

The Impact of the One NC Small Business Matching Grants Program on North Carolina's Economy: Evidence from IMPLAN

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Executive Summary

The One NC Small Business program provides matching grants to North Carolina small businesses that have been awarded highly competitive federal Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) Phase I awards, which fund the businesses' efforts to develop and commercialize innovative new technologies. This report analyzes the overall estimated impacts on North Carolina's economy resulting from the increased number of employees that North Carolina small businesses have created with the matching grants between 2006 and 2018 (thus far). To examine the impacts in more depth, four small businesses that were funded by the program are also analyzed separately. These analyses are conducted using IMPLAN, a widely-used software program designed to account for both the expected direct and indirect economic impacts of a given event.

The overall analysis finds that each new job created directly from the grant program was expected to indirectly create 1.6 additional new jobs from an increase in demand down the supply chain and a general increase in demand for consumer goods. Each new job said to be created directly from the grant program is expected to generate state and local tax revenue in excess of \$19,000. In aggregate, the \$17,172,444 in matching grants is estimated to have created 739 jobs (287 jobs directly, 452 jobs indirectly) and an additional \$5,554,954 in state and local tax revenue generated from both directly and indirectly created jobs. These figures are based on surveys administered to the recipient firms before most of them could commercialize their technology, and are therefore only partial estimates of the benefits generated by this program.

I. Introduction

There is a growing consensus among policy makers that it is important to encourage innovation and the development and commercialization of new technology. Notably, Enrico Moretti at the University of California at Berkeley argues in his 2012 book *The New Geography of Jobs* that innovative businesses and individuals are becoming the new drivers of economic growth and that a region's ability to foster and encourage innovation is the key determinant of whether that region will prosper or experience economic decline.¹ Successful innovators earn higher-than-average salaries and generate large amounts of wealth for themselves, which they then spend on various goods and services.¹ This increased spending, in turn, has a multiplier impact, causing the creation of additional jobs across a variety of industries and sectors, both high tech and low tech.¹

Within this context, the One NC Small Business grant program was established by the North Carolina legislature in 2005 to encourage the development of innovative new technology and the commercialization of it within the state.² Because a significant number of grant recipients have now completed their technology development and commercialization projects funded by the program, it is possible to estimate some of the impacts that these completed grants had on the North Carolina

¹ Moretti, E. (2012). *The new geography of jobs*. Boston, MA: Houghton Mifflin Harcourt.

² Hardin, J. (2012). *Office of Science & Technology Continuation Review Final Report*. Retrieved from http://www.nccommerce.com/Portals/6/Documents/Resources/OST_Continuation_Review_Report_Final.pdf.

economy overall. Doing so will both shed more light on the economic impacts of the program and provide a better understanding of the economics of innovation in North Carolina.

The software program IMPLAN is used to conduct this assessment. This widely used software is designed to estimate the economic impact that a given change to a regional economy in a particular year would have had in that year.³ IMPLAN can provide an estimate of the economic impact of a given event in terms of its overall dollar value, its impact on employment across all industries, and its impact on tax revenue.³ This report examines the estimated impacts of the One NC Small Business grant program on all three of these metrics. In keeping with the work of Moretti (2012), this report focuses on estimating the economic impact—in terms of the overall number of jobs created—of the program’s grantees hiring highly skilled, innovative individuals as a direct result of receiving the grant.⁴ It includes impacts on tax revenue as well.

To shed additional light on the broader impacts of the One NC Small Business grant program, this analysis also looks more specifically at the impact that four different companies that received the grants have had on the North Carolina economy. These companies are the 3C Institute for Social Development, Nitronex, Clinical Tools, and Vadum. The 3C Institute for Social Development hired five innovative, highly skilled individuals as a result of receiving a One NC grant, Vadum hired four such individuals, and both Nitronex and Clinical Tools hired three. The companies have continued to grow and have been able to have broader impacts on the economy.

It is important to acknowledge that determining how much of the success of these companies was directly caused by receiving a One NC Small Business grant is beyond the scope of this analysis. It cannot be ruled out that these companies could have grown without receiving a One NC Small Business grant. In addition, it should be noted that the numbers for jobs created directly because of the One NC Small Business grant program are taken from a survey administered to grant recipients once they had finished the R&D project funded by their grant.

The remainder of this report is organized as follows: Section II provides a brief overview of the SBIR/STTR program, while Section III provides a more in depth look at the One NC Small Business Matching Grants Program itself. Section IV, in turn, details the nature of IMPLAN. Section V provides brief profiles of the four companies discussed in the report. Section VI discusses the data and methodology employed in this analysis in more detail, while Section VII presents the empirical results of the analysis. Section VIII concludes.

II. Overview of the SBIR/STTR Program

The SBIR program was enacted in 1982, while the STTR program was put into law in 1992.⁵⁶ Both programs were created in response to increasing concerns that U.S. global economic competitiveness was declining.^{5,6} One of the reasons for this decline was believed to be that the high cost and uncertainty associated with conducting research and development (R&D) was preventing small businesses in the U.S. from engaging in it.² This lack of R&D, in turn, was hampering the overall innovation and competitiveness

³ Lindall, S. [IMPLAN]. (2015, February 2). *Lecture 1: What Is IMPLAN?*. [Video File]. Retrieved from <https://www.youtube.com/watch?v=c7xHwi69kl4&list=PLiosUB8174HE1pFZk04tNXIBfSocpufyF>.

⁴ As discussed in section V below, the One NC Small Business Program tracks job creation in six categories: professional/scientific, management, technical/technician, skilled labor, unskilled labor, and other. For the purposes of this economic impact analysis, only job creation in the first four of these categories is considered. Focusing on only these high-skill, high-wage jobs is consistent with Moretti’s definition of innovation jobs. Were the analysis to focus on job creation across all six categories, the impact would likely be higher than reported below. As such, this analysis takes a conservative approach to estimating the economic impact of the One NC Small Business Program.

⁵ U.S. Small Business Administration. (n.d.). *About SBIR*. Retrieved from <https://www.sbir.gov/about/about-sbir>.

⁶ U.S. Small Business Administration. (n.d.). *About STTR*. Retrieved from <https://www.sbir.gov/about/about-sttr>.

of the U.S. economy.² Because there is evidence that small businesses tend to both be more innovative and generate more new jobs than larger firms, both programs were geared exclusively toward them.²

The SBIR program is focused on subsidizing the R&D efforts of small, innovative firms, while the STTR program seeks to subsidize collaborative R&D between small firms and non-profit research organizations, such as universities.² Federal agencies that participate in the SBIR program with an R&D budget of over \$100 million are required to donate 2.8% of their R&D budget to the program each year, while federal agencies that participate in the STTR program with an R&D budget of over \$1 billion are required to donate 0.3% of that funding to the program.^{5,6} There are currently 11 federal agencies that participate in the SBIR program and five that participate in the STTR program.

Funding for both the SBIR and the STTR programs is divided into two distinct phases.² Money given during the first phase of the SBIR program is intended to assist firms in determining the technical merit and feasibility of pursuing a given research project.² If a given SBIR recipient is able to demonstrate that their research has sufficient technical merit and feasibility, they are then selected to receive the second phase of SBIR funding.² This funding is intended to help firms continue their R&D and (where applicable) develop a prototype of their proposed invention.² The SBIR and STTR programs had a combined annual budget of approximately \$2.4 billion in 2014.⁷ The SBIR program issued 4,805 awards in 2014, while the STTR program issued 706 awards.⁷ The average amount of an SBIR award in 2014 for the first phase was \$158,304, while the average amount for the second phase was \$919,943.⁷ Similarly, the average amount of an STTR award for the first phase in 2014 was \$189,530, while the average amount for the second phase was \$862,820.⁷

III. Overview of the One NC Small Business Program

The One NC Small Business program was created in July 2005 in response to concerns that many of the innovative technologies generated in the state were not being commercialized. The program began distributing grants to firms in 2006.² The program provides matching grants to North Carolina firms that receive SBIR or STTR Phase I awards.² The One NC Small Business program is administered by the Office of Science, Technology & Innovation (OSTI) in the North Carolina Department of Commerce.²

One NC Small Business matching grants are capped at \$100,000 (although annual maximum amounts distributed fluctuate with funding), with 75% of the total grant being given to an awardee firm during the initial phase of the SBIR/STTR award process, and the remainder given if the firm reaches the second phase.² The program was designed this way to increase the likelihood that awardee firms would reach the second phase of the program and thus become eligible for additional federal funding.² In addition to being located in North Carolina, firms that receive One NC grants must ensure that at least 51% of the R&D related to the SBIR/STTR award be conducted in North Carolina.² Companies may receive only one grant per year, with a lifetime cap of five awards.

In the period from 2006-2018, a total of 398 grants were given out to 254 unique companies. The average size of the grants was \$62,000 and the average number of employees per company was 10. The vast majority of these companies reported biotechnology as their main business activity, with advanced materials a distant second. Table 1 provides a more in-depth look at the business activities of the grant recipients. The companies expend the matching grant funds in several ways. Slightly more than half the expenditures go toward covering the wages and salaries of employees, while the remaining amount is spread broadly across costs such as equipment, supplies, facility rental, consultant fees, computer software, patent and legal fees, and specialized training and workshops, all of which help the companies develop and commercialize their technologies.

⁷ Small Business Administration. (2015). *SBA Office of Investment & Innovation SBIR-STTR Presentation*. Retrieved from https://www.sbir.gov/sites/default/files/SBA_SBIR-STTR_Overview_October_2015.pptx. The year 2014 was chosen because it is the most recent year for which the IMPAN data used in the analysis was available. For more information, see the "Data and Methodology" section below.

Table 1. Reported Main Business Activities of One NC Small Business Program Grant Recipients

Business Activity	Number of Firms	% of Total
Biotechnology	133	33%
Advanced Materials	42	11%
Medical	38	10%
Computer Software	40	10%
Defense	33	8%
Other	28	7%
Pharmaceuticals	23	6%
Education	17	4%
Photonics	8	2%
Subassemblies/Components	7	2%
Energy	7	2%
Environmental	5	1%
Manufacturing Equipment	4	1%
Test & Measurement	4	1%
Chemicals	3	1%
Telecommunications/Internet	3	1%
Computer Hardware	3	1%

IV. Select Company Profiles

The 3C Institute for Social Development, Nitronex, Clinical Tools, and Vadum were selected as case studies because they had all received multiple One NC Small Business grants since 2006. They are therefore more likely to have had their development as a business boosted by the One NC Small Business grant program. Studies have shown that receiving government grants has a beneficial impact on the development of small firms, so a small business that received multiple grants would likely receive more benefits from those grants than a small business that just received one.⁸ Three of the companies have received One NC Small Business grants as recently as 2015 (the remaining firm was acquired in 2014).¹⁰ The companies are also among the larger businesses to have received One NC Small Business grants.

The 3C Institute for Social Development was founded in 2001 by Dr. Melissa DeRosier.⁹ Its primary goal is to develop computer-based technology to assist people addressing the social problems of children.⁹ 3C’s technology is currently used by schools, hospitals, and research organizations in the United States and 11 additional countries. 3C employs a staff of over 75 people, and its founder was recently given an Award for Excellence for Innovation and Social Entrepreneurship by the U.S. Small Business Administration.⁹

Nitronex was a company that specialized in semiconductor technology related to radio frequency (RF) devices.¹⁰ It was founded in 1999 and purchased in 2014 by MACOM, a Massachusetts-based

⁸ Audretsch, D., Link, A., and Scott, J. (2002). Public/private partnerships: Evaluating SBIR-supported research. *Research Policy*, 31(1), 145-158.

⁹ Small Business and Technology Development Center. (2016). *3C Institute*. Retrieved from <http://www.sbtcdc.org/results/success/3c-institute/>.

¹⁰ Juno Publishing and Media Solutions. (2014, February 13). MACOM acquires Nitronex for \$26m. *Semiconductor Today*. Retrieved from http://www.semiconductor-today.com/news_items/2014/FEB/MACOM_130214.shtml.

manufacturer of semiconductors and related technologies.^{10,11} Its technology is used in advanced communication and electronic warfare devices.¹⁷ However, while MACOM is not based in North Carolina, it does continue to maintain Nitronex as an active company in North Carolina.¹² As of 2012, Nitronex employed 65 individuals.

Clinical Tools is a company that makes software designed to help students in health professions learn their material more effectively.¹³ It was founded in 1999 and employs 23 people in total.¹⁴ Clinical Tools employs individuals with backgrounds in medicine, psychology, and statistics.¹⁵

Vadum is an engineering and design firm that works for clients in defense, law enforcement, and the private sector.¹⁶ It was founded in 2004 and currently employs 20 people. Vadum employs individuals with a diverse array of knowledge and skills, including those with backgrounds in electrical engineering, computer science, lasers, and medical technologies.¹⁷

V. Data and Methodology

The aim of this report is to provide an estimate of the economic impact that the high-skilled jobs directly created by the One NC Small Business grant program had on North Carolina overall. This information is drawn from reports that grantees were required to submit to the North Carolina Department of Commerce in the final year that they received funding through the One NC Small Business grant program. As part of these reports, grantees had to state how many professional and scientific personnel, managers, technical personnel, and other skilled workers they hired due to receiving the grant. These values were therefore added together to determine the overall number of skilled, innovative employees that a given grantee hired because they received a One NC Small Business grant. This same standard was also applied when the impacts of the overall numbers of employees working for the four selected grantees were estimated.

The number of highly skilled employees claimed to be hired due to the One NC Small Business grants in each industry was entered into IMPLAN to assess the economic impact of the grants. In total, at the time of this analysis, 183 of the 398 grantees, accounting for \$17,172,444 in matching grants, had finished their grant-funded projects and submitted their completed final reports.

Because IMPLAN updates its data yearly, the economic impact of the employees added due to the grant is assessed separately for each year. These values were then added together to determine the overall economic impact of the One NC Small Business program. The final year of a grant is the year in which the economic impact of the total number of employees added due to the grant was assessed. Because IMPLAN data was only available for the time period from 2008-2014, the economic impacts of employees hired due to grants that ended outside of this time period were assessed based on the closest year for which data was available.

The economic impact of the grants was measured using two distinct metrics. First was an estimate of how many additional jobs were estimated to have been indirectly created because of the

¹¹ North Carolina Secretary of State. (n.d.). *Corporations division*. Retrieved from <https://www.sosnc.gov/Search/profcorp/5071980>.

¹² North Carolina Secretary of State. (n.d.). *Corporations division*. Retrieved from <https://www.sosnc.gov/Search/profcorp/10081861>.

¹³ Clinical Tools. (2016). *About Us*. Retrieved from <http://www.clinicaltools.com/about>.

¹⁴ North Carolina Secretary of State. (n.d.). *Corporations division*. Retrieved from <https://www.sosnc.gov/Search/profcorp/4622863>.

¹⁵ Clinical Tools. (2016). *Meet Our Core Team*. Retrieved from <http://www.clinicaltools.com/about/core-team>.

¹⁶ Vadum. (2016). *Company Overview*. Retrieved from <http://www.vaduminc.com/index.aspx?urlname=company>.

¹⁷ North Carolina Department of Commerce. (n.d.). *Company Matching Grant Application*. Retrieved from Commerce Department archives.

innovative employees hired as a direct result of the One NC Small Business grants. Second, an estimate of how much additional state and local tax revenue from direct and indirect jobs was generated due to the One NC Small Business grants was included. The tax revenue measure includes both the revenue directly generated by the grant and the additional revenue created by the indirect effects of the grant. The tax revenue figures were adjusted to reflect the current rate of inflation.

VI. Results

Overall, the results suggest that jobs in innovative, high-technology fields do have a significant indirect impact on North Carolina’s economy in addition to their direct impacts. As shown in Table 2, each job created directly by the One NC Small Business grant program is estimated to have indirectly created 1.6 additional jobs elsewhere in the North Carolina economy¹⁸. Each individual job created through the grant program is also projected to have generated more than \$19,000 in state and local tax revenue. In addition, as shown in Table 3, each of the four grant recipients examined in this report appear to have contributed significantly to the North Carolina economy, both in terms of tax revenue and the overall number of jobs they created. It is important to note that Table 2 shows the effects of jobs claimed to have been created *directly* by the One NC Small Business grant program (for grants that have been completed), while Table 3 shows the effects of *all* the jobs created by the four selected funded firms, not just those jobs caused directly by the One NC funding. The “additional jobs created” figure displayed in Table 2 should thus be viewed as distinct from the “additional jobs created” figures in Table 3, because the former reflects additional jobs created as a result of the One NC Small Business grant program, while the latter reflects all additional jobs created due to the total number of employees at the four selected firms.

Table 2. Results of IMPLAN Analysis for Jobs Created Due to the Grant Program¹⁹

Jobs created directly from grant	287
Additional jobs created	452
State and local tax revenue generated	\$5,554,954

Table 3. Results of IMPLAN Analysis for Select Funded Firms²⁰

Job Source	Jobs directly created by firm	Additional jobs created	State and local tax revenue generated
3C Institute for Social Development	68	141	\$1,212,533
Nitronex	65	111	\$1,273,094
Clinical Tools	23	36	\$377,287
Vadum	20	37	\$323,342
Total	176	325	\$3,186,256

¹⁸ 452/287 = 1.6.

¹⁹ As noted in section V, the impacts—in terms of additional jobs created and state and local tax revenue generated—are measured only for the final year of a grant. This should not be taken as an indication that the jobs directly and indirectly created by the grant program (or their effects on tax revenue) were eliminated after one year. IMPLAN can evaluate the economic impact of a given change only on a yearly basis.

²⁰ As noted in section V, the impacts—in terms of additional jobs created and state and local tax revenue generated—are measured only for a one-year period. This should not be taken as an indication that the jobs directly and indirectly created by the grant program (or their effects on tax revenue) were eliminated after one year. IMPLAN can evaluate the economic impact of a given change only on a yearly basis.

It is important to acknowledge some of the limitations of this analysis. These estimates are based on economic data from the North Carolina economy during the period from 2008-2014. This means that they reflect the economic conditions of that time period and may not accurately predict future impacts if economic conditions are significantly different. In addition, IMPLAN does not distinguish between jobs of different quality, or even between full-time and part-time jobs.²¹ However, even with these limitations, this analysis suggests that the One NC Small Business grant program has generated significant economic benefits for North Carolina.²²

VII. Conclusion

In conclusion, this analysis has shown that the One NC Small Business grant program is estimated to have created a large number of jobs both directly and indirectly. This is especially noteworthy because the firms involved were surveyed in the final year that they received funding from the One NC Small Business grant program, which would have most likely been before they had the opportunity to fully commercialize the R&D for which they had received funding.² In addition, IMPLAN can assess only the direct and indirect effects of a given change in a given year. This means that, if a job were created due to the One NC Small Business grant program in one year but the job lasted multiple years, IMPLAN could only assess the economic effects of that job in the year it was created, not any subsequent years. This analysis should therefore be interpreted as only a partial estimate of the overall benefits of the One NC Small Business program. In addition, this analysis has not examined the effects of the grant program on metrics such as new intellectual property created or firm sales revenue. These metrics are detailed in the 2012 *Continuation Review Final Report*.²

Going forward, more research on the overall benefits of the One NC Small Business grant program is needed, particularly research focusing on the commercialization efforts of the firms that participated in it. However, this report has shown evidence that the One NC Small Business grant program has had a positive impact on the North Carolina economy, and that an increase in innovative, highly skilled job opportunities causes an increase in employment in other industries as well.

²¹ Lindall, S. [IMPLAN]. (2015, March 30). *Lecture 8: Understanding Your Results*. [Video File]. Retrieved from <https://www.youtube.com/watch?v=ODM6J5FXPZ8>.

²² It should be noted that, while the statute (§ 143B-437.81) authorizing the One NC Small Business Program states that the overall long-term goal of the program is foster job creation and economic development in the State, it specifically enumerates four near-term objectives for the program to achieve as a means of realizing that goal: (1) Increase the amount of federal research dollars received by North Carolina small businesses; (2) help North Carolina companies bridge the funding gap period between the final Phase I payment and the first Phase II payment in the Federal Program; (3) increase the intensity of the research conducted under Phase I, making North Carolina small businesses more competitive in the competition for Phase II funds; and (4) encourage the establishment and growth of high-quality, advanced technology firms in the State. Accordingly, job creation was not expected to be a primary near-term objective of the program. Rather, it was expected to be a longer-term outcome resulting from near-term grant-supported technology development and commercialization activities. In light of this expectation, it is particularly notable that the program generates significant direct and indirect job impacts.

VIII. Appendix. Overview of IMPLAN

IMPLAN is a software program that measures the overall economic impact a given event has on a regional economy.³ For instance, when evaluating the economic impact of a biotechnology company hiring a new scientist, IMPLAN measures the additional economic value created directly by the scientist, the increased demand for laboratory equipment that the new hire caused, and the increased consumer spending the new scientist engaged in. IMPLAN bases its evaluation of the economic benefits of a given event on data at the county level for all economic transactions that took place in the same year as the event in question.³ This data is gathered and organized into a single dataset by the company that created IMPLAN, the IMPLAN Group (formerly MIG).^{3,23} The IMPLAN Group draws this data from a variety of different sources, most of them federal.³ These sources include the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor Statistics, the U.S. Census Bureau, the U.S. Department of Agriculture, and the U.S. Geological Survey.³ As of the time of this report, 2014 is the most recent year for which IMPLAN data is available.

IMPLAN was originally created to assist the U.S. Forest Service in determining the impact their activities had on the communities nearby the forests they were charged with managing.²⁴ The Forest Service eventually privatized IMPLAN by creating an independent organization known as the Minnesota IMPLAN Group, or MIG.²⁴ MIG, in turn, was eventually acquired by another private business called the IMPLAN Group.²³ That business is currently located in Huntersville, North Carolina.²⁵

²³ PR Newswire. (2013). *IMPLAN Group Acquires MIG, Inc.; Moves Headquarters to Charlotte Area and Creates Jobs*. Retrieved from <http://www.prnewswire.com/news-releases/implan-group-llc-acquires-mig-inc-moves-headquarters-to-charlotte-area-and-creates-jobs-217408341.html>.

²⁴ Lindall, S. [IMPLAN]. (2015, March 13). *Lecture 2: The History of IMPLAN*. [Video File]. Retrieved from https://www.youtube.com/watch?v=iCYns53J_fQ.

²⁵ IMPLAN. (2016). *IMPLAN: Economic Impact Modeling*. Retrieved from <http://implan.com/>.