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Glossary

High-growth industries	STEM-adjacent industries.
High-yield industries	STEM industries.
NAICS	North American Industry Classification System.
Patentee	Someone who owns a patent.
Sector	Industry associated with a particular NAICS code.
STEM industries	Defined as science, technology, engineering and mathematics industries, and others such as data processing, medicine, and pharmaceuticals that yield high profits for entrepreneurs.
STEM-adjacent	Industries such as architecture, engineering and construction (AEC), and industries that have come into focus recently such as, infrastructure, supply chain, sustainability, etc. These industries are growing rapidly but do not yield profits comparable to classic STEM industries.
Undervalued industries	Care providing industries such as, home healthcare, nursing care, childcare, elder care, adult care, and others such as arts and education related industries.
Women in STEM	Women entrepreneurs in the high-yield and high-growth industries.

1. Executive Summary

We performed this research to further understand female entrepreneurship in high-yield and high-growth industries. Phase I of this research resulted in a report (NWBC 2023) that examined the current status of "Women in STEM" and provided policy solutions for their success. However, the Phase I research relied only on 2019 Census data for female-owned STEM businesses. In this Phase (Phase II) we collected and examined data on these businesses for the years 2012 through 2020, studied the impact of variables that influence these entrepreneurs, and developed policy recommendations based on the relationships between these variables and women STEM entrepreneurs.

1-1 Background

The Bipartisan Infrastructure Law, the CHIPS and Science Act, and the Inflation Reduction Act include large investments in manufacturing, clean energy and infrastructure projects, intended to expand opportunities in disadvantaged communities. Women are underrepresented and have long faced challenges to starting and owning businesses in these sectors. To assure long-term US leadership and domestic development of greater capacity and innovative products and processes, our missing talent must be activated. We must do more to support and encourage women at all stages of their careers to consider scientific and technologically-driven entrepreneurship.

1-2 National Level Analysis and Results

Female STEM entrepreneurs are concentrated in the Professional, Scientific, and Technical Services (NAICS Code 541) and Ambulatory Health Care (NAICS Code 621) sectors at the national level. This is true for both employer and nonemployer firms, over the years 2012 through 2020. We found the following from running the national level log-log model:

- A 1% increase in the number of women patentees produces about a 0.56% increase in the number of women STEM entrepreneurs. So, higher numbers of female patentees lead to increases in female STEM entrepreneurship.
- A 1% increase in female venture capital funding (funding to female-founded and co-founded firms) leads to a .29% increase in the number of female STEM entrepreneurs. This could be because more of this funding is directed towards STEM, including the sectors where female STEM businesses are concentrated. This could alleviate the intense competition for limited resources that these firms face, allowing them to flourish.
- An increase in the national labor force of 1% results in a 37% increase in the number of these entrepreneurs. Saksena et al. (2022) in a USPTO study mention the better childcare options and increased networking opportunities for women entrepreneurs due to a large labor force. This could result in an increase in their numbers.

- An increase in female STEM graduates leads to a decrease in the number of female STEM entrepreneurs, who are in sectors as diverse as Fabricated Metal Product Manufacturing (NAICS Code 332) to Data Processing, Hosting, and Related Services (NAICS Code 518). The academic credentials needed for these sectors could be very different. A 1% increase leads to a 9.9% fall in the number of entrepreneurs in business. This could happen if these graduates gravitate towards sectors that female STEM entrepreneurs are concentrated in, leading to increased competition and firm failures.
- If interest rates rise by one percentage point, it will cause a cause a 0.08% decrease in the number of women STEM entrepreneurs. Rising interest rates imply increasing financing difficulties for these entrepreneurs. The magnitude of this decline is small, possibly because most of these businesses are nonemployer firms, which because of their low capital requirements are less susceptible to interest rate changes.
- Higher per-capita incomes lead to a decline in female STEM entrepreneurship. A 1% increase in per-capita real income causes a close to 3% decrease in the number of women STEM entrepreneurs. Higher per capita incomes could act as a supply variable instead of a demand variable that stimulates the demand for female STEM firms' services. With the flexibility that higher incomes provide, women could prioritize raising families over starting businesses. Also, the gender disparity in incomes and the glass ceiling that women face in the STEM workforce leads some of them to start businesses. With higher incomes this may no longer be the case. In other words, when good jobs are available, women seize the option.
- There is a positive relationship between the COVID-19 pandemic and female STEM entrepreneurship[1]. Among the many reasons for this contrary result are:
    - Early-stage female entrepreneurs reported finding new opportunities during the pandemic (Elam et al. 2021/2022).
    - In 2020, women reached their highest monthly rate of new entrepreneurs in 24 years (Fairlie and Desai 2021).
    - Women STEM entrepreneurs are concentrated in the healthcare sector which grew during COVID-19.
    - The second round of pandemic funding through community organizations could have benefited these entrepreneurs.
    - Direct cash payments to families could have helped women start new businesses.

[1] The magnitude of the COVID-19 results and their interpretation is included in Appendix A for the national results.

- Economic necessity could have driven rising entrepreneurship.

1-3 Observations

Important takeaways from our data analysis at the national level and by race, ethnicity and veteran status include:

- Female STEM entrepreneurs are concentrated in the professional, scientific, and technical services, and health care sectors.
- Black, Hispanic and Asian women STEM entrepreneurs are highly positively responsive to women patentee numbers, venture capital funding and labor force size, and highly negatively responsive to per-capita incomes and female STEM graduate numbers.
- The White, non-Hispanic results are close and American Indian or Alaska Native (AIAN), Native Hawaiian results reflect a small base.
- Higher interest rates do not impact female STEM entrepreneurs greatly.

1-4 Policy Implications

The above findings that show positive correlations suggest that federal policy should aim to increase the magnitude of those independent variables to increase women STEM entrepreneurship. This leads to the following policy implications:

- Congress and the Department of Education could work with state and local jurisdictions to condition public funding of higher education institutions on female students' commercialization exposure. This could lead more female students to patent their research. The increase in patentees would bring about an increase in the number of female STEM entrepreneurs.
- Congress could authorize state and local governments to use grant funding in programs including Community Development Block Grants (CDBGs) to establish commercialization authorities that work with institutions to help commercialize the research of underserved populations in STEM, leading to more patentees in these fields and more female STEM entrepreneurs.
- Congress could legislate additional public funding for Small Business Investment Companies (SBICs)[i] and the State Small Business Credit Initiative (SSBCI)[ii] to strategically invest in sectors in which women STEM entrepreneurs are concentrated, and to target women in sectors in which they're underrepresented. These partners could target both crowded and less crowded female STEM sectors. Increased funding in crowded sectors could take the pressure of businesses competing for limited dollar amounts and help them succeed. Other STEM sectors in which female firms are less represented could benefit from additional funding, allowing new female entrepreneurs to access funding to start businesses.
- The SBA could train investors and lenders on targeted female STEM investment. The SBA could train female venture capitalists and angel investors to invest in female businesses in specific STEM sectors. The SBA could also partner with

banks and other institutional lenders to help them lend to female businesses in these sectors.

- The federal government could provide grants similar to the child care stabilization grants to increase the childcare labor force and increase childcare options for women entrepreneurs.
- State government access to federal grants and other resources could be conditioned on their support of child care worker wages and benefits, again increasing care options for women businesses.
- The federal government could tie K-12 funding to female STEM learning. This would create a pipeline for a skilled STEM workforce which would allow for more networking options and employee options for female STEM businesses.
- The SBA could provide application assistance to female businesses during emergencies, helping them access government funding during these times.
- The federal government could use community organizations to provide emergency assistance, leading to more assistance for female businesses.
- The federal government could provide direct cash payments to families during shocks. This would give more women the flexibility to start new businesses.

These policies would result in increased commercialization, funding, childcare, training and emergency support for Women in STEM. Society would benefit through increased innovation, patenting, entrepreneurship, productivity and resilience.

2. Introduction

The *Bipartisan Infrastructure Law* (BIL), the *CHIPS and Science Act and Inflation Reduction Act (IRA) of 2022* include large investments in manufacturing, clean energy and infrastructure projects. These Acts also aim to invest in disadvantaged communities. The National Women's Business Council (NWBC, Council) wants female entrepreneurs in high-yield and high-growth industries to take advantage of these historic opportunities. However, women-owned businesses face challenges in finding and growing their businesses in these sectors. The Women in STEM research aims to understand the current representation of women in these industries and identify policies to support these businesses. We describe the two phases of this research below.

In Phase I, we performed a literature survey of previous research on female STEM entrepreneurship, an analysis of the most recent (2019) data on women business owners in these industries, and a policy review of existing policies impacting these businesses. The literature survey and data analysis helped us make policy inferences to support these businesses. The policy review helped us further refine these inferences and develop policy solutions to enhance Women in STEM success. However, these policy recommendations were preliminary, because they were based on data at a point-in-time that presented a snapshot of Women in STEM status in 2019.

We conducted a Phase II of this research to understand the historical trends of female STEM businesses, and to make more definitive policy recommendations based on these trends. We gathered national- and state-level Census data on employer and nonemployer female STEM businesses from 2012 through 2020, and data on factors such as female patentees, funding and financing, STEM graduates, labor force, and per-capita incomes that could influence these numbers. In order to study the impact of these factors, we performed an econometric analysis based on log-log models at the national and state levels and by race and ethnicity. We examined the results of these analyses to understand the influence of these variables on female STEM entrepreneurs and developed national policy implications as well as those specific to race and ethnicity and the 50 U.S. states and District of Columbia.

The remainder of this National Findings report is organized as follows:

- Chapter 3, describes the Data and Methodology
- Chapter 4, provides National Results and Policy Implications
- Chapter 5, is the Conclusion
- Chapter 6, is a list of References
- Appendices with model results and statistical references are included at the end of the report

A full version of this report that also includes State-level results and policy implications is available online.

3. Data and Methodology

This chapter describes the data sets we accessed and the research methodology we used to further investigate Women in STEM entrepreneurship. We identify the sources we used to gather the data, steps we undertook to prepare the data and close data gaps for data analysis, the econometric and statistical methods we used to analyze the data and the software we employed to run the econometric models.

3-1 Data Sets

We developed data sets for this research by gathering data on the number and location of female STEM entrepreneurs, patent information, funding and financing data, employment data, female STEM graduates' data, and per capita income data. We used the same NAICS codes for STEM sectors that were identified and used in Phase I of the research.

3-1-1 Number and Location of Women STEM Entrepreneurs

We chose to gather the number and location of female STEM entrepreneurs at the more detailed three-digit NAICS level, as opposed to the two-digit level. The NAICS at the three-digit level covers both STEM and STEM-adjacent industries. For example, NAICS 541 covers STEM industries such as "Scientific research and development services", but also STEM-adjacent industries such as "Architectural, engineering, and related services". For the years where the data was available only at the two-digit level, we used three-digit by two-digit ratios from appropriate years to convert the data to three-digit levels. Some of the sources we used report data by 2017 NAICS, whereas some use 2012 NAICS. We looked at the correspondence between 2012 and 2017 NAICS codes for the STEM sectors and found that they matched.

We obtained the number of female employer STEM entrepreneurs, and their location by state from the Census SBO, for the year 2012[iii]. This data is by the 2012 NAICS and is available at the two-digit NAICS level[iv]. To obtain this data at the three-digit level, we applied the 2017 female employer three-digit by two-digit ratios for each sector to the 2012 two-digit number of female employer firms per sector.

We used the 2013 SUSB Annual Data Tables by Establishment Industry as a source for the number of employer firms in 2013 by 2012 NAICS, but the data are not divided by sex[v]. We calculated the 2017 three-digit number of female STEM employer firms as a percent of 2017 three-digit total number of STEM employer firms. We applied this percentage to the 2013 three-digit STEM total number of firms from SUSB to obtain the estimated number of three-digit female-owned STEM employer firms in 2013.

For the years 2014, 2015, and 2016, we obtained female STEM employer data from the ASE. The ASE provides "economic and demographic characteristics of employer businesses and their owners by sector, sex, ethnicity, race, and veteran status for the nation, states, and the fifty most populous metropolitan statistical areas (MSAs)"[vi]. This data was available by sex at the two-digit level. We applied the 2017 female employer three-digit by two-digit ratios for each sector to the two-digit number of female employer firms per sector for each of these years to obtain the data at the three-digit level.

We obtained the number of female employer STEM entrepreneurs, and their location by state from the ABS, for the years 2017 to 2020[vii] from the 2018, 2019, 2020 and 2021 ABS. Each ABS provides data for the previous year. For example, the 2018 ABS covers reference year 2017.

The 2018, 2020 and 2021 ABS provide employer information for three-digit NAICS, whereas, the 2019 ABS provides employer data only for two-digit NAICS (the above endnote has links to the methodology of these surveys). So, the employer data for 2017, 2019 and 2020 is more detailed at the three-digit NAICS level, as compared to the data for 2018, which is at the two-digit level. We calculated the data for 2018 by taking an average of the 2017 and 2019 female employer three-digit by two-digit ratios for each sector, and applying this average to the 2018 two-digit number of female employer firms by STEM sector.

The Census NES Tables[viii] provide data on U.S. nonemployer businesses by sector at the three-digit level. However, this data is not differentiated by sex. So, we calculated the 2018 three-digit number of female STEM nonemployer firms as a percent of 2018 three-digit total number of STEM nonemployer firms. We applied this percentage to the 2012 through 2016 three-digit STEM total number of nonemployer firms from NES to obtain the estimated number of three-digit female-owned STEM nonemployer firms for these years.

For 2017, the estimated number of female nonemployer firms is available from Table 1 of the 2017 NES-D[ix]. However, these are just estimates. So, we used the NES Tables for 2017 that have data that are not estimates, and applied the fraction of female to total number of nonemployer establishments from 2017 to obtain the number of 2017 nonemployer female firms. For the years 2018 and 2019, NES-D data is available at the three-digit NAICS level and we used this data for the number of nonemployer firms in these years. For 2020, NES-D data was not available when we started the analysis, though it has become available recently[x]. So, in the beginning, for 2020 we used NES data on total nonemployer establishments and applied an average of 2018 and 2019 female nonemployer fractions to it, to obtain the 2020 female STEM nonemployer firms' number. However, we updated the regression analysis with actual 2020 female STEM nonemployer firm numbers as the data became available. The results after the update were very close to the initial results.

3-1-2 Patent Information

We gathered national level patent data from PatentsView Annualized Data Tables[xi] that provide information on the inventors, companies and gender of inventors for the patents granted in a particular year. We downloaded patent data by year from these data tables, then distilled patent data where at least one of the inventors was female, and summed the number of female patentees by year to obtain the national number of women patentees by year.

For the state level patent data, we constructed our own dataset. We used the data downloads found at PatentsView[xii]. Next, we merged the following files together: g_patent with g_inventor by patent_id to get the patent grant date, and merged the above dataset to g_location_disambiguated by location_id to get the locations of the inventors by year. We then extracted the female inventors from these files to get the number of female inventor patentees by state by year.

3-1-3 Funding and Financing Data

We accessed venture capital funding data for women entrepreneur startups at the state and national levels from PitchBook's Female Founders Dashboard[xiii]. We gathered investment data for female-only founded and co-founded firms by year, and summed this data to get the total investment in female-founded firms by year, both nationally and by state.

To understand the impact of changing interest rates on the financing obtained by female entrepreneurs, we collected national interest rate data (30-year fixed rate mortgage average in the U.S.) from sources such as the Federal Reserve Bank of St. Louis Federal Reserve Economic Data, (FRED), series[xiv].

3-1-4 Labor Force/Employment Data

We obtained national level employment data from the CPS[xv]. We collected data on the Total employed, 16 years and over in thousands, for the years 2012 through 2020.

For state-level employment data we used the Bureau of Labor Statistics (BLS) [xvi] as a source. We chose a state, and then selected Total Nonfarm, Not Seasonally Adjusted, include Annual Average (All Employees, In Thousands)[xvii] data. Seasonal adjustment is only used for quarterly and more frequent data and annual average data are never seasonally adjusted.

3-1-5 Women STEM Graduates Data

To obtain this data we accessed NCES Digest of Education Statistics and found information on the number of STEM degrees by sex of student[xviii]. We collected data on the total number of STEM degrees/certificates obtained by female U.S. citizens, permanent residents, and nonresidents by year for the years 2012-13 through 2020-21.

3-1-6 Per capita Income Data

We accessed this data from the Bureau of Economic Analysis (BEA) “Regional Data and Personal Income” [xix]. We used “Per capita personal income (dollars)” as the chosen statistic, and “United States” as the chosen area for the national data. For the state-level data, we picked each state instead of selecting the United States. We adjusted these data to take account of the effects of inflation, to get “real” per capita income for all years.

3-2 National Level Methodology

We used the Continuous Variables Approach (CVR) to evaluate how explanatory variables such as female patentee numbers, venture capital funding, interest rates, etc. impact the number of female STEM entrepreneurs at the national level. The variables at the national level are as follows:

NWSTEM = the number of women STEM entrepreneurs nationally

W_{PAT} = the number of women patentees nationally

VCF = national level venture funding for women STEM entrepreneurs

LF = national labor force

WSG = women STEM graduates in the U.S.

R = Interest rate (30-year fixed rate mortgage average in the U.S.[xx])

PCI = Real per-capita income in the U.S.

D = Dummy with a value of 0 for non-pandemic years (2012 thru 2019) and 1 for the pandemic year 2020

ε = random error

log = the natural logarithm

Then a continuous variables equation for women STEM entrepreneurs at the national level is below. This equation is based on a log-log model.

The log-log model is a standard statistical form used frequently in econometric research. Perhaps the most famous use is the Cobb-Douglas production function, which is the basic form used for decades in (industry) production or cost studies (Cobb and Douglas 1928, Biddle 2012)[xxi]. A recent study uses the model in much more complex form to study industrial behavior (Baum-Snow et al. 2024)[xxii].

This model has the convenient and widely used feature that elasticities (percent changes in the dependent variable due to a percent change in an independent variable) are easy to calculate. We found that the model captured a high percent of variation in the dependent variable, the model fit the data well, and the model explained the effects of changes in independent variables such as women patentees, venture capital funding on the dependent variable reasonably well.

We tested other models, such a logistic regression to model the data by sector (for states with missing values in the female STEM employer and nonemployer numbers), and the standard errors in the results were very high, showing the low accuracy of the statistics. So, we did not use this approach.

We did not use a fixed effects model with states. A fixed effects estimator sets a variety of constant adjustments for different individual series. For 50 states, plus the District of

Columbia, there would be 51 possible numbers that would get added to the constant, to change the constant to be appropriate for each individual series. However, the state-level models did not converge with all the variables in several cases. There were serious differences in the variable coefficients well beyond the differences in the constants. For example, there were different coefficients for the venture-capital variable by state, and the real per-capita income variable by state. The fixed effects model would have blurred all these differences into the fixed effects. With the log-log model we have much more information individual state by individual state. It is not clear that that there is one national market, and there are only differences in constants, and everything would be captured by the fixed-effect terms. Knowing what the individual state coefficients are is a useful starting point because for example, it cannot be said that Nebraska is competing with California for women STEM entrepreneurs, and all the independent variable effects are really the same for both of them except for constants modified by fixed effect intercepts.

The national level equation based on the log-log model is:

$$\log(\text{NWSTEM}) = \beta_0 + \beta_1 * \log(\text{WPAT}) + \beta_2 * \log(\text{VCF}) + \beta_3 * \log(\text{LF}) + \beta_4 * \log(\text{WSG}) + \beta_5 * R + \beta_6 * \log(\text{RI}) + \beta_7 * \text{COVID19\_D} + \varepsilon$$

The model is in (natural) logarithms, and attempts to describe the (logarithm of the) number of women STEM entrepreneurs in the U.S. in the years 2012 – 2020. The variable names are as follows:

LNWSTEM = Log of number of Women STEM Entrepreneurs in a year

LWPAT = Log of the number of Women Patentees for a given year

LVCF = Log of venture capital funding (Inflation-Adjusted) in firms with at least one female founder in millions of dollars

LLF = Log of the (Employed) U.S. Labor Force, 16 and older for the given year in thousands

LWSG = Log of the number of Women STEM graduates in the given year

R = Average 30-year Mortgage Rate in the given year

LRI = Log of Real (Inflation-Adjusted) Per-Capita Income in the given year in dollars

COVID19_D = A dummy variable to account for COVID-19 (1 only in 2020)

(Intercept) = The Constant Intercept in the regression

The independent variables used to examine the women STEM entrepreneurs are natural ones to use. Patentees, venture funding, financing based on interest rates, employment, and female STEM graduates impact the supply of female STEM entrepreneurs whereas per-capita incomes impact their demand.

Changes in any of these independent variables cannot be guaranteed to cause entrepreneurship. The motivations to enter entrepreneurship have been studied by The World Bank, and are due to factors such as economic necessity, entrepreneurship as a complement to family orientation (Carranza et al. 2018). But the features covered by these variables map very well to endowments, which The World Bank study finds highly related to women entrepreneurial success[xxiii].

The economic variables discussed in this study are corroborated in The World Bank Study. The study states: "Access to finance is an important constraint of women entrepreneurs". Venture capital financing, especially from women-founded venture capital funds, can help relieve this constraint. Interest rates, which are included as a variable here, are an important feature in measuring the relative ease of obtaining not just venture capital funding, but all funding, especially loan-based. The study also states: "Education and experience can be improved by business training. Network endowments can be strengthened by networking and mentoring opportunities.". These are directly connected to the number of women STEM graduates, and labor force variables included in our study. In comparing women STEM entrepreneurs to men STEM entrepreneurs, the study states: "In particular, the size and sector of the firm often explain a large portion of the differences in performance." Real income is a useful explanatory variable in explaining the relative openness and market demand in the STEM sectors.

We used R to run the above regression model to explain female entrepreneurship in STEM in the U.S., for the years 2012 – 2020. The regression describes how different factors affect the number of women STEM entrepreneurs in the U.S.

We also ran this equation at the national level by demographic characteristics, such as race and ethnicity. The equations that we used for this modeling are:

$$\log(\text{NWSTEMR}) = \beta_0 + \beta_1 * \log(\text{WPAT}) + \beta_2 * \log(\text{VCF}) + \beta_3 * \log(\text{LF}) + \beta_4 * \log(\text{WSG}) + \beta_5 * \text{R} + \beta_6 * \log(\text{RI}) + \beta_7 * \text{COVID19\_D} + \varepsilon$$

$$\log(\text{NWSTEME}) = \beta_0 + \beta_1 * \log(\text{WPAT}) + \beta_2 * \log(\text{VCF}) + \beta_3 * \log(\text{LF}) + \beta_4 * \log(\text{WSG}) + \beta_5 * \text{R} + \beta_6 * \log(\text{RI}) + \beta_7 * \text{COVID19\_D} + \varepsilon$$

$$\log(\text{NWSTEMV}) = \beta_0 + \beta_1 * \log(\text{WPAT}) + \beta_2 * \log(\text{VCF}) + \beta_3 * \log(\text{LF}) + \beta_4 * \log(\text{WSG}) + \beta_5 * \text{R} + \beta_6 * \log(\text{RI}) + \beta_7 * \text{COVID19\_D} + \varepsilon$$

The three new variable names are as follows:

LNWSTEMR = Log of the number of Women STEM Entrepreneurs in a race in a year nationally for each of the five races identified in the ABS and NES-D - White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander

LNWSTEME = Log of the number of Women STEM Entrepreneurs by ethnicity in a year nationally for each of the two ethnicities identified in the ABS and NES-D – Hispanic, and non-Hispanic

LNWSTEMV = Log of the number of Women STEM entrepreneurs by veteran status in a year nationally for each of the two veteran statuses identified in the ABS and NES-D – Veteran, and Non-veteran.

We gathered Census data for these three variables at the two-digit NAICS level (31-33 Manufacturing, 51 Information, 54 Professional, scientific, and technical services, 55 Management of companies and enterprises, and 62 Health care and social assistance). This is because data at the three-digit level for these variables was not available for the years of our study. For employer businesses in these sectors, we used the SBO (2012), ASE (2014, 2015, 2016), and ABS (2017, 2018, 2019, 2020) as sources to gather data on the two ethnicities, five races, and two veteran statuses. For the year 2013 we used SUSB as a source. This data was not differentiated by sex, race, ethnicity, or veteran status. We applied the appropriate 2017 ratios (for example, 2017 female STEM Hispanic employer numbers by 2017 total STEM employer numbers) to obtain the 2013 employer numbers.

For the nonemployer data for these variables, we used NES as a source for the years 2012 through 2016. However, this data was not differentiated by sex, ethnicity, race, or veteran status. The 2017 NES-D estimates provide nonemployer data differentiated by these categories. We applied 2017 demographic percentages (for example, 2017 female STEM Hispanic nonemployer numbers by 2017 total STEM nonemployer numbers) to the total nonemployer numbers from these years to obtain the data by the different race, ethnic and veteran status categories. For the years 2018, 2019, and 2020, we were able to obtain data differentiated by sex, race, and veteran status from the NES-D.

3-3 Data Limitations

Besides the limitations related to employer and nonemployer data that we discussed in Section 3-1, there were other limitations to the data we collected for this analysis. These include the following:

- We used employer and nonemployer female STEM data from the years 2012 through 2020, the years with information available on the number of female STEM businesses. There were limited statistical results and/or coefficients for some states due to missing values for employer and nonemployer female STEM numbers for certain sectors for some years. These states include Alabama, Alaska, Hawaii, Maine, Mississippi, Nevada, New Mexico, North Dakota, South Dakota, West Virginia, and Wyoming.
- There was little or no data on female STEM numbers for certain manufacturing sectors in some other states, either because there were no firms in these sectors, or because the data was not reported. However, there was enough data across sectors for these states, so that statistical results and coefficients were successfully computed.
- More recent (2020) nonemployer data became available during the course of our analysis. We used estimations of this data for 2020 based on NES data and average of 2018 and 2019 data fractions, that were available at the start of our

analysis. However, we updated our analysis with the actual 2020 nonemployer data as it became available.

- Some values in the Census data collected included letters rather than numbers, making it difficult to compile the data. Below are the letters included and their interpretation[xxiv]:
    - D- Estimate is withheld to avoid disclosing data for individual companies; data are included in higher level totals.
    - N - Estimates are not available or not comparable.
    - S- Estimate did not meet the Census reporting standards so it is unreported.
    - X- Estimates that were identified as " Not applicable" by the Census.

We did not impute values to estimates where these letters occurred in the data.

4. National Results and Policy Implications

This chapter examines the results of the national level log-log models to understand the factors that influence the number of female STEM entrepreneurs at the national level. It is important to note that these relationships identified by our research are correlations, not definitive proofs of causality. This is the case for all statistical analyses in the social sciences for which double-blind tests are simply not available. We also draw policy implications from these results to show how government programs and assistance can enhance female STEM entrepreneurs' success.

4-1 National Model Results and Policy Implications

Nationally female STEM entrepreneurs are concentrated in the Professional, Scientific, and Technical Services and Ambulatory Health Care sectors. This is true for both employer and nonemployer firms, over the years 2012 through 2020. The regression output for the national model is in Appendix A. We have interpreted the coefficients and explained the results below.

4-1-1 National Model Interpretations

Based on the National Level CVR Model Results, we draw the following interpretations.

A 1% increase in the number of women patentees produces about a 0.56% increase in the number of women entrepreneurs. A policy to address social pressures on women patentees could thus increase the number of women entrepreneurs. The sign of this coefficient conforms to expectation.

Similarly, a 1% increase in venture capital funding produces about a .29% increase in the number of women entrepreneurs. Venture capital funds devoted to promotion of women entrepreneurs thus do have the expected effect. It is surprising that a 1% increase in venture capital funding yields a 0.29% increase in the number of women entrepreneurs, since the funding to women owned firms tends to be very small to begin with. It could be that most venture capital funding even though it is a small amount goes to female STEM businesses and more specifically STEM businesses in the healthcare/medical services sector where female firms dominate, allowing for less competition towards limited resources, and leading to increases in the number of female STEM entrepreneurs.

The estimated effect of the labor force is extremely high. The estimate indicates a 1% increase in the labor force would produce a 37% increase in the number of women entrepreneurs. However, the aggregate number for the labor force is also large. The labor force currently (and in 2012 and all the years thereafter) was close to 150 million. So, a 1% increase in the labor force would be close to an increase of 1.5 million people or more, and thus, the 37% increase in projected women STEM entrepreneurs may not seem so high in context. Female STEM entrepreneurs can take advantage of increased networking opportunities and better options for childcare due to the large labor force, per the Saksena et al. (2022) USPTO study.

The increase in the interest rates has the predicted negative sign, a one percentage point rise in interest rates is projected to cause a 0.08% decrease in the number of women STEM entrepreneurs. Since such an increase would increase funding/financing difficulties for the entrepreneurs, only the magnitude of this coefficient, which is relatively small, is of any surprise. This small change could be because female STEM firms are primarily nonemployer firms, that possibly have low capital requirements and interest rate changes don't have much impact on them. Women also consistently have less access to third party capital as opposed to bootstrapping sources to raise funds, so it's possible that they're less affected than other business owners would be by interest rates.

The remaining coefficients are somewhat surprising, and some may relate to the large (relative) number of women entrepreneurs who seek to enter health or medical fields. Per the analysis of Census data in the initial phase of this study, "...a large number of STEM businesses are providing health care, professional, scientific, and technical services. In the Ambulatory Healthcare Services sector, there are more female-owned businesses overall compared to male-owned businesses. This is also true for nonemployer firms in this sector."

It would be expected that a 1% increase in women STEM graduates would lead to a positive increase in the number of women STEM entrepreneurs. The LWSG coefficient indicates that the opposite is true; that a 1% increase leads to a 9.9% fall in the number of entrepreneurs. It is quite possible that the increase in supply leads to increased competition, in which both incumbents and entrants fail, especially if the entrants specialize in concentrated fields, where the incumbents already are in place. It may be the case that there are implicit socially binding constraints to push women into the fields, and thus generate cutthroat competition. In addition, it is possible that STEM education is a pipeline to academia rather than to entrepreneurship.

Something similar may apply to the per-capita real income variable. Per-capita real income should reflect demand, in that more demand should lead to more women STEM entrepreneurs, so that the LRI sign should be positive. But in this regression, a 1% increase in per-capita real income is projected to cause close to a 3% decrease in the number of women STEM entrepreneurs, all else held constant. In addition to the possible implicit constraint, there may be abandonment of entrepreneurship by the women to raise families, so that per-capita real income is not a demand variable, but a supply variable. It is also possible that women may be opting for better-paid employment opportunities when wages are high, vs. starting their own businesses.

Finally, the COVID-19 dummy is positive. It would seem *a priori* that this sign should be negative, that the pandemic would have decreased the number of women STEM entrepreneurs, whereas the regression suggests that there was an increase in their number. The literature survey performed in the initial phase of this study could explain this relationship.

“Despite gaps in funding during the pandemic within the United States in 2021, 21.5% of early-stage women entrepreneurs reported that the pandemic provided them with new opportunities (Elam et al. 2021/2022). This coupled with the finding in the report that North American women are 78% more likely than men to start a business in the ICT fields, could imply that early-stage women entrepreneurs in these STEM-related fields found new opportunities during the pandemic…”

“Fairlie and Desai (2021) find that in 2020 the monthly rate of new entrepreneurs was .30 percent among women, and .48 percent among men. These were large increases for both men and women from the previous year. Women reached their highest monthly rate in 24 years. This monthly rate increased for all racial groups from 2019. It also increased greatly for all age groups. The increases in this rate happened as the economy experienced shutdowns, layoffs and re-openings. While this finding is not STEM-specific, the favorable entrepreneurship climate for start-ups could have helped female STEM founders as well.”

Women entrepreneurs had a hard time accessing external funds during the pandemic years, and used their own funds to start businesses. During the pandemic years, women did not receive funds during the first round of funding, but did better during the second round of funding. In addition, women might have benefited from direct cash payments to families. This could have helped them start new businesses including in the STEM fields. Also, the positive results for the number of female STEM entrepreneurs during the COVID years could be related to the focus of the women STEM entrepreneurs in the health and medical fields – the pandemic would have increased the demand for these services.

4-1-2 National Policy Implications

Based on the National Level CVR Model Results, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-1: National Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with states to tie institutional funding to female student STEM exposure. 2. Congress could authorize states to use grant funding to establish commercialization authorities. 3. Congress could legislate additional public funding for SBICs and SSBCI to target concentrated and less crowded STEM sectors. 4. The SBA could train investors and lenders on targeted female STEM investment. 5. The federal government could provide child care stabilization grants. 6. The federal government could tie K-12 funding to female STEM learning. 7. The federal government could use community organizations for emergency assistance. 8. The federal government could provide direct cash payments to families during shocks.	1. Increase female commercialization exposure. 2. Support female academics innovation. 3. Increase funding in underrepresented STEM sectors for women. 4. Increase credit and investment availability in specific sectors. 5. Create a large pool of childcare options for female STEM businesses. 6. Create a skilled female workforce and networking opportunities. 7. Increase female entrepreneurs access to financing. 8. Help women start new STEM businesses.

We describe these policy interpretations in detail below.

1. An increase in the number of women patentees leads to an increase in the number of women STEM entrepreneurs.
    a. Congress and the Department of Education could work with state and local jurisdictions to condition public funding of higher education institutions on increased female STEM enrollment & commercialization exposure.
    b. This would encourage institutions to perform outreach to female academics and help them succeed academically.
    c. Institutions could make female faculty aware of commercialization training programs, and support their commercialization efforts.
    d. Congress could authorize state and local governments to use grant funding in programs including CDBGs to establish commercialization authorities, to support STEM research, innovation, entrepreneurship with licensing offices.

2. An increase in venture capital funding leads to an increase in the number of female STEM entrepreneurs.
    a. Congress could legislate additional public funding for SBICs and SSBCI to invest in sectors in which women STEM entrepreneurs are concentrated, and to target women in sectors in which they're underrepresented.
    b. SBA could train STEM-related female venture capital/angel investors.
    c. SBA could educate local lenders on female STEM investment, in healthcare and in the less concentrated sectors.
3. An increase in the labor force increases the number of female STEM entrepreneurs.
    a. The federal government could provide grants similar to the American Rescue Plan's child care stabilization grants[xxv] that provided funding to states to allocate to child care providers. This will help providers offer competitive wages to their employees, leading to an increase in the child care labor force.
    b. This could encourage states to adopt initiatives to increase the childcare labor force:
        i. Assist with child care wages similar to Minnesota's grant program.
        ii. Provide monthly stipends to child care workers similar to what is being done in Maine.
        iii. Provide additional funding to selected providers for staff recruitment and bonuses, and assist with them with payroll taxes.
        iv. Provide free health insurance to child care workers and their families similar to Washington, D.C.
    c. The federal government and states could adopt practices to increase the skilled female STEM workforce, leading to more networking opportunities for female STEM entrepreneurs:
        i. Federal funding programs for K-12, such as, Title I grants could be tied to increased exposure to STEM learning for female students by schools.
        ii. State funding per student to institutions could be tied to increased female STEM enrollment and commercialization exposure.
4. Unprecedented shocks to the economy could create new opportunities for female STEM businesses.
    a. Congress could legislate financial assistance through local/community organizations during emergencies, to help female STEM entrepreneurs.
    b. SBA could assist female STEM entrepreneurs with emergency funding applications through its resource networks.
    c. The federal government could provide direct cash payments to families during economy-wide shocks. This could benefit women and help them start new STEM businesses.

4-2 National Model by Race, Ethnicity and Veteran Status Interpretations

In this section we describe the results of the regression analyses, by year, broken down into race, ethnic, and veteran status categories. The regression outputs for the national models by race, ethnicity, and veteran status are in Appendix A. We have interpreted the coefficients and explained the results below for each racial and ethnic group, and veteran status separately.

4-2-1 Black or African American Results Interpretation

We found that over the time period of this study, female Black or African American employer and nonemployer STEM firms are concentrated in the Health Care and Social Assistance sectors. There is also a relatively large number of nonemployer STEM firms from this racial category in the Professional, Scientific, and Technical Services sectors.

The regression output for the National Level Black or African American CVR Model is in Appendix A. Based on the results of this model, we draw the following interpretations.

A 1% increase in female patentees is expected to lead to a 1.6% increase in entrepreneurship for this group. This is likely because the increase in female patentees also leads to an increase in Black women patentees, who go on to start STEM businesses.

Similarly, a 1% increase in female venture capital funding is associated with a .9% increase in the number of Black or African American women STEM entrepreneurs. The reasons for this could be many, the share of funding for these entrepreneurs is low[xxvi] to begin with (Houston 2023). The funding could be directed to sectors where these firms are concentrated alleviating the competition for resources in these areas, or the increased funding could go to STEM sectors where there are not a relatively large number of these firms. This could help in creating new businesses in these sectors.

A 1% increase in the labor force leads to a 114% rise for female STEM entrepreneurs in this racial category. This could be because of better child care and networking options for these firms with an increase in the work force and Black female STEM entrepreneurs being more responsive to labor force changes.

An increase in the number of female STEM graduates by 1% leads to a close to 31% decrease in the number of female STEM firms in this group. This could be because increases in the number of these graduates happen in the sectors where these firms are concentrated leading to increased competition and business failures.

A 1% increase in the interest rate leads to a .31% decrease in the number of these entrepreneurs. This small decrease could be because these businesses don’t rely on traditional financing to begin with, and therefore higher interest rates don’t impact them in a significant way. There is a significantly higher number of nonemployer firms compared to employer firms in this group, across STEM sectors. These entrepreneurs operating nonemployer firms may be less sensitive to changes in interest rates due to lower capital requirements and less reliance on external financing.

Real per-capita income increases of 1% lead to a 10.5% decrease in entrepreneurship for the group. This could imply that with increasing family incomes, Black women leave to raise families. They may be less incentivized to start businesses due to declining income disparity.

COVID-19 had a positive effect for these entrepreneurs. Our literature review in Phase I of this research showed that Black women-owned businesses faced greater financial challenges than other businesses during the pandemic and were less likely to receive federal assistance and traditional financing (Wiersch and Misera 2021). Black women entered the pandemic with lower wealth status (Hernández 2021), and childcare disruptions impacted the labor force participation rates and financial status of Black mothers (Lloro 2021). However, Black STEM businesses are concentrated in the health care sector which grew during the pandemic and Black women could have found that the pandemic provided them with new opportunities in STEM. These factors probably impacted their STEM entrepreneurship positively.

4-2-1-A Black or African American Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-2: Black or African American Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Federal agencies could develop programs to support Black female inventors. 2. Congress could work with states to support Black women-owned inventors' commercialization. 3. SBA could train lenders on Black female STEM investment and help develop alternative financing. 4. Federal agencies could provide targeted mentoring, networking to Black female businesses in certain STEM sectors. 5. The federal government could tie school funding to educating Black female students in STEM. 6. Congress could work with states to tie institutional funding to increased Black female STEM enrollment in specific sectors. 7. The federal government could provide financial and child care assistance to Black mothers during emergencies.	1. Increase Black female commercialization and patenting success. 2. Increase Black women founded firms in certain STEM sectors. 3. Support Black women-owned STEM businesses funding and financing needs. 4. Help Black women take advantage of these opportunities and start new STEM businesses. 5. Develop a skilled Black female work force. 6. Increase the number of Black female STEM graduates in certain sectors. 7. Help Black women maintain their financial status and invest in new businesses.

We describe these policy interpretations in detail below.

1. The positive relationship between women patentees and Black female STEM entrepreneurs, highlights the need for targeted support and resources to help these inventors commercialize their patents and start successful ventures.
    a. Federal agencies could develop programs to provide guidance, mentorship, and resources to Black women inventors, helping them navigate the patent process, especially in STEM sectors where they are not concentrated, and explore entrepreneurial opportunities.
    b. Congress could work with states to help them partner with universities, research institutions, and industry partners to create a supportive ecosystem for Black women inventors, offering access to facilities, expertise, and networks to facilitate the commercialization of their patents in STEM sectors where they are not concentrated.

    c. Congress could work with state governments to provide funding and incentives for Black women-owned STEM startups, particularly those based on patented technologies in less concentrated STEM sectors, to help them overcome initial barriers and scale their ventures.
2. The positive relationship between venture capital funding and Black female STEM entrepreneurs, suggests a need to address the magnitude and sectoral allocation of venture capital.
    a. The SBA could provide targeted training and support for female STEM venture capital and angel investors that invest in these firms.
    b. The SBA could educate lenders about the potential of Black female STEM investments, especially in non-healthcare and non-professional services fields.
    c. The SBA could partner with local and regional banks, credit unions, and other financial institutions to develop alternative financing programs for these entrepreneurs, such as microloans, revenue-based financing, and grants.
3. The positive relationship between the labor force and Black women STEM entrepreneurship, suggests a need to investigate and enhance their participation in the entrepreneurial ecosystem.
    a. The SBA could conduct a comprehensive study to identify the specific factors that lead to their engagement in STEM entrepreneurship, such as access to education and training in certain STEM sectors, child care options, or networking opportunities.
    b. Based on the findings, the federal government could provide child care support and tie school funding to educating female students in STEM leading to availability of a skilled workforce for these entrepreneurs.
4. The negative relationship between female STEM graduates and Black female STEM entrepreneurship leads to the following policy implications.
    a. The federal government could tie federal funding for K-12 to increased exposure to certain STEM sectors for Black female students by schools.
    b. Congress could work with states to tie institutional funding to increased enrollment of Black female students in STEM programs in less crowded sectors.
    c. This would incentivize academic institutions to place special emphasis in their entrepreneurship programs on preparing Black female students for entrepreneurship in STEM sectors where they are not concentrated.
5. The positive sign of the COVID-19 variable implies that support for Black female entrepreneurs during emergencies could lead them to create and grow STEM businesses.
    a. The federal government could provide limited resources for temporary childcare and other care in emergencies, to increase the financial stability, and entrepreneurship of Black mothers living in childcare deserts during these times.

b. The federal government could deliver financial assistance to these businesses through local/community organizations rather than mainstream financial institutions.
c. The federal government could provide paid family and medical leave, cash payments to help Black women maintain their financial status and invest in businesses during economy-wide shocks.

4-2-2 AIAN Results Interpretation

From 2012 through 2020, AIAN employer and nonemployer STEM firms are concentrated in the Professional, Scientific, and Technical Services, and Health Care and Social Assistance sectors.

We are aware of the data reliability issues with this group. There are small numbers for female STEM entrepreneurs in the initial years, but large numbers in later years. This could be the result of changes in recording, classification and reliability of data. However, the numbers of female STEM firms in this group, especially in later years are not small, and looking at the data across different STEM sectors yields numbers that add up to tens of thousands of firms. So, the results are worth considering, and also because the statistical tests point to some model validity.

The regression output for the national model for this group is in Appendix A. Below is a description of these interpretations based on the National Level AIAN CVR Model Results.

The effect of women patentees among AIAN women STEM entrepreneurs is strong and significantly positive, with a 1% increase in patentees projected to lead to a 17% increase in entrepreneurship for this group.

Venture capital also has a strongly positive effect for the group, with a 1% increase in female venture capital funding leading to a 6.5 % increase in entrepreneurship for the group.

Labor force increases promote entrepreneurship for this group, and the effect is seen as dramatic: a 1% increase in labor force leads to an 865% increase in entrepreneurship for the group. Unemployment among the group has historically been high, and increased employment overall could increase employment in these communities leading to greater access to childcare and a skilled labor force for female STEM entrepreneurs. The difference between the number of female STEM firms in the initial years versus the latter years for this group could have produced the large percentage change associated with the change in the labor force.

The impact of an increase in female STEM graduates leads to a decline in the number of STEM firms in this racial category. A 1% increase in these graduates leads to a 240% decline in these entrepreneurs' numbers. If female STEM graduates gravitate towards the already crowded sectors for this group, this could lead to increased competition and business failures.

A rise in the interest rate leads to a decrease in the number of female STEM entrepreneurs in this group – a 1% rise corresponds to an approximately 3% decline. Rising interest rates lead to financing difficulties for entrepreneurs and this could explain the decline.

Higher incomes lead to a decline in the number of these entrepreneurs. The effect of a 1% increase in real per-capita income leading to a 71% decrease in entrepreneurship for this group, could imply the supply effect of Native American women leaving to raise families or not starting businesses due to available employment opportunities.

COVID-19 had a positive impact on the number of the female STEM entrepreneurs in this racial category. This could reflect the relative separation of the group from other groups. It could also mean that given the concentration of these entrepreneurs in the health care fields, the demand for their services was greater, which led to a greater number of these businesses.

4-2-2-A AIAN Policy Implications

Based on the National Level CVR Model Results, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-3: AIAN Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Federal funding to schools in indigenous communities could be tied to female STEM enrollment and exposure. 2. Congress could work with states to tie funding for tribal institutions to innovation exposure for female students and faculty. 3. Congress could authorize that states with large indigenous populations could use grant funding to establish an authority to encourage innovation by Native American faculty. 4. Federal government and non-profits could provide venture capital training and mentors to Native American female entrepreneurs. 5. SBA could train female venture capitalists, local lenders, and financial institutions in investing in these businesses. 6. The federal government could provide child care grants to states with large indigenous populations and states could support wages and benefits of child care workers. 7. Congress could legislate emergency funding assistance through local organizations in these communities. 8. SBA's resource networks could train Native American female entrepreneurs on emergency funding applications. 9. The federal government could provide direct cash payments to families in these communities during emergencies.	1. Develop a pipeline of skilled Native American innovators and workforce. 2. Help American Indian female students and faculty commercialize their research. 3. Foster innovation and patenting by female Native American faculty. 4. Increase venture capital funding successes of Native American female businesses. 5. Increase access to funding and financing for AIAN female businesses. 6. Enhance child care options for female American Indian and Native American businesses. 7. Provide greater funding access to these businesses in times of economy-wide shocks. 8. Help these businesses access funding during emergency situations. 9. Maintain the financial status of women in these communities and help them open new businesses.

We describe these policy interpretations in detail below.

1. An increase in the number of women patentees leads to an increase in the number of AIAN women STEM entrepreneurs.
    a. Indigenous American innovators have made major contributions to the tech industry[xxvii]. Federal funding for K-12 in AIAN communities could be tied to increased female STEM enrollment & commercialization exposure.
    b. Congress could work with states so that public funding for tribal colleges and universities could be tied to increased commercialization exposure for female STEM students.
    c. This would encourage tribal colleges and universities to make female faculty aware of commercialization training programs, and support their commercialization efforts.
    d. Congress could authorize states with large Native American populations such as, Alaska, California, New Mexico, Oklahoma, South Dakota, Arizona, and Washington to use federal grant funding to establish an authority to support STEM research, innovation, entrepreneurship of Native American faculty with university licensing offices.
2. There is a strong positive relationship between venture capital funding for women-owned businesses and the number of female AIAN STEM entrepreneurs. This would indicate equity funders are better connected to AIAN entrepreneurs, and this is a situation from which to potentially draw best practices.
    a. Not-for-profit organizations could provide training (similar to SheBoot[xxviii]) to female entrepreneurs especially AIAN STEM women-owned businesses on how to access funding.
    b. Federal agencies could develop mentorship programs that connect AIAN female entrepreneurs to mentors who can guide them on the intricacies of accessing investment for their businesses.
    c. The SBA could provide targeted training and support for Native American female STEM venture capital and angel investors.
    d. The SBA could educate lenders about the potential of AIAN female STEM investments, especially in non-concentrated fields.
    e. The SBA could partner with local and regional banks, credit unions, and other financial institutions to develop alternative financing programs for these entrepreneurs, such as microloans, revenue-based financing, and grants.
    f. The SBA could train venture capitalists on implicit biases in funding and on targeted investments in female AIAN STEM businesses in sectors outside of concentrated sectors.
3. An increase in the labor force increases the number of female STEM entrepreneurs.
    a. The federal government could provide grants that provide funding to states with large Native American populations to allocate to child care providers. This will help providers offer competitive wages to these providers, leading to an increase in the child care labor force.

   b. The federal government could provide grants to states with large indigenous populations to adopt initiatives such as providing funding for the wages and benefits of the childcare labor force.
   c. Federal funding for K-12 int these communities could be tied to increased STEM learning for female students, helping create a skilled workforce for Native American women-owned businesses.
4. Unprecedented shocks to the economy could create new opportunities for AIAN female STEM businesses.
   a. Congress could legislate financial assistance through local/community organizations in these communities during emergencies, to help female STEM entrepreneurs.
   b. SBA offices in states with large Native American populations could assist female STEM entrepreneurs with emergency funding applications through SBA resource networks[xxix] in these communities.
   c. The federal government could provide direct cash payments to families in these communities during economy-wide shocks. This could benefit women and help them start new STEM businesses.

4-2-3 White Group Results Interpretation

There are relatively large numbers of White female-owned employer and nonemployer businesses in the Professional, Scientific, and Technical Services, and Health Care and Social Assistance STEM sectors, over the years 2012 through 2020.

The regression output for the National Level White CVR Model is in Appendix A. We draw the following interpretations from the results of this model.

A 1% increase in women patentees produces about a .68% increase in the number of White women STEM entrepreneurs. This is likely a reflection of the numbers of White women patentees increasing as the national number of female patentees goes up, and these entrepreneurs starting more businesses.

As regards venture capital funding, a 1% increase in female funding leads to a .47% increase in the number of White women STEM entrepreneurs. Only a small percentage of venture capital funding goes to female entrepreneurs. It is possible that the additional funding goes to sectors in which these firms are concentrated, leading to less competition for resources, or the increased funding goes to less concentrated STEM sectors, increasing the number of new White female businesses in these sectors.

The labor force variable has a positive relationship with these firms. A 1% increase in the labor force produces a 56.86% increase in the number of White women entrepreneurs. This may have to do with the increased child care and networking options available with the increased labor force.

A 1% increase in women STEM graduates' results in a 15% decline in White female STEM entrepreneurship. This could be because increases in the number of these graduates are in sectors where these firms are concentrated, leading to increased competition and business failures.

The interest rate variable is not very impactful for this group. A 1% increase in the interest rate leads to a .14% decline in entrepreneurship for this group. There is a significantly higher number of nonemployer firms compared to employer firms in this group, across STEM sectors. These entrepreneurs operating nonemployer firms may be less sensitive to changes in interest rates due to lower capital requirements.

A 1% increase in per-capita real income is a reduction in the supply in the market of these entrepreneurs, and leads to a 5% decrease in entrepreneurship for this group. With higher incomes, more White women could leave to raise families. They could also be less motivated to start businesses because of better employment opportunities and because some of the glass ceiling and gender disparity in the workplace could be alleviated by rising incomes.

COVID-19 did not impact these businesses adversely. This could be because of their concentration in the health care sector.

4-2-3-A White Racial Category Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-4: White Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with state governments to support White women inventors' commercialization in specific sectors. 2. SBA could train funders and lenders on White female STEM investment and help develop alternative financing. 3. Federal agencies could provide targeted mentoring, networking to White female businesses in certain STEM sectors. 4. The federal government could tie school funding to educating White female students in STEM. 5. Congress and the Department of Education could work with states to ensure that public funding for institutions is tied to increased White female STEM enrollment and commercialization exposure in targeted sectors.	1. Increase White female commercialization and patenting success. 2. Support White women-owned STEM businesses funding and financing needs. 3. Increase White female- founded firms in less concentrated STEM sectors. 4. Help White women-owned businesses take advantage of increases in a skilled labor force. 5. Develop a pipeline of White female STEM graduates in diverse sectors.

We describe these policy interpretations in detail below.

1. The positive relationship between women patentees and White female STEM entrepreneurs, highlights the need for targeted support and resources to help these inventors commercialize their patents and start successful ventures in sectors where they are not concentrated.
    a. Congress could incentivize state governments to partner with universities, research institutions, and industry partners, and offer expertise and networks to White female faculty to help them commercialize patents in STEM sectors where they are not heavily concentrated.
    b. This could motivate state governments to provide training for White women-owned STEM startups, particularly those based on patented technologies in less concentrated sectors, to help them overcome initial barriers and scale their ventures.
    c. Congress and the Department of Education could work with states to ensure that public funding for institutions is tied to increased commercialization exposure of White female students and faculty in targeted sectors.

2. The positive relationship between venture capital funding and the number of White female STEM entrepreneurs, suggests a need to address the magnitude and sectoral allocation of venture capital to these firms.
    a. The SBA could train White female STEM venture capital and angel investors to invest in less concentrated STEM sectors.
    b. The SBA could educate lenders about the potential of White female STEM investments, especially in non-healthcare and non-professional services sectors.
    c. The SBA could partner with local and regional banks, credit unions, and other financial institutions to develop alternative financing programs for these entrepreneurs, such as microloans, revenue-based financing, and grants.
3. The positive relationship between the labor force and White women STEM entrepreneurship, suggests a need to investigate and support the growth of these businesses through childcare and skilled workforce options.
    a. The SBA could conduct a comprehensive study to identify the specific factors that increase their engagement in STEM entrepreneurship in certain STEM sectors, such as access to child care, networking, or mentoring options.
    b. Based on the findings, the federal agencies could develop targeted initiatives and programs to support and encourage White women's entrepreneurship through the availability of childcare and skilled workforce options.
4. The negative relationship between female STEM graduates and White female STEM entrepreneurship leads to the following policy implications.
    a. The federal government could tie federal funding for K-12 to increased exposure to diverse STEM sectors for White female students by schools.
    b. State funding per student for an institution could be tied to increased enrollment of White female students in STEM programs in noncrowded sectors.
    c. Academic institutions could place special emphasis in their entrepreneurship programs on preparing White female students for entrepreneurship in STEM sectors where they are not concentrated.

4-2-4 Asian Group Results Interpretation

For the years 2012 through 2020, Asian female STEM employer firms are concentrated in the Professional, Scientific, and Technical services and Health Care and Social Assistance sectors. Nonemployer female Asian STEM firms are also concentrated in these sectors, and their numbers in these sectors are approximately equal between the two sectors for all the years in the study.

The regression outputs for the Asian group are in Appendix A. Below is an explanation of the model results.

An increase of 1% in female patentees leads to an increase of 2.4% in the number of these firms. More women patentees possibly lead to more Asian women patentees who go on to start more STEM businesses.

A 1% increase in female venture capital funding leads to a 1.4% increase in the number of female Asian STEM firms. It is possible that the increase in funding goes to sectors where these firms are already in large numbers, and helps the resource crunch faced by firms in these sectors. In addition, increased funding could be directed to the less popular sectors, leading to the formation of new firms.

A 1% increase in the labor force leads to a 168% increase in the number of these firms. The presence of more child care and skilled workers could mean greater care and networking options for these firms.

More female STEM graduates lead to a decline in the number of Asian female STEM firms. A 1% increase in these graduates leads to a 45% decrease in these firms. The increase in the number of female STEM graduates going into overcrowded fields could lead to greater competition and firm demises.

An increase in the interest rate will lead to a 0.5% decrease in the number of Asian female STEM entrepreneurs, due to higher financing terms.

Increases in per-capita incomes lead to declines in these firms' numbers. A 1% increase in incomes causes a 15% decrease in Asian female STEM numbers. The flexibility that higher incomes provide could lead more Asian women to leave and raise families. Also, the glass ceiling and income disparity issues in the workplace could be mitigated through rising incomes, leading to fewer Asian women starting businesses.

The pandemic led to increases in these firm's numbers. This seems counterintuitive, but the fact that these businesses are concentrated in the health care sector, which grew under the pandemic could explain the higher numbers.

4-2-4-A Asian Group Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-5: Asian Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with states to ensure that public funding for institutions supports Asian female student commercialization exposure. 2. Congress could authorize states to use grant funding to establish authorities to help Asian female faculty commercialize their research. 3. SBA could train funders and lenders on Asian female STEM investment and help develop alternative financing. 4. The federal government could tie school funding to educating Asian female students in STEM in diverse disciplines.	1. Increase Asian female commercialization and patenting success. 2. Bring Asian female faculty research to commercial fruition. 3. Support Asian women-owned STEM businesses funding and financing needs. 4. Build a pipeline of Asian female STEM graduates in diverse sectors.

We don't detail these policy interpretations, because they are similar to those of the White racial group.

4-2-5 Native Hawaiian and Other Pacific Islander Group Results Interpretation

The number of Native Hawaiian and Other Pacific Islander female STEM firms is quite small, compared to other racial groups. There are only a few hundred STEM employer firms and a few thousand nonemployer firms in this category, for all the years of the study. Both employer and nonemployer firms are concentrated in the Professional, Scientific, and Technical Services, and Health Care and Social Assistance categories, though there are more nonemployer firms in the health care sector than in the professional services sector from 2012 to 2020.

We are aware of the data limitation issues with this group, however the results are worth considering, because the statistical tests point to some validity of the model and the number of observations across sectors lends them to some statistical validity. The regression outputs for this group are in Appendix A. Below is an explanation of the model results.

An increase of 1% in female patentees leads to an increase of 8.8% in the number of these firms. More women patentees possibly lead to more women patentees in this group who go on to start more STEM businesses.

A 1% increase in female venture capital funding leads to a 3% increase in the number of these firms. It is possible that the increase in funding goes to sectors where these firms are already in large numbers. The funding could create less competition for resources and allow these firms to thrive. In addition, funding could go to less concentrated STEM sectors, allowing for more firm creation.

A 1% increase in the labor force leads to a 437% increase in the number of these firms. The presence of more skilled and child care workers could imply more networking and child care options for these firms.

More female STEM graduates lead to a lower number of Native Hawaiian and Other Pacific Islander female STEM firms. A 1% increase in these graduates leads to a 121% decrease in these firms. The increase in the number of female STEM graduates could occur in concentrated sectors, leading to greater competition and failure of firms.

Financing difficulties due to higher interest rates impact these firms negatively. A 1% increase in the interest rate leads to a 1.4% decline in the number of these firms.

If per-capita incomes rise by 1%, the number of Native American and Pacific Islander firms goes down by close to 37%. Higher per-capita incomes allow women from these communities to devote more time to raising families, leading to less business formation.

The pandemic had a positive impact on these firms, possibly because of their concentration in the health care sector.

4-2-5-A Native Hawaiian and Other Pacific Islander Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-6: Native Hawaiian and Other Pacific Islander Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Federal Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI) funding could support Native Hawaiian and Other Pacific Islander female student and faculty commercialization exposure. 2. Federal Pacific Islands institutional funding could support commercialization exposure for female students and faculty from this group. 3. SBA could train funders and lenders on Native Hawaiian and Other Pacific Islander female STEM investment, and help develop alternative financing. 4. The federal government could tie school funding to educating Native Hawaiian and Other Pacific Islander female students in varied STEM disciplines.	1. Increase female commercialization and patenting success for this group. 2. Increase female students and faculty from this group who patent their research. 3. Support Native Hawaiian and Other Pacific Islander women-owned STEM businesses funding and financing needs. 4. Build a pipeline of female STEM graduates in diverse sectors from this group.

We describe these policy interpretations in detail below.

1. An increase in the number of women patentees leads to an increase in the number of Native Hawaiian and Other Pacific Islander women STEM entrepreneurs.
    a. Federal funding for AANAPISI institutions could be tied to increased training and commercialization exposure for female Asian American or Native American Pacific Islander students and faculty.
    b. Federal funding for Pacific Islands institutions could be tied to increased commercialization exposure for Native Hawaiian and Other Pacific Islander female STEM students and faculty.
    c. This could incentivize institutions to perform outreach to female academics from this group and help them succeed academically.
    d. This could also lead to institutions making Native Hawaiian and Other Pacific Islander female faculty aware of commercialization training programs and support their commercialization efforts.

2. The positive relationship between venture capital funding and the number of female STEM entrepreneurs from this group, suggests a need to address the magnitude and sectoral allocation of venture capital to these firms.
    a. The SBA could train female STEM venture capital and angel investors from this group to invest in less concentrated STEM sectors.
    b. The SBA could educate lenders about the potential of Native Hawaiian and Other Pacific Islander female STEM investments, especially in non-healthcare and non-professional services sectors.
    c. The SBA could partner with local and regional banks, credit unions, and other financial institutions to develop alternative financing programs for these entrepreneurs, such as microloans, revenue-based financing, and grants.
3. The positive relationship between the labor force and women STEM entrepreneurship from this group, suggests a need to investigate and support the success of these firms.
    a. The SBA could conduct a comprehensive study to identify the specific factors that increase their engagement in STEM entrepreneurship such as child care and networking opportunities.
    b. Based on the findings, the federal agencies could develop targeted initiatives and programs to support and encourage Native Hawaiian and Other Pacific Islander women's entrepreneurship, such as increasing access to the childcare and skilled workforce.
4. The negative relationship between female STEM graduates and female STEM entrepreneurship in this group leads to the following policy implications.
    a. The federal government could tie federal funding for K-12 to increased exposure to STEM for Native Hawaiian and Other Pacific Islander female students in diverse disciplines by schools.
    b. AANAPISI and Pacific Islands institutions could place special emphasis in their entrepreneurship programs on preparing Pacific Islander female students for entrepreneurship in STEM sectors where they are not concentrated.

4-2-6 Hispanic Group Results Interpretation

Hispanic woman-owned female STEM employer and nonemployer firms are concentrated in the Professional, Scientific, and Technical Services, and Health Care and Social Assistance sectors, for the years 2012 to 2020. Nonemployer female STEM Hispanic firms in the health care sector are close to twice the number of these firms in the professional services sector.

The regression output for this group is included in Appendix A and the interpretation of the results is below.

There is a positive relationship between female patentees and number of firms for this group. A 1% increase in aggregate women patentees leads to a 1.5% increase in entrepreneurship for the group. An increase in the number of female patentees could lead to more Hispanic female patentees, who go on to form new STEM businesses.

Female venture capital funding has a positive relationship with Hispanic female STEM entrepreneurship. A 1% increase in venture funding leads to a close to 1% increase in the number of Hispanic female STEM firms. This could be because the funding goes to sectors in which these firms are concentrated leading to less competition for resources. This funding could also be going to STEM sectors where these firms are not highly represented, leading to new business formation in those sectors.

The labor force coefficient is positive. A 1% increase in aggregate labor force leads to a 122% increase in entrepreneurship. Hispanic women may be very responsive to labor force changes and increased child care and networking options could increase their propensity to start businesses.

Increases in interest rates lead to a decrease in the number of Hispanic female STEM entrepreneurs, albeit small. A one percentage point increase in interest rates leads to a .33% decrease in the number of these businesses. This could be because these businesses don't rely on traditional financing to begin with, and therefore higher interest rates don't impact them. There is a significantly higher number of nonemployer firms compared to employer firms in this group, across STEM sectors. These entrepreneurs operating nonemployer firms may be less sensitive to changes in interest rates due to lower capital requirements and less reliance on external financing. According to the U.S. Senate Committee on Small Business and Entrepreneurship report (July 2023)[xxx], Latino-owned businesses have the lowest rate of using bank and financial institution loans.

An increase of 1% in real per capita incomes leads to a 11% decrease in the number of these businesses. Rising incomes could provide Hispanic woman-owned businesses with the flexibility to leave and raise families.

There is a negative relationship between the number of female STEM graduates and the number of Hispanic women-owned businesses. A 1% increase in these graduates leads to a 33% decline in Hispanic women STEM entrepreneurs. This could be because increases in the number of these graduates in overcrowded sectors could lead to greater competition and business failures.

The positive sign of the COVID-19 dummy shows that the pandemic did not impact these entrepreneurs adversely. Phase I of this research shows that Hispanic women-owned woman-owned businesses faced greater financial challenges than other businesses during the pandemic, and were less likely to receive federal assistance and traditional financing (Wiersch and Misera 2021). Hispanic women entered the pandemic with lower wealth status (Hernández 2021), and childcare disruptions impacted the labor force participation rates and financial status of Hispanic mothers (Lloro 2021). These factors probably impacted their overall entrepreneurship, but the fact that these entrepreneurs are concentrated in the health care sector which grew during the pandemic might explain the positive impact on their STEM entrepreneurship.

4-2-6-A Hispanic Group Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-7: Hispanic Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Federal agencies could provide support for Hispanic female inventors. 2. Congress could work with state governments to support Hispanic women-owned inventors' commercialization. 3. SBA could train lenders on Hispanic female STEM investment and help develop alternative financing. 4. The federal government could provide childcare and skilled workforce support to Hispanic female businesses. 5. The federal government could tie school funding to educating Hispanic female students in certain STEM sectors. 6. Congress could work with states to condition public funding for institutions on increased Hispanic female STEM enrollment and exposure in targeted STEM sectors. 7. The federal government could provide financial and child care assistance to Hispanic mothers during emergencies.	1. Increase Hispanic female commercialization and patenting success. 2. Increase Hispanic women founded firms in certain STEM sectors. 3. Support Hispanic women-owned STEM businesses funding and financing needs. 4. Help Hispanic women-owned businesses take advantage of increases in skilled workforce and child care labor force. 5. Develop a pipeline of Hispanic female STEM graduates in diverse STEM sectors. 6. Increase the number of Hispanic female STEM graduates in diverse sectors. 7. Help Hispanic women maintain their financial status and invest in new STEM businesses.

We don't detail these policy interpretations, because they are very similar to those of the Black or African American racial group.

4-2-7 Non-Hispanic Group Results Interpretation

Non-Hispanic female STEM employer and nonemployer businesses are concentrated in the Professional, scientific, and technical services, and Health care and social assistance sectors, for all the years of our study. The number of employer firms is roughly the same for the two sectors over the years, whereas the number of nonemployer firms in the health care sector is higher than professional services in the early years, but this changes in the latter years where nonemployer professional services numbers start becoming roughly equal and then overtaking the health care sector numbers from 2015 onwards.

Appendix A includes the regression outputs for this group. An explanation of the results from the model follows.

This group has many similar coefficients to the coefficients for White women STEM entrepreneurs, who are a large part of non-Hispanic female STEM entrepreneurs.

A 1% increase in women patentees is seen as increasing entrepreneurship for this group by 0.6%. This could mean that increasing women patentees leads to increases in non-Hispanic female patentee numbers, which leads to more businesses founded by these firms.

Increasing female venture capital funding by 1% increases the number of these entrepreneurs by .4%. It is possible that the additional funding goes to sectors in which these firms are concentrated, leading to more resources and less competition for firms in these sectors, or the increased funding goes to less concentrated sectors, increasing the number of non-Hispanic female STEM entrepreneurs through new business formation.

Increasing the labor force by 1% increases the number of these firms by 52%. Increased networking and child care options could help non-Hispanic women start more STEM businesses.

An increase in female STEM graduates has a negative impact on these firms. A 1% increase in women STEM graduates decreases the number of non-Hispanic female STEM businesses by close to 14%, compared to 15% for White female STEM firms. This could be because increases in the number of female STEM graduates occur in sectors where these firms are already concentrated, leading to increased competition and failure of firms.

A one percentage point increase in interest rates leads to a .13% decrease in the number of these firms. This is almost identical to the .14% decrease for White female STEM firms. There is a significantly higher number of non-Hispanic nonemployer firms compared to employer firms, across STEM sectors. Non-Hispanic female STEM entrepreneurs operating nonemployer firms may be less sensitive to changes in interest rates due to lower capital requirements.

The effect of real income is also similar for the non-Hispanic and White female STEM entrepreneur groups. A 1% increase in per-capita real income leads to a 4.7% decrease in non-Hispanic women STEM entrepreneurs versus the effect of 5.4% in the case of White women STEM entrepreneurs.

The pandemic had a positive impact on these businesses.

4-2-7-A Non-Hispanic Group Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-8: Non-Hispanic Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with states to support non-Hispanic women-owned inventors' commercialization in non-concentrated sectors. 2. SBA could train funders and lenders on non-Hispanic female STEM investment and help develop alternative financing. 3. Federal agencies could provide targeted mentoring, networking to non-Hispanic female businesses in certain STEM sectors. 4. The federal government could tie school funding to educating non-Hispanic female students in STEM. 5. State institutional funding could be tied to increased non-Hispanic female STEM enrollment in diverse STEM fields.	1. Increase non-Hispanic female commercialization and patenting success in these sectors. 2. Support non-Hispanic women-owned STEM businesses funding and financing needs. 3. Increase non-Hispanic female-founded firms in less concentrated STEM sectors. 4. Help non-Hispanic women-owned businesses take advantage of increases in a skilled labor force. 5. Develop a pipeline of non-Hispanic female STEM graduates in diverse sectors.

We don't detail these policy interpretations, because they are very similar to those for White female STEM entrepreneurs.

4-2-8 Veteran Group Results Interpretation

Veteran female STEM entrepreneurs are concentrated in the Professional, Scientific, and Technical Services, and Health Care and Social Assistance sectors. There are more nonemployer than employer businesses for both sectors, with a few thousand more firms in the health care sector compared to the professional services sector.

The regression output for the National Level Veteran CVR Model is in Appendix A. We draw the following interpretations from the results of this model.

A 1% increase in women patentees produces about a .62% increase in the number of Veteran women STEM entrepreneurs. This is possibly due to the numbers of Veteran women patentees increasing as the national number of female patentees goes up, and these entrepreneurs starting more businesses.

As regards venture capital funding, a 1% increase in female funding leads to a .374% increase in the number of Veteran women STEM entrepreneurs. It is possible that the additional funding goes to sectors in which these firms are concentrated, leading to less competition for resources, or the increased funding goes to less concentrated STEM sectors, increasing the number of new Veteran female businesses in these sectors.

The labor force variable has a positive relationship with these firms. A 1% increase in the labor force produces a close to 41% increase in the number of Veteran women entrepreneurs. This may have to do with the increased child care and networking options available with the increased labor force.

A 1% increase in women STEM graduates' results in a 11% decline in Veteran female STEM entrepreneurship. This could be because the number of these graduates increases in sectors where these firms are concentrated, leading to increased competition and business failures.

The interest rate variable is not very important for this group. A 1% increase in the interest rate leads to a .15% decline in entrepreneurship for this group. It is possible that these firms don't rely on traditional financing and are not impacted much by changes in interest rates.

A 1% increase in per-capita real income is a change in supply in the market of these entrepreneurs, and leads to a close to 4% decrease in entrepreneurship for this group. With higher incomes, more Veteran women have the flexibility to raise families and might decide to do so, rather than start new businesses.

COVID-19 did not impact these businesses negatively. This could be because these businesses are concentrated in the health care sector or because they found new opportunities to start other STEM businesses during the pandemic.

4-2-8-A Veteran Group Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-9: Veteran Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with states to support Veteran women inventors' commercialization in specific sectors. 2. SBA could train funders and lenders on Veteran female STEM investment and help develop alternative financing. 3. Federal agencies could provide targeted mentoring, networking to Veteran female businesses in certain STEM sectors. 4. The federal government could tie school funding to educating Veteran female students in STEM. 5. State institutional funding could be tied to increased Veteran female STEM enrollment and commercialization exposure in targeted sectors.	1. Increase Veteran female commercialization and patenting success. 2. Support Veteran women-owned STEM businesses funding and financing needs. 3. Increase Veteran female- founded firms in less concentrated STEM sectors. 4. Help Veteran women-owned businesses take advantage of increases in a skilled labor force. 5. Develop a pipeline of Veteran female STEM graduates in diverse sectors.

We describe these policy interpretations in detail below.

1. The positive relationship between women patentees and Veteran female STEM entrepreneurs, highlights the need for targeted support and resources to help these inventors commercialize their patents and start successful ventures in sectors where they are not concentrated.
    a. Congress could incentivize states to provide training for Veteran women-owned STEM startups, particularly those based on patented technologies in less concentrated sectors, to help them overcome initial barriers and scale their ventures.
    b. Congress and the Department of Education could work with states to condition funding for institutions to increased commercialization exposure of Veteran female students and faculty in targeted sectors.
2. The positive relationship between venture capital funding and the number of Veteran female STEM entrepreneurs, suggests a need to address the magnitude and sectoral allocation of venture capital to these firms.
    a. The SBA could train Veteran female STEM venture capital and angel investors to invest in less concentrated STEM sectors.

b. The SBA could educate lenders about the potential of Veteran female STEM investments, especially in non-healthcare and non-professional services sectors.
c. The SBA could partner with local and regional banks, credit unions, and other financial institutions to develop alternative financing programs for these entrepreneurs, such as microloans, revenue-based financing, and grants.

3. The positive relationship between the labor force and Veteran women STEM entrepreneurship, suggests a need to investigate and support the growth of these businesses.
   a. The SBA could conduct a comprehensive study to identify the specific factors that increases their engagement in STEM entrepreneurship in certain STEM sectors, such as access to child care, networking, or mentoring options.
   b. Based on the findings, the federal agencies could develop targeted initiatives and programs to support and encourage Veteran women's entrepreneurship by providing childcare and skilled workforce options.
4. The negative relationship between female STEM graduates and Veteran female STEM entrepreneurship leads to the following policy implications.
   a. The federal government could tie federal funding for K-12 to increased exposure to diverse STEM sectors for Veteran female students by schools.
   b. Congress could work with states so that public funding per student for an institution could be tied to increased enrollment of Veteran female students in STEM programs in noncrowded sectors.
   c. Academic institutions could place special emphasis in their entrepreneurship programs on preparing Veteran female students for entrepreneurship in STEM sectors where they are not concentrated.

4-2-9 Non-Veteran Group Results Interpretation

Non-veteran female employer and nonemployer STEM entrepreneurs are concentrated in the Professional, Scientific, and Technical Services, and Health Care and Social assistance sectors. There are more nonemployer than employer businesses for both sectors, with slightly larger number of health care employer and nonemployer firms compared to professional services.

The regression output for the National Level Non-Veteran CVR Model is in Appendix A. We draw the following interpretations from the results of this model.

A 1% increase in women patentees produces about a .7% increase in the number of non-Veteran women STEM entrepreneurs.

As regards venture capital funding, a 1% increase in female funding leads to a .5% increase in the number of non-veteran women STEM entrepreneurs.

The labor force variable has a positive relationship with these firms. A 1% increase in the labor force produces a close to 60% increase in the number of non-veteran women entrepreneurs.

A 1% increase in women STEM graduates' results in a 16% decline in non-veteran female STEM entrepreneurship.

The interest rate variable is not very important for this group. A 1% increase in the interest rate leads to a .16% decline in entrepreneurship for this group. It is possible that these firms don't rely on traditional financing and are not impacted much by changes in interest rates.

A 1% increase in per-capita real income leads to a 5.5% decrease in entrepreneurship for this group.

COVID-19 did not impact these businesses negatively.

4-2-9-A Non-Veteran Group Policy Implications

Based on the CVR Model Results for this group, we drew a number of policy implications. The table below lists these policies and their corresponding benefits.

Table 4-10: Non-Veteran Group Policy Solutions and Benefits

Policy Solution/s	Benefits
1. Congress could work with states to support non-veteran women inventors' commercialization in specific sectors. 2. SBA could train funders and lenders on non-veteran female STEM investment and help develop alternative financing. 3. Federal agencies could provide targeted mentoring, networking to non-veteran female businesses in certain STEM sectors. 4. The federal government could tie school funding to educating female students in STEM. 5. Congress could work with states to tie institutional funding to increased female STEM enrollment and commercialization exposure in targeted sectors.	1. Increase non-veteran female commercialization and patenting success. 2. Support non-veteran women-owned STEM businesses funding and financing needs. 3. Increase non-veteran female-founded firms in less concentrated STEM sectors. 4. Help non-veteran women-owned businesses take advantage of increases in a skilled labor force. 5. Develop a pipeline of female STEM graduates in diverse sectors.

5. Conclusion

Our investigation to further understand the entrepreneurship of Women in STEM in Phase II involved analyses at the national level.

5-1 National Level Analyses

We started with collecting data at the national level on female employer and nonemployer STEM firms at the three-digit NAICS level for the years 2012 to 2020 through various Census sources. We used other sources to collect data on female patentees, female venture capital funding, women STEM graduates, labor force, per capita income, and interest rates at the national level. Next, we applied the econometric approach of a log-log model to analyze the impact of these explanatory variables and of a COVID-19 dummy variable on the number of female STEM entrepreneurs. In addition to running this model at the aggregate national level, we applied this approach to female employer and nonemployer firm data at the two-digit NAICS level broken down by racial and ethnic categories, and veteran status at the national level, for the years 2012 to 2020.

The results of running this model at the aggregate national level and by race and ethnic categories, and veteran status nationally are captured in the Table 6-1 below.

Table 5-1: National Level Log-Log Model Results

National	Increase in Female Patentees	Increase in female venture funding	Increase in the national labor force	Increase in women STEM graduates	Increase in interest rates	Increase in per-capita incomes	COVID-19
Whole Nation	↑	↑	↑	↓	↓	↓	↑
American Indian or Alaska Native	↑	↑	↑	↓	↓	↓	↑
Black or African American	↑	↑	↑	↓	↓	↓	↑
White	↑	↑	↑	↓	↓	↓	↑
Asian	↑	↑	↑	↓	↓	↓	↑
Native Hawaiian or Pacific Islander	↑	↑	↑	↓	↓	↓	↑
Hispanic	↑	↑	↑	↓	↓	↓	↑
Non-Hispanic	↑	↑	↑	↓	↓	↓	↑
Veteran	↑	↑	↑	↓	↓	↓	↑
Non-veteran	↑	↑	↑	↓	↓	↓	↑

Based on the table, the results for certain groups show similar relationships, even though the magnitude of these results can be different. We discuss the results and inferences for groups with similar relationships in the section below.

5-1-1 Nation Aggregate and all Races, Ethnicities and Veteran Groups Results and Policy Inferences

The female entrepreneur numbers for all races, Hispanic and non-Hispanic ethnicities, and Veteran and non-veteran groups have similar relationships to female patentees, female venture funding, labor force, women STEM graduates, interest rates and the dummy representing COVID-19 as the aggregate national female STEM numbers. Increases in female patentees bring about increases in female STEM numbers for all of these groups. More female patentees at the national level, provide greater opportunity for women nationally and in these other groups to open STEM businesses. Similarly, larger amounts of venture funding going to women founders' results in greater availability of capital for STEM firms in these groups, possibly for sectors that they are highly concentrated in, alleviating competition and spurring the growth of new STEM businesses. A larger labor force allows for more childcare options and greater access to a skilled workforce for networking for Women in STEM leading to the formation of new businesses.

Some of the other variables for these groups show a negative relationship. Increases in the number of female STEM graduates possibly leads to greater competition in the sectors these businesses are concentrated in, leading to business failures and drops in the number of female STEM firms. An increase in interest rates leads to financing difficulties and decreases in the number of female STEM firms nationally and for these other groups. The COVID-19 variable shows that the number of these firms went up during the pandemic. This could be because nationally early-stage women entrepreneurs found new opportunities during the pandemic and the monthly rate of new entrepreneurs was the highest in 24 years for women. For female STEM entrepreneurs in these groups the pandemic could have opened up new opportunities, due to their concentration in the health care sector.

Policy approaches to help female STEM entrepreneurs in these groups are similar. Congress could work with states so that public funding to institutions is tied to increased training and commercialization exposure for female students, thereby increasing the number of female patentees. Congress could authorize states to use grant funding to establish a commercialization authority to help institutions support female faculty innovations. Congress could legislate additional funding for SBICs and the SSBCI to fund various STEM sectors for these groups. Additional funding would alleviate the funding pressure in crowded sectors and provide capital in the less crowded sectors for new businesses. The SBA could train female venture capitalists, local lenders, and financial institutions in investing in these businesses. The federal government could provide grants to increase childcare options for female STEM entrepreneurs and help states support the wages and benefits of childcare workers. Federal K-12 funding for schools could be tied to female STEM learning creating a pipeline for a skilled STEM workforce to support female STEM businesses. The SBA could provide emergency application assistance to female STEM businesses using its resource networks in these communities. The federal government could provide emergency assistance to female STEM businesses through community organizations and direct cash payments to families during economy-wide shocks. This would stabilize the financial status of female STEM businesses and provide women the flexibility to start new STEM firms.

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Updated: March 7 2024. "The data on this dashboard is free to use and can be attributed to PitchBook."

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[xvii] For example, for Alabama, this is at https://data.bls.gov/cgi-bin/surveymost?sm, Series SMU01000000000000001.
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Appendix A
National Level Results

National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	0.034	7	0.005	F Statistic	=	205.311	
Residual	0.000	1	0.000	Prob > F	=	0.054	
Total	0.034	8	0.004	R-squared	=	0.999	
				Adj. R-squared	=	0.994	
				Root MS	=	0.005	
LNWSTEM **VIF**	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**		
LWPAT 162.2249	0.556	0.125	4.461	0.140		-1.028	2.141
LVCF 784.7314	0.288	0.092	3.143	0.196		-0.876	1.453
LLF 43960.048	37.294	10.420	3.579	0.173		-95.104	169.693
LWSG 60979.1369	-9.906	2.745	-3.608	0.172		-44.790	24.979
X30YR_MORT_RT 68.7228	-0.080	0.036	-2.204	0.271		-0.540	0.381
LRI 1560.6102	-2.967	1.149	-2.583	0.235		-17.562	11.628
COVID19_D 26526.6486	2.990	0.842	3.553	0.175		-7.703	13.682
(Intercept)	-298.415	85.280	-3.499	0.177		-1381.994	785.164

Model Fit

The Total Sum of Squares (Total SS) is a measure of the total variability in the data. The Model Sum of Squares (Model SS) is the variability captured by the model. The Residual Sum of Squares (Residual SS) is the remaining variability that the model does not capture. The model captures a high percentage of the variation in the data, since the Model SS is high and the Residual SS is low. MS is "Mean Sum of Squares" and provides another measure of the relative fit of the model given the Residual MS is low.

R-squared describes the percent of variation the model captures, and is quite high, at 99.9%. Adjusted R-Squared (Adj. R-squared) adjusts the R-squared statistic for number of variables included in the regression, to attempt a more accurate measure, and is still high, at over 99% of the variation explained. "Root MS" is taken as the square root of the mean squared error (MSE), and is a measure of the accuracy of the model, with low values indicating that the model is highly descriptive. In this case, the model appears to describe the data well.

Statistical Significance

The F statistic is a measure of whether the coefficients arose by chance. An F statistic close to zero would indicate that this was the case. Since the F-statistic is 205.311, it is evident that these coefficients did not arise by chance. "Prob" is probability, and there is still some possibility that the coefficients did arise by chance since "Prob > F" is 0.054, although the probability is quite small. This is based on using the criterion that "Prob > F" should be less than 0.05 or 5%, that the coefficients did arise by chance.

Coef. is the coefficient estimated by Ordinary Least Squares (OLS) and Std. Err. describes the OLS standard error, which is a measure of variability. The t statistic (Coef/Std. Err.) is represented by t and describes the likelihood the coefficient arose by chance, whereas Pr > |t| is the probability that the coefficient arose by chance or the probability that the absolute value of the coefficient is zero. All the coefficients appear statistically strong, in that all the t statistics are significantly different than zero. Given the small number of observations, the t statistics are good, though there are none for which Pr > |t| < 0.05, or 5%, which is the usual criterion.

The 95% Confidence Interval predicts the range in which the true coefficient lies. Given the regression results, in 19 out of 20 cases, the true coefficient will lie in this interval if the model is true. Many of the ranges of the 95% confidence intervals have the same sign as the coefficients, but are quite wide, relative to the value of the coefficients.

Model Choice

The log-log national regression is a good model choice for the following reasons:

- The national level Census data that the model uses is researched and verified well.
- The R-squared and Adjusted R-Squared values for the model are high. This implies that the model captures a high percent of variation in the dependent variable.
- The Root Mean Square Error value for the model is low, which indicates that the model fits the data well.
- Multicollinearity is present, but it is to be expected given that some of the independent variables, such as income, education, patents increase is correlated.
- Running the model using percentages, or correcting for multicollinearity by centering independent variables, or removing correlated variables leads to strange coefficient results.
- The model is able to explain the effects of changes in independent variables such as women patentees, venture capital funding etc. reasonably well.
- We tested other models, such as we used a logistic regression to model the data by sector (for states with missing values in the female STEM employer and nonemployer numbers), and the standard errors in the results were very high, showing the low accuracy of the statistics. So, we did not use this approach.

COVID-19 Coefficient interpretation

We are interpreting the COVID-19 dummy variable according to the approximate interpretation of Duquette (1999).

Duquette Christopher M., "Is Charitable Giving by Nonitemizers Responsive to Tax Incentives? New evidence." *National Tax Journal*, 52(2), 195-206.

This is to have the coefficient on the dummy variable, times 100, to indicate approximately how much percentage effect the dummy variable being 1 instead of 0 has on the predicted dependent variable. However, given that some states had missing values for employer and nonemployer female STEM numbers for certain sectors for some years, the COVID-19 dummy variable coefficient interpretations at the national level should be treated with caution. These states include Alabama, Alaska, Hawaii, Maine, Mississippi, Nevada, New Mexico, North Dakota, South Dakota, West Virginia, and Wyoming.

The missing values in these data are such that the COVID-19 dummy variable coefficient interpretations should be treated with caution. This is because in the case of missing dependent values in earlier years the COVID-19 dummy coefficient could show large positive percentage changes in the pandemic year, or in the case where there are missing dependent values in the pandemic year it could show large negative percentage changes due to the pandemic. We believe that the direction rather than the magnitude of these results is more reliable.

Keeping this in mind, below are the approximate interpretations of the dummy variable coefficients at the national level:

- The COVID-19 dummy variable coefficient for the overall national-level model indicates a 299% increase in women STEM entrepreneurs due to the pandemic.

Black or African American National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	0.023	7	0.003	F Statistic	=	48541.543	
Residual	0.000	1	0.000	Prob > F	=	0.003	
Total	0.023	8	0.003	R-squared	=	1.000	
				Adj. R-squared	=	1.000	
				Root MS	=	0.000	
B_AA_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**		
LWPAT 162.2249	1.574	0.007	234.896	0.003		1.489	1.659
LVCF 784.7314	0.922	0.005	187.165	0.003		0.859	0.984
LLF 43960.048	114.476	0.560	204.455	0.003		107.361	121.590
LWSG 60979.1369	-30.908	0.148	-209.512	0.003		-32.782	-29.033
X30YR_MORT_RT 68.7228	-0.319	0.002	-163.782	0.004		-0.344	-0.294
LRI 1560.6102	-10.518	0.062	-170.411	0.004		-11.302	-9.734
COVID19_D 26526.6486	9.223	0.045	203.964	0.003		8.648	9.797
(Intercept)	-931.615	4.582	-203.303	0.003		-989.840	-873.390

Note:

- The COVID-19 dummy variable coefficient for the Black or African-American group indicates a 922% increase in these women STEM entrepreneurs due to the pandemic.

American Indian and Alaska Native National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	2.486	7	0.355	F Statistic	=	110.061	
Residual	0.003	1	0.003	Prob > F	=	0.073	
Total	2.490	8	0.311	R-squared	=	0.999	
				Adj. R-squared	=	0.990	
				Root MS	=	0.057	
AI_AN_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**		**[95% Confidence Interval]**	
LWPAT 162.2249	17.662	1.455	12.142	0.052		-0.820	36.143
LVCF 784.7314	6.550	1.069	6.129	0.103		-7.030	20.131
LLF 43960.048	864.629	121.521	7.115	0.089		-679.440	2408.697
LWSG 60979.1369	-240.996	32.018	-7.527	0.084		-647.826	165.834
X30YR_MORT_RT 68.7228	-2.810	0.423	-6.647	0.095		-8.181	2.562
LRI 1560.6102	-70.948	13.396	-5.296	0.119		-241.161	99.265
COVID19_D 26526.6486	69.174	9.814	7.049	0.090		-55.524	193.872
(Intercept)	- 7148.124	994.553	-7.187	0.088		- 19785.117	5488.868

Note:

- The COVID-19 dummy variable coefficient for the American Indian or Alaska Native group indicates a 6917% increase in these women STEM entrepreneurs due to the pandemic.

White National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9
Model	0.012	7	0.002	F Statistic	=	121.286
Residual	0.000	1	0.000	Prob > F	=	0.070
Total	0.012	8	0.002	R-squared	=	0.999
				Adj. R-squared	=	0.991
				Root MS	=	0.004

W_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**	
LWPAT 162.2249	0.682	0.097	7.049	0.090	-0.547	1.911
LVCF 784.7314	0.465	0.071	6.538	0.097	-0.438	1.368
LLF 43960.048	56.863	8.082	7.036	0.090	-45.826	159.553
LWSG 60979.1369	-15.109	2.129	-7.095	0.089	-42.166	11.948
X30YR_MORT_RT 68.7228	-0.142	0.028	-5.058	0.124	-0.499	0.215
LRI 1560.6102	-5.399	0.891	-6.060	0.104	-16.719	5.921
COVID19_D 26526.6486	4.580	0.653	7.018	0.090	-3.713	12.873
(Intercept)	-455.392	66.144	-6.885	0.092	-1295.826	385.042

Note:

- The COVID-19 dummy variable coefficient for the White group indicates a 458% increase in these women STEM entrepreneurs due to the pandemic.

Asian National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	0.067	7	0.010	F Statistic	=	2818.686	
Residual	0.000	1	0.000	Prob > F	=	0.015	
Total	0.067	8	0.008	R-squared	=	1.000	
				Adj. R-squared	=	1.000	
				Root MS	=	0.002	
A_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**		**[95% Confidence Interval]**	
LWPAT 162.2249	2.417	0.047	51.045	0.012		1.815	3.019
LVCF 784.7314	1.359	0.035	39.064	0.016		0.917	1.801
LLF 43960.048	168.135	3.956	42.503	0.015		117.871	218.398
LWSG 60979.1369	-45.440	1.042	-43.597	0.015		-58.683	-32.196
X30YR_MORT_RT 68.7228	-0.498	0.014	-36.155	0.018		-0.672	-0.323
LRI 1560.6102	-15.477	0.436	-35.491	0.018		-21.017	-9.936
COVID19_D 26526.6486	13.541	0.319	42.385	0.015		9.481	17.600
(Intercept)	- 1375.592	32.375	-42.489	0.015		-1786.956	-964.228

Note:

- The COVID-19 dummy variable coefficient for the Asian group indicates a 1,354% increase in these women STEM entrepreneurs due to the pandemic.

Native Hawaiian and Other Pacific Islander National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9
Model	0.634	7	0.091	F Statistic	=	33.458
Residual	0.003	1	0.003	Prob > F	=	0.132
Total	0.637	8	0.080	R-squared	=	0.996
				Adj. R-squared	=	0.966
				Root MS	=	0.052
NH_OP_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**	
LWPAT 162.2249	8.775	1.332	6.586	0.096	-8.153	25.703
LVCF 784.7314	3.318	0.979	3.389	0.183	-9.121	15.757
LLF 43960.048	437.194	111.306	3.928	0.159	-977.079	1851.467
LWSG 60979.1369	-121.400	29.327	-4.140	0.151	-494.032	251.232
X30YR_MORT_RT 68.7228	-1.393	0.387	-3.598	0.173	-6.313	3.527
LRI 1560.6102	-36.639	12.270	-2.986	0.206	-192.543	119.266
COVID19_D 26526.6486	35.023	8.989	3.896	0.160	-79.193	149.240
(Intercept)	-3609.739	910.950	-3.963	0.157	-15184.455	7964.977

Note:

- The COVID-19 dummy variable coefficient for the Native Hawaiian or Other Pacific Islander group indicates a 3,502% increase in these women STEM entrepreneurs due to the pandemic.

Hispanic National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9
Model	0.048	7	0.007	F Statistic	=	111.467
Residual	0.000	1	0.000	Prob > F	=	0.073
Total	0.048	8	0.006	R-squared	=	0.999
				Adj. R-squared	=	0.990
				Root MS	=	0.008
H_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**	
LWPAT 162.2249	1.494	0.202	7.413	0.085	-1.067	4.055
LVCF 784.7314	0.989	0.148	6.682	0.095	-0.892	2.871
LLF 43960.048	121.744	16.837	7.231	0.087	-92.193	335.681
LWSG 60979.1369	-32.622	4.436	-7.354	0.086	-88.990	23.746
X30YR_MORT_RT 68.7228	-0.335	0.059	-5.716	0.110	-1.079	0.409
LRI 1560.6102	-11.337	1.856	-6.108	0.103	-34.921	12.247
COVID19_D 26526.6486	9.896	1.360	7.278	0.087	-7.382	27.173
(Intercept)	-991.936	137.799	-7.198	0.088	-2742.842	758.970

Note:

- The COVID-19 dummy variable coefficient for the Hispanic group indicates a 990% increase in these women STEM entrepreneurs due to the pandemic.

Non-Hispanic National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	0.037	7	0.005	F Statistic	=	201.536	
Residual	0.000	1	0.000	Prob > F	=	0.054	
Total	0.037	8	0.005	R-squared	=	0.999	
				Adj. R-squared	=	0.994	
				Root MS	=	0.005	
N_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**		
LWPAT 162.2249	0.602	0.131	4.602	0.136		-1.060	2.263
LVCF 784.7314	0.433	0.096	4.505	0.139		-0.788	1.654
LLF 43960.048	51.757	10.923	4.738	0.132		-87.035	190.548
LWSG 60979.1369	-13.801	2.878	-4.795	0.131		-50.370	22.768
X30YR_MORT_RT 68.7228	-0.134	0.038	-3.532	0.176		-0.617	0.349
LRI 1560.6102	-4.701	1.204	-3.904	0.160		-20.001	10.599
COVID19_D 26526.6486	4.282	0.882	4.855	0.129		-6.926	15.491
(Intercept)	-413.608	89.397	-4.627	0.136		-1549.505	722.290

Note:

- The COVID-19 dummy variable coefficient for the non-Hispanic group indicates a 428% increase in these women STEM entrepreneurs due to the pandemic.

Veteran National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9	
Model	0.009	7	0.001	F Statistic	=	30.686	
Residual	0.000	1	0.000	Prob > F	=	0.138	
Total	0.009	8	0.001	R-squared	=	0.995	
				Adj. R-squared	=	0.963	
				Root MS	=	0.006	
V_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**		**[95% Confidence Interval]**	
LWPAT 162.2249	0.620	0.163	3.802	0.164		-1.451	2.690
LVCF 784.7314	0.374	0.120	3.123	0.197		-1.147	1.895
LLF 43960.048	40.921	13.613	3.006	0.204		-132.049	213.890
LWSG 60979.1369	-11.086	3.587	-3.091	0.199		-56.660	34.488
X30YR_MORT_RT 68.7228	-0.150	0.047	-3.177	0.194		-0.752	0.451
LRI 1560.6102	-3.846	1.501	-2.563	0.237		-22.913	15.222
COVID19_D 26526.6486	3.227	1.099	2.935	0.209		-10.742	17.196
(Intercept)	-326.869	111.412	-2.934	0.209		-1742.487	1088.748

Note:

- The COVID-19 dummy variable coefficient for the Veteran group indicates a 323% increase in these women STEM entrepreneurs due to the pandemic.

Non-Veteran National Level CVR Model Results

Source	SS	df	MS	Number of Obs.	=	9
Model	0.014	7	0.002	F Statistic	=	69.908
Residual	0.000	1	0.000	Prob > F	=	0.092
Total	0.014	8	0.002	R-squared	=	0.998
				Adj. R-squared	=	0.984
				Root MS	=	0.005
NV_LNWSTEM VIF	**Coef.**	**Std. Err**	**t**	**Pr > |t|**	**[95% Confidence Interval]**	
LWPAT 162.2249	0.710	0.139	5.111	0.123	-1.055	2.476
LVCF 784.7314	0.501	0.102	4.909	0.128	-0.796	1.798
LLF 43960.048	60.355	11.608	5.199	0.121	-87.141	207.852
LWSG 60979.1369	-16.112	3.059	-5.268	0.119	-54.975	22.750
X30YR_MORT_RT 68.7228	-0.159	0.040	-3.925	0.159	-0.672	0.355
LRI 1560.6102	-5.515	1.280	-4.310	0.145	-21.774	10.745
COVID19_D 26526.6486	4.854	0.937	5.178	0.121	-7.058	16.766
(Intercept)	-484.310	95.005	-5.098	0.123	-1691.457	722.837

Note:

- The COVID-19 dummy variable coefficient for the non-veteran group indicates a 485% increase in these women STEM entrepreneurs due to the pandemic.