

The Economic Impact of Ben Franklin Technology Partners

BFTP Boosted GSP by \$4.1 Billion



4,182 additional PA jobs generated by BFTP



3.9 : 1 New State Tax Revenue : PA Investment in BFTP



BFTP client industries pay workers 52% more than the PA average



Ben Franklin
Technology PARTners



PENNSYLVANIA
ECONOMY LEAGUE
Information, Insight, Integrity.

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Executive Summary

The Pennsylvania General Assembly created the Ben Franklin partnership in 1982 to spur economic growth and prosperity in the Commonwealth through technological innovation. Subsequently, through a series of legislative acts, the organization took its present form as the Ben Franklin Technology Partners (BFTP). Beginning in 1999, BFTP began to periodically supplement its annual performance assessment with in-depth analysis of the impact of the program. With the availability of several additional years of data since the last study—which was completed in 2012 and examined the period 2007 through 2011—BFTP decided to undertake another in-depth evaluation of the impact of its funding and services on individual companies and the overall Pennsylvania economy. This study continues BFTP’s efforts to objectively measure program impacts and gather information useful for planning. It covers the five-year period of 2012 through 2016.

Rather than rely on client-reported impacts, the methodology used in this study compares the performance of BFTP clients directly to a “control” group of similar companies that did not receive BFTP assistance. This quasi-experimental design enables program impacts to be isolated from other factors affecting company performance. It also provides a solid foundation for estimating the additional value added, employment, and tax revenues in the Commonwealth resulting from program investment from 2012 to 2016.

BFTP has invested in more than 4,500 technology-based companies across Pennsylvania.

BFTP has, among its objectives, the improvement of the business environment in which technology-based companies operate in the Commonwealth. It works to achieve those objectives by providing capital and access to technical expertise and other business assistance. BFTP has invested in more than 4,500 companies across Pennsylvania since it began through its four independent non-profit affiliates. It also provides technical assistance to those companies, as well as granting access to other resources, such as additional capital, professional, and technical expertise. Many of the companies are at the earliest stages of development when BFTP first engages with them—the period when such companies are most vulnerable and when outside intervention is likely to be most essential.

This study attempts to answer two important questions:

- ▶ How do companies that receive BFTP funding perform with respect to job formation relative to a comparable group of peers (“control group”) that do not receive BFTP intervention?
- ▶ How does the additional incremental economic and fiscal impact of BFTP intervention affect the Commonwealth of Pennsylvania’s overall economy? This is measured as the additional Gross State Product (GSP) and tax revenue that would not exist except for the activities and investment of BFTP.

Key Findings: Program Impacts

To determine BFTP's impact on funded client firms, the average change in employment performance was compared with the change in a comparison group of companies that did not receive assistance. To the extent that the two groups—funded and unfunded companies—are similar, estimated differences in performance can be attributed to BFTP program interventions.

The current analysis found that, on average, BFTP clients employed 3.6 more people in each year following funding than they would have in the absence of such investment. In aggregate, the BFTP program generated over 4,000 additional jobs in client firms between 2012 and 2016. Those jobs are in industries that pay annual salaries roughly 52 percent higher than the average private sector salary in Pennsylvania.

Client impacts rippled throughout the Pennsylvania economy, contributing to higher gross state product and additional employment across the state. From 2012 through 2016, BFTP generated an additional 7,225 jobs in Pennsylvania beyond those in client firms. The result was that BFTP produced a total of 11,407 jobs in the Commonwealth between 2012 and 2016 that would otherwise not have existed.

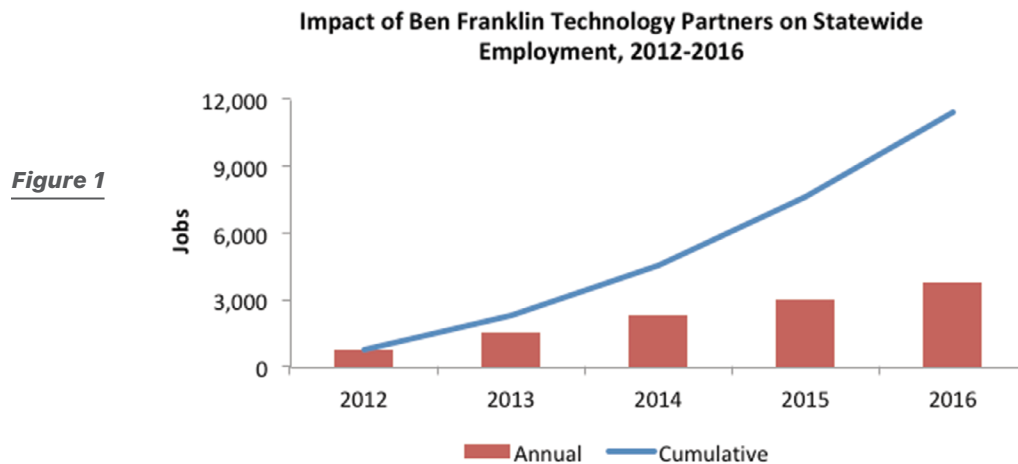


Figure 1

Gross State Product (GSP), a measure of the value of total economic activity was boosted by \$4.1 billion between 2012 and 2016 as a result of the direct impacts on client firms and subsequent multiplier effects due to BFTP client-related investments during the period.

Since 1989, BFTP has generated 54,000 additional jobs in client firms and 94,000 additional jobs beyond those in client firms.

Impact of Ben Franklin Technology Partners on Gross State Product, 2012-2016

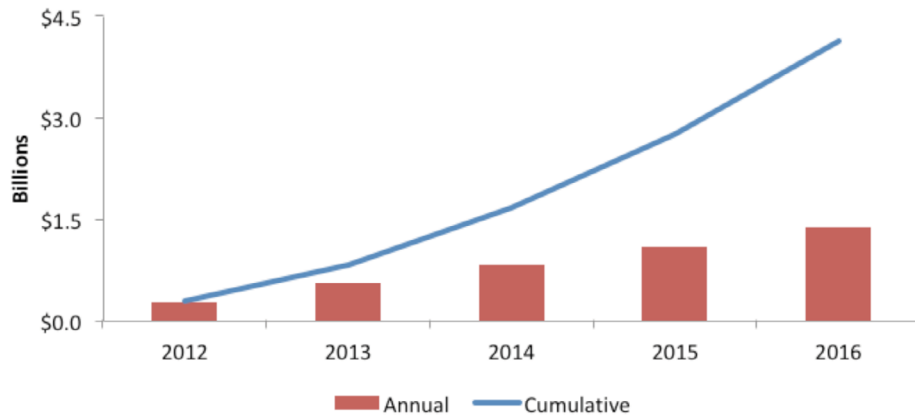


Figure 2

From 2012 through 2016, the Commonwealth received \$350 million in additional state tax receipts as a direct result of BFTP investments in client firms. Another \$36 million in state tax receipts flowed from spending by firms related to BFTP client services for a total increase of \$386 million in state revenue due to BFTP. New state tax revenue generated because of BFTP represents a 3.9 to 1 payback to the Commonwealth on its \$101 million investment during that period.

Cumulatively, since 1989, BFTP has generated 54,000 additional jobs in client firms and 94,000 additional jobs beyond those in client firms. The result has been 148,000 additional jobs in Pennsylvania that would not exist were it not for the activities of BFTP.

Section One: Introduction

This study is intended to quantify the economic impact of Ben Franklin Technology Partners (BFTP).

This report is divided into seven sections. Following this introduction, Section 2 reviews the mission and activities of BFTP. Section 3 describes the types of companies that comprise the BFTP investment portfolio. Section 4 presents an analysis of the impact of the program on BFTP clients during the period from 2012 to 2016, focusing on the degree to which BFTP clients increased employment as a direct result of the financial and technical assistance provided by BFTP. Section 5 presents an assessment of the impact of BFTP on the overall economy of the Commonwealth of Pennsylvania during the period 2012 to 2016. Section 6 describes the cumulative impact of BFTP since 1989. The final section summarizes the principal conclusions of the study. The Appendix provides a description of the methodology and data employed in the execution of this analysis.

In 1982, the Pennsylvania General Assembly established the Advanced Technology Centers of the Ben Franklin Partnership to promote technological innovation and economic growth in the Commonwealth. Since then, through a subsequent series of legislative acts, the organization took its present day shape as Ben Franklin Technology Partners (BFTP). BFTP accomplishes its mission through a broad range of activities, including investments in technology-based companies, provision of business and technical assistance, support to university-based centers of excellence, development of business incubators and research parks, and the promotion of greater collaboration between businesses, academia, investors and government.

BFTP has retained an independent consultant to evaluate the economic impact of its program four times previously. A similar methodology was used in 1999, 2003, 2009, and 2012. The first study considered the period 1989 to 1996. The next report furthered the analysis by including new data and extending the study period through 2001. The third study examined the period 2002 to 2006. The penultimate report covered the period 2007 to 2011, ending where this analysis picks up.

As for earlier analyses, this evaluation examines two interrelated impacts of BFTP's financial and technical intervention:

- ▶ The impact that BFTP has on companies that receive support;
- ▶ The impact that BFTP-funded clients have, in turn, across the Pennsylvania economy.

This study compares the performance of BFTP-funded clients to a control group of similar companies that did not receive assistance from BFTP. Known as a quasi-experimental design, the methodology attempts to isolate BFTP program impacts and control for other influences outside a laboratory setting. The approach enables the isolation of program impacts from other factors affecting company performance—such as firm size, industry trends, and general economic conditions. This comparative analysis provides a basis for estimating the additional value added, employment, and tax revenues accruing to Pennsylvania as a result of the BFTP program. This analysis examines the impact of BFTP's new client company investments from 2012 to 2016. It also considers the cumulative program's impact since 1989, the earliest year for which data are available.

Section Two: Program Background

Ben Franklin Technology Partners (BFTP) was established to promote technological innovation and economic growth in the Commonwealth of Pennsylvania. BFTP consists of four independent, nonprofit affiliates established to serve different portions of the state:

- ▶ **Ben Franklin Technology Partners of Central and Northern Pennsylvania (BFTP/CNP)**
headquartered in University Park
- ▶ **Ben Franklin Technology Partners of Northeastern Pennsylvania (BFTP/NEP)**
headquartered in the Lehigh Valley
- ▶ **Ben Franklin Technology Partners of Southeastern Pennsylvania (BFTP/SEP)**
headquartered in Philadelphia
- ▶ **Innovation Works, the Ben Franklin Technology Partner of Southwestern Pennsylvania (BFTP/IW)**
headquartered in Pittsburgh

Together, these organizations' provide comprehensive coverage across the Commonwealth. BFTP undertakes a wide range of initiatives in areas related to its core mission and relevant to the needs of each respective region. While subject to statutory requirements and program guidelines, each of the independent affiliates is responsible for setting its own strategic agenda, defining specific activities, and managing its own investment portfolio. The common goal of BFTP is to spur the growth of companies in technology-based industry sectors, leading to job creation and retention, and an increase in Gross State Product in the Commonwealth. BFTP accomplishes its goal through three primary activities:

1. **Financial investment.** Statewide, BFTP makes investments in technology-based companies, primarily to help cover costs associated with commercialization activities. BFTP investments serve as a bridge between personal, friends and family funding and third-party capital. The spectrum of financial investment activities includes: identification of potential investment opportunities; proposal review; selecting promising projects and/or companies for investment; monitoring progress toward identified milestones; and identifying opportunities for follow-on or supplemental investment through outside investors.
2. **Business and technical assistance.** BFTP also provides business and technical assistance to technology-based companies, spanning a wide range of service offerings, from short-term technical problem solving to ongoing business counseling over extended periods. Assistance may be provided by BFTP staff based on their own expertise and experience or through appropriate third-party service providers. The offices of BFTP draw on an extensive network of contacts within state and local economic development agencies, financial institutions, academic institutions, and private consultants to provide needed clients services.

- 3. Building economic development infrastructure.** The offices of the BFTP organizations promote the development of the infrastructure needed to grow and sustain technology-based companies within their respective regions and the Commonwealth. These efforts include, but are not limited to, the establishment or support of university-based centers of excellence, business incubators and research parks, venture capital funds, angel investor networks, and other initiatives designed to address particular issues that may constrain the growth of technology-based companies within the Commonwealth.

Changes in behavior and actions within firms are necessary ingredients for improved performance. In return for the assistance it provides, BFTP expects that companies will modify their strategic and operating plans, make necessary investments in R&D and capital equipment, upgrade worker skills, and modify certain critical processes as necessary. In return, such actions are intended to yield a variety of performance improvements and thereby aid in increasing value added, sales, and profitability. As a corollary, BFTP expects that growth in innovative, high-performance client companies will produce broader economic benefits across the Commonwealth of Pennsylvania, including increased employment in high-wage jobs.

BFTP helps build and strengthen Pennsylvania's innovation economy through its impacts on regional infrastructure and the expansion of financial, human, and physical capital available to technology-based companies across the Commonwealth.

The BFTP regional organizations are now regarded as crucial elements of the business, academic, and economic development ecosystems in their respective coverage areas. Over the years, they have helped identify specific needs within their respective regions and have launched various initiatives designed to promote innovation in the growth of technology-based businesses. BFTP helps build and strengthen Pennsylvania's innovation economy through its impacts on regional infrastructure and the expansion of financial, human, and physical capital available to technology-based companies across the Commonwealth.

BFTP helps clients grow by providing them with capital as well as technical and business assistance. While BFTP's involvement in various regional initiatives is significant, the bulk of organizational effort is focused on making investments in individual companies and providing related business and technical assistance. BFTP investment programs have been established in part to address the scarcity of seed financing provided by institutional investors to companies in Pennsylvania.

Figure 3

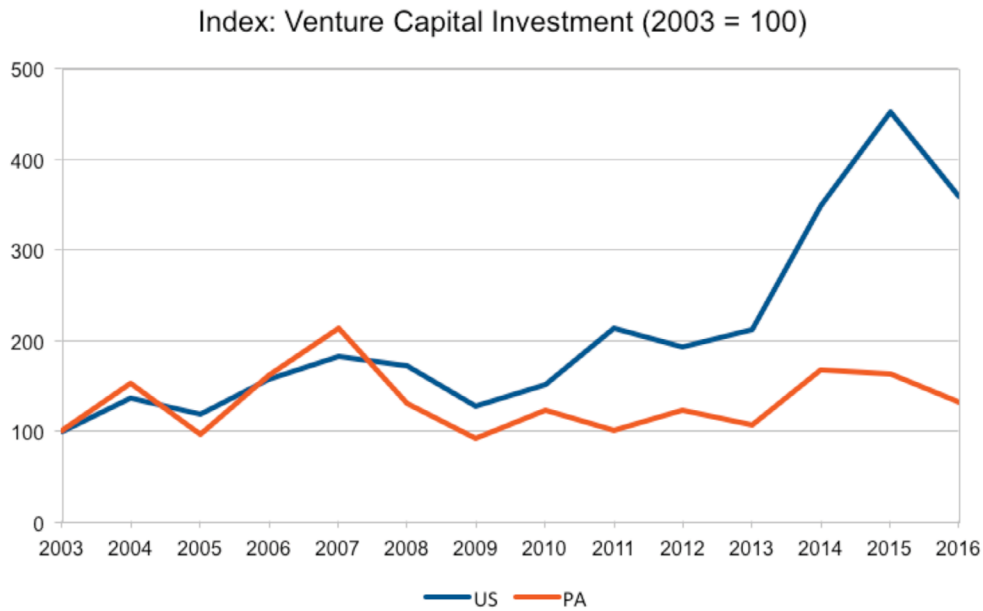
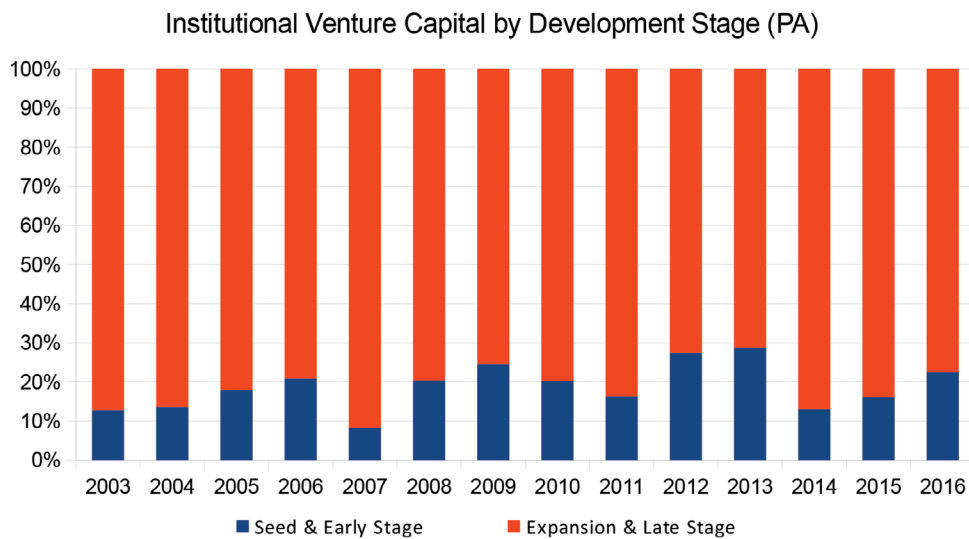


Figure 4



The amount of institutional venture capital invested in the Commonwealth has varied over the years. Similarly, the share of venture capital allocated to seed and early stage investments in the Commonwealth by institutional investors also fluctuates. It remains relatively low. In general, institutional venture capital investing is biased toward expansion and later-stage deals rather than start-up/seed and early stage investments.

Large institutional investors participate in the start-up and early-stage markets less frequently, given their need to invest large sums in a relatively short period of time and to generate above market rates of return. Additional barriers to venture investing by large institutional investors include relatively high transaction costs and “hands on” management requirements to enhance the chances of success for early investments.

While individual investors or angels are more likely than institutional investors to invest at the seed level, they tend to limit investment activity to sectors with which they are familiar. They usually do not provide hands-on management counseling or other forms of business assistance. Thus, the BFTP regional organizations operate across the Commonwealth in a space to which they are uniquely suited and that is largely ignored by other organizations.

BFTP investments are made through a process that includes both staff and peer review, with considerable due diligence of the proposals that are submitted.

Each BFTP regional affiliate's office conducts extensive outreach to ensure that companies in its region are aware of the programs that are available. BFTP staff meets with individual entrepreneurs and representatives of existing firms to review needs and discuss potential funding opportunities. If warranted, companies are encouraged to submit proposals. Funding awards are often provided in stages corresponding to project milestones. Many companies are eligible for follow-on funding if they achieve satisfactory progress toward agreed-upon milestones.

BFTP investments are made through a process that includes both staff and peer review, with considerable due diligence of the proposals that are submitted. While there is regional variation in the process, in most cases third-party experts identified by the respective regional affiliates also review the proposals submitted by applicants to assess the technical, business and commercial merits of proposed projects. Where necessary, companies are asked to clarify or elaborate further on different aspects of their proposals and to resubmit as needed.

Applicant companies are asked a series of questions concerning the objectives of the project, specific tasks and milestones, roles and responsibilities of participating organizations, qualifications of key personnel, and expected results. Investments are made based on the recommendations of BFTP staff with input from the reviewers and are subject to the availability of funds and final regional board approval. Regardless of funding decisions, all applicants are provided with feedback and recommendations regarding potential next steps.

Section Three: BFTP Investment Portfolio, 2012-2016

It is important for BFTP to maintain a large and diverse investment portfolio and to provide sufficient investment to achieve program goals. BFTP works with individual entrepreneurs, early-stage and established companies in a wide range of technology-based industry sectors. BFTP clients come from a variety of industries—from computer software, hardware and telecommunications firms to a variety of fabricated metal and industrial machinery manufacturers to life science companies, including pharmaceutical manufacturers, biotech firms, instrumentation, robotics, and medical device companies. BFTP clients in these industries are innovative and technology-intensive, investing in research and development, intellectual property, capital equipment, and highly skilled labor. According to data maintained by the centers, BFTP invested over \$82 million in 560 companies between 2012 and 2016 and \$100 million overall. Some funding was provided to community colleges, universities and local economic development organizations for economic development infrastructure initiatives, but the majority of funds went directly to entrepreneurs in early-stage as well as established companies.

BFTP clients are in industries that pay relatively high annual salaries and wages. Given the client industry profile of BFTP-funded companies, the weighted average annual salary for client industries was \$79,364 in 2016, which is 52 percent higher than the average of \$52,105 for all private nonfarm industries in the Commonwealth.

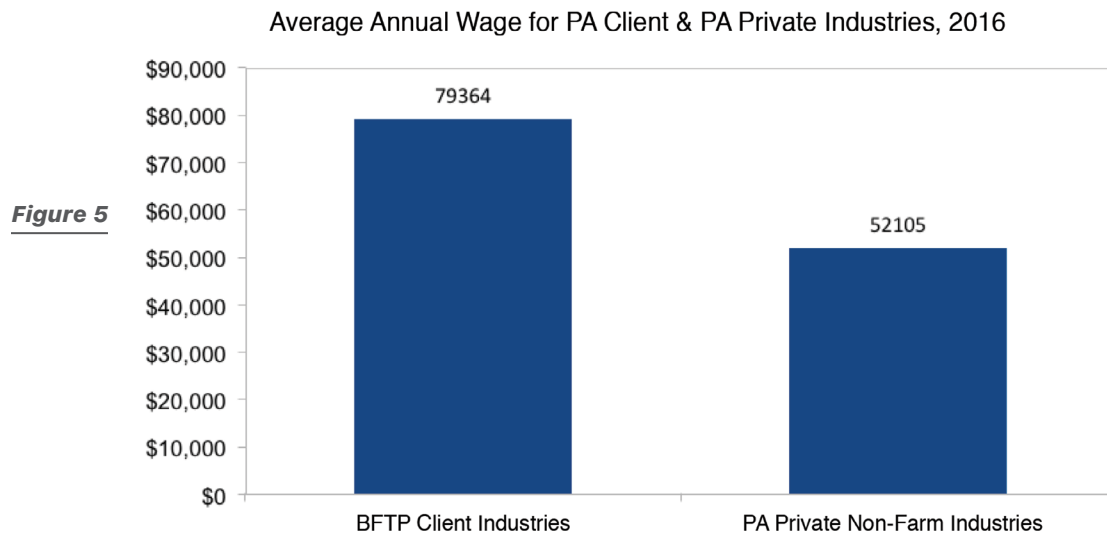


Figure 5

Section Four: Program Impacts, 2012-2016

Analysis was conducted to determine the impact of BFTP on employment within client firms.

The analysis examined whether the number of employees from 2012 through 2016 in companies that received initial BFTP funding in 2012 or later grew more than for similar companies in the Commonwealth that did not receive BFTP funding. To the extent that the two groups have similar characteristics, differences in performance can be attributed to BFTP's intervention.

For this study, BFTP client firms were "matched" with other companies in the same industry that had comparable employment in the year prior to BFTP funding. In this way, the profile of the matched comparison group mirrored that of the client group. While the matching procedure was done very carefully, there are always some differences between the two groups. Statistical procedures were employed to further control for factors that may affect changes in employment within firms. Attention was given to include variables to address potential selection bias and other unwanted differences between the groups.

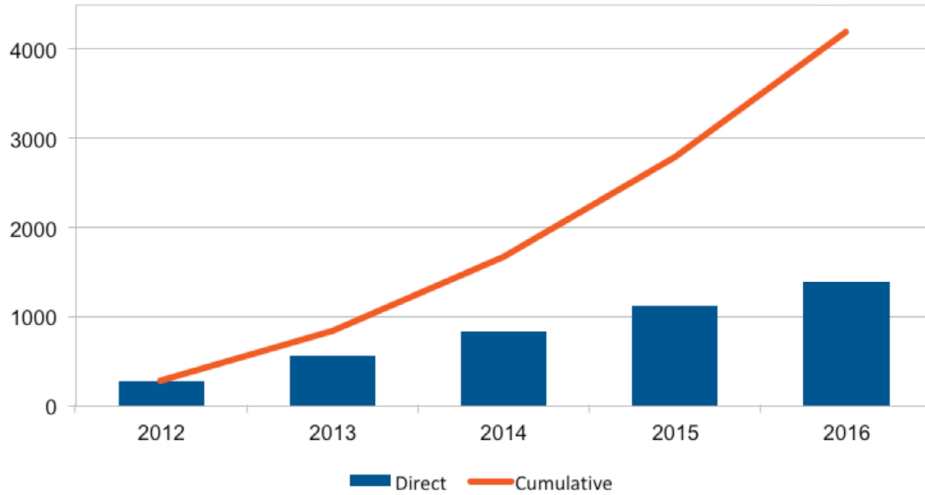
The results demonstrate that BFTP has a direct, positive impact on employment within client firms. Using this quasi-experimental design, it was determined that:

- ▶ **On average, for the period 2012 through 2016, BFTP client firms employed 3.6 more people in each year following funding than they would have in the absence of BFTP investment.**
- ▶ **In aggregate, BFTP generated 4,182 jobs in client firms between 2012 and 2016 as a result of new investment during the period.**

These are jobs in client firms that would likely not have existed except for BFTP intervention and investment. Employment gains increase each year as new companies are added to the roster of BFTP clients and as existing client companies continue to retain and create new jobs due to BFTP investment in earlier years. As a result, there were more jobs in BFTP-funded companies at the end of the period than at the beginning.

Impact of BFTP Program on Employment in Client Firms

Figure 6



Impact of BFTP on Employment in Client Firms, 2012-2016	
Additional jobs (direct)	4,182

While the majority of BFTP clients added employees, a smaller group accounted for the bulk of the gains. The concentration of employment growth among a subset of firms is not surprising. History has shown that a relatively small percentage of firms and innovations achieve dramatic success. This demonstrates the skewed nature of returns to innovation and also highlights some of the risks associated with venture investing.

While the methodology employed here is the same as for earlier studies of BFTP’s economic impact, there have been changes to the labor force which may affect employment in BFTP client firms. Nationally as well as in the Commonwealth, there has been a shift toward outsourcing and the use of consultants for essential functions in small and early-stage high-tech companies. These trends represents part of the so-called “gig economy.” In the economic data, such workers are called either nonemployer or contingent workers. Labor and occupational data agencies are finding it difficult to quantify how large these components of the workforce are. The US Department of Labor will not release its next analysis of the freelance labor force until 2018. Most of the evidence to date points to the size of this contingent workforce as at least ten percent of reported nonfarm private employment and growing at an accelerated pace.

As a result of alternate work arrangements such as independent contractors, contract firm workers, and some temporary help agency workers, it is likely that there are additional employment impacts not captured here that result from BFTP investments in client firms.

Section Five: Economic and Fiscal Impacts, 2012-2016

The performance of BFTP clients influences the overall Pennsylvania economy. Impacts on client firms ripple throughout the economy, giving rise to additional added value and employment around the state. The operation of BFTP client firms (“direct impact”) drives the purchase of goods and services from other firms and those firms purchase additional goods and services, in turn. Each additional round of spending (“indirect impact”) also generates income for employees associated with the respective firms. Those employees make purchases such as food, clothing, housing, entertainment, and personal services (“induced impact”) for their households. Each round of spending or recirculation is further removed from the initial, direct investment but multiplies its impact throughout the economy by generating additional jobs and Gross State Product (GSP). Finally, all of the economic activity generated by BFTP’s programs affects state and local tax receipts in the Commonwealth, based on jobs created and goods and services purchased. The direct, indirect, and induced multiplier effects as well as fiscal or tax effects are calculated with the assistance of economic models.

Between 2012 and 2016, BFTP generated a total of 11,407 additional jobs in Pennsylvania from investment in client firms.

As noted in the previous section, between 2012 and 2016, BFTP generated 4,182 additional jobs in client firms that otherwise would not have existed as a result of new company investments. This activity by BFTP clients generated an additional 7,225 jobs in other companies and organizations across the state. Due to these direct and indirect employment impacts, a total of 11,407 jobs were created that would not otherwise have existed in the Commonwealth between 2012 and 2016 without the new investments in client firms made by BFTP.

Impact of Ben Franklin Technology Partners on Statewide Employment, 2012-2016

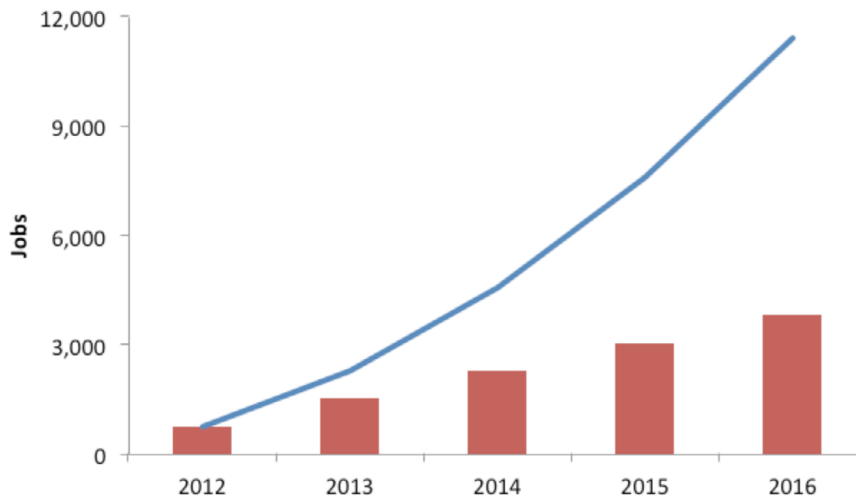
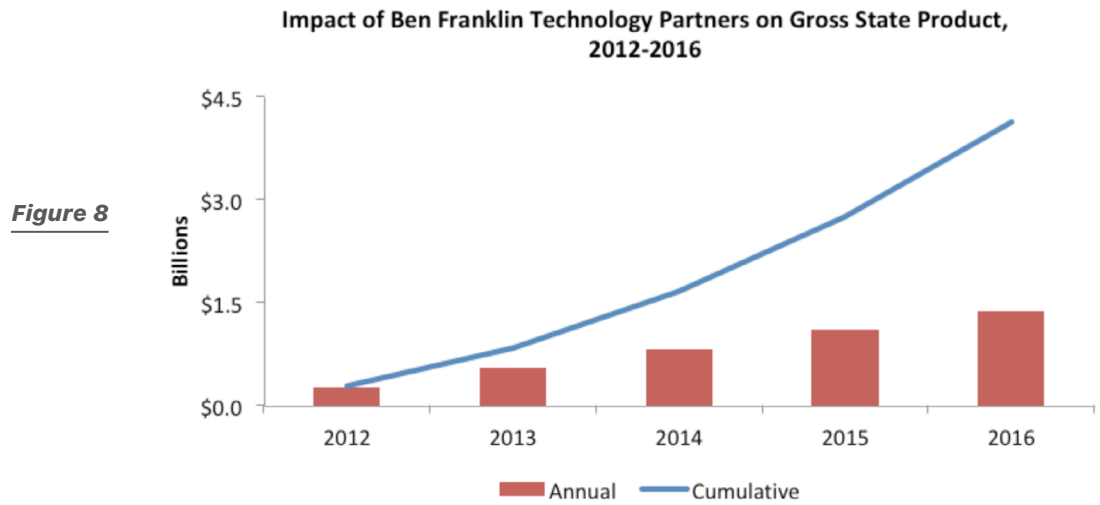


Figure 7

Total Statewide Employment Impact of BFTP Program, 2012-2016	
Total additional jobs in state (direct + indirect)	11,407

Gross State Product (GSP) is a measure of total economic activity in the state. It is equal to the total output produced in Pennsylvania less the cost of intermediate goods and services. As a gauge of value-added, GSP is roughly equivalent to employee compensation, business profits, and other income in the state.

As a result of the direct impacts on client firms and subsequent multiplier effects due to BFTP client-related investments made during the period, BFTP boosted the Pennsylvania economy by \$4.1 billion between 2012 and 2016.



BFTP also had a positive impact on the state treasury and fiscal health during the period. Between 2012 and 2016, the Pennsylvania received \$386 million in additional state tax receipts as a result of BFTP investment during the period, including \$350 million as a result of direct investment in client firms and \$36 million as a result of spending by other firms related to BFTP client services.

Fiscal Impact of BFTP Program, 2012-2016	
Additional state tax receipts	\$386 million

That represents a 3.9-to-1 payback to the Commonwealth on its \$100 million investment during the same period.

Section Six: Cumulative Economic Impact, 1989-2016

To this point, the analysis and discussion within this report has been related to the period 2012 to 2016. The methodology for this study was essentially the same as was utilized during prior statewide BFTP economic impact studies in 1999, 2003, 2008, and 2012. The first study considered the period 1989 to 1996. The next report extended the study by including new data and analysis relating to the period 1997 through 2001. The third study included the period 2002 to 2006. In 2012, the study was updated to include the period 2007 through 2011. The analysis that follows relates to the cumulative period of 1989 to 2016.

As a result of the direct impact on clients and subsequent multiplier effects beginning with BFTP client-related investments and services, BFTP has boosted the Pennsylvania economy by \$25 billion since 1989.

BFTP generated 54,000 additional jobs in client firms over the period since 1989. These are jobs that would not have existed except for BFTP investment. Commonwealth employment grows as new companies are added to the roster of BFTP clients. As they mature, successful firms that received BFTP investments in earlier years “assimilate” into the macroeconomy, at which time other effects predominate to influence firm behavior.

In addition to the 54,000 additional jobs in client firms since 1989, as the impact rippled through the economy, an additional 94,000 jobs were generated in other companies and organizations across the Commonwealth. The total of 148,000 jobs that were created would not have existed in Pennsylvania without the new investments made by BFTP in client firms since 1989.

As a result of the direct impact on clients and subsequent multiplier effects beginning with BFTP client-related investments and services, BFTP has boosted the Pennsylvania economy by \$25 billion since 1989.

Section Seven: Conclusion

BFTP was established to promote technological innovation and stimulate job growth and economic well-being across the Commonwealth. This evaluation demonstrates that companies across Pennsylvania benefit from the assistance provided by BFTP. Individually, portfolio companies have developed new products and services, built management teams, established production capacity, identified new markets, and increased sales as a direct result of BFTP investment programs. BFTP programs have generated substantial public benefits in terms of an increase in employment and income in Pennsylvania, along with an expansion of the state's tax base.

An analysis of economic impacts of the program for the years from 2012 to 2016 demonstrates that BFTP is fulfilling its mission as summarized below:

- ▶ The BFTP program boosted the Pennsylvania economy by \$4.1 billion.
- ▶ The Commonwealth received \$350 million in additional state tax receipts as a direct result of BFTP investments in client firms. Another \$36 million in state tax receipts flowed from related BFTP client services, for a total increase of \$386 million in state revenue due to BFTP.
- ▶ New state tax revenue generated because of BFTP represents a 3.9-to-1 payback to the Commonwealth on its \$100 million investment in BFTP.
- ▶ The BFTPs generated 4,182 jobs in client firms. These jobs are in industries that pay annual salaries 52% higher than the average private nonfarm salary in Pennsylvania.
- ▶ Client revenues, purchasing, and investments rippled throughout the Pennsylvania economy, giving rise to higher employment across the state. BFTP generated an additional 7,225 jobs beyond the 4,182 in client firms for a total of 11,407 new Pennsylvania jobs.
- ▶ BFTP clients employed, on average, 3.6 more people in each year following funding than they would have in the absence of BFTP investment.

Ben Franklin Technology Partners produced the following impacts between 1989-2016:

- ▶ BFTP boosted the state economy by more than \$25 billion.
- ▶ BFTP generated 54,000 jobs in client firms.
- ▶ BFTP generated 94,000 additional jobs as a result of increased purchasing and investment by client firms, yielding a total of 148,000 additional jobs attributable to BFTP's work.

BFTP continues to be a catalyst for technology-based entrepreneurship and technological innovation, as well as a driver of economic growth in Pennsylvania. BFTP is among the most widely known and emulated state technology-based economic development programs in the nation. By providing capital and expertise to early-stage startups and established companies, as well as promoting the development of a statewide infrastructure favorable to technology-based companies, BFTP generates immediate economic gains while strengthening the foundation for continued economic growth.

Appendix

The methodology used to obtain results for the period 2012 to 2016 consists of two parts: econometric analysis to calculate client impacts and economic modeling to calculate macroeconomic impacts. The first part of the study used regression techniques to calculate the impact of the program on employment growth within client firms. The second part of the analysis used economic modeling techniques to calculate macroeconomic and fiscal effects resulting from the client impacts, along with other expenditures by BFTP. The process steps are discussed in more detail below.

Econometric analysis—calculating client impacts

Regression analysis is the statistical procedure that explains the degree to which the variation of a dependent variable—in this case, company level employment—can be explained by the variation of one or more independent variables such as firm size, wage rates, industry trends, general economic conditions and—most importantly—whether a company was a client of BFTP or not. Regression analysis provides an answer to the question of whether, on average, BFTP clients have increased employment more than they would have in the absence of the program.

To create a comparison or control group, each BFTP-funded company client record was matched with similar non-client companies operating in the Commonwealth. The goal was to develop a representative sample non-client control group. Ideally, the employment level in non-client companies was similar to the employment level in funded companies just prior to funding.

Economic modeling—calculating macroeconomic impacts

The coefficients derived through the regression analysis explain how many more employees per year the average BFTP client has than similar non-client companies. The resulting additional jobs created can be said to be client impacts due to BFTP activity during the period 2012 through 2016.

BFTP client impacts ripple through the economy, giving rise to additional Gross State Product and employment across the state. BFTP funding has an economic impact by creating demand and employment that would otherwise not exist in Pennsylvania, as calculated via the regression analysis. This new employment creates a larger impact on the Pennsylvania economy through economic multipliers and the so-called “multiplier effect.” Multipliers quantify the total impact within the Commonwealth of successive rounds of spending that occur as the direct BFTP investments in new employment generate new business for other firms and residents of the state. Those entities make additional purchases and generate additional rounds of economic activity.

The analysis of these multiplier effects is based on estimates derived from a regional economic model developed by the US Department of Commerce' Bureau of Economic Analysis (BEA). Known as the Regional Input-Output Modeling System (RIMS II), the model estimates the impact of spending by a given industry on a region — in this case, Pennsylvania. RIMS II takes into account the relationships among nearly 500 US industries and BEA's regional economic accounts. Within a defined region, the RIMS II model measures the extent to which an investment in one industry affects all other industries in that region and, ultimately, the region's economy. Systematic analysis of economic impacts must account for the inter-industry relationships within regions because these relationships largely determine how regional economies respond to changes.

Regional input-output (I/O) multipliers account for inter-industry relationships within regions and are useful tools for conducting regional economic impact analysis. RIMS II multipliers have been used in a wide variety of studies to analyze the economic impact of projects and events on state and local areas. Users can be found inside government, the private sector and academia. The accuracy of RIMS II has been documented through a number of studies comparing RIMS II multipliers and analyses based on the RIMS II model with results from other economic models.

RIMS II is based on an accounting framework called an I/O table. For each industry, an I/O table shows the industrial distribution of inputs purchased and outputs sold. A typical I/O table in RIMS II is derived mainly from two data sources: BEA's national I/O table—which shows the input and output structure of 500 US industries—and BEA's regional economic accounts, which are used to adjust the national I/O table to show a region's industrial structure and trading patterns.

The RIMS II model allows for calculation of three economic impacts:

1. **Economic output:** the value of goods and services produced in the state (GSP)
2. **Employment:** number of jobs in the state
3. **Employee earnings:** wage and salary income associated with the affected jobs.

Using the RIMS II model to calculate economic impacts of BFTP is a multi-step process. Gross State Product is calculated for each year that BFTP clients add employment.

Cumulative economic impact for the BFTP program was computed using historic data combined with sensitivity analysis to account for the difference in direct impact on firms receiving BFTP funding, as documented by this and earlier studies.