

The Economic and Fiscal Impacts of TEDCO's Seven Core Programs—FY2023

PREPARED BY



**UNIVERSITY OF
BALTIMORE**

Jacob France Institute

Executive Summary

The Maryland Technology Development Corporation (TEDCO) retained the University of Baltimore’s Jacob France Institute to update the prior 2013, 2015, 2018 and 2021 analyses of the corporation’s economic and fiscal impacts. The key findings of this analysis are as follows:

Maryland has been at the forefront of investing in technology-based economic development for more than a quarter of a century. Across the nation, states are increasingly taking the lead in promoting entrepreneurship, innovation, and technology commercialization as a core focus of their economic development strategy. According to the Information Technology and Innovation Foundation (ITIF)’s How Technology-Based Start-Ups Support U.S. Economic Growth report, “Technology-based start-ups have long been an important driver of America’s economic growth and competitiveness.” States invest in programs such as TEDCO to support the formation and growth of these firms because according to ITIF, “start-ups in technology-based industries benefit the economy in a number of ways: they create many high-paying jobs; they invest heavily in R&D; and they are more likely to export their goods and services.” Maryland has been at the forefront of supporting technology-based development, through programs such as TEDCO. Created in 1998 by Maryland General Assembly to facilitate the transfer and commercialization of technology from Maryland’s research universities and federal labs into the marketplace and to assist in the creation and growth of technology-based businesses in all regions of the State, TEDCO has supported the development and expansion of Maryland’s entrepreneurial and innovation driven economy through targeted research, commercialization support, business financing and social investing programs as well as business support and outreach programs.

TEDCO’s programs have supported the development of a large, diverse and growing portfolio of companies that supports the growth and diversification of the Maryland economy. TEDCO’s current portfolio of companies assisted by its seven primary research and business funding programs has grown from 212 Maryland companies¹ with 1,147 jobs in the 2013 study to 442 companies with 5,918 jobs in 2023.²

Maryland has received significant and growing economic benefits from its investment in TEDCO. When multiplier effects are included, the companies created or supported by the seven core TEDCO programs generated a total of \$2.7 billion in Maryland economic activity in 2023, supporting a total of 12,082 jobs earning \$1.1 billion in labor income and generating estimated state and local government revenues of \$140.3 million.³ As a result of the growth of TEDCO’s portfolio of assisted companies; the development of new programs; and the assumption of management of the Maryland Venture Fund (MVF), TEDCO’s impacts have increased significantly since the first economic impact study was prepared in 2013, with current total impacts of \$2.7 billion and 12,082 jobs nearing five times the \$566 million in output and more than four times the 2,835 jobs in the 2013 report (Figures ES-1 and ES-2).

¹ Some TEDCO supported companies were formed or have moved out of state and are excluded from this analysis.

² TEDCO assumed management of the Maryland Venture Fund (MVF) in 2016; and therefore, MVF’s companies and impacts were excluded from the earlier 2013 and 2015 analyses. MVF accounted for 37 Maryland companies with 1,182 jobs in 2018, 52 Maryland companies with 1,601 jobs in 2021 and 61 companies and 1,983 jobs in 2023.

³ It is important to note that this study does not include the downstream impacts of research funding—for instance, companies formed to commercialize MSCRF technologies or additional R&D funding leveraged. Furthermore, any economic benefits of the research that don’t occur within the current year—which is the typical outcome for research—will not be captured. The economic contribution of these effects is substantial.

Figure ES1: Total Impacts on Output - FY2013 - FY2023

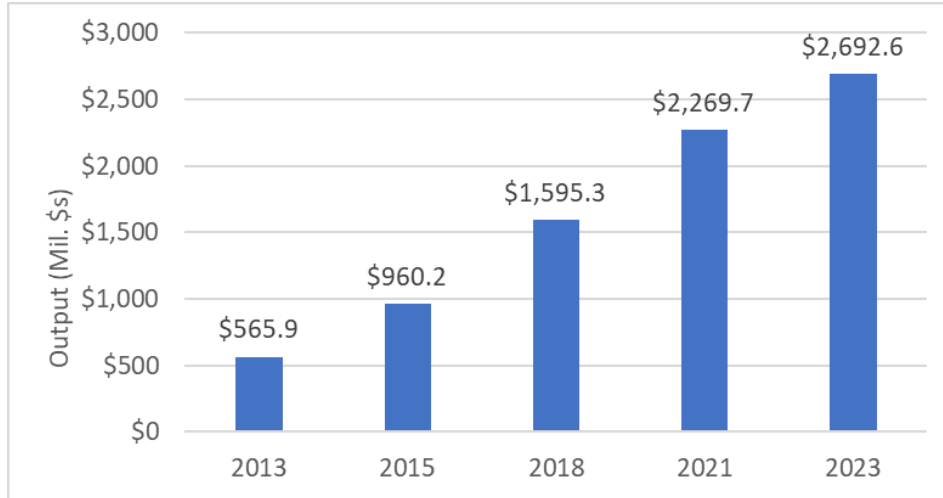
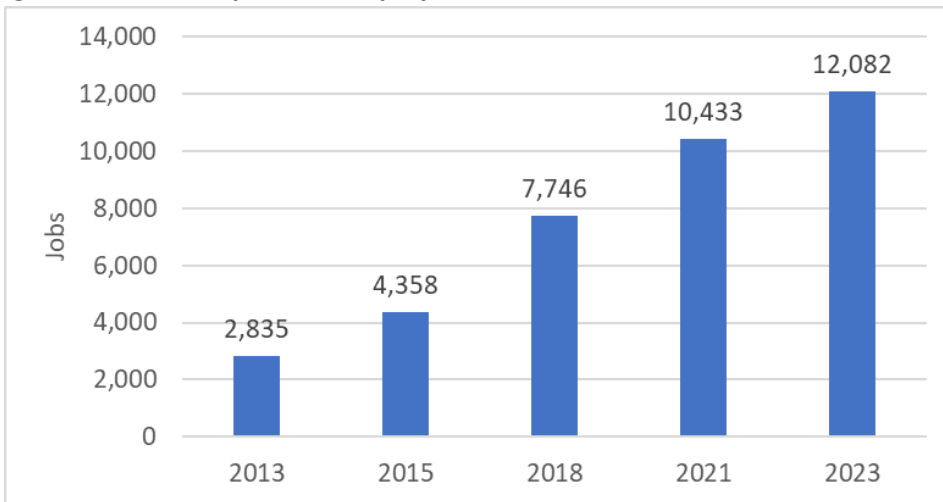


Figure ES2: Total Impacts on Employment - FY2013 - FY2023



Maryland has received a strong return on its investment in TEDCO. IMPLAN, the widely employed input-output model for economic analysis, estimates that the total portfolio of TEDCO funded companies, plus the research expenditures of MSCRF and Small Business Innovation Research (SBIR), generate a total of \$140.3 million in combined state and local government revenues, consisting of \$80.1 million in State of Maryland revenues and \$60.1 in county and local government revenues. Estimated State of Maryland government revenues of \$140.3 million are nearly three times the FY2023 state appropriation of \$50.5 million. The Jacob France Institute (JFI) also calculated an estimated 2023 return on investment of the State of Maryland’s investment in TEDCO’s Maryland Innovation Initiative (MII), Rural and Urban Business Innovation Initiative (RBII-UBII), SBIR and Seed Investment Funds and found that focusing narrowly on the estimated state tax revenues and TEDCO expenditures associated with these five primary investment programs, the 2023 return on the state investment in TEDCO totals 32 percent⁴. The overall rate of return across all TEDCO’s programs and funding (except for MVF) is 15 percent. It is important to note that the economic and ROI estimates in this report are only for TEDCO’s primary funding programs and do not include MVF activities or the business, economic, fiscal, or innovation ecosystem enhancement impacts of TEDCO’s related business outreach and support programs.

⁴ Since the Maryland Venture Fund is internally funded, its activities are excluded from the ROI calculations.

Contents

Executive Summary	i
Introduction	1
TEDCO's Mission	1
Jacob France Institute Approach to Measuring the Economic Impact of TEDCO	2
Total Direct Impacts: TEDCO's Seven Primary Funding Vehicles.....	3
The Economic Impact of TEDCO's Seven Primary Funding Vehicles	5
TEDCO's Overall Impact	5
Total Program-Specific Estimated Economic Impacts for TEDCO's Seven Primary Funding Vehicles.....	7
Economic Impacts of the Maryland Innovation Initiative.....	8
Economic Impacts of the Maryland Social Impact Fund.....	9
Economic Impacts of the Maryland Stem Cell Research Fund	9
Economic Impacts of the Maryland Venture Fund	11
Economic Impacts of the Rural Business Innovation Initiative-Urban Business Innovation Initiative	11
Economic Impacts of the Seed Investment Funds.....	12
Economic Impacts of the Small Business Innovation Research Fund	13
Summary and Conclusion	14
Appendix – Economic Impact Methodology	16

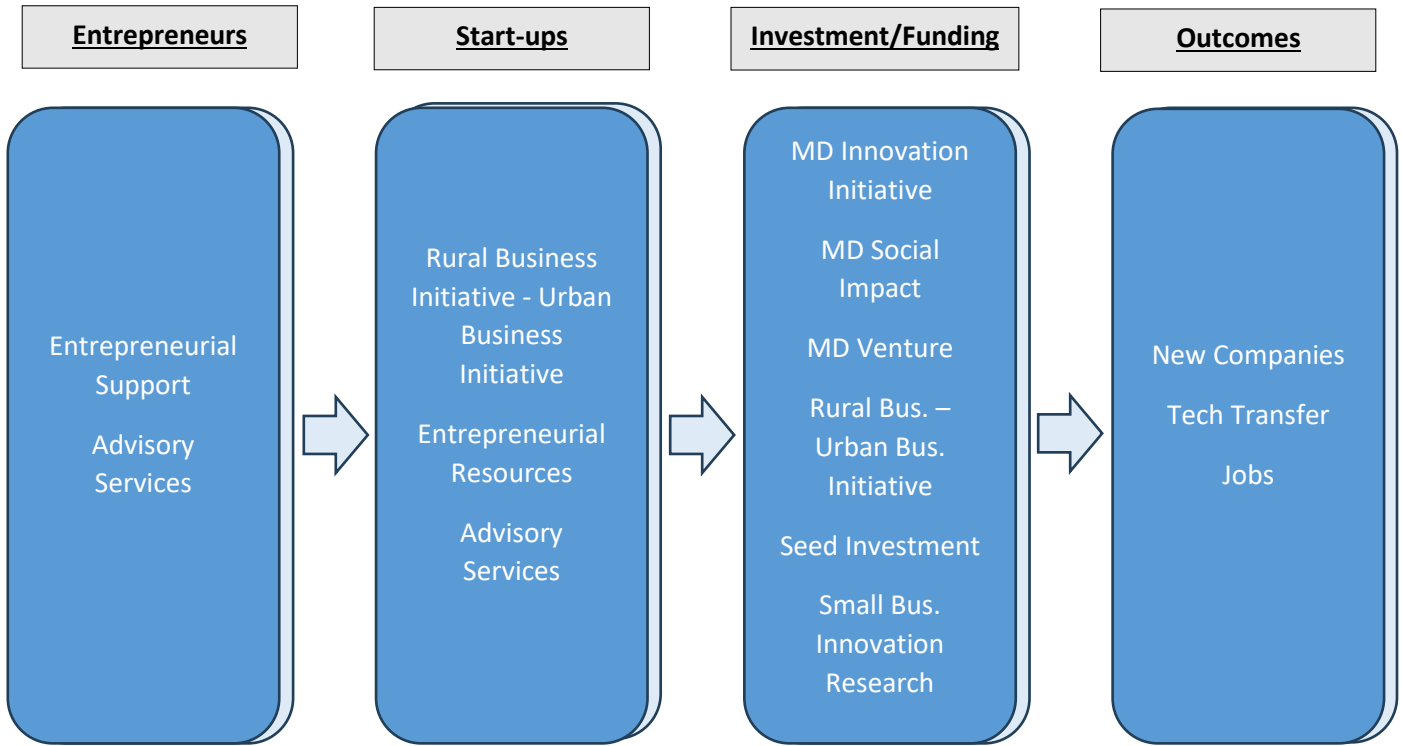
Introduction

TEDCO retained the Jacob France Institute to update the economic and fiscal impact portions of its 2013, 2015, 2018, and 2021 economic impact reports.⁵ This report assesses only the economic and fiscal contributions of the portfolio of companies and research spending supported by TEDCO’s seven primary funding vehicles, not the full functional and strategic impacts covered in the first two (2013 and 2015) reports or the additional impacts generated by TEDCO’s other business support and innovation system enhancement programs such as Network Advisors, Prelude Pitch, Market Search Databases, Roundtables, and MARCOMM support. See the Appendix for a description of the methodology used in this report.

TEDCO’s Mission

TEDCO was created by the Maryland General Assembly in 1998 to facilitate the transfer and commercialization of technology from Maryland’s research universities and federal labs into the marketplace and to assist in the creation and growth of technology-based businesses in all regions of the state. TEDCO’s mission is to, *Enhance economic empowerment by fostering an inclusive and entrepreneurial innovation ecosystem. Identify, invest in, and help grow technology companies in Maryland.* TEDCO’s vision statement is, TEDCO will be the recognized national leader for supporting translational research, and technology-based, economic, and entrepreneurial development while being the hub of Maryland’s innovation ecosystem. TEDCO fulfils its mission by investing in **research**—through Maryland Innovation Initiative (MII), MSCRF, and SBIR programs—and by providing **technical assistance and funding** to entrepreneurs, start-ups, and early-stage companies in Maryland through its core entrepreneurial and business programs (Figure 1).

Figure 1: TEDCO's Core Entrepreneurial and Business Funding Programs

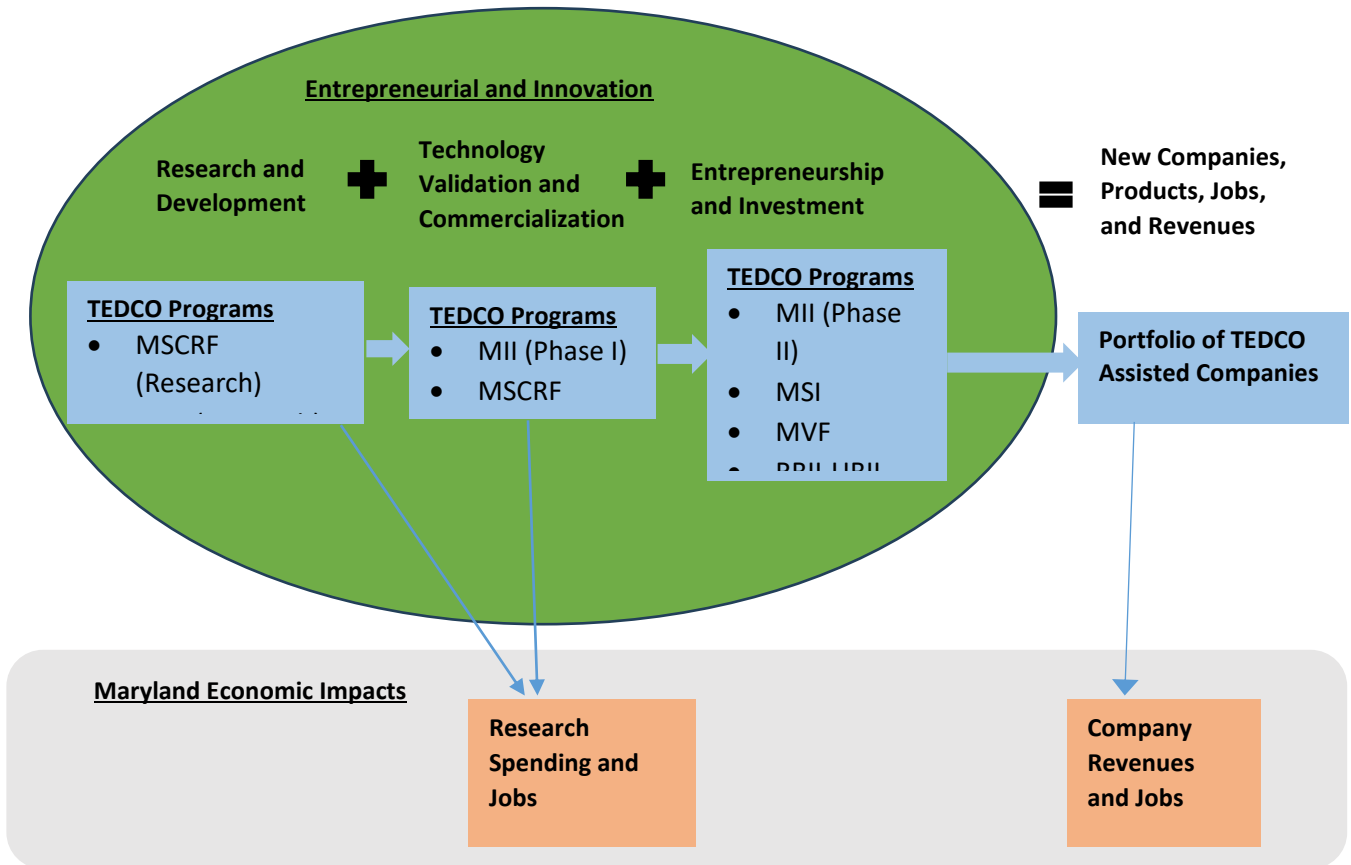


⁵ The 2013, 2015 and 2018 Economic and Programmatic Impacts of the Maryland Technology Development Corporation on the Maryland Economy reports were prepared by the Battelle Technology Partnership Practice or its successor TEconomy Partners. The 2021 and this report were prepared by the JFI and the principal investigator on these projects is now the Director of the JFI.

Jacob France Institute Approach to Measuring the Economic Impact of TEDCO

The Jacob France Institute’s approach to analyzing the economic contribution of technology-based economic development programs is presented in Figure 2. Broadly speaking, the *Maryland Entrepreneurial and Innovation Ecosystem* consists of the generation of new products, processes and technologies through *research and development*; the transformation of these technologies into products through *technology commercialization*; and the development and sale of new products and technologies in the global marketplace through the start-up of new companies, and investment by existing companies through *entrepreneurship and investment*. TEDCO is active in all these three key phases, resulting in the development of a “portfolio” of supported companies and research activities. To estimate the economic impacts on Maryland, we focus on the research spending, and the number of Maryland jobs generated by the portfolio of TEDCO assisted companies. Using these observable variables as inputs to the IMPLAN model of Maryland we gain a complete picture of the economic consequences of the activities of the seven core TEDCO programs.

Figure 2: TEDCO’s Seven Primary Business Investment and Research Funding Vehicles and the Entrepreneurial and Innovation Ecosystem



Total Direct Impacts: TEDCO's Seven Primary Funding Vehicles

The Jacob France Institute used the IMPLAN model for the State of Maryland to estimate the economic and fiscal impacts associated with TEDCO's Seven Primary Funding Vehicles. IMPLAN input-output (I/O) models can be used to estimate the economic and fiscal contributions of projects, companies or of entire industries from a national or state perspective down to regional, or even micro-level local views. To estimate the impact of any change in business activity with an IMPLAN I/O model, it is necessary to identify the industry sector and enter the change in: (1) the dollar amount of the revenues (which equal the expenditures, when viewed from the purchaser's viewpoint); (2) the number of employees, or (3) the labor income. Given at least one of these three variables is entered, IMPLAN will estimate any that are missing⁶. The *inputs* to this economic and fiscal impact analysis are:

- The dollar value of the FY2023 research activities funded via the MII, MSCRF and the SBIR, which are additions to the revenue, or *direct output* of the research sector, and,
- The FY2023 number of employees and industry sector classification of each company in the portfolio of companies supported via the core research, technology commercialization and investment programs—MII, Maryland Social Impact Fund (MSI), MVF, RBII-UBII, and the Seed Investment Fund.

The *annual direct impacts* of the seven core TEDCO primary funding vehicles are presented in Table 1, and consist of the following:

- The direct impacts of the MII, MSI, MVF, RBII-UBII, and Seed Investment programs consisting of the 2023 employment levels of the portfolio of assisted companies that are currently active in Maryland.⁷ For the MII, the research, development and commercialization support provided to each project's university partners was also included. The employment and corresponding IMPLAN-estimated revenues of the portfolio of companies represent the direct impact of TEDCO's core business investment programs.
- The direct impacts of the MSCRF, MII, and SBIR research expenditures were analyzed as occurring in the R&D sector of the Maryland economy. The corresponding direct impacts on employment associated with these research expenditures in Table 1, were estimated by the IMPLAN model.⁸

TEDCO has supported the development of an expanding portfolio of companies and research activities in Maryland. The Maryland economic activity generated by the seven primary funding vehicles analyzed in this report totals more than \$1.5 billion in direct economic activity and 6,010 jobs in 2023; more than 4.25 times the direct employment number reported in 2013. As presented in Figure 3, the number of Maryland companies supported by TEDCO's core business and research funding vehicles has increased from 212 in

⁶ By employing the known production functions of each industry, IMPLAN estimates any variables that were not supplied as inputs, given *at least* one of; employment; labor income, or revenue.

⁷ TEDCO provided data on 442 companies (92 MII firms; 61 MVF firms; 12 RBII-UBII firms, 243 SEED Investment Fund firms and 34 Social Impact Fund firms) with 5,918 jobs. The JFI merged this database with the company database used in the prior 2021 analysis to create an analytical database. Firms that went out of business or moved out of state were removed from the database. The JFI identified the current levels of employment and industry classification of these companies through a combination of TEDCO provided data, commercial databases (Hoover's and Pitchbook), and web searches. Where complete data were not available, company industry and/or employment were estimated by the JFI where feasible, or the company was removed.

⁸ IMPLAN estimated a direct impact of 92 research jobs related to the research support provided through MII, MSCRF and SBIR, which added to the 5,918 jobs from the TEDCO-supported companies data provides a total of 6,010 jobs.

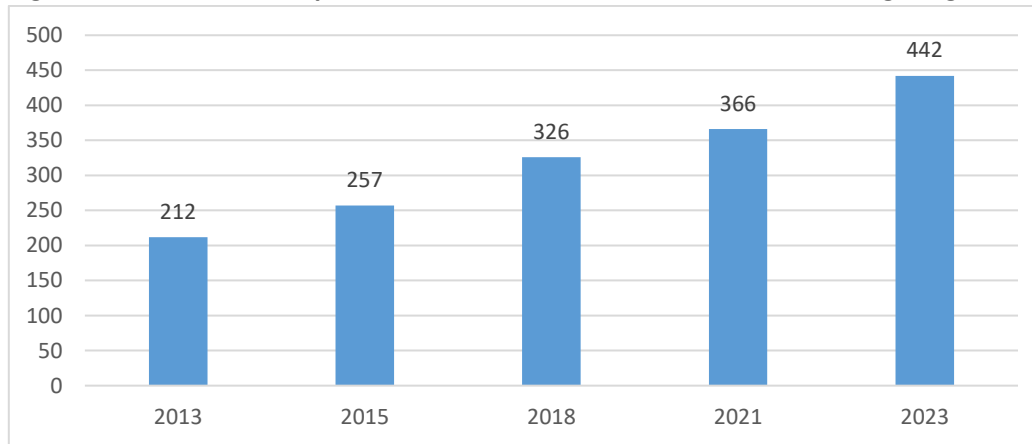
the first 2013 analysis to 442 companies in 2023, with the TEDCO-assisted company portfolio employment increasing from 1,147 in 2013 to 5,918 in 2023 (Figure 4). A large share of this growth can be attributed to the inclusion of the Maryland Venture Fund, which TEDCO assumed control over in 2016, as well as the expansion in TEDCO’s programmatic offerings.⁹

Table 1: Direct Maryland Impacts Associated with TEDCO's Seven Core Funding Programs - FY2023

	Revenues or Expenditures	Employment
Seven Core TEDCO Programs	\$1,525,127,532	6,010
Maryland Innovation Initiative	\$157,292,160	635
Maryland Social Impact Fund	\$33,404,095	159
Maryland Stem Cell Research Fund	\$17,885,989	67
Maryland Venture Fund	\$464,633,663	1,983
RBII-UBII	\$9,852,780	56
Seed Investment Funds	\$840,410,118	3,102
Small Business Innovation Research	\$1,648,727	8

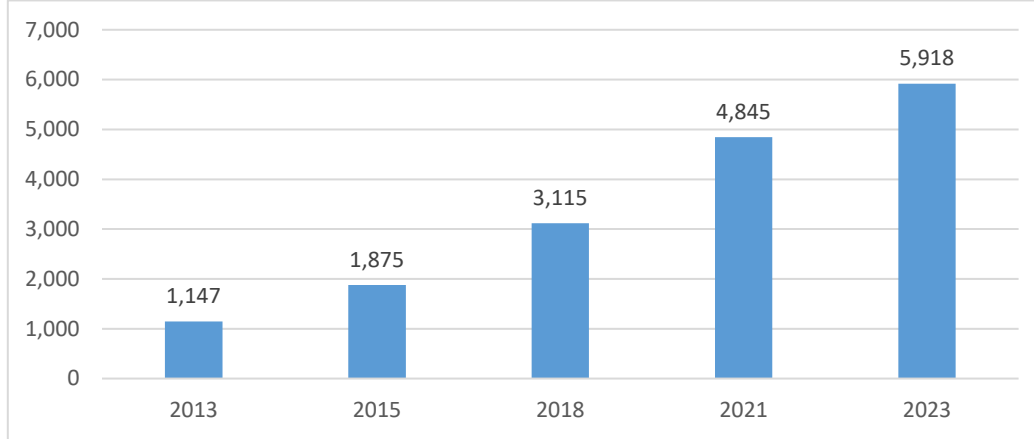
Source: JFI analysis of TEDCO data.

Figure 3: Number of Companies assisted via TEDCO’s Seven Core Funding Programs - FY2013 – FY2023



⁹ The remaining 92 jobs in the direct impacts (below) are created by the research activities supported by the MII, MSCRF and SBIR.

Figure 4: Direct Employment by Companies Assisted by TEDCO's Seven Primary Funding Vehicles by Year



The Economic Impact of TEDCO's Seven Primary Funding Vehicles

This section presents the results of the economic impact analyses for the Seven Primary Funding Vehicles in aggregate, with the discrete program by program results presented below. For each analysis, the Jacob France Institute provides the direct effect values driving the model (based upon the operational data provided by TEDCO and refined by the Jacob France Institute), the additional estimated, indirect, and induced multiplier impacts, and a summation of the total impacts (direct, indirect, and induced) from the IMPLAN model. An impact multiplier is also provided for the three model drivers (employment, labor income, and output). The multiplier number will equal the total (including the direct effect) number of jobs or dollars created in the regional economy, per job or dollar of direct effect. For each analysis, output, labor income (including both wages and benefits), employment, state and local tax revenue, and federal tax revenue, are provided.¹⁰

TEDCO's Overall Impact

As presented in Table 2, the economic contribution to the Maryland economy of the seven core TEDCO programs totaled almost \$2.7 billion in 2023, with a total of 12,082 jobs earning \$1.1 billion in labor income. These additions to the economy generated estimated state and local government revenues of \$140.3 million. Total direct research expenditures and portfolio company revenues of \$1.5 billion, and employment of 6,010 are augmented by an additional \$555 million in economic activity and 2,778 jobs as Indirect Impacts generated by the local purchases made to support TEDCO's portfolio of research and assisted companies, and by Induced Impacts of \$612.5 million in economic activity and 3,294 jobs, created by the increase in local incomes attributable to TEDCO's Seven Primary Funding Vehicles. The \$2.7 billion estimated total TEDCO-supported output impact results in an output multiplier of 1.77, or \$1.77 in Maryland economic activity resulting from each \$1 in research expenditures and portfolio company revenues. Similarly, the multiplier associated with employment indicates that each job provided directly by TEDCO-supported research or portfolio companies, results in 2.01 Maryland jobs in total¹¹.

¹⁰ The estimation of tax revenue is subject to significant variability due to ever-changing rate structures, the use of exemptions, and the accounting of potential income, if any, subject to taxation. These figures should be viewed with some measure of caution throughout this analysis.

¹¹ The impact of the research sectors is unquestionably under-estimated since it captures only the current year economic activities driven by the research expenditure. This is especially true for the MSCRF, where only direct state

Table 2: Total Impacts of TEDCO’s Seven Core Programs on Maryland, In Aggregate - FY2023

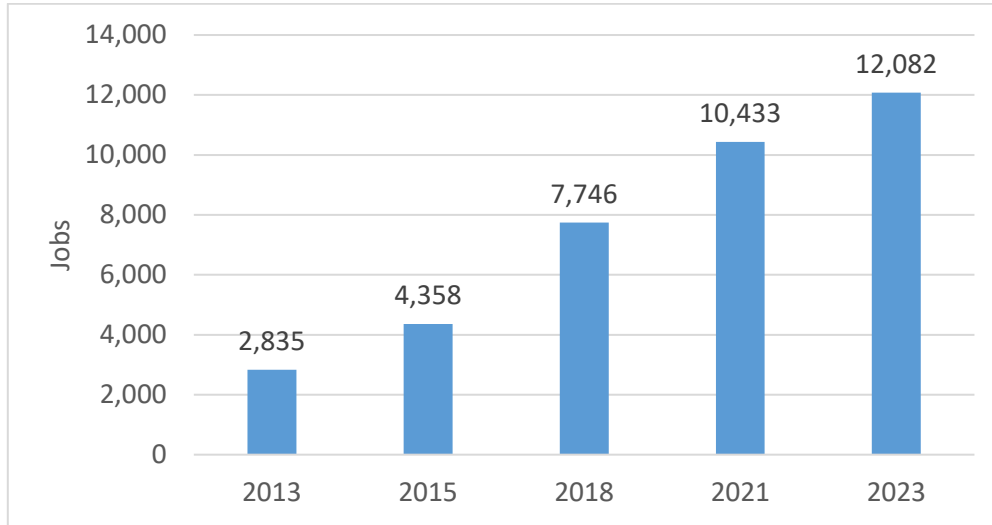
	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$1,525,127,532	\$667,605,330	6,010	\$69,864,239	\$151,621,085
Indirect Impacts	\$554,986,952	\$205,288,689	2,778	\$25,077,401	\$48,539,011
Induced Impacts	\$612,532,303	\$196,991,290	3,294	\$45,310,666	\$49,797,721
Total Impact	\$2,692,646,787	\$1,069,885,309	12,082	\$140,252,306	\$249,957,817
State Impact Multiplier	1.77	1.60	2.01		

Source: JFI calculations using IMPLAN I/O model for the State.

The Maryland impacts associated with TEDCO’s core operations have grown with the State’s investment.

The State of Maryland has continued to invest in expanding its innovation economy through targeted investments in TEDCO. TEDCO has expanded from three core programs in the 2013 report, to seven primary funding vehicles in 2023.¹² While the addition of the MVF to TEDCO’s operations in 2016 and expansion of MII since its inception in 2013 account for much of this growth, TEDCO has broadened and deepened its programmatic offerings to better support technology-based development in Maryland. TEDCO’s current impacts of nearly \$2.7 billion in output and 12,082 jobs represent an increase in TEDCO supported jobs of more than 4.25 times, and an increase in TEDCO supported economic activity of almost 4.8 times, since the first report in 2013 (Figures 5 and 6).

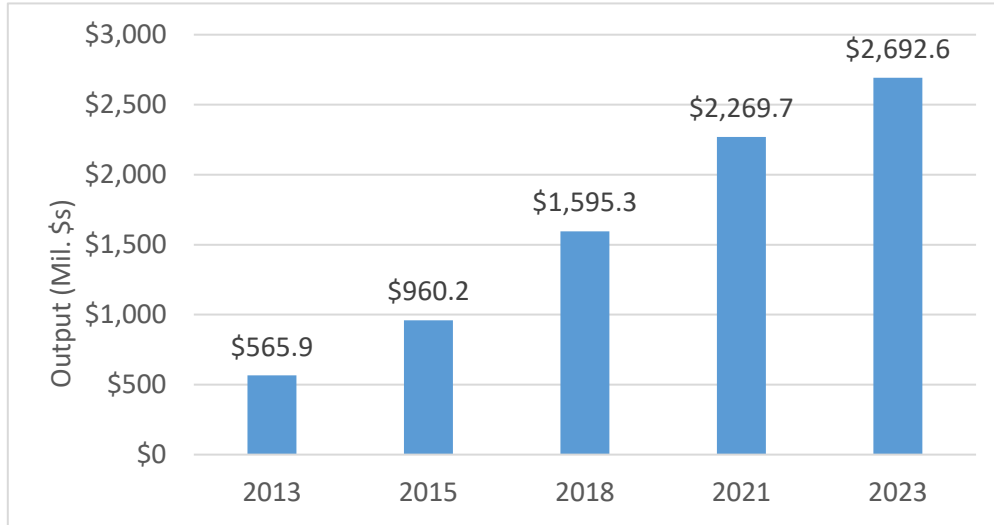
Figure 5: TEDCO Job Impacts by Year - FY2013 - FY2023



R&D expenditures are included, while any additional funding leveraged by the initial R&D investment or companies formed to commercialize new technologies will not be captured.

¹² Several programs analyzed separately in previous reports have been integrated into the Seed Investment Fund, some smaller programs have been discontinued and are no longer counted, and the Small Business Innovation Research Program and Maryland Social Impact Fund have been added.

Figure 6: TEDCO Output Impacts by Year - FY2013 - FY2023



The Seed Investment program accounts for 54 percent of the total Maryland output impact associated with TEDCO support, followed by MVF at 31 percent and MII at 10 percent (Table 3). The Seed Investment Fund captures 6,347 of the 12,082 Maryland jobs, while the MVF and MII follow with 3,935 and 1,240 jobs, respectively. The five programs that continued operating since the 2021 report, all demonstrated substantial growth in terms of both employment and output. Since 2021, the MII has contributed to the creation of 567 more jobs and more than \$126 million in output. Support from the Seed Investment Fund is associated with \$152.7 million in impact on output—which is significantly more than the \$29.6 million reported in the 2021 report as generated via the Builder Fund, which it absorbed—as well as 323 jobs. The MVF shows similar gains over the period with 433 more jobs and \$81.7 million in output.

Total Program-Specific Estimated Economic Impacts for TEDCO’s Seven Primary Funding Vehicles

The JFI analyzed the individual impacts of each of TEDCO’s Six Primary Funding Vehicles. When a company participated in more than one of TEDCO’s core programs, it was allocated to the first program in which it participated.

Table 3: TEDCO’s Total Maryland Employment and Output Impact FY2021 and FY2023, by Program

Program/Impact	FY2021 Report		FY2023 Report		% of 2023 impacts	
	Employment (Jobs)	Output (Mil. \$s)	Employment (Jobs)	Output (Mil. \$s)	Jobs	Output
Total	10,433	\$2,269.7	12,082	\$2,692.6	100%	100%
Builder Fund	127	\$29.6	Now in Seed Fund			
Maryland Innovation Initiative	673	\$147.1	1,240	\$273.5	10%	10%
Maryland Social Impact Fund	Not analyzed		296	\$59.0	2%	2%
Maryland Stem Cell Research Fund	75	\$15.8	148	\$34.1	1%	1%
Maryland Venture Fund	3,502	\$759.6	3,935	\$841.3	33%	31%
Rural Business Innovation Initiative	33	\$6.8	101	\$18.4	1%	1%
Seed Investment Funds	6,024	\$1,310.8	6,347	\$1,463.5	53%	54%
Small Business Innovation Research	Not analyzed		14	\$2.9	0.1%	0.1%

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Maryland Innovation Initiative

Maryland Innovation Initiative (MII) was created as a collaboration between the State of Maryland and five Maryland academic research institutions (Johns Hopkins University, Morgan State University, University of Maryland College Park, University of Maryland Baltimore, and University of Maryland Baltimore County). The program is designed to promote commercialization of research conducted in these universities and leverage each institution's strengths. The objective of the MII is to foster the transition of promising technologies having significant commercial potential from the five participating universities, where they were discovered, to the commercial sector, where they can be developed into products and services that meet identified market needs. The MII promotes commercialization through technology validation, market assessment, and the creation of start-up companies in Maryland based on university discovered technology. MII provides up to \$315,000 in project funding in a two-phase process:

- Technology Assessment - Technology Validation and Market Assessment, 9 months, up to \$115,000 (\$165,000 if a joint university effort); and
- Company Formation - Commercial Launch, 9 months, up to \$150,000.

The JFI analyzed the economic impacts associated with the portfolio of 92 currently active MII companies with direct employment of 617 workers. The JFI also analyzed the economic activity associated with the \$4.8 million in MII Phase 1 Technology Assessment research and development activity provided to the five partner universities in FY 2023. As presented in Table 4, the \$157.3 million in estimated MII portfolio company revenues and associated research expenditures supports a total of \$273.5 million in economic activity in Maryland, supports 1,240 jobs earning \$107.1 million in labor income, and has an associated \$11.9 million in estimated state and local government revenues. The MII portfolio of companies and research direct impacts of 635 jobs¹³ and \$157.3 million in research and estimated company revenues are augmented by an additional \$54.7 million in economic activity and 275 jobs in the form of Indirect Impacts through the local purchases made to support the operations of these companies and research projects, and by \$61.4 million in economic activity and 330 jobs as Induced Impacts from the increase in local incomes attributable to portfolio and supplier company operations. The \$273.5 million in estimated MII-supported economic activity results in an output multiplier of 1.74, or \$1.74 in economic activity supported for each \$1 in associated company revenues/research expenditures. Or, from the perspective of the jobs multiplier, each job directly added via the operations of MII supported companies and research, ultimately results in 1.95 Maryland jobs.

¹³ IMPLAN estimates that the \$4.8 million research expenditure directly generates 18 jobs, which are included in the 635 direct employment number.

Table 4: Maryland Innovation Initiative Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$157,292,160	\$67,059,646	635	\$4,857,158	\$15,531,523
Indirect Impacts	\$54,711,608	\$20,275,938	275	\$2,545,049	\$4,790,273
Induced Impacts	\$61,448,615	\$19,762,016	330	\$4,545,509	\$4,995,665
Total Impact	\$273,452,382	\$107,097,599	1,240	\$11,947,716	\$25,317,461
State Impact Multiplier	1.74	1.60	1.95		

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Maryland Social Impact Fund

The Maryland Social Impact Fund assists companies that may be overlooked by traditional sources of funding due to economic disadvantage. Applications are welcomed from pre-seed technology start-ups in any industry. To be successful, applications must first qualify by satisfying all the following qualifications:

- The principal place of business must be in Maryland.
- There must be at least one employee.
- At least 50 percent of the founders must demonstrate economic disadvantage.

In 2023, the MSI supported 34 companies which had direct employment of 159 and IMPLAN-estimated direct output of \$33.4 million, as shown in Table 5. The in-state purchases made to support these companies' activities create indirect impacts which in 2023 amounted to \$10.5 million in additional output, and 56 jobs. The expenditures resulting from the additional income that arises through the direct and indirect impacts creates induced impacts and in 2023, the impacts related to the MSI-supported companies were \$15.1 million in output, and 81 jobs. Combined, the totals of these impacts were \$59.0 million in output, \$26.3 million in labor income and 296 jobs, which contributed almost \$3.2 million in state and local tax revenues. The final row of Table 5 displays multipliers, which reveal that each additional \$1.00 of direct output added, results in \$1.77 in total output and in terms of jobs, each job directly added by the MSI-supported companies adds 1.86 Maryland jobs in total.

Table 5: Maryland Social Impact Fund Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$33,404,095	\$17,433,345	159	\$1,532,257	\$3,883,091
Indirect Impacts	\$10,540,862	\$4,019,422	56	\$540,620	\$945,482
Induced Impacts	\$15,061,024	\$4,843,730	81	\$1,114,087	\$1,224,447
Total Impact	\$59,005,981	\$26,296,497	296	\$3,186,963	\$6,053,020
State Impact Multiplier	1.77	1.51	1.86		

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Maryland Stem Cell Research Fund

TEDCO's Maryland Stem Cell Research Fund (MSCRF) was established by the governor and the Maryland General Assembly under the Maryland Stem Cell Research Act of 2006. The purpose of the fund is to promote state-funded human stem cell research and medical treatments through grants to public and

private entities in Maryland. MSCRF offers six programs to accelerate research and commercialization of human stem cell-based technologies:

- Clinical – Funds companies or Universities/Research Institutes that wish to conduct human stem cell-based clinical trials in the State of Maryland.
- Commercialization – Funds Maryland-based start-up companies or established companies developing new human stem cell-based products.
- Validation – Funds faculty at Maryland-based Universities/Research institutes with IP for human stem cell-based technologies that require additional validation before creation of start-up companies.
- Launch – Funds new faculty or researchers, of any rank, who are new to the field of human stem cell research at Maryland-based Universities/Research Institutes.
- Discovery – Funds faculty at Maryland-based Universities/Research Institutes (not federal labs) with innovative ideas to develop novel human stem cell-based technologies and cures.
- Post-Doctoral Fellowship – Funds exceptional post-doctoral fellows who wish to conduct human stem cell research in academia or in industry in the State of Maryland.

The MSCRF was not established to be a job-creation program but rather as a pathway to medical breakthroughs using this novel science to treat and cure diseases. Nevertheless, as presented in Table 6, the \$17.9 million R&D activities associated with the MSCRF support a total of \$34.1 million in Maryland economic activity, 148 jobs earning \$13.5 million in labor income, and have an associated \$1.4 million in estimated state and local government revenues. Total direct research expenditures of \$17.9 million and direct employment of 67 research jobs are augmented with an additional \$8.4 million in economic activity and 40 jobs in the form of Indirect Impacts through the local purchases made to support this research activity and, by induced impacts of \$7.7 million in economic activity and 42 jobs attributable to the increase in local incomes from the research expenditures. The \$34.1 million in estimated MSCRF-supported economic activity results in an output multiplier of 1.90, or \$1.90 in economic activity for each \$1 in State of Maryland supported research expenditures. The employment multiplier is larger, with each of the 67 directly created jobs ultimately becoming 2.21 jobs supported by the MSCRF. It is most important to note that the MSCRF does not track the benefits that arise in following years from the initial research expenditures. Only the current year impacts from the actual research expenditures are estimated by the IMPLAN model. Much larger impacts undoubtedly arise through the benefits of the research, whether they be commercialized products and processes, new companies, or long-term health improvements, for example. To estimate these effects correctly is well beyond the scope of the present study.¹⁴

Table 6: Maryland Stem Cell Research Fund Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$17,885,989	\$7,960,475	67	\$470,030	\$1,786,670
Indirect Impacts	\$8,433,269	\$3,058,175	40	\$374,957	\$722,652
Induced Impacts	\$7,731,905	\$2,486,582	42	\$571,952	\$628,588
Total Impact	\$34,051,163	\$13,505,232	148	\$1,416,939	\$3,137,909
State Impact Multiplier	1.90	1.70	2.21		

Source: JFI calculations using IMPLAN I/O model for the State.

¹⁴ The JFI’s approach potentially undercounts the impacts of MSCRF since only direct state R&D expenditures are included in our analysis. This excludes any additional funding leveraged by the initial State R&D investment or the economic value of companies formed to commercialize new technologies. This omission will be addressed in future work with TEDCO.

Economic Impacts of the Maryland Venture Fund

The Maryland Venture Fund (MVF) is an early-stage, evergreen venture capital fund dedicated to funding and growing the next generation of outstanding businesses in Maryland. MVF is managed by an experienced team with significant operating and venture experience whose focus is on making the entrepreneurs successful. With more than \$110 million in assets under management, MVF supports exceptional entrepreneurs and helps them build valuable companies that last. As presented in Table 7, the portfolio of 61 currently active Maryland companies in which MVF has invested have direct employment of 1,983 workers and estimated revenues of \$464.6 million. The MVF portfolio of companies' direct impacts are augmented with an additional \$177.8 million in economic activity and 882 jobs in the form of indirect impacts through the local purchases made to support the operations of these companies and by \$198.9 million in economic activity and 1,070 jobs in the form of Induced Impacts from the increase in local incomes attributable to portfolio and supplier company operations. Including multiplier effects, these companies generate \$841.3 million in economic activity in Maryland, support 3,935 jobs earning \$347.1 million in labor income, and have an associated \$37.6 million in estimated state and local government revenues. The \$841.3 million in estimated MVF-supported economic activity results in an output multiplier of 1.81, or \$1.81 in economic activity supported for each \$1 in associated company revenues. The employment multiplier of 1.98 indicates that each direct job created by the MVF-supported companies becomes 1.98 jobs through the impacts of indirect and induced economic effects.

Table 7: Maryland Venture Fund Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$464,633,663	\$217,953,274	1983	\$15,367,823	\$48,578,324
Indirect Impacts	\$177,761,720	\$65,121,489	882	\$7,495,755	\$15,317,505
Induced Impacts	\$198,948,914	\$63,982,622	1070	\$14,716,709	\$16,174,231
Total Impact	\$841,344,297	\$347,057,385	3935	\$37,580,287	\$80,070,060
State Impact Multiplier	1.81	1.59	1.98		

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Rural Business Innovation Initiative-Urban Business Innovation Initiative

TEDCO's Rural Business Innovation Initiative-Urban Business Initiative (RBII-UBII) was originally established to assist start-up and small technology-based businesses in the rural areas of Maryland to advance the company to a higher level of success. Its urban counterpart, UBII, was added in 2021 to serve the same purpose in Maryland's urban centers. The programs offer both assistance and pre-seed funding to qualified companies. Companies are eligible if they meet all the following criteria:

- Involved in developing new technologies/products or utilizing technology to create new or expand their business.
- Have fewer than 16 employees.
- Have annual revenues of \$1 million or less.

TEDCO provides **assistance** to companies through local RBII-UBII representatives. Each rural, or urban region has a dedicated, highly experienced mentor who evaluates potential clients and provides resources, consulting services, technical management assistance and professional ongoing mentoring through targeted projects to help companies succeed, all at no cost to the company. Companies that have received

mentoring services from the RBII-UBII programs for at least 90 days are eligible to apply for \$25,000 in **pre-seed funding**.

As presented in Table 8, the portfolio of 12 currently active Maryland companies in which TEDCO has invested have direct employment of 56 workers and estimated revenues of \$9.9 million.¹⁵ The RBII-UBII portfolio’s direct impacts are augmented with an additional \$4.0 million in economic activity and 21 jobs in the form of Indirect Impacts through the local purchases made to support the operations of these companies and by \$4.5 million in economic activity and 24 jobs in the form of Induced Impacts from the increase in local incomes attributable to portfolio and supplier company operations. When multiplier effects are included, these companies generate \$18.4 million in economic activity in Maryland, support 101 jobs earning \$7.8 million in labor income, and have an associated \$0.8 million in estimated state and local government revenues. The \$18.4 million in estimated RBII-UBII-supported impacts results in an output multiplier of 1.87, or \$1.87 in economic activity supported for each \$1 in associated company revenues. The employment multiplier of 1.80 indicates that each direct RBII-UBII-supported job ultimately results in 1.8 jobs after including indirect and induced impacts.

Table 8: Rural Business Innovation Initiative - Urban Business Innovation Initiative Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$9,852,780	\$4,910,904	56	\$324,313	\$1,093,103
Indirect Impacts	\$4,043,089	\$1,474,399	21	\$182,486	\$348,410
Induced Impacts	\$4,490,609	\$1,444,177	24	\$332,185	\$365,076
Total Impact	\$18,386,478	\$7,829,480	101	\$838,983	\$1,806,590
State Impact Multiplier	1.87	1.59	1.80		

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Seed Investment Funds

TEDCO’s Seed Investment Funds support businesses that have the potential to scale, to create jobs, and to provide a return on investment to the State through targeted investments in companies that represent good opportunities to grow strong, sustainable businesses in Maryland. The Seed investment funds include:

- **Technology Commercialization Fund (TCF)** is TEDCO’s primary and legacy seed investment initiative and supports technology and product development by start-up companies to advance their development to attract the interest of traditional venture capital investors.
- **Cybersecurity Investment Fund (CIF)** invests in cybersecurity technologies and builds on TEDCO’s Technology Commercialization Fund.
- **Life Science Investment Fund (LSIF)** provides funding to companies developing products for human health that require FDA approval. This fund was transferred to TEDCO from the Department of Commerce’s BioMaryland program.
- **Gap Investment Fund** invests in technology-based start-up companies that need capital to grow their businesses in Maryland. Investments are matched by other investments the company has received from private sources. The purpose of this fund is to help bridge the gap between seed funding and venture capital investments. Companies must use Gap Investment Funds to employ

¹⁵ These impact calculations are only for the companies participating in the pre-seed funding program.

new staff in Maryland to grow and accelerate commercialization efforts to become better positioned to attract institutional venture capital.

As presented in Table 9, the portfolio of 243 active Maryland companies that have received Seed Fund investments have direct employment of 3,102 workers and estimated revenues of \$840.4 million – the largest direct impact of TEDCO’s Seven Primary Funding Vehicles. The SEED fund portfolio’s direct impacts are augmented with an additional \$298.9 million in economic activity and 1,502 jobs in the form of *Indirect Impacts* through the local purchases made to support the operations of these companies and by \$324.2 million in economic activity and 1,743 jobs in the form of *Induced Impacts* from the increase in local incomes attributable to portfolio and supplier company operations. When multiplier effects are included, these companies generate \$1.5 billion in economic activity in Maryland, support 6,347 jobs earning \$566.9 million in labor income, and have an associated \$85.2 million in estimated state and local government revenues. The \$1.5 billion in estimated Seed Investment Funds-supported economic activity results in an output multiplier of 1.74, or \$1.74 in economic activity supported for each \$1 in associated company revenues. The employment multiplier indicates that each job directly supported by Seed Fund portfolio companies becomes 2.05 jobs when indirect and induced impacts are included.

Table 9: Seed Investment Funds Impact - FY2023

	Output (\$s)	Labor Income (\$s)	Employment	State/Local Tax Revenue (\$s)	Federal Tax Revenue (\$s)
Direct Effect	\$840,410,118	\$351,559,584	3,102	\$47,263,562	\$80,580,681
Indirect Impacts	\$298,892,499	\$111,118,938	1,502	\$13,908,192	\$26,362,435
Induced Impacts	\$324,182,784	\$104,257,184	1,743	\$23,980,778	\$26,355,369
Total Impact	\$1,463,485,401	\$566,935,706	6,347	\$85,152,531	\$133,298,484
State Impact Multiplier	1.74	1.61	2.05		

Source: JFI calculations using IMPLAN I/O model for the State.

Economic Impacts of the Small Business Innovation Research Fund

TEDCO’s Small Business Innovation Research Fund (SBIR) assists Maryland life science and technology businesses with a compelling innovation, in writing proposals for federal grants and contracts. For the past five years, the SBIR has been supporting Maryland’s small businesses in crafting and submitting proposals to the NSF for Phase I awards of up to \$275,000.¹⁶ Up to 25 companies are selected each year to join the SBIR/STTR Proposal Lab, where they are guided in crafting proposals, and graduates of the program have a 40 percent success rate in their first Phase I award applications.

In this analysis, there are 6 SBIR-supported companies which each received Phase I grants from the NSF in 2023. As presented in Table 10, the \$1.6 million in activities associated with the SBIR-assisted companies support a total of \$2.9 million in Maryland economic activity, support 14 jobs earning \$1.2 million in labor income, and have an associated \$0.1 million in estimated state and local government revenues. Total direct research expenditures of \$1.6 million and direct employment of 8 research jobs are augmented with an additional \$0.6 million in economic activity and 3 jobs in the form of Indirect Impacts through the local purchases made to support this research activity and by \$0.7 million in economic activity and 4 jobs in the form of Induced Impacts from the increase in local incomes attributable to these research expenditures. The \$2.9 million in estimated SBIR-supported economic activity results in an output multiplier of 1.77, or

¹⁶ TEDCO’s SBIR Proposal Lab has been operating for 5 years and was not included in the 2021 Report.

\$1.77 in economic activity for each \$1 in State of Maryland supported research expenditures. The employment multiplier is larger, with each of the 8 directly created jobs ultimately becoming 1.85 jobs supported by the SBIR. All of the caveats pointed out previously in relation to the MSCRF research expenditures also apply to the SBIR. The eventual benefits of research—such as the commercialization of new products, expansion of existing companies, or the development of new companies--will far exceed the current year impacts estimated here, but are not captured in the IMPLAN model.¹⁷

Table 10: Small Business Innovation Research Fund Impact - FY2023

	Labor Income			State/Local Tax	Federal Tax
	Output (\$s)	(\$s)	Employment	Revenue (\$s)	Revenue (\$s)
Direct Effect	\$1,648,727	\$728,102	8	\$49,098	\$167,695
Indirect Impacts	\$603,906	\$220,328	3	\$30,343	\$52,253
Induced Impacts	\$668,452	\$214,981	4	\$49,446	\$54,345
Total Impact	\$2,921,085	\$1,163,411	14	\$128,886	\$274,293
State Impact Multiplier	1.77	1.60	1.85		

Source: JFI calculations using IMPLAN I/O model for the State.

Summary and Conclusion

TEDCO makes a significant and growing contribution to the Maryland economy. TEDCO’s economic impact was not analyzed as a simple source of expenditures because it serves as a mechanism for the State to invest in research, technology commercialization, the start-up of new companies, and the expansion of existing companies in new and leading technology areas. As a source of investment, TEDCO’s operations create a “portfolio” of activities that continues to provide returns to the State of Maryland in the form of new jobs, new and expanded companies, and new product revenues. Across the nation, competitor states are similarly investing in both their innovation economies and entrepreneurial ecosystems to grow their economies. Maryland, with leading federal, university and private research assets, a skilled and educated workforce, and a strong position in technology development and innovation, is well positioned to compete nationally and globally across multiple technology and innovation areas. TEDCO plays a central role in supporting the local generation, commercialization, development, production and sale of the technologies and products of tomorrow.

By supporting entrepreneurship and innovation in Maryland, TEDCO generates significant economic and fiscal returns to the State. These include:

- TEDCO has supported the development of a portfolio of 442 Maryland technology-based companies that directly provide 5,918 jobs and TEDCO research funding creates another 92 jobs as a direct impact. Since the first TEDCO impacts study in 2013, the number of companies in TEDCO’s portfolio of impacted companies has increased by 108 percent and the number of portfolio company jobs has increased to more than five times its 2013 level.
- TEDCO’s Seven Primary Funding Vehicles generated \$2.7 billion in economic activity in 2023, supporting 12,082 jobs earning \$1.1 billion in labor income, and generating estimated state and local government revenues of \$140.3 million, including an estimated \$80.1 million in estimated state revenues. As explained in previous sections, the estimates are understatements because the

¹⁷ As with the estimates for the SCRF, only the direct research expenditures of the current year are included as inputs, even though the majority of any benefits to research are likely to occur in the longer term. This is a known issue that is beyond the scope of this study, to be addressed in future work with TEDCO.

economic impact arising beyond the year of the direct research expenditures, from TEDCO supported research, although substantial, is not captured in these estimates.

- TEDCO's impacts have grown with the State of Maryland's investment in the program, with current total impacts of \$2.7 billion and 12,082 jobs representing a nearly fivefold output level, and more than fourfold employment impacts since the first, 2013 study.
- The \$80.1 million in estimated state government revenues attributable to TEDCO's Seven Primary Funding Vehicles exceed the State's FY2023 TEDCO appropriation of \$50.5 million, which includes \$20.5 million in appropriations to support the MSCRF.
- The JFI estimates that the Maryland Return on Investment (ROI) for TEDCO's core commercialization programs is 32%.¹⁸

¹⁸ The ROI calculation ignores the \$21.7 million state revenues contributed by the MVF, since it is internally funded and the \$0.8 million from the SCRF since its research expenditures will not generate large short-term returns.

Appendix – Economic Impact Methodology

The economic activity generated in a city, county, region, or state is greater than the simple total of spending associated with the event or activity being studied. This is because as this money is earned, it is, in turn, spent, earned and re-spent by other businesses and workers in the local economy through successive cycles of spending, earning and spending. However, the spending in each successive cycle is less than in the preceding cycle because a certain portion of spending “leaks” out of the economy in each round of spending. Leakages occur through purchases of goods or services from outside of the region, and federal taxation. The IMPLAN multipliers used in this analysis capture the effects of these multiple rounds of spending. This analysis focuses on five measures of economic impact:

- Output. The total value of production or sales in all industries.
- Employment. The total number of full and part time jobs in all industries.
- Labor Income. The wages and salaries, including benefits, and other labor income earned by the workers holding the jobs created.
- State and Local Government Revenues. The fiscal benefits accruing to both state and local governments in Maryland because of the direct and multiplier impacts associated with TEDCO’s Seven Primary Funding Vehicles.
- Federal Government Revenues. The fiscal benefits accruing to the federal government as a result of the direct and multiplier impacts associated with TEDCO’s Seven Primary Funding Vehicles.

Four measures of the economic impacts and fiscal impacts of TEDCO’s Seven Primary Funding Vehicles are presented in this report:

- Direct effects. The change in economic activity being analyzed—in this case portfolio of assisted companies supported by TEDCO’s five core business investment programs and the MII, and stem cell research expenditures associated with the MSCRF. For this analysis, the JFI used the employment data for TEDCO’s portfolio companies, MII and MSCRF research funding, and the IMPLAN model to estimate business activity based on these activities.
- Indirect effects. The changes in inter-industry purchases, for example the purchase of research supplies by a university or start-up company.
- Induced effects. The changes in spending from households as income and population increase due to changes in production.
- Total effects. The combined total of direct, indirect, and induced effects.

The input to the IMPLAN modeling for TEDCO’s five core business investment programs was the employment of the portfolio of currently active companies that have been supported by these programs. IMPLAN was used to estimate revenues and economic activity based on company employment. Company employment figures and industry were based on data provided by TEDCO, business databases, and internet searches; with missing values estimated by the JFI. The inputs for MII (research), SBIR and MSCRF were the actual FY2021 programmatic research expenditures.