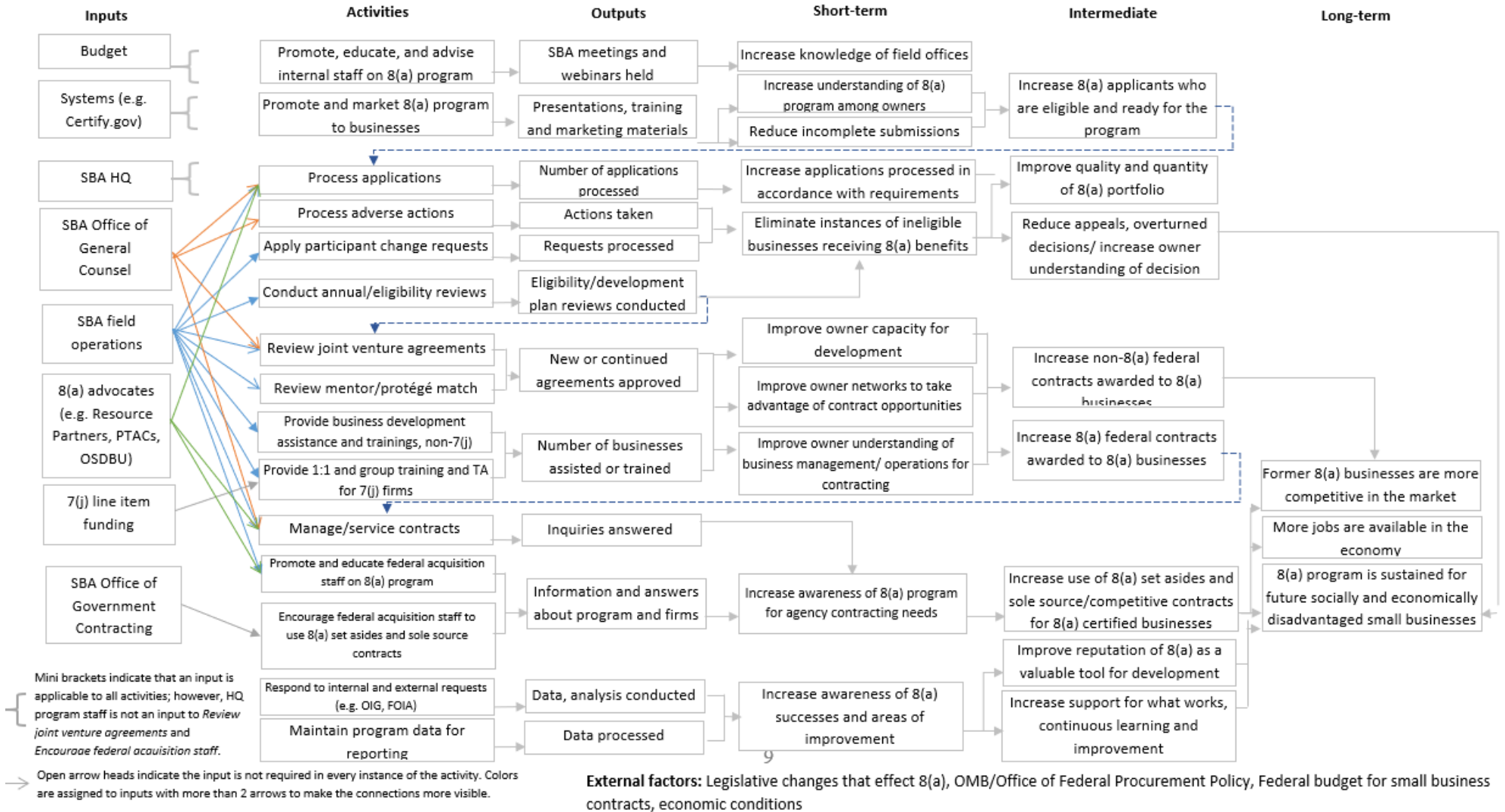
*Background of the Program:* Formalized by Congress in 1978, the 8(a) Program is a business assistance program created to support businesses owned and controlled by socially and economically disadvantaged members of society to improve their ability to compete effectively in the U.S. economy. To help provide a level playing field for such small businesses and increase their supplier base, the government limits competition for certain contracts to businesses that participate in the 8(a) program. Businesses enrolled in the 8(a) program can:

1. Compete for 8(a) set-aside contracts.
2. Receive 8(a) sole source contracts.
3. Receive support from a business opportunity specialist to aid them in navigating the federal contracting process.
4. Form partnerships with more established businesses through the SBA's Mentor-Protégé Program.
5. Receive management technical assistance, including business training, counseling, marketing assistance, and high-level executive development.

Figure 1 below illustrates the mechanism of the 8(a) program through its logic model.

**Figure 1: Logic model of the 8(a) program**

Program Mission: Help socially and economically disadvantaged owners develop their business



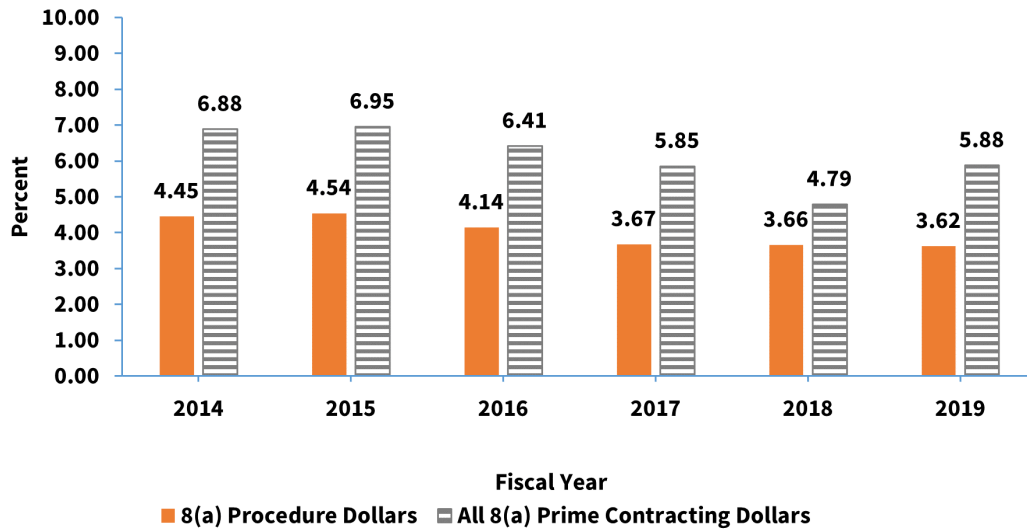
*Government Spending on 8(a) Businesses:* Federal Government spending on 8(a) businesses has fluctuated during the period of this study, fiscal year 2014 to 2019. As illustrated in Figure 2, the percent of 8(a) procedure dollars or spending through 8(a) contract vehicles increased slightly from 2014 to 2015, and then decreased each year for fiscal years 2015 to 2019. A similar pattern was observed for the percent of all 8(a) prime contracting dollars spent by the Federal Government between fiscal years 2014 to 2018. However, unlike the percent of 8(a) procedure dollars, percent of all small business eligible dollars spent on 8(a) businesses increased between fiscal years 2018 and 2019. The fluctuation in 8(a) spending could likely be influenced by changes in the federal procurement landscape in the time period before and during the period of the study<sup>8</sup>. Between fiscal years 2014 and 2019, federal agencies on average spent 32 percent of all 8(a) dollars through 8(a) set-aside vehicles, 34 percent through 8(a) sole source vehicles, and obligated the remaining 34 percent of all prime contracting dollars to 8(a) businesses through non-8(a) vehicles. Figure 3 illustrates this finding. Lastly, federal agencies spent about 38 percent of all 8(a) prime contracting dollars in the Professional, Scientific, Technical Services industry sector; 36 percent in Construction; 9 percent in Administrative and Support and Waste Management and Remediation Services; 5 percent in Manufacturing; and the remaining 13 percent in other industry sectors<sup>9</sup> during the period of this study. Figure 4 presents this finding.

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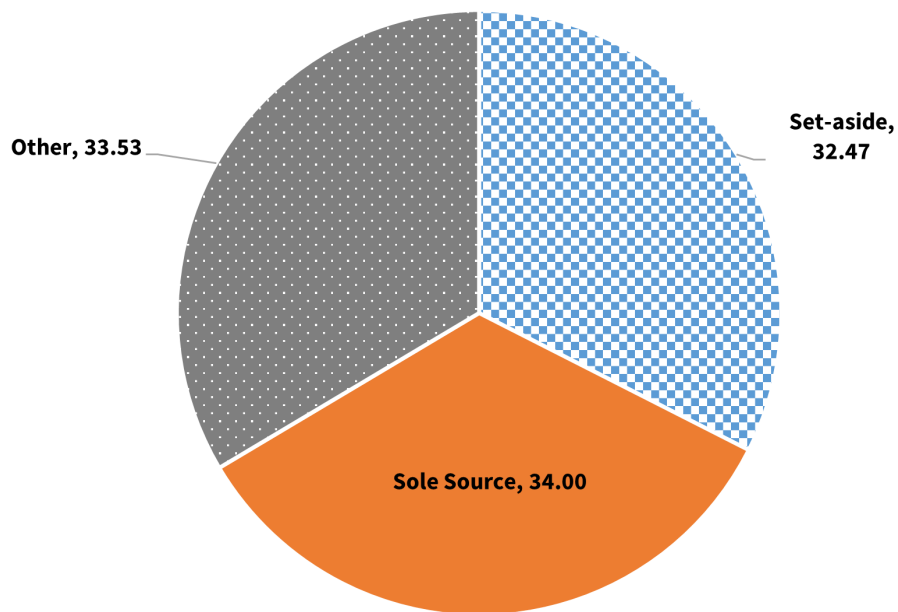
8 Factors that likely contributed to such changes could include the American Recovery and Reinvestment Act of 2009, Budget Control Act of 2011, and the Federal Government shutdown in January 2019.

9 These industry sectors include Agriculture, Forestry, Fishing and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Wholesale Trade; Retail Trade; Transportation and Warehousing; Information Sector; Finance and Insurance; Real Estate and Rental and Leasing; Management of Companies and Enterprises; Educational Services; Healthcare and Social Assistance; Arts, Entertainment, and Recreation; Accommodations and Food Services; Public Administration; and Other Services (except Public Administration).

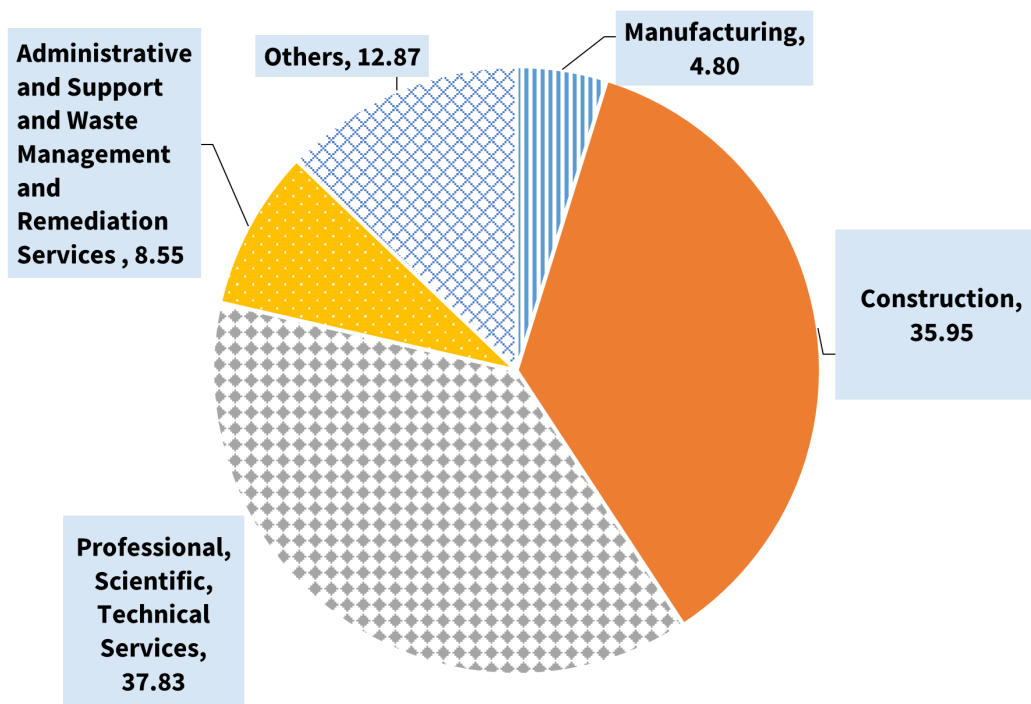
**Figure 2: Percent of small business eligible dollars spent on 8(a) businesses government-wide for fiscal years 2014 through 2019**



**Figure 3: Percent of 8(a) dollars obligated through 8(a) specific vehicles by federal agencies**



**Figure 4: Percent of 8(a) dollars obligated by industry by federal agencies**



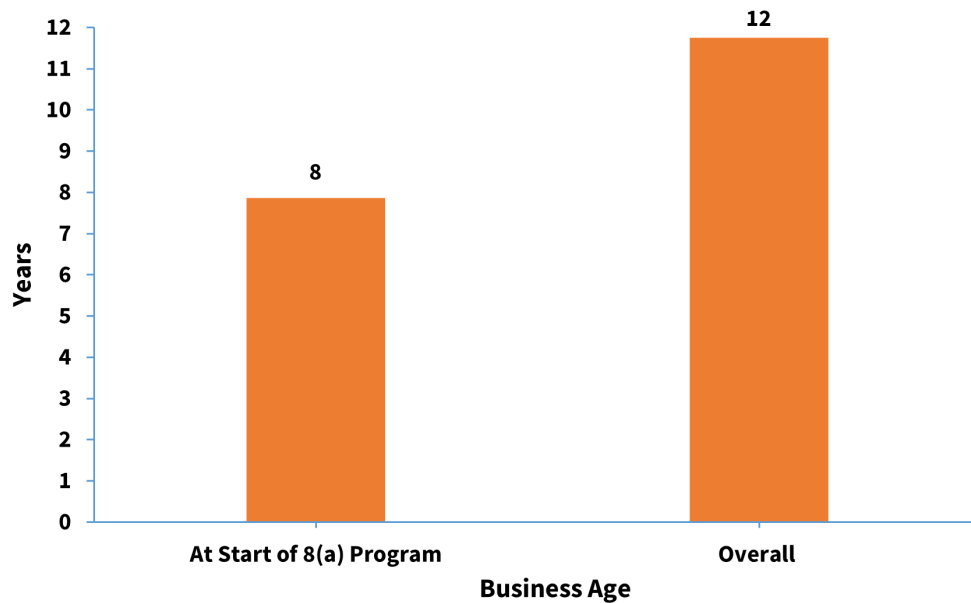
**Characteristics of 8(a) Businesses:** During fiscal years 2014 through 2019, small businesses that made up the 8(a) program<sup>10</sup> had been operating on average for nearly 12 years, with a range of a few months to some operating as long as 87 years. The average age of the businesses when they joined the 8(a) program was almost 8 years. Figure 5 illustrates these characteristics. The revenues of 8(a) businesses are highly skewed with an annual average value of \$3.7 million, median value of \$1.4 million, and a range of up to \$100 million. Figure 6 below illustrates the range of the average annual revenue of 8(a) businesses by industry. Almost 90 percent of the 8(a) businesses are located in metropolitan areas with approximately 28 percent in the Washington, D.C., metropolitan area as shown in Figures 7, 8, and 9. Businesses in the 8(a) program are heavily concentrated in a few industry sectors: Professional, Scientific, Technical Services (44 percent), Construction (26 percent), Administrative and Support and Waste Management and Remediation Services (11 percent), Manufacturing (3 percent), with 16 percent in other sectors<sup>11</sup> as illustrated in Figure 10. Only

10 The total number of records in the analytical dataset of businesses that participated in the 8(a) program during fiscal years 2014 through 2019 that received 8(a) certification during or after fiscal year 2006 was 27,643 where a unique record is an 8(a) business in a given fiscal year. The number of 8(a) businesses in each fiscal year in the dataset are 4,574 in 2014, 4,469 in 2015, 4,829 in 2016, 4,855 in 2017, 4,578 in 2018, and 4,338 in 2019.

11 These industry sectors include Agriculture, Forestry, Fishing and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Wholesale Trade; Retail Trade; Transportation and Warehousing; Information Sector; Finance and Insurance; Real

26 percent of 8(a) businesses had been awarded at least one prime federal contract before they joined the 8(a) program.

**Figure 5: Age of 8(a) businesses**



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Estate and Rental and Leasing; Management of Companies and Enterprises; Educational Services; Healthcare and Social Assistance; Arts, Entertainment, and Recreation; Accommodations and Food Services; Public Administration; and Other Services (except Public Administration).

Figure 6: Average annual revenue of 8(a) businesses by industry

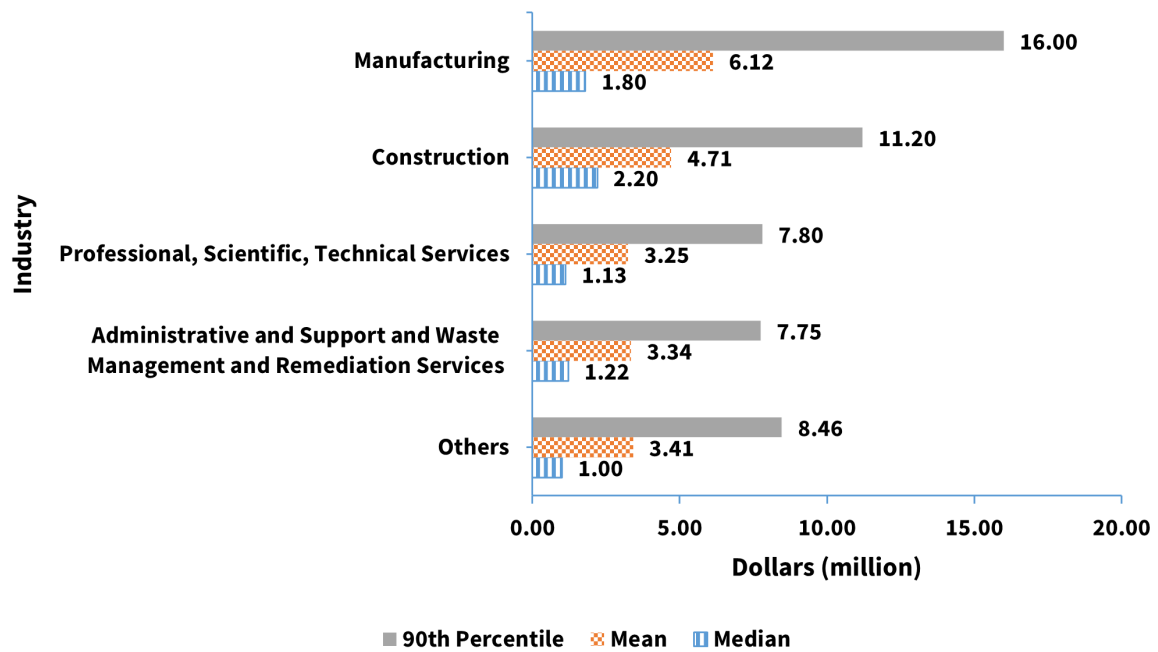


Figure 7: Percent of 8(a) businesses by location

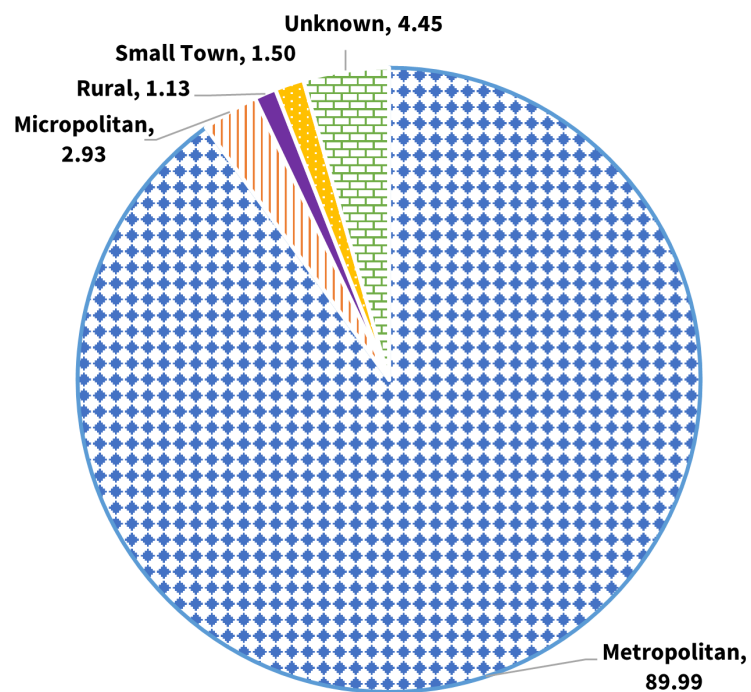


Figure 8: Percent of 8(a) businesses located in the Washington, D.C., metropolitan area

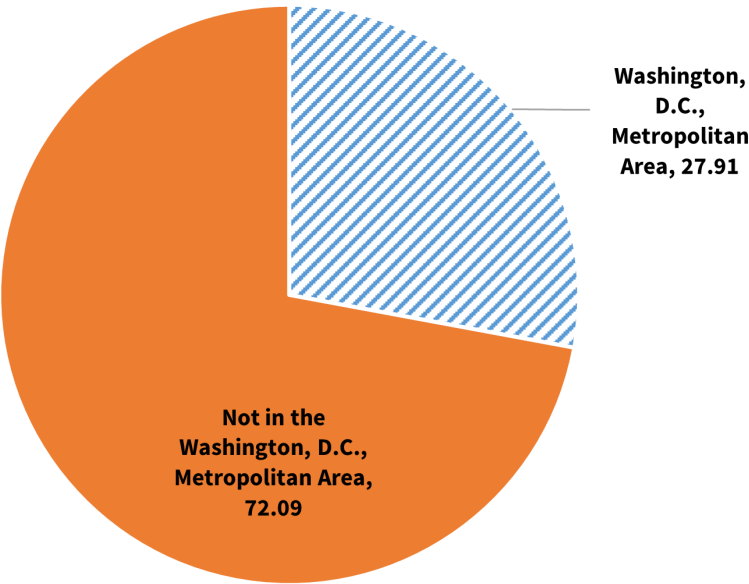
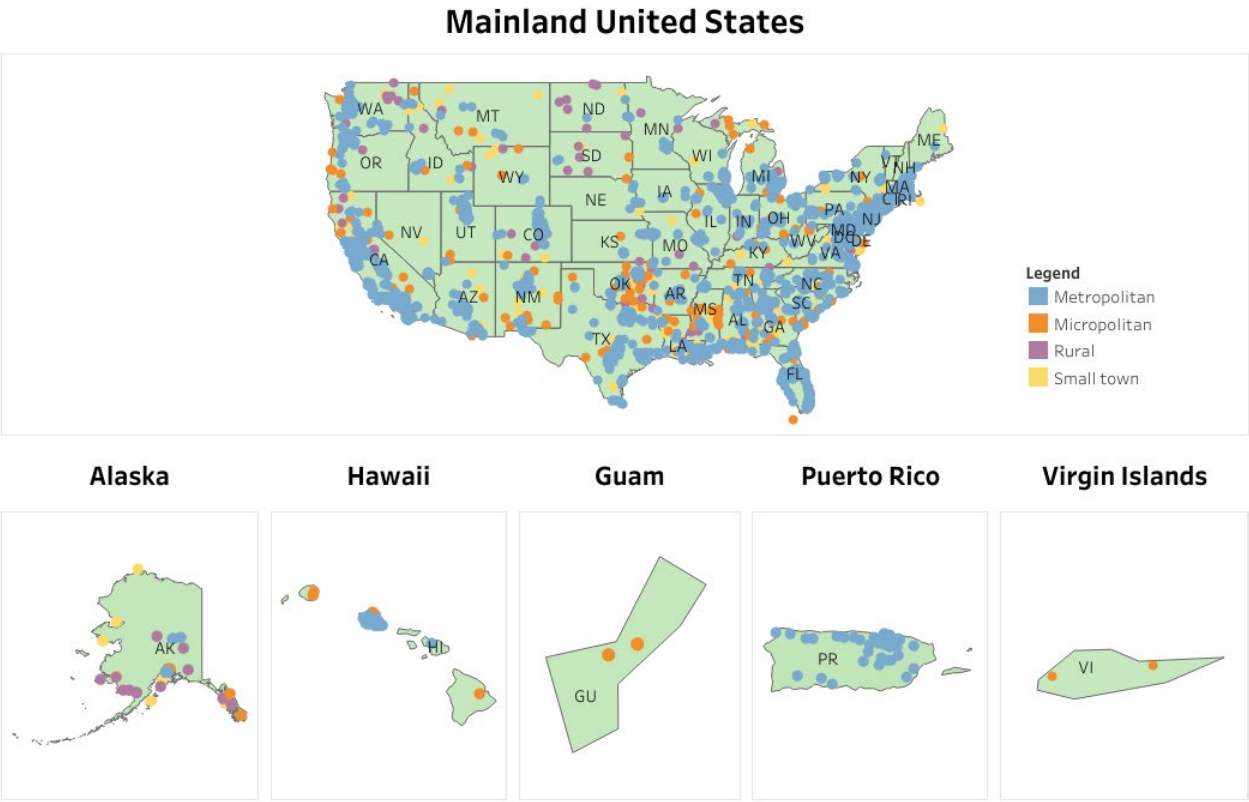


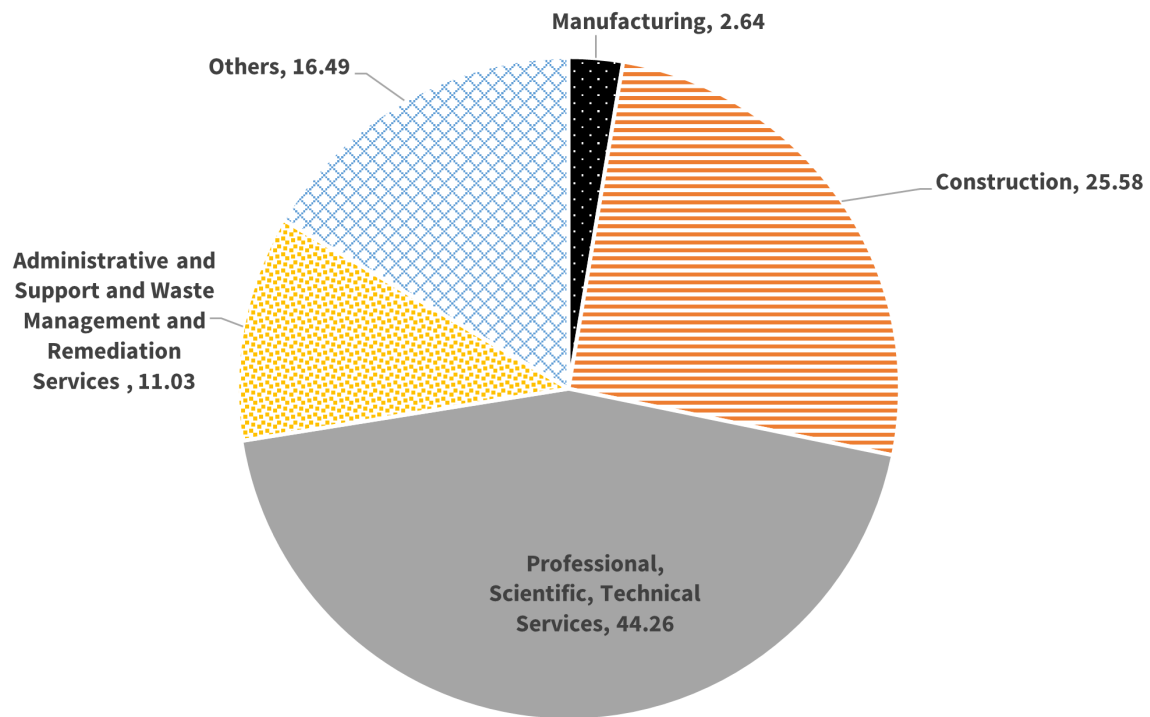
Figure 9: Map displaying the location of 8(a) businesses<sup>12</sup>



<sup>12</sup> The geographic locations depicted on the map are not drawn to scale. See Appendix G to see full description



**Figure 10: Percent of 8(a) businesses by industry**



## Research Design

To answer the research questions, the study explored the market for goods and services demanded by federal agencies and those supplied by 8(a) businesses during and after they graduate from the 8(a) program by conducting retrospective repeated measures analyses.

***Research Question 1: Is there a relationship between the types of industries contracted to and agencies that award 8(a) contracts? What other factors predict whether federal agencies award 8(a) contracts?***

**Methodological Approach:** The research team leading this study answered the first research question by modeling the contracting experience of federal agencies with 8(a) businesses to understand the demand side of the market. Specifically, the model explored the relationship of agency characteristics, procurement practices, and industry sectors from which they buy goods and services with 8(a) spending. The unit of analysis is a federal agency in a given fiscal year, the independent variables are the agency factors, and the dependent variable is the

percent of small business eligible contract dollars obligated to 8(a) businesses<sup>13</sup>. The choice of independent variables was informed by existing literature on government contracting, which includes recent studies commissioned by the SBA to evaluate the 7(j) online training program and the HUBZone program. The analytical approach involved first exploring the bi-variate relationship of each independent variable with the dependent variable, and the multivariate analysis then estimated the coefficients of the predictors on the dependent variable controlling for changes over time.

***Data Source and Preparation:*** The data source used for this analysis is the Federal Procurement Data System-Next Generation (FPDS-NG) for fiscal years 2014-2019 that covers 13 modules, such as Contract Dollar Values, Product or Service Information, Purchaser Information, Contractor Data, and Competition Information, which provide the percent of prime contract dollars to 8(a) businesses and relevant agency indicators of efforts toward 8(a) contracting. The SBA maintains a static version of the FPDS-NG as of March each year called the Small Business Goaling Report (SBGR), which excludes contracts that are not small business eligible. The study used the SBGR version of the FPDS-NG. The analytical dataset was prepared by collapsing the contract action level SBGR version of the FPDS-NG data to the funding agency level for each fiscal year.

***Research Question 2: Are there any factors that predict federal contract awards for 8(a) firms (such as firm size, location, industry, age, prior contract awards, etc.)?***

***Methodological Approach:*** The study answered the second research question by modeling the experiences of 8(a) businesses in competing for and acquiring contracts with federal agencies to understand the supply side of the market. The unit of analysis is certified 8(a) businesses in a fiscal year. The independent variables are predictors designed to capture business characteristics and contracting history with the Federal Government. The dependent variables are whether or not the 8(a) businesses received any federal prime contracts, and if so, the total value of the prime contracting dollars.

The analytical approach involved exploring the bi-variate relationship of each independent variable with the dependent variables. The multivariate analysis is a two-part model with

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<sup>13</sup> The percent of small business eligible contract dollars obligated to 8(a) businesses was selected as the dependent variables instead of total dollars obligated to 8(a) businesses to standardize the model such that all variables are on the same scale. This improves the interpretability of the findings and informs the explanatory power of the independent variables.

time and entity<sup>14</sup> fixed effects: the first part estimates the coefficients for each predictor on whether the 8(a) businesses receive any prime contracting dollars, and the second part estimates coefficients for the predictors on the total amount of dollars received for only those 8(a) businesses that received a prime contract.

***Data Source and Preparation:*** The data sources used for the analysis are the SBGR version of the FPDS-NG for fiscal years 2013-2019<sup>15</sup>, business profile data from the System for Award Management (SAM) for fiscal years 2014-2019, and the 8(a) portfolio data that contain the approval date, annual review, and status of all businesses that joined the program in fiscal years 2006-2019 and were in the program during fiscal years 2014-2019.

Optimal prepared the master analytical dataset by first creating a cascading panel dataset using the cross sectional 8(a) portfolio intake, annual review, and status data such that the unit of observation is the Data Universal Numbering System (DUNS) numbers of the 8(a) business and the fiscal year in which they were in the program. Then the team collapsed the contract action level FPDS-NG data to individual DUNS numbers for each fiscal year and merged it to the 8(a) panel dataset. The last step involved merging the DUNS level SAM data to the composite 8(a) portfolio and FPDS-NG data to create the master analytical dataset.

***Research Question 3: What year of the program do 8(a) firms win their first federal government contract? Do they obtain federal contracts at a faster rate than non-8(a) firms?***

***Methodological Approach:*** The research team developed a quasi-experimental model by identifying businesses similar to those that joined the 8(a) program using statistical matching and conducted time-to-event or survival analysis to answer the third research question. The team started with the master analytical dataset prepared for Research Question 2 and filtered it to only keep small businesses that joined the 8(a) program in FY 2016<sup>16</sup>. Then it employed a statistical matching technique called Coarsened Exact Matching (CEM) to match businesses in the 8(a) program to those that are not, based on select business characteristics available in

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14 The entity fixed effects used the state in which the businesses are located.

15 While the period of the study was fiscal years 2014 through 2019, contracting data from fiscal year 2013 was included in the model to capture prior prime contracting experience of 8(a) businesses.

16 While the period of the study is fiscal years 2014 through 2019, only businesses that joined the 8(a) program in 2016 were included in this analysis due to the technical complexities brought on by data limitations of tracking the performance of all business that joined the 8(a) program between 2014 and 2019. Businesses that joined the 8(a) program in 2016 were chosen for this analysis as they were the most recent cohort for whom data were available for each of the first four years in the developmental stage of the program

the SAM dataset to create a control group. These characteristics were average annual revenue, business age, number of employees, whether the business was located in the Washington, D.C., metropolitan area, primary industry, and whether they received a prime federal contract in the past. The study created the control group of a matched set of businesses to improve the validity of the model so that it better isolates the impact of the 8(a) program. Once the treatment and control groups were constructed, the study first estimated the sample average treatment effect on the treated (SATT) to assess the effect of the 8(a) program on businesses' ability to obtain prime federal contracts. Then the study conducted survival analysis using the number of days between joining the 8(a) program and signing of the first federal contract to measure the amount of time it takes to obtain the first contracts and whether participation in the 8(a) program led businesses to obtain their first contracts at a faster rate.

***Data Source and Preparation:*** The study used the master analytical dataset prepared for the second research question and performed the additional modifications described in the methodological approach above to answer this research question.

***Research Question 4: Do 8(a) firms win more federal contracts in the development stage or the transitional stage of the 8(a) program?***

***Methodological Approach:*** The research team developed a pre- post-estimation model with time and entity<sup>17</sup> fixed effects to answer the fourth research question. To maximize statistical power, the team started with the master analytical dataset prepared for Research Question 2 and grouped businesses in the dataset into the developmental stage (years 1-4) and transitional stage (years 5-9) of the 8(a) program and assessed the change in the outcome variable of the value of federal contracts obtained by businesses in the transitional stage compared to the developmental stage by controlling for business characteristics, contracting history, as well as changes across cohorts and over time. The unit of analysis for the model is an 8(a) business in a fiscal year

***Data Source and Preparation:*** The study used the master analytical dataset prepared for the second research question and performed the additional modifications described in the methodological approach above to answer this research question.

***Research Question 5: When firms graduate from the 8(a) program, do they continue to win federal contracts?***

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<sup>17</sup> The entity fixed effects used the state in which the businesses are located.

***Methodological Approach:*** The research team conducted panel data analysis with a polychotomous post-treatment variable with time fixed effects to answer the fifth research question. To maximize statistical power, the team started with the master analytical dataset prepared for research question 2. However, unlike research question 4, the data for research question 5 kept records of business that graduated from the 8(a) program during fiscal years 2014-2019 such that the unit of analysis is an 8(a) business in a fiscal year. The team then grouped businesses in the dataset into six groups with the zeroth group containing businesses actively participating in the 8(a) program and groups one to five containing businesses in their first through fifth year after graduating from the 8(a) program, respectively. The team then assessed the change in the outcome variable of the value of federal contracts obtained by businesses in each of the first 5 years after graduation compared to businesses still active in the 8(a) program, while controlling for business characteristics, contracting history, as well as changes over time.

***Data Source and Preparation:*** The study used the master analytical dataset prepared for the second research question and performed the additional modifications described in the methodological approach above to answer this research question.

***Research Question 6: What is the success rate 1, 2, 3, 4, or 5 years after graduation from the 8(a) program?***

***Methodological Approach:*** The research team conducted panel data analysis with a polychotomous post-treatment variable with time fixed effects to answer the fifth research question. To maximize statistical power, the team started with the master analytical dataset prepared for research question 2. However, unlike research question 4, the data for research question 5 kept records of businesses that graduated from the 8(a) program during fiscal years 2014-2019 such that the unit of observation is an 8(a) business in a fiscal year. The team then grouped businesses in the dataset into six groups with the zeroth group containing businesses actively participating in the 8(a) program and groups one to five containing businesses in their first through fifth year after graduating from the 8(a) program, respectively. The team then assessed the change in the outcome variable of success rate of businesses, measured in terms of annual revenue, in each of the first 5 years after graduation compared to businesses still active in the 8(a) program, while controlling for business characteristics, contracting history, as well as changes over time. The methodological approach for research question six is almost identical to that of research question five except for the choice of the dependent variable.

**Data Source and Preparation:** The study used the master analytical dataset prepared for the second research question and performed the additional modifications described in the methodological approach above to answer this research question.

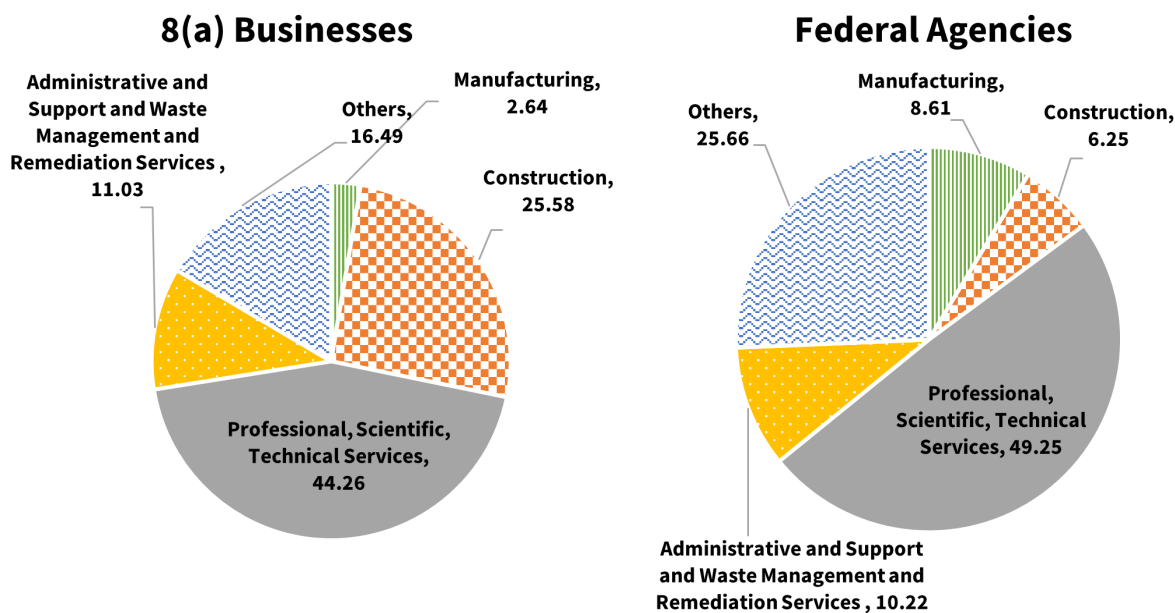
## Findings

The findings of the study are discussed in detail below.

*Research Question 1: Is there a relationship between the types of industries contracted to and agencies that award 8(a) contracts? What other factors predict whether federal agencies award 8(a) contracts?*

As illustrated in Figure 11, the study found that there is overlap between the industries that federal agencies buy goods and services from and those in which 8(a) businesses operate. The results show that an increase in spending by agencies in the industry sectors in which 8(a) businesses mostly operate would not differentially affect contracting dollars to 8(a) businesses except for NAICS code 33 Manufacturing, where an increase in federal agency spending in NAICS code 33 is associated with a small decrease in prime contracting dollars to 8(a) businesses. This suggests a crowding out effect such that any increased spending in this industry sector will be obligated to non-8(a) businesses while 8(a) businesses will likely experience a marginal decrease in their prime federal contracting dollars in that sector.

**Figure 11: Industries that federal agencies buy goods and services from and those in which 8(a) businesses operate**



Going beyond the overlap of industry sectors, the model found federal agency spending through certain IDVs to have a positive association with 8(a) contracting dollars. Specifically, the results show that an increase in federal agency spending through BOAs would have a strong positive relationship with 8(a) spending and an increase in spending through the FSS and GWACs would also have a positive, albeit less strong, relationship with 8(a) spending<sup>18</sup>.

Use of set-aside and sole source vehicles were also found to play a role in how federal agencies obligate prime contracting dollars to 8(a) businesses. Procurement through 8(a) set-aside and sole source vehicles were detected to have a very strong positive relationship with overall 8(a) spending. At the same time, increase in spending through VOSB set-aside and sole source vehicles are likely to have a negative relationship with 8(a) spending. This again suggests a crowding out effect where an increase in spending to VOSBs through VOSB set-aside and sole source vehicles is associated with a slight decrease in prime contracting dollars obligated to 8(a) businesses. While 31 percent of 8(a) businesses are also WOSBs and 12 percent are HUBZone certified, increase in spending through WOSB or HUBZone set-aside and sole source vehicles did not appear to have a relationship with spending on 8(a) businesses.

*Research Question 2: Are there any factors that predict federal contract awards for 8(a) firms (such as firm size, location, industry, age, prior contract awards, etc.)?*

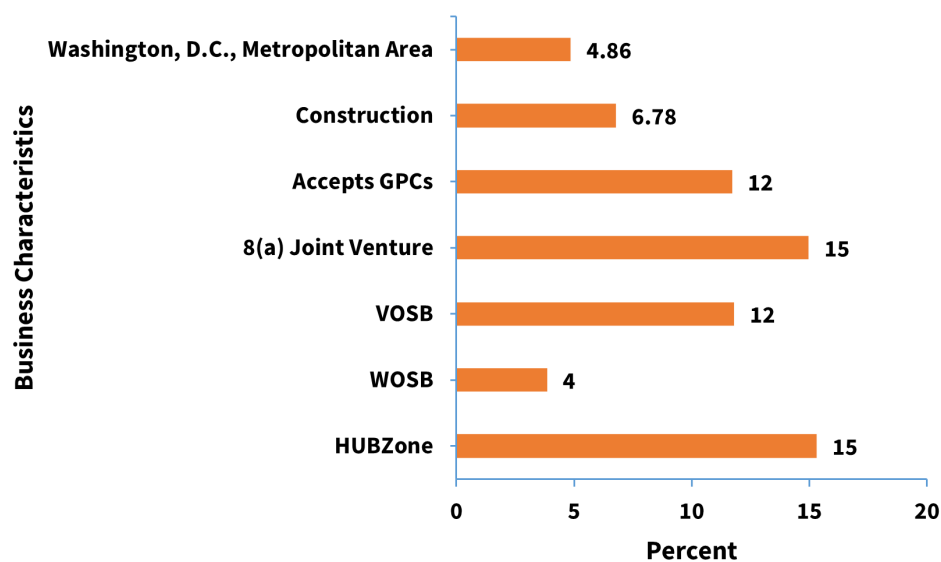
***Factors Associated with 8(a) Businesses Obtaining Prime Federal Contracts:*** Businesses in the 8(a) program with multiple SBA certifications and socioeconomic program designations have a higher likelihood of obtaining prime federal contracts. Businesses that are both 8(a) and HUBZone certified are 15 percentage points more likely to obtain a prime federal contract compared to businesses that are just 8(a) certified. Similarly, 8(a) businesses that are also a VOSB and a WOSB are 12 and 4 percentage points respectively more likely to obtain a prime contract. Additionally, the results show that entering a joint venture can be beneficial, as 8(a) businesses that are part of a joint venture are 15 percentage points more likely to obtain a prime federal contract compared to 8(a) businesses that are not part of a joint venture.

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18 A 1 percentage point increase in small business eligible dollars obligated through BOAs is associated with a 96 percentage point increase in 8(a) dollars. A 1 percentage point increase in spending through FSS and GWACs is associated with a 14 and 17 percentage points increase in 8(a) dollars respectively.

At the same time, industry sector, location, and other business practices likely play a role in winning prime contracts. Businesses in the 8(a) program in the Construction sector have a 6 percentage point higher likelihood of obtaining a prime contract than 8(a) businesses in the Manufacturing sector. Businesses that are 8(a) certified and located in the Washington, D.C., metropolitan area are 5 percentage points more likely to win a prime contract than those located elsewhere<sup>19</sup>. Lastly, 8(a) businesses that accept GPCs as a form of payment are 12 percentage points more likely to obtain a prime contract than 8(a) businesses that do not accept this form of payment. Figure 12 illustrates these findings.

**Figure 12: Factors associated with 8(a) businesses obtaining prime federal contracts**



***Factors Associated with the Value of Prime Federal Dollars Obligated to 8(a) Businesses:***

Examining the pool of businesses that have been successful in winning a prime federal contract once they received 8(a) certification reveals characteristics that shed light on the value of prime contracting dollars they obtain. Businesses in the 8(a) program with prior prime federal contracting experience in terms of receiving more than one prime contract<sup>20</sup> are associated with having a prime federal contracting portfolio that on average is \$643,540 more in value compared to 8(a) businesses that just have a single prime federal contract

19 This finding describes the location of the 8(a) business not the place of performance. Information on the place of performance of prime federal contracts were not available in the SBGR version of FPDS-NG. Therefore, the place of performance of prime federal contracts obtained by 8(a) businesses located in the Washington, D.C., metropolitan area could be at a different location.

20 Either prior to joining the 8(a) program or after they joined the 8(a) program. In the latter case, this finding refers to the value of prime dollars obligated to 8(a) businesses after their first prime contract award.



award. The results also showed that 8(a) businesses that have a higher percentage of their revenue from prime federal contracts are likely to receive more prime contracting dollars; an increase in the percentage of the overall revenue from prime contracts by 1 percentage point is associated with a \$41,633 increase in total prime contracting dollars. At the same time, certain factors were found to have a negative relationship with the value of the prime contracts. Businesses that are 8(a) certified and also WOSBs are likely to have prime contracts that are worth \$413,312 less than 8(a) businesses that are not WOSBs. Moreover, businesses in the 8(a) program located in the Washington, D.C., metropolitan area on average are likely to have \$3.2 million smaller federal revenue than those located elsewhere<sup>21</sup>, and 8(a) businesses in industry sectors other than Construction<sup>22</sup> are likely to have federal revenues between \$1.5 to \$2 million less than those in the Manufacturing sector. Lastly, the findings illustrate the role of 8(a) set-aside and sole source vehicles on the value of the prime federal contracting portfolio of 8(a) businesses. Obtaining an additional 8(a) set-aside contract is associated with a \$106,267 increase in the value of the businesses' prime federal dollars, and obtaining an additional sole source contract is associated with a \$172,757 increase in their prime federal dollars.

***Research Question 3: What year of the program do 8(a) firms win their first federal government contract? Do they obtain federal contracts at a faster rate than non-8(a) firms?***

The study found that businesses in the 8(a) program not only have a higher likelihood of obtaining a prime federal contract, but it also increases the rate at which they obtain contracts. Specifically, the SATT analysis using 8(a) businesses from the 2016 cohort that were statistically matched to similar small, disadvantaged businesses registered on SAM found that 8(a) businesses are 51.06 percentage points more likely to obtain a federal contract than businesses not in the 8(a) program. This increases the likelihood of obtaining federal contracts for 8(a) businesses from approximately 17.12 percent to 68.18 percent.

Using the statistically matched sample, the results of the survival analysis, also known as time to event analysis, found that businesses in the 8(a) program obtain prime federal

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21 The lower value of prime federal revenue of 8(a) businesses located in the Washington, D.C., metropolitan area could in part be related to the industry sectors in which they operate. Majority of the 8(a) businesses located in the Washington, D.C., metropolitan area operate in the Professional, Scientific, Technical Services sector. 8(a) business in this sector on average have lower prime federal revenue compared to the those in the Manufacturing and Construction sectors and have lower overall average annual revenue compared to businesses that operate in all other sectors.

22 These include Professional, Scientific, Technical Services; Administrative and Support and Waste Management and Remediation Services; as well as all other remaining industry sectors in which 8(a) businesses operate.

contracts at a faster rate than non-8(a) programs, such that 5.43 times the number of prime federal contracts are awarded to businesses in the 8(a) program compared to similar non-8(a) businesses during the first 4 years of the 8(a) program. This suggests that businesses in the 8(a) program obtain prime federal contracts at a rate 5.43 times as fast as similar businesses not in the 8(a) program. Lastly, the median time it takes for businesses to win their first prime federal contract after they joined the 8(a) program is 687.96 days or approximately 22 months.

***Research Question 4: Do 8(a) firms win more federal contracts in the development stage or the transitional stage of the 8(a) program?***

Accounting for business characteristics, prior prime federal contracting history, and geographic location, the study found that businesses in the transitional stage (stage 2) of the 8(a) program are on average likely to receive \$536,060 more in prime federal contracting dollars than those in the developmental stage (stage 1) of the program. At the same time, businesses in stage 2 of the 8(a) program with non-8(a) contracts are likely to have on average \$897,202 higher prime federal revenue than stage 1 businesses that only have contracts awarded through 8(a) specific vehicles. Lastly, for stage 2 businesses, each additional 8(a) set-aside contract award is associated with a \$229,162 increase in their prime federal revenue compared to businesses in stage 1 of the 8(a) program.

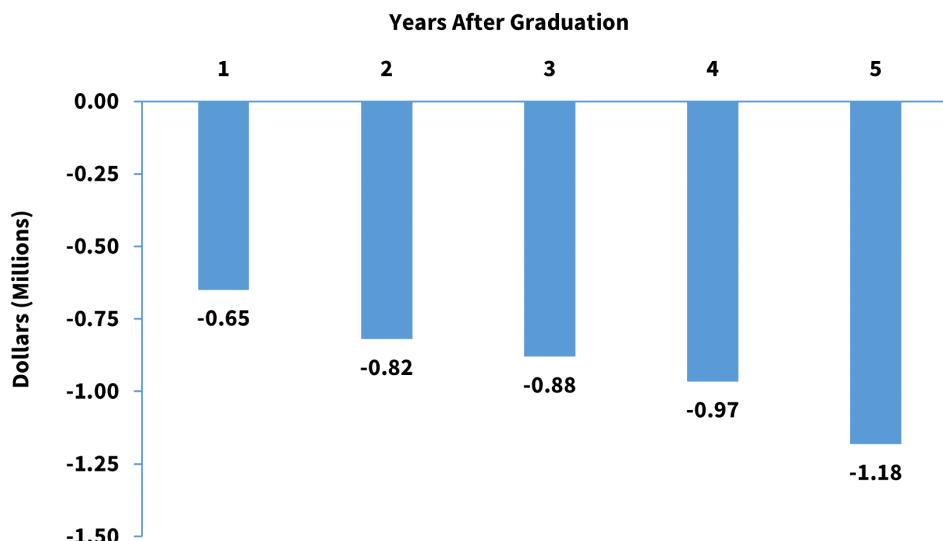
***Research Question 5: When firms graduate from the 8(a) program, do they continue to win federal contracts?***

Controlling for business characteristics, prior prime federal contracting experience, non-prime federal revenue, and geographic location, the study found that businesses are likely to experience a decrease in prime federal contracting dollars in each of the first 5 years after graduating from the 8(a) program. Businesses in their first year after graduation are likely to earn \$0.65 million less prime federal dollars than those still in the 8(a) program. Businesses in years 2 through 4 after graduation are likely to receive \$0.82 million, \$0.88 million, and \$0.97 million fewer prime federal dollars, respectively, than businesses still in the 8(a) program. Five years after graduating from the 8(a) program, businesses are likely to have federal prime contracting portfolios worth \$1.2 million less than businesses still in the 8(a) program<sup>23</sup>. Figure 13 illustrates these findings.

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23 This finding does not account for incumbent prime federal contracts held by 8(a) businesses that may have continued after graduating from the program and contributed to their on-going revenue streams.

**Figure 13: Difference in prime federal contracting revenue of 8(a) businesses in years 1 through 5 after graduating from the 8(a) program compared to businesses still in the program**



While the overall trend was a steady decrease in prime federal revenue, the research team leading the study hypothesized that not all 8(a) businesses are likely to experience the same trend. To test this hypothesis, the team segmented the analytical dataset for Research Question 5 into four groups based on the prime contract dollars awarded to 8(a) businesses still in the program and those in years 1 through 5 after graduating from the program. Specifically, the study based the grouping on quartiles such that group 1 consisted of businesses in the bottom 25 percent in prime federal revenue, group 2 contained businesses that were between 26 and 50 percent in prime federal revenue, group 3 between 51 and 75 percent, and lastly, group 4 contained businesses in the top 25 percent in prime federal revenue. The team then ran the same model for each of the groups and found that businesses in group 4, those in the top 25 percent, are likely to have prime federal revenues that are statistically not significantly different in their first 5 years after graduation compared to businesses still in the 8(a) program. Businesses in group 3, those that rank between 51 and 75 percent in prime federal revenue, are likely to receive fewer prime contracting dollars each year after graduation compared to businesses still in the 8(a) program. Similar to group 4, businesses in group 2, those that rank between 26 and 50 percent in prime federal revenue, are likely to generate prime federal revenues that are not statistically significantly different in their first 5 years after graduation compared to businesses still in the 8(a) program. Lastly, the study found that businesses in the bottom 25 percent in prime federal revenue are likely to have zero federal prime contracting revenue in the first 5 years after graduating from the 8(a) program. The results also show that businesses still in the 8(a) program but in the bottom 25

percent in revenue are also likely to not earn any prime contracting dollars. Therefore, businesses in group 1 are likely to earn the same amount of prime contracting dollars in years 1 through 5 after graduating from the 8(a) program as group 1 businesses still in the 8(a) program. While the businesses in group 1 had received prime federal contracts in the past<sup>24</sup>, by the time they reached phase 2, and then years 1 through 5 after graduation, they did not win any more prime federal contracts even though they had positive revenue from nonfederal sources<sup>25</sup>. Table 1 presents these findings. This suggests that the decline in prime federal dollars in each of the first 5 years after graduation observed in the overall model that contained businesses in all four groups are likely driven by 8(a) businesses that ranked in the bottom 25 percent and those between 51 and 75 percent in prime federal revenue.

**Table 1: Difference in prime federal contracting revenue of 8(a) businesses in years 1 through 5 after graduating from the 8(a) program compared to businesses still in the program grouped by quartiles of prime federal revenue**

Group	Years After Graduation <sup>26</sup>				
	1	2	3	4	5
<i>One</i>	0	0	0	0	0
<i>Two</i>	↔	↔	↔	↔	↔
<i>Three</i>	-\$68,906	-\$110,973	-\$81,509	-\$91,352	-\$151,101
<i>Four</i>	↔	↔	↔	↔	↔

*Research Question 6: What is the success rate 1, 2, 3, 4, or 5 years after graduation from the 8(a) program?*

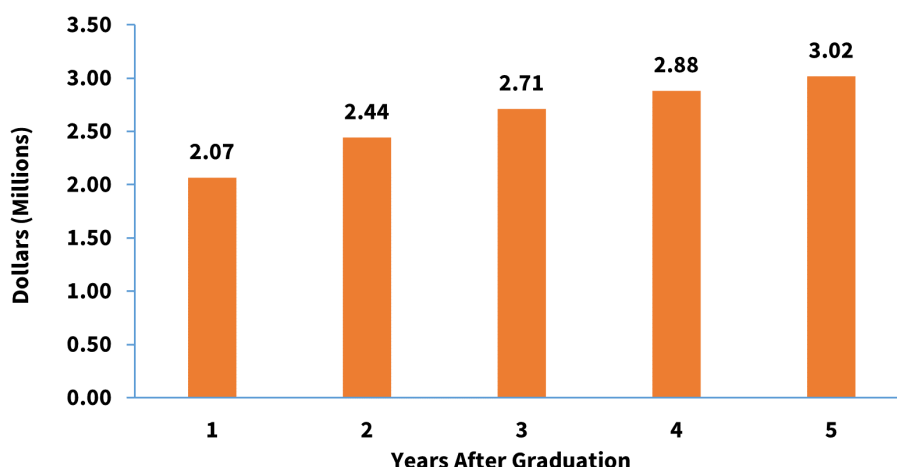
Controlling for business characteristics, prior prime federal contracting experience, prime federal revenue, and geographic location, the study found that businesses are likely to experience a steady increase in overall revenue in each of the first 5 years after graduating from the 8(a) program. Specifically, businesses that graduated from the 8(a) program are likely to go from earning \$2.1 million to \$3 million dollars more in revenue between years 1 through 5 after graduation compared to businesses still in the program. Figure 14 illustrates this finding.

24 Around 77 percent of the group 1 businesses had obtained a prime federal contract in the past.

25 The overall average annual revenue for 8(a) businesses in group 1 who were still in the program was \$2.4 million. The overall average annual revenue for businesses in group 1 that were in years 1 through 5 after graduating from the 8(a) program were \$3.0 million, \$3.1 million, \$3.4 million, \$3.5 million, and \$3.6 million respectively.

26 The symbol “↔” denotes that there is no statistically significant difference from businesses still in the 8(a) program.

**Figure 14: Difference in overall revenue of 8(a) businesses in years 1 through 5 after graduating from the 8(a) program compared to businesses still in the program**



While the overarching trend was a steady increase in overall revenue, the research team hypothesized that not all 8(a) businesses experienced the same trend after graduation. To test this hypothesis, the team segmented the analytical dataset for Research Question 6 into four groups based on the overall revenue of 8(a) businesses still in the program and those in years 1 to 5 after graduating from the program. Specifically, the study based the grouping on quartiles such that group 1 consisted of businesses in the bottom 25 percent in overall revenue, group 2 contained businesses that were between 26 and 50 percent in overall revenue, group 3 between 51 and 75 percent, and lastly, group 4 contained businesses in the top 25 percent in overall revenue. The team then ran the same model for each of the groups and found that businesses in group 1, those in the bottom 25 percent, are likely to have less revenue in year 5 after graduation compared to those still in the 8(a) program. There was no statistically significant difference in their revenue in the first 4 years after graduation compared to businesses still in the 8(a) program. Businesses in group 2, those that rank between 26 and 50 percent, are likely to see their overall revenue increase at an increasing rate in years 1 and 2 and then decrease in years 3 through 5 after graduation compared to businesses still in the 8(a) program. In other words, while the overall revenue is likely to be higher for each of the 5 years after graduation compared to businesses still in the 8(a) program, the margin by which the post-graduation revenue is likely to be higher is greater in the first two years but smaller each consecutive year for businesses in group 2. Businesses in groups 3 and 4, those in the top 50 percent, are likely to see their overall revenue increase at an increasing rate in the first 5 years after graduation compared to businesses still in the 8(a)

program. In other words, the overall revenue is not only likely to be higher for each of the 5 years after graduation for businesses in groups 3 and 4 compared to businesses still in the 8(a) program, the margin by which the post-graduation revenue is likely to be higher is larger each consecutive year. Table 2 presents these findings. This suggests that the trend of steady increase in overall revenue of businesses in each of the first 5 years after graduation compared to those still in the 8(a) program found in the first model are likely driven by 8(a) businesses that rank in the top 50 percent in overall revenue.

**Table 2: Difference in overall revenue of 8(a) businesses in years 1 through 5 after graduating from the 8(a) program compared to businesses still in the program grouped by quartiles of prime federal revenue**

Group	Years After Graduation <sup>27</sup>				
	1	2	3	4	5
<i>One</i>	↔	↔	↔	↔	-\$38,845
<i>Two</i>	\$149,837	\$178,333	\$138,995	\$135,891	\$87,107
<i>Three</i>	\$584,943	\$788,782	\$793,108	\$797,838	\$862,132
<i>Four</i>	\$4,750,317	\$5,632,428	\$6,524,221	\$6,838,703	\$7,602,963

## Limitations

The findings of this study are limited by the quality and completeness of the data used and the methodological challenges faced in modeling factors that could not be directly measured.

In the first research question, the study could not perfectly replicate the estimates for the percent of small business eligible dollars contracted by federal agencies each fiscal year through IDVs using the SBGR version of the FPDS-NG data. The estimates are accurate up to one decimal point for data validation purposes.

For Research Questions 2 through 6 that identified factors that predict whether 8(a) businesses obtain federal contracts, the 8(a) portfolio data did not contain all the relevant information on pertinent business characteristics relevant to the analyses. To resolve this issue, the study linked business characteristics data of 8(a) businesses from historical archives of the For Official Use Only (FOUO) level SAM data. However, as the FOUO level historical SAM data was only available from January 2014, the study completed the analysis for the Research Questions 2, 4, 5, and 6 for fiscal years 2014 to 2019. Although business characteristics from SAM data could be linked to the businesses in the 8(a) portfolio using DUNS numbers, not all businesses listed as participants in the 8(a) portfolio were present in

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<sup>27</sup> The symbol “↔” denotes that there is no statistically significant difference from businesses still in the 8(a) program.

the historical SAM archives during their time in the 8(a) program. As a result, the study did not include the observations with missing information in the analyses. While excluding the observations with missing information may introduce some bias to the models, given the relatively small number of exclusions<sup>28</sup> and the similarity in characteristics of the sample included in the analytical dataset when compared to the population, the findings of the models and the recommendations derived from them should largely be representative of the entire population.

At the same time, certain business characteristics information from the archived SAM extracts suffered from data quality and completeness issues. As a result, socioeconomic status variables that identify whether the ownership of an 8(a) business is an Alaska Native Corporation (ANC), Native Hawaiian Organization (NHO), or American Indian Tribal (AIT) entity was not factored in the analysis for answering the research questions.

For the third research question, the study used the CEM statistical matching technique to identify a sample of small, disadvantaged businesses that did not join the 8(a) program but were comparable in characteristics to those that did based on a select few business characteristics from SAM. These characteristics were the average annual revenue, business age, number of employees, whether the business was located in the Washington, D.C., metropolitan area, primary industry, and whether they already had a federal contract prior to joining the 8(a) program. While the study could have performed the matching using additional business characteristics to generate statistically closer matches, it would have reduced the number of 8(a) businesses in the matched sample, which could have potentially affected the representativeness of the findings and the generalizability of the recommendations. The matching approach used for analysis did not result in the loss of a single 8(a) business and had a near perfect match with the non-8(a) businesses based on the select business characteristics.

During the data preparation phase of the statistical matching for Research Question 3, the research team encountered many observations of the select business characteristics with missing values. To address missing observations, the CEM approach allows missing values to be treated as a valid response category within variables. The study treated the missing values of observations in both 8(a) and non-8(a) businesses as a valid response category to perform

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<sup>28</sup> The percent of observations dropped due to data quality and completeness issues are:  
Research Questions 2 and 4: 5 percent.  
Research Question 3: 8 percent.  
Research Questions 5 and 6: 14 percent.

the matching to avoid losing 8(a) businesses from the analysis sample. Imputing missing values in this manner may affect the validity of the matching and the findings.

For the survival analysis in Research Question 3, the time taken to obtain a contract was calculated as the time between the approval date of joining the 8(a) program and the date of signing the next federal contract. Since businesses that did not join the 8(a) program do not have an approval date, the study had to assign an estimated date to calculate their time to obtain a federal contract. As each non-8(a) business was statistically matched to one or more businesses that joined the 8(a) program, the study assigned the approval date of joining the 8(a) program of the matched 8(a) businesses to the non-8(a) businesses to estimate the time to obtain a federal contract. Also, as the calculation for estimating the time to obtain a federal contract did not account for any lag period between being approved in the 8(a) program and obtaining a federal contract, the findings of the survival analysis may be biased and be presenting an inflated effect.

## Conclusions and Recommendations

This study conducted empirical analyses using federal contracts and business profile data to evaluate the performance of the 8(a) program. Specifically, the study explored the market for goods and services demanded by federal agencies and those supplied by 8(a) businesses, as well as identified factors that predict 8(a) businesses' ability to obtain prime federal contracts during and after they graduate from the 8(a) program.

**Major Findings:** Examining the demand side of the market, the study found that there is overlap between the industries federal agencies buy goods and services from and those in which 8(a) businesses operate. However, the results show that a change in spending in those industry sectors by federal agencies would largely not differentially affect contracting dollars to 8(a) businesses. Going beyond industry sectors, the study found that spending through certain IDVs is likely to increase 8(a) dollars. Contracts through BOAs have a very strong positive relationship with 8(a) dollars while those through FSS and GWACs also have a positive, but less, strong relationship with 8(a) spending. The strongest relationships of any agency procurement practices with 8(a) spending were identified with the use of 8(a) set-aside and sole source vehicles. Spending through these vehicles have a very strong positive relationship with increasing 8(a) prime contracting dollars. While many 8(a) businesses have other SBA socioeconomic program designations such as WOSB, VOSB, and HUBZone certification, a statistically significant relationship was observed only between spending through VOSB set-aside and sole source vehicles with 8(a) dollars, such that an increase in



spending through VOSB set-aside and sole source vehicles would likely be associated with a decrease in 8(a) spending, implying a crowding out effect.

On the supply side of the market, the results show that 8(a) businesses that accept GPCs, those located in the Washington, D.C., metropolitan area, are part of a joint venture, have additional SBA socioeconomic program designations, and operate in the Construction sector as compared to Manufacturing have a higher likelihood of obtaining a prime federal contract. Of the 8(a) businesses that have been successful in obtaining a first prime federal contract, the ones likely to receive higher prime contracting dollars are those that have won more than one prime federal contract, have a higher concentration of federal earnings in their overall revenue, and have more 8(a) set-aside and sole source contracts. On the other hand, 8(a) businesses located in the Washington, D.C., metropolitan area and in most industries, other than Construction compared to Manufacturing, are likely to receive fewer prime contracting dollars.

Comparing the performance of businesses that joined the 8(a) program in fiscal year 2016 to a group of non-8(a) businesses statistically matched based on their characteristics, the study found that 8(a) businesses are 51 percentage points more likely to obtain a prime federal contract in the first 4 years after joining the program compared to the non-8(a) businesses. Moreover, the results show that businesses in the 8(a) program obtain prime federal contracts at a faster rate than non-8(a) programs, such that 5.43 times the number of prime federal contracts are awarded to 8(a) businesses compared to similar non-8(a) businesses in the first 4 years of the program. The median time it takes for businesses to win their first prime federal contract after they joined the 8(a) program is 687.96 days or approximately 22 months.

Looking at how 8(a) businesses progress through the program, the study found that businesses in the transitional second stage of the program are likely to win contracts of higher value than 8(a) businesses in the first stage of the program. As businesses graduate from the 8(a) program, their revenue from prime federal contracts is likely to decrease in each of the first 5 years after leaving the program compared to businesses still in the 8(a) program. This decrease is most likely driven by 8(a) businesses in the bottom quartile (25 percent) and those in the third quartile (51-75 percent), respectively, in terms of their federal revenue. On the other hand, the results show that 8(a) businesses are likely to experience an increase in their overall revenue in each of the first 5 years after leaving the program compared to businesses still in the 8(a) program. This increase is most likely driven by businesses in the top two quartiles (51-100 percent) in terms of overall revenue.

**Recommendations:** Based on the findings, the research team leading the study have identified the following recommendations that the SBA can provide 8(a) businesses to increase the likelihood of their success in obtaining a prime federal contract, increase the value of prime contracts they receive as they progress through the 8(a) program, and enjoy continued business success after they graduate from the program.

To increase the chances of obtaining a prime federal contract, the SBA could:

1. Encourage 8(a) businesses to join additional socioeconomic programs like VOSB, WOSB, and HUBZone if they qualify.
2. Consider forming a joint venture with an established business with a solid track record of obtaining prime federal contracts.
3. Encourage 8(a) businesses to be willing to accept GPCs as a form of payment.

To increase their chance of receiving contracts of higher value during their time in the 8(a) program, the SBA could:

1. Encourage businesses to respond to Requests for Information (RFIs) and Sources Sought Notices (SSNs) to increase their chances of receiving contracts obligated through 8(a) set-aside and sole source vehicles.
2. Advise businesses to primarily focus on pursuing prime federal contracts.
3. Advise businesses to compete for IDVs, particularly BOAs.

To have continued success after they graduate from the 8(a) program, the SBA could:

1. Encourage businesses in stage 2 to increase the portion of non-8(a) specific contracts in their portfolio. The SBA could closely monitor this ratio for businesses in stage 2 of the 8(a) program and direct them to resources at the SBA and other agencies to increase their chances of winning non-8(a) contracts.
2. Encourage businesses to diversify their portfolio beyond prime federal contracts and pursue subcontracting opportunities with recipients of other-than-small prime contracts, as well as pursuing nongovernment or commercial contracts.

In addition to the specific recommendations outlined above, the research team leading this study would like to recommend additional research that could be conducted to understand factors that may influence the success of 8(a) businesses that were beyond the scope of this study.

To improve the SBA's ability to understand the longer-term outcomes of the 8(a) program, the research team recommends that the SBA should consider developing a framework to track in real time the performance of businesses after they graduate from the 8(a) program.

Such a framework can be developed using the methodological approach used to answer Research Questions 5 and 6 and be automated using the principles of robotic data automation (RDA) where raw data can be obtained in real time using Application Programming Interfaces (APIs) from the different data sources and dedicated scripts can be developed to process it into analytical datasets, perform the analysis, and present the findings to the relevant stakeholders at the SBA. This approach would provide longer term cost savings to the SBA as it would eliminate the very high level of effort to manually gather, link, process, and analyze data each time the SBA would require an update on the performance of 8(a) businesses once they graduate from the program.

As an added step, the research team recommends that additional research be conducted to understand why businesses perform the way they do after they graduate from the 8(a) program to further shed light on the program's longer-term outcomes as it was beyond the scope of this study. Specifically, the additional research should aim to understand why certain business enjoy great success after graduating from the 8(a) program while others do not. This can be achieved by exploring the characteristics of these 8(a) businesses by looking at the industry sectors in which they operate, their location and place of performance of their prime contracts, types of contracting vehicles through which they obtained the prime contracts, and whether they are owned by entities such as ANCs, NHOs, and AITs. At the same time, future studies should also aim to understand whether 8(a) businesses that fail to win prime federal contracts after graduating from the program receive subawards of prime contracts or obtain federal funding through vehicles such as Ability One and Other Transaction Authority (OTA) or dollars obligated through Federally Funded Research and Development Centers (FFRDCs) and micro-purchases that do not count towards small business eligible dollars.

Lastly, future research could also try to understand why accepting GPCs as a form of payment increases the likelihood of 8(a) businesses obtaining their first prime federal contract. Micro-purchases are not subject to regular procurement procedures such that goods and limited services can be procured without price competition provided the contracting officer deems that the price is reasonable<sup>29</sup>; GPCs are the preferred method of payment for micro-purchases<sup>30</sup>. This suggests that accepting GPCs for micro-purchases could be a potential business opportunity, particularly as the threshold was increased to \$10,000 in 2017 and put

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<sup>29</sup> FAR 13.203(a)(2).

<sup>30</sup> FAR 13.201(b).

it effect August, 2020<sup>31</sup>. However, the findings of this study suggest that accepting GPCs as a form of payment possibly extends beyond micro-purchases as businesses that accept GPCs have a higher likelihood of winning their first prime federal contract above the micro-purchase threshold compared to 8(a) businesses that do not accept GPCs. Exploring the characteristics of 8(a) businesses that accept GPCs in terms of the industry sectors in which they operate, their business age, annual revenue, number of employees, prior federal contracting history, as well as the background and socioeconomic status of their ownership may shed light on why they have a higher likelihood of success in obtaining contracts above the micro-purchase threshold.

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31 Public Law 115-91 Subsection (a)(1).

## Appendix A: Research Question 1 Summary Statistics, Model Specifications, and Results

**Table 3: Summary statistics of the analytical dataset prepared to answer the first research question**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Percent of small business eligible dollars obligated to 8(a) businesses</i>	14.81613	19.71241	-3.616809	100.4652
<i>Funding Agency is a CFO Act Agency</i>	0.2796117	0.4492448	0	1
<i>Percent of small business eligible dollars obligated to NAICS code 51 - Information Sector</i>	9.178048	13.08389	-0.993121	100
<i>Percent of small business eligible dollars obligated to NAICS code 62 - Health Care and Social Assistance</i>	1.262012	5.215585	-0.502436	59.465
<i>Percent of small business eligible dollars obligated to NAICS code 23 - Construction</i>	6.251637	16.84257	-0.805229	100
<i>Percent of small business eligible dollars obligated to NAICS code 33 - Manufacturing</i>	6.807929	11.37344	-2.753172	100
<i>Percent of small business eligible dollars obligated to NAICS code 54 -Professional, Scientific, Technical Services</i>	49.25476	27.34728	-5.250687	106.5474
<i>Percent of small business eligible dollars obligated to NAICS code 56 - Administrative and Support, Waste Management and Remediation Service</i>	10.21795	16.10023	-20.22895	126.1791
<i>Percent of small business eligible dollars obligated to IDV type - Basic Ordering Agreement</i>	0.330248	1.691262	-0.403167	30.63058
<i>Percent of small business eligible dollars obligated to IDV type - Blank Purchasing Agreement</i>	7.368415	14.2666	-1.662723	121.9163
<i>Percent of small business eligible dollars obligated to IDV type - Federal Supply Schedule</i>	21.69241	21.16903	-1.081384	100
<i>Percent of small business eligible dollars obligated to IDV type - Government-Wide Acquisition Contract</i>	10.72916	17.94231	-1.165645	138.0025
<i>Percent of small business eligible dollars obligated to IDV type - Other Indefinite Delivery Contract</i>	21.8955	23.26148	-38.00252	152.9244
<i>Percent of small business eligible dollars obligated through Woman-Owned Small Business set-aside and Sole Source vehicles</i>	0.4050676	1.908226	-1.816172	25.55988
<i>Percent of small business eligible dollars obligated through Veteran-Owned Small Business set-aside and Sole Source vehicles</i>	2.190814	7.69664	-0.08611	92.70728
<i>Percent of small business eligible dollars obligated through HUBZone Set-aside, Sole Source, and Price Preference vehicles</i>	0.4393686	1.445418	-6.077005	23.21611
<i>Percent of small business eligible dollars obligated through 8(a) Set-aside Vehicles</i>	3.510448	9.978668	-2.022005	100
<i>Percent of small business eligible dollars obligated through 8(a) Sole Source Vehicles</i>	6.153143	13.23748	-5.200284	101.1656
<b>Number of observations</b>	<b>515</b>			

**Equation 1: Detailed specification of the multiple linear regression model to answer the first research question**

$$Y_{it} = \alpha + \Gamma N_{it} + \partial B_{it} + \beta E_{it} + \rho V_{it} + \sigma W_{it} + \tau S_{it} + \sigma O_{it} + \theta D_{it} + \Pi_t + \varepsilon_{it}$$

Where,

$i$  = is the federal agency;

$t$  = is the fiscal year;

$Y_{it}$  = percent of small business eligible dollars obligated to 8(a) businesses;

$N_{it}$  = vector of variables that capture percent of small business eligible dollars obligated to most prevalent NAICS codes of certified HUBZone businesses: NAICS code 23 – Construction, NAICS code 33 – Manufacturing, NAICS code 51 - Information Sector, NAICS code 54 - Professional, Scientific, Technical Services, and NAICS code 56 - Administrative and Support, Waste Management and Remediation Services, and NAICS code 62 - Health Care and Social Assistance;

$B_{it}$  = vector of variables that capture percent small business eligible dollars obligated to Indefinite Delivery Vehicles: Basic Order Agreement, Blank Purchasing Agreement, Federal Supply Schedule, Government-Wide Acquisition Contract, and Indefinite Delivery Contract;

$E_{it}$  = percent of small business eligible dollars obligated through 8(a) set-aside vehicles;

$V_{it}$  = percent of small business eligible dollars obligated through Veteran-Owned Small set-aside and sole source vehicles;

$W_{it}$  = percent of small business eligible dollars obligated through Women-Owned Small set-aside and sole source vehicles;

$S_{it}$  = percent of small business eligible dollars obligated to HUBZone set-aside, HUBZone sole source, or price preference awards;

$O_{it}$  = percent of small business eligible dollars obligated through 8(a) sole source vehicles;

$D_{it}$  = the funding agency is a CFO ACT agency; and

$\Pi_t$  = fixed effects that align with the fiscal year to control for changes across time.

**Table 4: Results of the multiple linear regression model developed to answer the first research question**

<b>Independent Variables<sup>32</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Funding Agency is a CFO Act Agency</i>	-1.943079	1.625319
<i>Percent of small business eligible dollars obligated to NAICS code 51 - Information Sector</i>	-0.0211729	0.1472663
<i>Percent of small business eligible dollars obligated to NAICS code 62 - Health Care and Social Assistance</i>	-0.0268791	0.1106711
<i>Percent of small business eligible dollars obligated to NAICS code 23 - Construction</i>	0.008388	0.1142035
<i>Percent of small business eligible dollars obligated to NAICS code 33 - Manufacturing</i>	-0.1210077	0.0706578
<i>Percent of small business eligible dollars obligated to NAICS code 54 -Professional, Scientific, Technical Services</i>	-0.1012632	0.0954136
<i>Percent of small business eligible dollars obligated to NAICS code 56 - Administrative and Support, Waste Management and Remediation Service</i>	-0.0724219	0.0582212
<i>Percent of small business eligible dollars obligated to IDV type - Basic Ordering Agreement***</i>	0.960028	0.2582093
<i>Percent of small business eligible dollars obligated to IDV type - Blank Purchasing Agreement</i>	-0.0385401	0.0292203
<i>Percent of small business eligible dollars obligated to IDV type - Federal Supply Schedule**</i>	0.1408611	0.0709176
<i>Percent of small business eligible dollars obligated to IDV type - Government-Wide Acquisition Contract*</i>	0.1708217	0.1020542
<i>Percent of small business eligible dollars obligated to IDV type – Other Indefinite Delivery Contract*</i>	0.0056992	0.0327808
<i>Percent of small business eligible dollars obligated through Woman-Owned Small Business set-aside and Sole Source vehicles</i>	0.1135853	0.0917023
<i>Percent of small business eligible dollars obligated through Veteran-Owned Small Business set-aside and Sole Source vehicles***</i>	-0.1992995	0.036319
<i>Percent of small business eligible dollars obligated through HUBZone Set-aside, Sole Source, and Price Preference vehicles</i>	-0.1011912	0.1250877
<i>Percent of small business eligible dollars obligated through 8(a) Set-aside Vehicles***</i>	0.8078352	0.0841554
<i>Percent of small business eligible dollars obligated through 8(a) Sole Source Vehicles***</i>	0.7678818	0.1018145
<b>Number of observations</b>	<b>515</b>	

32 \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

## Appendix B: Research Question 2 Summary Statistics, Model Specifications, and Results

**Table 5: Summary statistics of the analytical dataset prepared to answer the first part of second research question - Factors Associated with 8(a) Businesses Obtaining Prime Federal Contracts**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Has a prime federal contract</i>	0.5608291	0.496295	0	1
<i>HUBZone business</i>	0.1159787	0.3202052	0	1
<i>Woman-Owned Small Business</i>	0.3128098	0.463646	0	1
<i>HUBZone and Woman-Owned Small Business</i>	0.0380567	0.1913365	0	1
<i>Veteran-Owned Small Business</i>	0.1542524	0.3611971	0	1
<i>HUBZone and Veteran-Owned Small Business</i>	0.0200412	0.1401439	0	1
<i>Woman and Veteran-Owned Small Business</i>	0.0233694	0.1510764	0	1
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	0.0033281	0.0575951	0	1
<i>8(a) joint venture</i>	0.0010853	0.0329261	0	1
<i>Business age in days</i>	4288.425	2581.64	113	30561
<i>Accepts government credit cards</i>	0.633144	0.4819555	0	1
<i>Average annual revenue</i>	3734388	7145048	0	100000000
<i>Primary industry is Manufacturing</i>	0.0264443	0.1604554	0	1
<i>Primary industry is Construction</i>	0.2557971	0.4363162	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4426075	0.4967042	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1102992	0.313268	0	1
<i>Primary industry is other</i>	0.1648519	0.3710535	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2791303	0.4485798	0	1
<b>Number of observations</b>	<b>27643</b>			



**Equation 2: Detailed specification of the multiple linear regression model to answer the first part of the second research question- Factors Associated with 8(a) Businesses Obtaining Prime Federal Contracts**

$$Y_{it} = \alpha + \Gamma S_{it} + \beta D_{it} + \partial C_{it} + \rho A_{it} + \sigma R_{it} + \tau M_{it} + \theta I_{it} + \delta J_{it} + \Pi_t + \varepsilon_{it}$$

Where,

$i$  = is the DUNS number of the HUBZone business;

$t$  = is the fiscal year;

$Y_{it}$  = whether the 8(a) business has obtained a prime federal contract;

$S_{it}$  = vector of variables that capture additional SBA certifications and socio-economic program designations held by the 8(a) business: HUBZone business, Women-Owned Small Business, HUBZone business and a Women-Owned Small Business, Veteran-Owned Small Business, HUBZone business and a Veteran-Owned Small Business, Women-Owned Small Business and a Veteran-Owned Small Business, and HUBZone business, Women-Owned Small Business, and a Veteran-Owned Small Business;

$D_{it}$  = whether the 8(a) business was located in the Washington, D.C., metropolitan area;

$C_{it}$  = whether the 8(a) business accepts government credit cards;

$A_{it}$  = age of the 8(a) business in days;

$R_{it}$  = average annual revenue of the 8(a) business;

$M_{it}$  = whether the 8(a) business was part of a joint venture;

$I_{it}$  = vector of variables that capture the primary industry of the HUBZone business: Manufacturing, Construction, Professional, Scientific, Technical Services, Administrative and Support and Waste Management and Remediation Services, and other industries;

$J_{it}$  = vector of variables to control for underlying characteristics of the state or territory in which the 8(a) business is located; and

$\Pi_t$  = fixed effects that align with the fiscal year to control for changes across time.

**Table 6: Results of the multiple linear regression model developed to answer the first part of the second research question - Factors Associated with 8(a) Businesses Obtaining Prime Federal Contracts**

<b>Independent Variables<sup>33</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>HUBZone business***</i>	0.1531167	0.0152217
<i>Woman-Owned Small Business***</i>	0.0385032	0.0109061
<i>HUBZone and Woman-Owned Small Business</i>	-0.0157275	0.0245341
<i>Veteran-Owned Small Business***</i>	0.1180397	0.01424
<i>HUBZone and Veteran-Owned Small Business</i>	-0.0545787	0.0331583
<i>Woman and Veteran-Owned Small Business</i>	0.0023953	0.0320896
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	-0.0379422	0.0623267
<i>8(a) joint venture</i>	0.1497371	0.0754741
<i>Business age in days**</i>	0	0
<i>Accepts government credit cards***</i>	0.1171824	0.0085291
<i>Average annual revenue</i>	0	0
<i>Primary industry is Construction**</i>	0.0677753	0.0296416
<i>Primary industry is Professional, Scientific, Technical Services</i>	-0.0481058	0.0294444
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.027849	0.0314286
<i>Primary industry is other</i>	-0.03018	0.031311
<i>Located in the Washington, D.C., metropolitan area*</i>	0.0486167	0.0257701
<b>Number of observations</b>	<b>27643</b>	

<sup>33</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 7: Summary statistics of the analytical dataset prepared to answer the second part of second research question - Factors Associated with the Value of Prime Federal Dollars Obligated to 8(a) Businesses**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	3169174	6262001	0.01	95000000
<i>Had a prime federal contract in the past</i>	0.8599626	0.347037	0	1
<i>HUBZone business</i>	0.1528736	0.3598773	0	1
<i>Woman-Owned Small Business</i>	0.3134232	0.4638998	0	1
<i>HUBZone and Woman-Owned Small Business</i>	0.0496033	0.217131	0	1
<i>Veteran-Owned Small Business</i>	0.1831904	0.386835	0	1
<i>HUBZone and Veteran-Owned Small Business</i>	0.0287686	0.167161	0	1
<i>Woman and Veteran-Owned Small Business</i>	0.0290911	0.1680675	0	1
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	0.0045798	0.0675209	0	1
<i>8(a) joint venture</i>	0.0016126	0.040126	0	1
<i>Count of 8(a) set-aside contracts received</i>	1.283365	8.106464	0	436
<i>Count of 8(a) sole source contracts received</i>	4.719087	9.764521	0	314
<i>Business age in days</i>	4254.482	2529.439	138	26873
<i>Percentage of overall annual revenue from prime federal contracting</i>	56.31242	39.47382	0	100
<i>Primary industry is Manufacturing</i>	0.0279946	0.1649625	0	1
<i>Primary industry is Construction</i>	0.2967168	0.4568253	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4088886	0.4916445	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1155905	0.3197436	0	1
<i>Primary industry is other</i>	0.1508095	0.3578747	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2947172	0.4559302	0	1
<b>Number of observations</b>	<b>15503</b>			

**Equation 3: Detailed specification of the multiple linear regression model to answer the second part of second research question - Factors Associated with the Value of Prime Federal Dollars Obligated to 8(a) Businesses**

$$Y_{it} = \alpha + \Omega O_{it} + \Gamma S_{it} + \vartheta P_{it} + \beta D_{it} + \partial C_{it} + \rho A_{it} + \tau F_{it} + \mu N_{it} + \theta I_{it} + \delta J_{it} + \Pi_t + \varepsilon_{it}$$

Where,

$i$  = is the DUNS number of the 8(a) business;

$t$  = is the fiscal year;

$Y_{it}$  = total small business eligible dollars received by the 8(a) business;

$O_{it}$  = had received a prime federal contract in the past;

$S_{it}$  = vector of variables that capture additional SBA certifications and socio-economic program designations held by the 8(a) business: HUBZone business, Women-Owned Small Business, HUBZone business and a Women-Owned Small Business, Veteran-Owned Small Business, HUBZone business and a Veteran-Owned Small Business, Women-Owned Small Business and a Veteran-Owned Small Business, and HUBZone business, Women-Owned Small Business, and a Veteran-Owned Small Business;

$P_{it}$  = count of 8(a) set-aside contracts received;

$D_{it}$  = whether the 8(a) business was located in the Washington, D.C., metropolitan area;

$C_{it}$  = count of 8(a) sole source contracts received;

$A_{it}$  = age of the 8(a) business in days;

$F_{it}$  = percentage of overall annual revenue from prime federal contracting;

$N_{it}$  = whether the 8(a) business was part of a joint venture;

$I_{it}$  = vector of variables that capture the primary industry of the 8(a) business: Manufacturing, Construction, Professional, Scientific, Technical Services, Administrative and Support and Waste Management and Remediation Services, and other industries;

$J_{it}$  = vector of variables to control for underlying characteristics of the state or territory in which the 8(a) business is located; and

$\Pi_t$  = fixed effects that align with the fiscal year to control for changes across time.

**Table 8: Results of the multiple linear regression model developed to answer the second part of second research question - Factors Associated with the Value of Prime Federal Dollars Obligated to 8(a) Businesses**

<b>Independent Variables<sup>34</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	643540.4	80318.84
<i>HUBZone business</i>	25595.47	222754.8
<i>Woman-Owned Small Business***</i>	-413311.5	131987.1
<i>HUBZone and Woman-Owned Small Business</i>	-42604.43	288170.9
<i>Veteran-Owned Small Business</i>	126692.4	197166.6
<i>HUBZone and Veteran-Owned Small Business</i>	55765.51	404939.2
<i>Woman and Veteran-Owned Small Business</i>	181070	397082.4
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	572451.9	947967.8
<i>8(a) joint venture</i>	-391656.9	581716.6
<i>Count of 8(a) set-aside contracts received***</i>	106267.1	25148.03
<i>Count of 8(a) sole source contracts received***</i>	172757.2	22185.29
<i>Business age in days</i>	2.004207	19.70096
<i>Percentage of overall annual revenue from prime federal contracting***</i>	41633.45	1524.053
<i>Primary industry is Construction</i>	-993496.8	775957
<i>Primary industry is Professional, Scientific, Technical Services*</i>	-1509113	769105.6
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services**</i>	-2010182	776520
<i>Primary industry is other**</i>	-1733648	788900.1
<i>Located in the Washington, D.C., metropolitan area***</i>	-3298766	650837.2
<b>Number of observations</b>	<b>15503</b>	

<sup>34</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

## Appendix C: Research Question 3 Summary Statistics, Model Specifications, and Results

**Table 9: Summary statistics of businesses from the FY2016 cohort during their first year in the 8(a) program developed for conducting CEM matching to create the analytical dataset for the third research question**

Variable	No. of obs. <sup>35</sup>	Mean	Std. Dev.	Min.	Max.
<i>Age of the business in years</i>	818	3199.401	2618.558	222	25445
<i>Primary industry is Manufacturing or Construction</i>	839	0.017878	0.132589	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	839	0.225268	0.418008	0	1
<i>Primary industry is other</i>	839	0.756853	0.429239	0	1
<i>Had a prime federal contract in the past</i>	818	0.157702	0.364684	0	1
<i>Average annual revenue for the past three years in dollars</i>	818	1189809	3974089	1	1.00e+08
<i>Number of employees</i>	818	8.051345	13.40097	0	125
<i>Located in the Washington, D.C., metropolitan area</i>	818	0.300734	0.458858	0	1

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<sup>35</sup> The number of observations listed in the table differ for some variables as observations with missing values were not dropped as the CEM matching allows for missing values to be treated as a valid response category in the coarsened version of the variables.

**Table 10: Summary of CEM matching – number of total strata in the dataset and the number of matched strata**

Matching Summary	
Number of strata	347
Number of matched strata	152

**Table 11: Number of observations matched and the multivariate L1 distance capturing the difference between the characteristics of 8(a) and non 8(a) businesses from the FY2016 cohort during their first year in the 8(a) program after CEM matching**

	Non-8(a) Businesses	8(a) Businesses
All observations	259860	839
Matched observations	248289	839
Unmatched observations	11571	
Multivariate L1 distance	1.722e-12	

**Table 12: Univariate imbalance capturing the difference between each variable of businesses characteristics of 8(a) and non 8(a) businesses from the FY2016 cohort during their first year in the 8(a) program after CEM matching**

Coarsened variables	L1	Mean	Min.	25%	50%	75%	Max.
Age of the business in years	1.6e-12	-5.6e-12	0	0	0	0	0
Primary industry is Manufacturing or Construction	3.9e-14	-6.0e-14	0	0	0	0	0
Primary industry is Professional, Scientific, Technical Services	2.1e-12	-7.5e-13	0	0	0	0	0
Primary industry is other	2.2e-12	-3.5e-12	0	0	0	0	0
Had a prime federal contract in the past	1.5e-12	-5.1e-13	0	0	0	0	0
Average annual revenue for the past three years in dollars	1.7e-12	-5.5e-12	0	0	0	0	0
Located in the Washington, D.C., metropolitan area	1.8e-12	-9.8e-13	0	0	0	0	0
<b>Number of observations</b>	<b>249127</b>						

**Equation 4: Detailed specification of the linear probability model to estimate the sample average treatment effect on the treated of 8(a) program for cohort FY2016 businesses**

$$Y_i = \alpha + \beta T_i + \varepsilon_i$$

Where,

$i$  = is the DUNS number of the small business;  
 $Y_i$  = whether the small business obtained a federal contract; and  
 $T_i$  = whether the small business joined the 8(a) program.

**Table 13: Results of the linear probability model to estimate the sample average treatment effect on the treated of 8(a) program for cohort FY2016 businesses**

Variable <sup>36</sup>	Mean.	Std. Error
<i>Joined the 8(a) program</i> ***	0.5105872	.0161961
<b>Number of observations</b>	<b>246535</b>	

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<sup>36</sup>

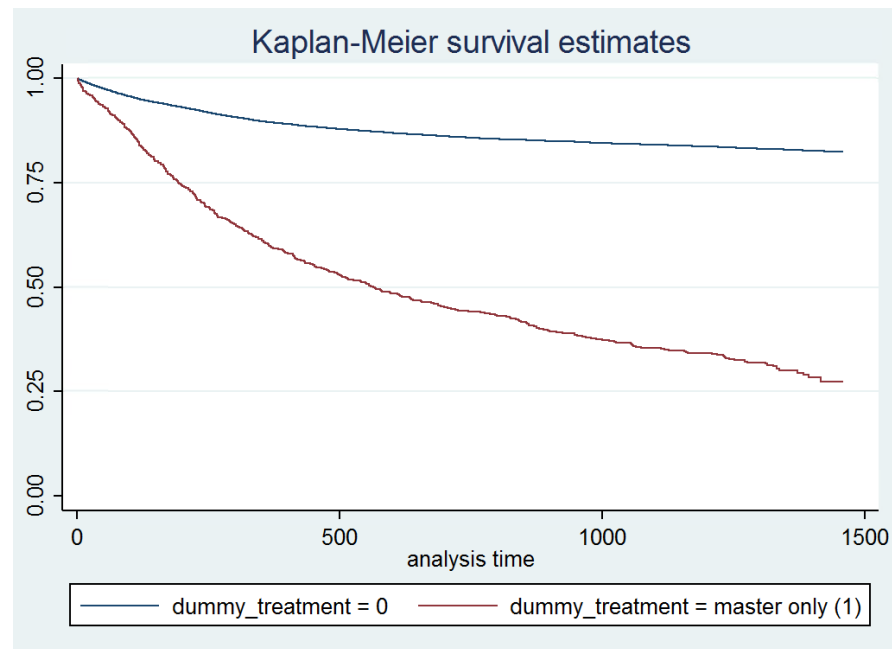
\*\*\* Denotes statistical significance at the 1 percent level.



**Table 14: Log-rank test of equality for the predictor variable that captures whether the businesses joined the 8(a) business program**

Variable	Events	Events
<i>Joined the 8(a) program</i>	<i>Observed</i>	<i>Expected</i>
No	41741.335	42206.75
Yes	572	106.58
<i>Total</i>	42313.335	42313.34
<i>chi2(1)</i>		2038.48
<i>Pr&gt;chi2</i>		<b>0.0000</b>

**Figure 15: Kaplan-Meier survival estimates by whether the businesses joined the 8(a) program**



**Equation 5: Detailed specification of the survival analysis model on obtaining contract with the hazard ratio**

$$h_i(t) = h_i(t) \exp(\beta T_i) + \varepsilon_i$$

Where,

$t$  = is time measured in days;  
 $h_i(t)$  = is the hazard function; and  
 $T_i$  = whether the business joined the 8(a) program.

**Table 15: Results of the survival analysis on obtaining contract run with the hazard ratio**

Variable <sup>37</sup>	Hazard Ratio	Std. Error
<i>Joined the 8(a) program ***</i>	5.430207	0.2286905
<b>Number of observations</b>	<b>244979</b>	

**Table 16: Test of proportionality assumption using the Schoenfeld and scaled Schoenfeld residuals**

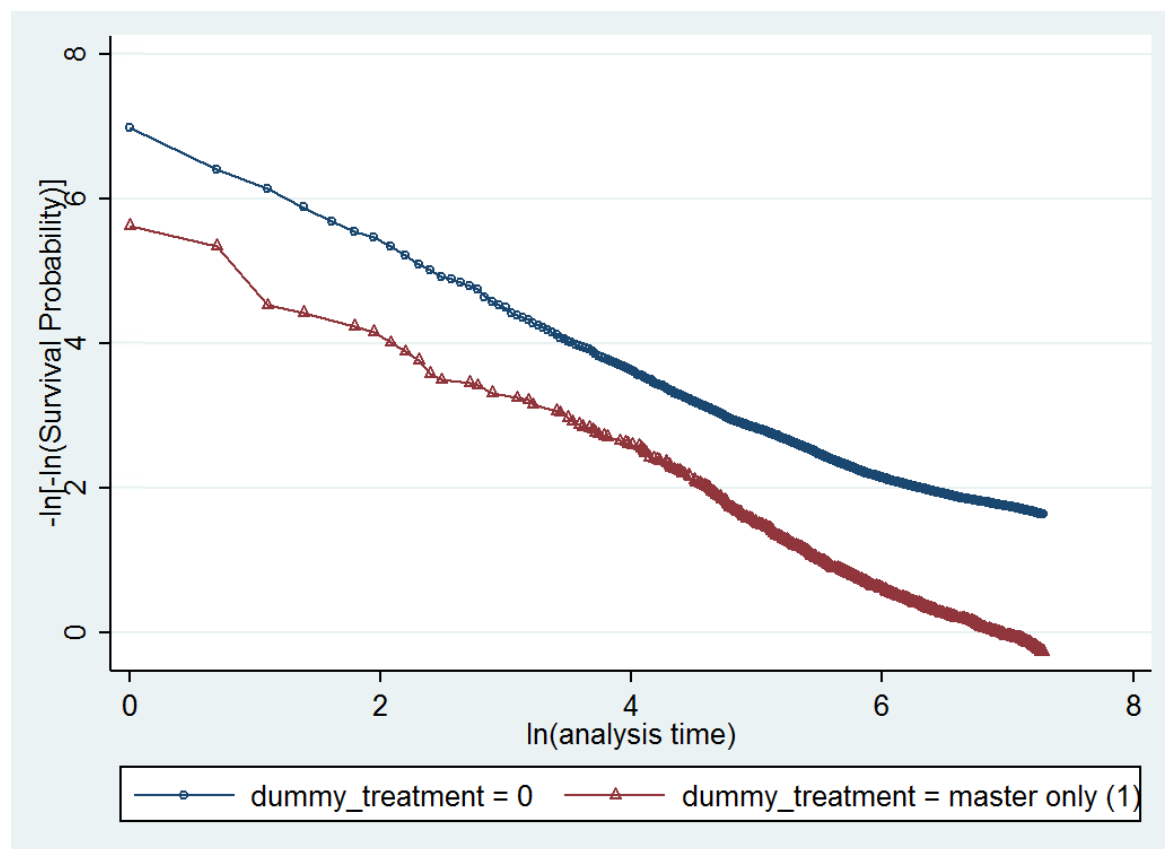
Variable	Rho	Chi2	Pr>chi2
<i>Joined the 8(a) program</i>	0.00699	1.68	0.1953
Global Test		1.68	0.1953

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<sup>37</sup>

\*\*\* Denotes statistical significance at the 1 percent level.

Figure 16: Test for proportionality assumption – plot of survival probability



## Appendix D: Research Question 4 Summary Statistics, Model Specifications, and Results

**Table 17: Summary statistics of the analytical dataset prepared to answer the fourth research question**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	1655680	4884022	0	95000000
<i>Count of 8(a) set-aside contracts received</i>	0.5664317	4.327507	0	171
<i>Count of 8(a) sole source contracts received</i>	2.313019	6.226322	0	103
<i>Count of 8(a) set-aside contracts received by a business in stage 2 of the 8(a) program</i>	0.4329437	3.751225	0	141
<i>Count of 8(a) sole source contracts received by a business in stage 2 of the 8(a) program</i>	1.501294	5.479569	0	103
<i>Has received a prime federal contract through a non-8(a) vehicle in the past</i>	0.218078	0.4129591	0	1
<i>Business in stage 2 of the 8(a) program that received a non-8(a) contract</i>	0.1094851	0.3122609	0	1
<i>Business in stage 2 of the 8(a) program</i>	0.4814848	0.4996794	0	1
<i>HUBZone business</i>	0.1176051	0.3221543	0	1
<i>Business in stage 2 of the 8(a) program and HUBZone business</i>	0.0529134	0.2238705	0	1
<i>Woman-Owned Small Business</i>	0.3206924	0.4667636	0	1
<i>Business in stage 2 of the 8(a) program and Woman-Owned Small Business</i>	0.1499063	0.3569955	0	1
<i>HUBZone and Woman-Owned Small Business</i>	0.0421165	0.200864	0	1
<i>Business in stage 2 of the 8(a) program, HUBZone and Woman-Owned Small Business</i>	0.017846	0.1323974	0	1
<i>Veteran-Owned Small Business</i>	0.1525832	0.3596013	0	1
<i>Business in stage 2 of the 8(a) program and Veteran-Owned Small Business</i>	0.0634425	0.243768	0	1
<i>HUBZone and Veteran-Owned Small Business</i>	0.0202552	0.1408783	0	1
<i>Business in stage 2 of the 8(a) program, HUBZone and Veteran-Owned Small Business</i>	0.0079415	0.0887643	0	1
<i>Woman and Veteran-Owned Small Business</i>	0.0283751	0.1660495	0	1
<i>Business in stage 2 of the 8(a) program, Woman and Veteran-Owned Small Business</i>	0.0091015	0.0949706	0	1
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	0.00464	0.067962	0	1
<i>Business in stage 2 of the 8(a) program, HUBZone, Woman and Veteran-Owned Small Business</i>	0.00116	0.0340404	0	1

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>8(a) joint venture</i>	0.0009815	0.0313154	0	1
<i>Business age in days</i>	4280.069	2707.044	113	30196
<i>Percentage of overall annual revenue from prime federal contracting</i>	30.93853	40.6514	0	100
<i>Primary industry is Manufacturing</i>	0.0247167	0.1552673	0	1
<i>Primary industry is Construction</i>	0.2805389	0.4492826	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4510574	0.4976211	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1180512	0.3226832	0	1
<i>Primary industry is other</i>	0.1256358	0.3314532	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.3079325	0.4616591	0	1
<b>Number of observations</b>	<b>11207</b>			

**Equation 6: Detailed specification of the multiple linear regression model to answer the fourth research question**

$$Y_{it} = \alpha + \tau A_{it} + \Gamma S_{it} + \tau A_{it} * \Gamma S_{it} + \partial C_{it} + \tau A_{it} * \partial C_{it} + \delta M_{it} + \tau A_{it} * \delta M_{it} + \beta D_{it} + \sigma R_{it} + \tau A_{it} * \sigma R_{it} + \sigma L_{it} + \theta I_{it} + \Omega P_{it} + \Upsilon F_{it} + J_{it} + \Pi_t + \varepsilon_{it}$$

Where,

- $i$  = is the DUNS number of the 8(a) business;
- $t$  = is the fiscal year;
- $Y_{it}$  = total small business eligible dollars received by the 8(a) business;
- $P_{it}$  = age of the 8(a) business in years;
- $S_{it}$  = count of contracts received through the 8(a) set-aside vehicle;
- $C_{it}$  = count of contracts received through the 8(a) sole source vehicle;
- $M_{it}$  = vector of variables that capture additional SBA certifications and socio-economic program designations held by the 8(a) business: HUBZone business, Women-Owned Small Business, HUBZone business and a Women-Owned Small Business, Veteran-Owned Small Business, HUBZone business and a Veteran-Owned Small Business, Women-Owned Small Business and a Veteran-Owned Small Business, and HUBZone business, Women-Owned Small Business, and a Veteran-Owned Small Business;
- $D_{it}$  = whether the 8(a) business was located in the Washington, D.C., metropolitan area;
- $A_{it}$  = whether the 8(a) business is in stage 2 of the 8(a) program;
- $R_{it}$  = whether the 8(a) business has obtained a contract obligated through non-8(a) specific vehicles;
- $F_{it}$  = percentage of overall annual revenue from prime federal contracting;
- $L_{it}$  = whether the 8(a) business is part of a joint venture;
- $I_{it}$  = vector of variables that capture the primary industry of the HUBZone business: Manufacturing, Construction, Professional, Scientific, Technical Services, Administrative and Support and Waste Management and Remediation Services, or other industries;
- $J_{it}$  = vector of variables to control for underlying characteristics of the state or territory in which the 8(a) business is located; and
- $\Pi_t$  = fixed effects that align with the fiscal year to control for changes across time.

**Table 18: Results of the multiple linear regression model developed to answer the fourth research question**

<b>Independent Variables<sup>38</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Count of 8(a) set-aside contracts received</i>	50430.61	78541.59
<i>Count of 8(a) sole source contracts received***</i>	262332.2	43691.07
<i>Count of 8(a) set-aside contracts received by a business in stage 2 of the 8(a) program**</i>	229162.3	90400.34
<i>Count of 8(a) sole source contracts received by a business in stage 2 of the 8(a) program</i>	-52409.14	49640.27
<i>Has received a prime federal contract through a non-8(a) vehicle in the past</i>	208542.4	175753.6
<i>Business in stage 2 of the 8(a) program that received a non-8(a) contract***</i>	897202.4	271508.7
<i>Business in stage 2 of the 8(a) program***</i>	536060.7	149799.8
<i>HUBZone business</i>	-124192.3	325576.4
<i>Business in stage 2 of the 8(a) program and HUBZone business</i>	478324	448531.2
<i>Woman-Owned Small Business**</i>	-232180.5	101162.7
<i>Business in stage 2 of the 8(a) program and Woman-Owned Small Business</i>	93858.19	281794.2
<i>HUBZone and Woman-Owned Small Business</i>	-191.0622	376426.9
<i>Business in stage 2 of the 8(a) program, HUBZone and Woman-Owned Small Business</i>	-820098.6	529240.7
<i>Veteran-Owned Small Business</i>	-236198.7	167468.4
<i>Business in stage 2 of the 8(a) program and Veteran-Owned Small Business*</i>	764493	450915.6
<i>HUBZone and Veteran-Owned Small Business</i>	743901.3	733953.4
<i>Business in stage 2 of the 8(a) program, HUBZone and Veteran-Owned Small Business</i>	-1462987	1050282
<i>Woman and Veteran-Owned Small Business</i>	1114.557	256792.5
<i>Business in stage 2 of the 8(a) program, Woman and Veteran-Owned Small Business</i>	1142701	1274793
<i>HUBZone, Woman, and Veteran-Owned Small Business</i>	1516011	2001267
<i>Business in stage 2 of the 8(a) program, HUBZone, Woman and Veteran-Owned Small Business</i>	-74044.36	2245428
<i>8(a) joint venture***</i>	-2110211	672207.7
<i>Business age in days***</i>	-82.5135	18.81054
<i>Percentage of overall annual revenue from prime federal contracting***</i>	28769.5	1608.919

38 \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

<b>Independent Variables<sup>38</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Primary industry is Construction</i>	88068.41	375479.8
<i>Primary industry is Professional, Scientific, Technical Services</i>	-121382.3	362898.5
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	-515345.7	362095.8
<i>Primary industry is other</i>	59348.93	427668.3
<i>Located in the Washington, D.C., metropolitan area<sup>***</sup></i>	-2133846	800926.6
<b>Number of observations</b>	<b>11207</b>	



## Appendix E: Research Question 5 Summary Statistics, Model Specifications, and Results

**Table 19: Summary statistics of the analytical dataset prepared to answer the fifth research question**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	2065666	5619147	0	95000000
<i>Had a prime federal contract in the past</i>	0.770066	0.4208056	0	1
<i>Business still in the 8(a) program</i>	0.5724872	0.4947359	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1531915	0.3601852	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1129861	0.3165874	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0802641	0.2717116	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0534116	0.2248611	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0276596	0.1640015	0	1
<i>HUBZone business</i>	0.1025679	0.3034048	0	1
<i>Woman-Owned Small Business</i>	0.3464417	0.4758534	0	1
<i>Veteran-Owned Small Business</i>	0.1443874	0.351495	0	1
<i>Business age in days</i>	2883.303	3047.828	0	24608
<i>Non-federal revenue</i>	3780130	7144908	0	97400000
<i>Primary industry is Manufacturing</i>	0.0330154	0.1786833	0	1
<i>Primary industry is Construction</i>	0.2545121	0.4356026	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4661042	0.4988681	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1151137	0.3191708	0	1
<i>Primary industry is other</i>	0.1312546	0.337691	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2760822	0.4470743	0	1
<b>Number of observations</b>	<b>13630</b>			

**Equation 7: Detailed specification of the multiple linear regression model to answer the fifth research question**

$$Y_{it} = \alpha + \Gamma S_{it} + \partial C_{it} + \delta M_{it} + \tau A_{it} + \beta D_{it} + \rho A_{it} + \mu R_{it} + \sigma L_{it} + \theta I_{it} + \Omega O_{it} + J_{it} + \varepsilon_{it}$$

Where,

$i$  = is the DUNS number of the 8(a) business;

$t$  = is the fiscal year;

$Y_{it}$  = total small business eligible dollars received by the 8(a) business;

$S_{it}$  = whether the business was also HUBZone certified;

$C_{it}$  = whether the business was also a Women-Owned Small Business;

$R_{it}$  = whether the business was also a Veteran-Owned Small Business;

$M_{it}$  = whether the 8(a) business was awarded a federal contract in the past;

$D_{it}$  = whether the 8(a) business is located in the Washington, D.C., metropolitan area;

$A_{it}$  = vector of dummy variables that represent whether the business is still in the 8(a) program or is in year- 1, 2, 3, 4, or 5 after graduating from the 8(a) program;

$O_{it}$  = age of the 8(a) business in days;

$L_{it}$  = overall annual revenue from sources other than prime federal contracting;

$I_{it}$  = vector of variables that capture the primary industry of the HUBZone business: Manufacturing, Construction, Professional, Scientific, Technical Services, Administrative and Support and Waste Management and Remediation Services, or other industries; and

$J_{it}$  = vector of variables to control for underlying characteristics of the state or territory in which the 8(a) business is located.

**Table 20: Results of the multiple linear regression model developed to answer the fifth research question**

<b>Independent Variables<sup>39</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	1312203	97650.14
<i>Business 1 year after graduating from the 8(a) program***</i>	-649134.7	200304.2
<i>Business 2 years after graduating from the 8(a) program***</i>	-819480.3	207074.1
<i>Business 3 years after graduating from the 8(a) program***</i>	-880068.4	246837.3
<i>Business 4 years after graduating from the 8(a) program***</i>	-965515.7	242736.8
<i>Business 5 years after graduating from the 8(a) program***</i>	-1181452	319096.1
<i>HUBZone business</i>	142535.9	179089.5
<i>Woman-Owned Small Business</i>	101446.4	180502.5
<i>Veteran-Owned Small Business***</i>	1055181	376213.5
<i>Business age in days***</i>	-87.61868	30.54533
<i>Non-federal revenue***</i>	-0.2145059	0.0239155
<i>Primary industry is Construction</i>	-603246.3	846729
<i>Primary industry is Professional, Scientific, Technical Services</i>	-1244563	834884.9
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services**</i>	-1701178	853020.9
<i>Primary industry is other</i>	-1293106	888021.6
<i>Located in the Washington, D.C., metropolitan area***</i>	-5922604	1312550
<b>Number of observations</b>	<b>13630</b>	

39 \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 21: Summary statistics of the analytical dataset prepared to answer the fifth research question – filtered to only include businesses in the first quartile of prime federal contracting revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	0	0	0	0
<i>Had a prime federal contract in the past</i>	0.5331835	0.4989408	0	1
<i>Business still in the 8(a) program</i>	0.5041479	0.500026	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1520913	0.3591404	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1296232	0.3359175	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0995506	0.2994258	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0743173	0.2623093	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0402696	0.1966079	0	1
<i>HUBZone business</i>	0.0701694	0.2554543	0	1
<i>Woman-Owned Small Business</i>	0.3297615	0.4701671	0	1
<i>Veteran-Owned Small Business</i>	0.1152783	0.3193851	0	1
<i>Business age in days</i>	2673.247	3138.268	0	24608
<i>Non-federal revenue</i>	2806855	5545087	0	97400000
<i>Primary industry is Manufacturing</i>	0.0356032	0.1853147	0	1
<i>Primary industry is Construction</i>	0.2245074	0.4172936	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.5	0.5000432	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1061182	0.3080155	0	1
<i>Primary industry is other</i>	0.1337712	0.3404357	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2509506	0.4335976	0	1
<b>Number of observations</b>	<b>5,786</b>			

**Table 22: Summary statistics of the analytical dataset prepared to answer the fifth research question – filtered to only include businesses in the second quartile of prime federal contracting revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	24814.96	17951.69	0.01	62139.01
<i>Had a prime federal contract in the past</i>	0.856171	0.3510869	0	1
<i>Business still in the 8(a) program</i>	0.5490768	0.4978276	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1477162	0.354991	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1389699	0.3460833	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.090379	0.2868634	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0495627	0.2171452	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0242954	0.1540397	0	1
<i>HUBZone business</i>	0.1088435	0.3115942	0	1
<i>Woman-Owned Small Business</i>	0.3858115	0.4870231	0	1
<i>Veteran-Owned Small Business</i>	0.1710398	0.3767269	0	1
<i>Business age in days</i>	2891.934	3162.727	0	23513
<i>Non-federal revenue</i>	3369581	5778372	0	53000000
<i>Primary industry is Manufacturing</i>	0.04276	0.2024138	0	1
<i>Primary industry is Construction</i>	0.2429543	0.4290763	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4071914	0.49155	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1496599	0.3569112	0	1
<i>Primary industry is other</i>	0.1574344	0.3643869	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2380952	0.4261248	0	1
<b>Number of observations</b>	<b>1,029</b>			

**Table 23: Results of the multiple linear regression model developed to answer the fifth research question – filtered to only include businesses in the second quartile of prime federal contracting revenue**

<b>Independent Variables<sup>40</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	4914.88	1601.831
<i>Business 1 year after graduating from the 8(a) program</i>	-1079.1	2519.266
<i>Business 2 years after graduating from the 8(a) program</i>	-3747.266	2524.129
<i>Business 3 years after graduating from the 8(a) program**</i>	-5244.451	2654.174
<i>Business 4 years after graduating from the 8(a) program</i>	-5094.065	3353.167
<i>Business 5 years after graduating from the 8(a) program</i>	-1171.421	4884.252
<i>HUBZone business</i>	3042.81	1973.022
<i>Woman-Owned Small Business</i>	318.68	1366.64
<i>Veteran-Owned Small Business</i>	841.1887	1707.445
<i>Business age in days</i>	0.0699714	0.3356703
<i>Non-federal revenue</i>	-0.0002181	0.0001332
<i>Primary industry is Construction</i>	4616.307	2981.829
<i>Primary industry is Professional, Scientific, Technical Services</i>	4474.133	3000.277
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services**</i>	7180.932	3179.101
<i>Primary industry is other</i>	2714.791	3152.666
<i>Located in the Washington, D.C., metropolitan area</i>	-9748.045	6108.177
<b>Number of observations</b>	<b>1029</b>	

<sup>40</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 24: Summary statistics of the analytical dataset prepared to answer the fifth research question – filtered to only include businesses in the third quartile of prime federal contracting revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	541716.3	400007.6	62168.35	1473656
<i>Had a prime federal contract in the past</i>	0.9319249	0.2519117	0	1
<i>Business still in the 8(a) program</i>	0.6255869	0.484042	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1622653	0.3687481	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.0971244	0.2961706	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0601526	0.2378042	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0355047	0.1850788	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0193662	0.1378286	0	1
<i>HUBZone business</i>	0.1261737	0.3320938	0	1
<i>Woman-Owned Small Business</i>	0.3747066	0.4841181	0	1
<i>Veteran-Owned Small Business</i>	0.1496479	0.3567783	0	1
<i>Business age in days</i>	3232.286	3176.302	0	20093
<i>Non-federal revenue</i>	3925464	7043877	0	82800000
<i>Primary industry is Manufacturing</i>	0.030223	0.1712255	0	1
<i>Primary industry is Construction</i>	0.2467723	0.4311963	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4372066	0.4961141	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1426056	0.3497215	0	1
<i>Primary industry is other</i>	0.1431925	0.3503204	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2717136	0.4449083	0	1
<b>Number of observations</b>	<b>3,408</b>			

**Table 25: Results of the multiple linear regression model developed to answer the fifth research question – filtered to only include businesses in the third quartile of prime federal contracting revenue**

<b>Independent Variables<sup>41</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	94341.28	24700.58
<i>Business 1 year after graduating from the 8(a) program**</i>	-68905.64	29013
<i>Business 2 years after graduating from the 8(a) program***</i>	-110973.1	30877.01
<i>Business 3 years after graduating from the 8(a) program**</i>	-81509.47	36175.04
<i>Business 4 years after graduating from the 8(a) program**</i>	-91352.08	42579.79
<i>Business 5 years after graduating from the 8(a) program***</i>	-151100.5	53142.85
<i>HUBZone business</i>	15661.1	27671.35
<i>Woman-Owned Small Business</i>	24315.95	18052.32
<i>Veteran-Owned Small Business**</i>	55349.61	24352.42
<i>Business age in days</i>	-4.141639	4.148194
<i>Non-federal revenue*</i>	0.002199	0.0012577
<i>Primary industry is Construction**</i>	103511.7	47191.48
<i>Primary industry is Professional, Scientific, Technical Services</i>	57125.79	46860.76
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	21020.83	49320.87
<i>Primary industry is other</i>	20341.31	48996.13
<i>Located in the Washington, D.C., metropolitan area</i>	-15295.69	70750.11
<b>Number of observations</b>	<b>3408</b>	

<sup>41</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.



**Table 26: Summary statistics of the analytical dataset prepared to answer the fifth research question – filtered to only include businesses in the fourth quartile of prime federal contracting revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Total small business eligible dollars received</i>	7714508	9134329	1473986	95000000
<i>Had a prime federal contract in the past</i>	0.9844438	0.1237688	0	1
<i>Business still in the 8(a) program</i>	0.6425007	0.4793339	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1476372	0.3547921	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.0927502	0.2901247	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0645729	0.2458069	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0369827	0.188747	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0155562	0.1237688	0	1
<i>HUBZone business</i>	0.132081	0.3386285	0	1
<i>Woman-Owned Small Business</i>	0.3346052	0.4719215	0	1
<i>Veteran-Owned Small Business</i>	0.1805107	0.3846687	0	1
<i>Business age in days</i>	2888.344	2671.156	0	17581
<i>Non-federal revenue</i>	5411630	9380666	0	91700000
<i>Primary industry is Manufacturing</i>	0.0284708	0.166338	0	1
<i>Primary industry is Construction</i>	0.3167009	0.465258	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4552392	0.4980655	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.0924567	0.2897121	0	1
<i>Primary industry is other</i>	0.1071324	0.3093269	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.3346052	0.4719215	0	1
<b>Number of observations</b>	<b>3,407</b>			

**Table 27: Results of the multiple linear regression model developed to answer the fifth research question – filtered to only include businesses in the fourth quartile of prime federal contracting revenue**

<b>Independent Variables<sup>42</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	3851537	556314.1
<i>Business 1 year after graduating from the 8(a) program</i>	-300520.4	603883.9
<i>Business 2 years after graduating from the 8(a) program</i>	389466.2	672782.4
<i>Business 3 years after graduating from the 8(a) program</i>	894192.6	875632.7
<i>Business 4 years after graduating from the 8(a) program</i>	1038799	914353.9
<i>Business 5 years after graduating from the 8(a) program</i>	1233727	1742957
<i>HUBZone business</i>	-241484.1	494232.6
<i>Woman-Owned Small Business</i>	83932.68	495724.4
<i>Veteran-Owned Small Business**</i>	1886375	783986.2
<i>Business age in days*</i>	-198.6113	106.9797
<i>Non-federal revenue***</i>	-0.3073857	0.0291802
<i>Primary industry is Construction**</i>	-5232723	2515326
<i>Primary industry is Professional, Scientific, Technical Services**</i>	-5949620	2510191
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services***</i>	-6921247	2559889
<i>Primary industry is other*</i>	-5158990	2706524
<i>Located in the Washington, D.C., metropolitan area***</i>	-9822272	1906554
<b>Number of observations</b>	<b>3407</b>	

<sup>42</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

## Appendix F: Research Question 6 Summary Statistics, Model Specifications, and Results

**Table 28: Summary statistics of the analytical dataset prepared to answer the sixth research question**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Average annual revenue</i>	5845796	9346143	0	97400000
<i>Had a prime federal contract in the past</i>	0.770066	0.4208056	0	1
<i>Business still in the 8(a) program</i>	0.5724872	0.4947359	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1531915	0.3601852	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1129861	0.3165874	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0802641	0.2717116	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0534116	0.2248611	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0276596	0.1640015	0	1
<i>HUBZone business</i>	0.1025679	0.3034048	0	1
<i>Woman-Owned Small Business</i>	0.3464417	0.4758534	0	1
<i>Veteran-Owned Small Business</i>	0.1443874	0.351495	0	1
<i>Business age in days</i>	2883.303	3047.828	0	24608
<i>Total small business eligible dollars received</i>	2065666	5619147	0	95000000
<i>Primary industry is Manufacturing</i>	0.0330154	0.1786833	0	1
<i>Primary industry is Construction</i>	0.2545121	0.4356026	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4661042	0.4988681	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1151137	0.3191708	0	1
<i>Primary industry is other</i>	0.1312546	0.337691	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2760822	0.4470743	0	1
<b>Number of observations</b>	<b>13630</b>			

**Equation 8: Detailed specification of the multiple linear regression model to answer the sixth research question**

$$Y_{it} = \alpha + \Gamma S_{it} + \partial C_{it} + \delta M_{it} + \tau A_{it} + \beta D_{it} + \rho A_{it} + \mu R_{it} + \sigma L_{it} + \theta I_{it} + \Omega O_{it} + J_{it} + \varepsilon_{it}$$

Where,

$i$  = is the DUNS number of the 8(a) business;

$t$  = is the fiscal year;

$Y_{it}$  = average annual revenue;

$S_{it}$  = whether the business was also HUBZone certified;

$C_{it}$  = whether the business was also a Women-Owned Small Business;

$R_{it}$  = whether the business was also a Veteran-Owned Small Business;

$M_{it}$  = whether the 8(a) business was awarded a federal contract in the past;

$D_{it}$  = whether the 8(a) business is located in the Washington, D.C., metropolitan area;

$A_{it}$  = vector of dummy variables that represent whether the business is still in the 8(a) program or is in year- 1, 2, 3, 4, or 5 after graduating from the 8(a) program;

$O_{it}$  = age of the 8(a) business in days;

$L_{it}$  = total small business eligible dollars received by the 8(a) business;

$I_{it}$  = vector of variables that capture the primary industry of the HUBZone business: Manufacturing, Construction, Professional, Scientific, Technical Services, Administrative and Support and Waste Management and Remediation Services, or other industries; and

$J_{it}$  = vector of variables to control for underlying characteristics of the state or territory in which the 8(a) business is located.

**Table 29: Results of the multiple linear regression model developed to answer the sixth research question**

<b>Independent Variables<sup>43</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	1027863	165294.1
<i>Business 1 year after graduating from the 8(a) program***</i>	2066650	232198.9
<i>Business 2 years after graduating from the 8(a) program***</i>	2441978	250776.2
<i>Business 3 years after graduating from the 8(a) program***</i>	2711225	291719.8
<i>Business 4 years after graduating from the 8(a) program***</i>	2882221	339594.7
<i>Business 5 years after graduating from the 8(a) program***</i>	3017781	393944.5
<i>HUBZone business**</i>	-426561.6	199010.8
<i>Woman-Owned Small Business***</i>	-696667.4	264305.7
<i>Veteran-Owned Small Business*</i>	-44030.4	384812.2
<i>Business age in days***</i>	182.2912	35.6443
<i>total small business eligible dollars received***</i>	0.6406362	0.0300684
<i>Primary industry is Construction</i>	-1132690	836213.8
<i>Primary industry is Professional, Scientific, Technical Services*</i>	-1444124	830926
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services**</i>	-1896137	873183.7
<i>Primary industry is other**</i>	-1873369	884628.9
<i>Located in the Washington, D.C., metropolitan area***</i>	-1.17E+07	1729843
<b>Number of observations</b>	<b>13630</b>	

<sup>43</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 30: Summary statistics of the analytical dataset prepared to answer the sixth research question – filtered to only include businesses in the first quartile of overall revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Average annual revenue</i>	363900.1	230924.6	0	817415.6
<i>Had a prime federal contract in the past</i>	0.5287559	0.4992457	0	1
<i>Business still in the 8(a) program</i>	0.6091549	0.4880114	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1405516	0.3476095	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1059272	0.3077896	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0721831	0.2588288	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0481221	0.2140555	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.024061	0.1532612	0	1
<i>HUBZone business</i>	0.0680751	0.2519117	0	1
<i>Woman-Owned Small Business</i>	0.3559272	0.4788636	0	1
<i>Veteran-Owned Small Business</i>	0.1405516	0.3476095	0	1
<i>Business age in days</i>	3177.028	3123.626	0	24608
<i>Total small business eligible dollars received</i>	54085.18	138461.2	0	817415.6
<i>Primary industry is Manufacturing</i>	0.0287559	0.1671441	0	1
<i>Primary industry is Construction</i>	0.1681338	0.3740399	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.5170188	0.4997836	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1255869	0.3314318	0	1
<i>Primary industry is other</i>	0.1605047	0.3671273	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2670188	0.4424672	0	1
<b>Number of observations</b>	<b>3,408</b>			

**Table 31: Results of the multiple linear regression model developed to answer the sixth research question – filtered to only include businesses in the first quartile of overall revenue**

<b>Independent Variables<sup>44</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	70486.33	11055.34
<i>Business 1 year after graduating from the 8(a) program</i>	-907.7284	13357.87
<i>Business 2 years after graduating from the 8(a) program</i>	-2915.783	14296.06
<i>Business 3 years after graduating from the 8(a) program</i>	-10459.79	14236.46
<i>Business 4 years after graduating from the 8(a) program</i>	-17111.86	16129.5
<i>Business 5 years after graduating from the 8(a) program**</i>	-38845.32	18770.79
<i>HUBZone business</i>	8452.769	18123.83
<i>Woman-Owned Small Business</i>	-16848.68	13102.42
<i>Veteran-Owned Small Business**</i>	-46384.79	18628.37
<i>Business age in days</i>	-1.487622	2.096263
<i>Total small business eligible dollars received***</i>	0.3243748	0.0295435
<i>Primary industry is Construction</i>	-1302.926	42236.92
<i>Primary industry is Professional, Scientific, Technical Services</i>	-6144.36	39802.87
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	-46679.7	43639.18
<i>Primary industry is other</i>	-44015.05	42744.89
<i>Located in the Washington, D.C., metropolitan area</i>	99110.1	63408.31
<b>Number of observations</b>	<b>3408</b>	

<sup>44</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 32: Summary statistics of the analytical dataset prepared to answer the sixth research question – filtered to only include businesses in the second quartile of overall revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Average annual revenue</i>	1538508	504035.8	818298	2500000
<i>Had a prime federal contract in the past</i>	0.7392284	0.4391174	0	1
<i>Business still in the 8(a) program</i>	0.6029288	0.4893599	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1470008	0.3541566	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1078569	0.3102433	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0712475	0.2572741	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0475922	0.2129319	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0233737	0.1511086	0	1
<i>HUBZone business</i>	0.0982822	0.2977377	0	1
<i>Woman-Owned Small Business</i>	0.343002	0.474779	0	1
<i>Veteran-Owned Small Business</i>	0.1301042	0.3364654	0	1
<i>Business age in days</i>	3109.892	3143.479	0	20579
<i>Total small business eligible dollars received</i>	327473.2	562514.2	0	2498521
<i>Primary industry is Manufacturing</i>	0.0371726	0.1892113	0	1
<i>Primary industry is Construction</i>	0.2433117	0.4291422	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4835258	0.4997989	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1137708	0.3175774	0	1
<i>Primary industry is other</i>	0.1222191	0.3275848	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2723177	0.4452152	0	1
<b>Number of observations</b>	<b>3,551</b>			



**Table 33: Results of the multiple linear regression model developed to answer the sixth research question – filtered to only include businesses in the second quartile of overall revenue**

<b>Independent Variables<sup>45</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past***</i>	84780	25676.25
<i>Business 1 year after graduating from the 8(a) program***</i>	149837.1	34476.63
<i>Business 2 years after graduating from the 8(a) program***</i>	178332.9	37853.58
<i>Business 3 years after graduating from the 8(a) program***</i>	138994.7	40587.63
<i>Business 4 years after graduating from the 8(a) program***</i>	135890.7	41080
<i>Business 5 years after graduating from the 8(a) program*</i>	87107.06	50210.22
<i>HUBZone business</i>	39595.48	37895.44
<i>Woman-Owned Small Business</i>	10907.67	28465.06
<i>Veteran-Owned Small Business</i>	-4746.01	41686.76
<i>Business age in days***</i>	13.45468	5.156757
<i>Total small business eligible dollars received***</i>	0.18198	0.015433
<i>Primary industry is Construction</i>	13490.94	82710.35
<i>Primary industry is Professional, Scientific, Technical Services</i>	-9222.74	79684.66
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	-53371	89683.18
<i>Primary industry is other</i>	-49338.6	87154.91
<i>Located in the Washington, D.C., metropolitan area</i>	-21042.5	100037.9
<b>Number of observations</b>	<b>3551</b>	

<sup>45</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 34: Summary statistics of the analytical dataset prepared to answer the sixth research question – filtered to only include businesses in the third quartile of overall revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Average annual revenue</i>	4271252	1177783	2501560	6770714
<i>Had a prime federal contract in the past</i>	0.8894334	0.3136427	0	1
<i>Business still in the 8(a) program</i>	0.5776417	0.4940106	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.1568147	0.3636817	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.1068913	0.3090223	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.0811639	0.2731284	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.0508423	0.2197092	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0266462	0.1610719	0	1
<i>HUBZone business</i>	0.1240429	0.329681	0	1
<i>Woman-Owned Small Business</i>	0.354977	0.4785797	0	1
<i>Veteran-Owned Small Business</i>	0.141807	0.3489056	0	1
<i>Business age in days</i>	2928.326	3055.818	0	17216
<i>Total small business eligible dollars received</i>	1316566	1705341	0	6766974
<i>Primary industry is Manufacturing</i>	0.024196	0.1536809	0	1
<i>Primary industry is Construction</i>	0.2912711	0.4544177	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.4290965	0.495023	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.1271057	0.3331423	0	1
<i>Primary industry is other</i>	0.1283308	0.334509	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.2732006	0.4456713	0	1
<b>Number of observations</b>	<b>3,265</b>			

**Table 35: Results of the multiple linear regression model developed to answer the sixth research question – filtered to only include businesses in the third quartile of overall revenue**

<b>Independent Variables<sup>46</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past</i>	70382.25	68642.81
<i>Business 1 year after graduating from the 8(a) program<sup>***</sup></i>	584942.7	84761.69
<i>Business 2 years after graduating from the 8(a) program<sup>***</sup></i>	788782.1	88728.94
<i>Business 3 years after graduating from the 8(a) program<sup>***</sup></i>	793108.3	97031.4
<i>Business 4 years after graduating from the 8(a) program<sup>***</sup></i>	797838.1	101951
<i>Business 5 years after graduating from the 8(a) program<sup>*</sup></i>	862132.2	127482.1
<i>HUBZone business</i>	118626.2	75096.06
<i>Woman-Owned Small Business</i>	-16325.04	74448.59
<i>Veteran-Owned Small Business</i>	22726.68	94850.43
<i>Business age in days<sup>***</sup></i>	52.30192	13.18192
<i>Total small business eligible dollars received<sup>***</sup></i>	0.1919092	0.0138126
<i>Primary industry is Construction</i>	-23566.85	248725.9
<i>Primary industry is Professional, Scientific, Technical Services</i>	-139941.7	249584.1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	-116767.5	259229.6
<i>Primary industry is other</i>	-176695.9	264336.9
<i>Located in the Washington, D.C., metropolitan area</i>	-7619.035	220453.5
<b>Number of observations</b>	<b>3265</b>	

<sup>46</sup> \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

**Table 36: Summary statistics of the analytical dataset prepared to answer the sixth research question – filtered to only include businesses in the fourth quartile of overall revenue**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Average annual revenue</i>	1.73E+07	1.28E+07	6772400	9.74E+07
<i>Had a prime federal contract in the past</i>	0.929243	0.256457	0	1
<i>Business still in the 8(a) program</i>	0.499119	0.500073	0	1
<i>Business 1 year after graduating from the 8(a) program</i>	0.16882	0.374648	0	1
<i>Business 2 years after graduating from the 8(a) program</i>	0.131239	0.337711	0	1
<i>Business 3 years after graduating from the 8(a) program</i>	0.096888	0.295848	0	1
<i>Business 4 years after graduating from the 8(a) program</i>	0.067234	0.250464	0	1
<i>Business 5 years after graduating from the 8(a) program</i>	0.0367	0.188052	0	1
<i>HUBZone business</i>	0.120963	0.326132	0	1
<i>Woman-Owned Small Business</i>	0.332355	0.471127	0	1
<i>Veteran-Owned Small Business</i>	0.16559	0.371767	0	1
<i>Business age in days</i>	2310.012	2773.916	0	20093
<i>Total small business eligible dollars received</i>	6608709	9739693	0	9.50E+07
<i>Primary industry is Manufacturing</i>	0.041398	0.199237	0	1
<i>Primary industry is Construction</i>	0.317381	0.465526	0	1
<i>Primary industry is Professional, Scientific, Technical Services</i>	0.432472	0.495492	0	1
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	0.094539	0.29262	0	1
<i>Primary industry is other</i>	0.11421	0.318113	0	1
<i>Located in the Washington, D.C., metropolitan area</i>	0.291838	0.454675	0	1
<b>Number of observations</b>	<b>3,406</b>			

**Table 37: Results of the multiple linear regression model developed to answer the sixth research question – filtered to only include businesses in the fourth quartile of overall revenue**

<b>Independent Variables<sup>47</sup></b>	<b>Coefficient</b>	<b>Robust Std. Error</b>
<i>Had a prime federal contract in the past</i>	-563039.3	1053189
<i>Business 1 year after graduating from the 8(a) program***</i>	4750317	754864
<i>Business 2 years after graduating from the 8(a) program***</i>	5632428	795708
<i>Business 3 years after graduating from the 8(a) program***</i>	6524221	953728.7
<i>Business 4 years after graduating from the 8(a) program***</i>	6838703	1111054
<i>Business 5 years after graduating from the 8(a) program*</i>	7602963	1165395
<i>HUBZone business***</i>	-2588083	613979.2
<i>Woman-Owned Small Business**</i>	-1584602	688180.8
<i>Veteran-Owned Small Business</i>	-722218.5	920465.2
<i>Business age in days***</i>	426.3929	137.5568
<i>total small business eligible dollars received***</i>	0.524829	0.0379082
<i>Primary industry is Construction*</i>	-3779700	2032392
<i>Primary industry is Professional, Scientific, Technical Services</i>	-2044488	2065004
<i>Primary industry is Administrative and Support and Waste Management and Remediation Services</i>	-3221110	2218912
<i>Primary industry is other</i>	-1620629	2239213
<i>Located in the Washington, D.C., metropolitan area***</i>	-12900000	2103939
<b>Number of observations</b>	<b>3406</b>	

47 \* Denotes statistical significance at the 10 percent level.

\*\* Denotes statistical significance at the 5 percent level.

\*\*\* Denotes statistical significance at the 1 percent level.

## Appendix G: Supplementary Data

Tables 38 below contain data presented in Figures 9 in the report. The table is included in the appendix to supplement the information presented in the figure in the report.

**Table 38: Count of 8(a) certified business by state and type of location**

State	Metropolitan	Micropolitan	Small town	Rural
AK	199	13	18	17
AL	89	4	7	1
AR	16	2	0	0
AZ	134	2	3	1
CA	666	14	9	7
CO	148	1	2	3
CT	19	0	0	0
DC	165	0	0	0
DE	13	0	0	0
FL	384	2	2	0
GA	255	7	3	0
GU	0	18	0	0
HI	111	5	0	0
IA	15	1	0	0
ID	22	4	3	2
IL	164	1	0	0
IN	41	1	0	1
KS	31	1	0	1
KY	17	3	1	0
LA	113	7	6	1
MA	43	0	2	0
MD	736	3	1	0
ME	6	0	1	0
MI	99	8	1	2
MN	26	0	0	1
MO	63	0	1	2
MS	26	11	3	2
MT	8	2	6	3
NC	86	11	0	0
ND	4	0	1	9
NE	16	0	1	0
NH	8	0	0	0
NJ	108	3	0	0
NM	94	9	5	0
NV	38	1	1	0
NY	111	2	3	0
OH	125	5	0	0
OK	73	18	5	8
OR	29	6	0	1

State	Metropolitan	Micropolitan	Small town	Rural
PA	93	3	0	0
PR	88	0	0	0
RI	7	0	0	0
SC	49	3	2	0
SD	3	2	2	5
TN	62	1	2	1
TX	512	8	6	1
UT	56	4	0	0
VA	976	0	4	1
VI	0	4	0	0
VT	1	0	0	0
WA	96	3	1	6
WI	30	0	1	1
WV	13	3	0	0
WY	5	2	2	2