Stevens Institute of Technology

2019 ECONOMIC IMPACT REPORT

MARCH 3, 2020

appleseed

Table of Contents

Executive Summary 2
Introduction 10
Part One: Stevens as an Enterprise 11
Part Two: Developing Human Capital 25
Part Three: The Impact of Research at Stevens 36
Part Four: Technological Innovation and Entrepreneurship at Stevens 41
Part Five: Community Engagement at Stevens 48
Part Six: Stevens' Growing Impact 52

Executive Summary

Stevens Institute of Technology, located in Hoboken, New Jersey, is one of America's leading technological universities. Stevens is also a major contributor to the economic vitality of its home city and of the State of New Jersey. This report assesses Stevens' economic impact in Hoboken, in Hudson County and statewide – both as an enterprise and through its mission of education, research, technology and business development and community service.

Stevens as an enterprise

Stevens is a significant enterprise in its own right – one of Hoboken's largest employers, a buyer of goods and services from New Jersey businesses and a sponsor of campus construction projects. The university also attracts thousands of students who through their day-to-day spending off-campus, also contribute to the strength of the local economy. Moreover, the university's projected growth during the years ahead will ensure that the benefits Hoboken derives from university and student spending will also continue to grow. Stevens' economic impact locally, in Hudson County, and statewide during fiscal year 2019 is summarized below.

Taking into account the impact of university spending on non-student payroll, purchasing and construction, along with off-campus spending by students and visitors, we estimate that in fiscal year 2019, Stevens directly and indirectly accounted for:

- 1,449 jobs in Hoboken (approximately 6.3 percent of the city's private-sector jobs), with earnings totaling nearly $119.6 million
- Nearly $141.3 million in citywide economic output

In Hudson County (including Hoboken), we estimate that spending by the university, students and visitors directly and indirectly accounted for:

- 1,822 jobs in Hudson County, with earnings totaling nearly $139.5 million
- Nearly $201.1 million in countywide economic output

Statewide (including Hudson County), spending by the university, students and visitors directly and indirectly accounted for:

- 2,492 jobs in New Jersey, with earnings totaling $182.5 million
- $320.7 million in statewide economic impact

The impacts of university, student and visitor spending in Hoboken, in Hudson County and in New Jersey are summarized in the table below.

Total impact of spending by Stevens, students and visitors in Hoboken, Hudson County and New Jersey, FY 2019 (wages and output in $000s)

	Jobs	Wages	Output
Hoboken			
Direct	1,363	$114,595.6	$127,958.8
Indirect/induced	86	$4,996.6	$13,311.9
Total impact in Hoboken	**1,449**	**$119,592.2**	**$141,270.7**
Hudson County			
Direct	1,545	$121,405.3	$152,197.4
Indirect/induced	277	$18,050.0	$48,855.2
Total impact in Hudson County	**1,822**	**$139,455.4**	**$201,052.6**
New Jersey			
Direct	1,764	$136,937.7	$195,544.6
Indirect/induced	728	$45,582.1	$125,158.2
Total impact in New Jersey	**2,492**	**$182,519.8**	**$320,702.7**

- With 1,186 full- and part-time employees (excluding student employees) as of the fall of 2018, Stevens is the seventh-largest private employer in the City of Hoboken,[1] directly accounting for approximately 5.2 percent of all private-sector jobs in the city.
- In the fall of 2018, 977 full- and part-time Stevens employees (82.4 percent of all non-student employees) lived in New Jersey, including 200 employees (16.9 percent) who lived in Hoboken.
- In fiscal year 2019, Stevens spent more than $57.3 million on purchases of goods and services and construction from companies and contractors in New Jersey, directly supporting 73 jobs in Hoboken; 96 jobs in Hudson County (including Hoboken); and 289 jobs throughout New Jersey (including Hudson County).
- Taking into account both the direct and indirect and induced (or "multiplier") effects of Stevens' spending on non-student payroll, purchasing and construction, we estimate that that in fiscal year 2019, Stevens accounted for:
    - 1,329 jobs in Hoboken, with earnings totaling $114.9 million
    - More than $127.8 million in citywide economic output

  In Hudson County (including Hoboken), we estimate that university spending directly and indirectly accounted for:
    - 1,479 jobs in Hudson County, with earnings totaling $125.4 million
    - $155.7 million in countywide economic output

[1] Hudson County Economic Development Corporation, *Major Employer's List*, 2019.

Statewide (including Hudson County), university spending directly and indirectly accounted for:

  - 2,112 jobs in New Jersey, with earnings totaling $167.8 million
  - Nearly $269.3 million in statewide economic output

- Off-campus spending by Stevens students and by visitors to the university also contributes to the local economy. We estimate that in fiscal year 2019, off-campus spending by students and visitors directly and indirectly accounted for:

  - 120 jobs in Hoboken, with earnings totaling nearly $4.7 million
  - $13.4 million in citywide economic output

  In Hudson County (including Hoboken), we estimate that off-campus spending by students and visitors directly and indirectly accounted for:

  - 343 jobs in Hudson County, with earnings totaling more than $14.0 million
  - $45.3 million in countywide economic output

  Statewide (including Hudson County), off-campus spending by students and visitors directly and indirectly accounted for:

  - 380 jobs in New Jersey, with earnings totaling nearly $14.7 million
  - $51.4 million in statewide economic output

Developing human capital

Human capital – the totality of knowledge, skills and experience accumulated over time by a community's or a region's workforce – is a critically important factor in determining whether cities and states are able to adapt successfully to the forces of economic, environmental and technological change. Stevens has long been a major contributor to the development of Hoboken's and New Jersey's human capital, especially in science, engineering and technology. By continuing to expand its programs in these critical areas, and by increasing the number of highly educated graduates it produces, Stevens can help during the years ahead to build an even stronger base of human capital in Hoboken, in New Jersey and beyond.

- In the fall of 2018, Stevens enrolled a total of 6,929 full- and part- time students, including:

  - 3,431 undergraduates, of whom 59.8 percent were New Jersey residents; and
  - 3,498 graduate students, of whom 21.9 percent were New Jersey residents.

- Stevens is a major source of engineering and other technical talent for New Jersey. In 2017-2018, Stevens ranked:

  - Third among all New Jersey colleges and universities in the number of bachelor's degrees awarded in engineering; and

- First in the number of graduate degrees awarded in engineering in New Jersey.[2]

In 2017-2018, Stevens accounted for 34.5 percent (595 of 1,724) of all master's and doctoral degrees in engineering awarded in New Jersey.[3]

- In fiscal year 2019, Stevens provided nearly $49.2 million in university-funded financial aid to students from New Jersey, including $3.5 million to students from Hudson County.

- As of the summer of 2019, 51.1 percent of all Stevens alumni whose addresses are known – 18,967 Stevens alumni – lived in New Jersey.

- Stevens is notable for the extent to which on-campus learning is combined with opportunities to gain real-world experience.

    - In the fall of 2018, 750 undergraduate students participated in the university's Cooperative Education Program. The majority of Co-op students worked for companies in the New York metropolitan area.

    - In the summer of 2019, 424 Stevens undergraduate students worked as interns – approximately 12 percent of all enrolled undergraduate students. More than half of the internships took place with New Jersey companies.

- Stevens is also notable for its consistently high graduation rates. The National Center for Education Statistics reports that 87 percent of all full-time first-year students who enrolled at Stevens in 2012 had graduated by 2018 – far higher than the nationwide average of 60 percent for all U.S. institutions granting bachelor's degrees.[4]

- According to PayScale's annual reports on the earnings of college graduates of more than 4,000 U.S. colleges and universities, in 2019 Stevens:

    - Ranked 13th in the U.S., measured by the average mid-career salary of its alumni who only received a bachelor's degree ($139,900); and
    - Ranked 16th in the U.S. when measured by the average early career salary of its alumni who only received a bachelor's degree ($75,100).[5]

In 2018, Stevens ranked 15th in the U.S. when measured by students' return on investment, with an average net return after twenty years of $832,000 (for students living on campus and not receiving financial aid).[6] According to a recent Georgetown University study, Stevens also ranked 14th among colleges and universities awarding four-year

[2] U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. IPEDS: Integrated Postsecondary Education Data System.
[3] Ibid.
[4] National Center for Education Statistics.
[5] PayScale, *2019-20 College Salary Report.*
[6] PayScale, *2018 College ROI Report*.

degrees when measured by the long-term earnings of its graduates, with an average net present value of $1.83 million over 40 years.[7]

Research, technology transfer and business development

Since the mid-twentieth century, university research has been an important source of economic growth in the United States. Stevens is one of New Jersey's leading research universities – and just as important, a leader in translating the results of university research into new products, processes and services, new businesses and new jobs, and into practical solutions to some of the local community's (and the broader society's) most pressing problems.

- In fiscal year 2019, research spending at Stevens totaled nearly $32.3 million, 88.0 percent of which was funded by federal agencies. Private for-profit funding accounted for 4.9 percent; private, non-profit institutions of higher education and foundation funding for 3.1 percent; state and local government funding for 3.8 percent; and internal funding for less than 1.0 percent.

- The university's research enterprise is especially strong in several areas that are of particular importance to the New Jersey economy and to New Jersey communities, including:

    - The security and resilience of maritime commerce;
    - Marine and coastal engineering;
    - Health systems analysis and health information technology;
    - Artificial intelligence and machine learning;
    - Cybersecurity and information security; and
    - Environmental sustainability and resilience.

- Technological innovation and commercialization are among the most important drivers of economic growth. A report prepared for the National Research Council in 2005 cited research showing that in the half-century following the Second World War, improvements in technology accounted for half of all growth in gross domestic product in the U.S., and about two-thirds of all growth in productivity.[8]

- In recent years Stevens has increased the rate at which the results of university research are made available for commercial use, providing a basis for development of new products, new businesses and new jobs. For example:

    - The number of invention disclosures filed by researchers at Stevens rose from 37 in fiscal year 2016 to 50 in fiscal year 2019;

[7] Anthony Carnevale, Ban Cheah and Martin Van der Werf, *A First Try at ROI: Ranking 4,500 Colleges* (Georgetown University Center on Education and the Workforce, 2019) p. 107.
[8] Committee on prospering in the Global Economy in the 21st Century, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,* National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2005, p. 205.

    - Gross licensing income rose by 16.0 percent between fiscal year 2016 and fiscal year 2019; and
    - Between fiscal year 2016 and fiscal year 2019, 39 new ventures were started for the purpose of further developing and bringing to market technologies first developed at Stevens.

- Stevens offers an extensive array of programs and services for aspiring student, faculty and alumni entrepreneurs – including the Stevens Venture Center, which opened in 2016 in an off-campus office building in Hoboken. The Stevens Venture Center nurtures the promising concepts and technologies of Stevens-affiliated entrepreneurs into thriving businesses through technology support, opportunities to share best practices and experiences, networking with investors and experts in legal and accounting, and education in building a successful business. Stevens also offers several academic programs focused on entrepreneurship and technological innovation for both undergraduate and graduate students.

Serving the community

Stevens contributes to the vitality of the City of Hoboken and the surrounding communities in economic and non-economic ways through its investment in and engagement with the community in which it operates. As the university grows, the human, intellectual, financial, physical and cultural resources that it can bring to its engagement with Hoboken and surrounding communities will grow as well.

- Stevens ACES (Accessing Careers in Engineering and Science) provides full scholarships for underserved and underrepresented students from New Jersey and New York to attend Stevens' Pre-College programs and provides financial and other support to underrepresented undergraduate students. Launched in 2017 with partner schools in Hoboken, Jersey City, Newark, Paterson, and Brooklyn, Stevens ACES is part of the university's strategic goal of increasing the number and percentage of underrepresented minority students pursuing STEM degrees and careers. In its first year of implementation, ACES resulted in a 60 percent increase in the participation of underrepresented minority students in an intensive, pre-college residential STEM summer program and a 46 percent increase in the number of underrepresented minority students in the freshman cohort at Stevens.

- Launched in 2017, Math Circles is an after-school program in which faculty and students from Stevens' Department of Mathematical Sciences introduce important mathematical concepts to elementary students through the use of games, stories and hands-on activities. Since its launch, more than 80 Hoboken students in grades 3-6 have participated in the program.

- Since 2015, Stevens has hosted its annual *STEM-a-thon* for all 8th grade students from Hoboken schools. In 2019 and in conjunction with the Stevens Innovation Expo, approximately 300 Hoboken students and their teachers attended a special faculty presentation, lunch, and tours of the exhibits at the Expo.

- Each year as part of Stevens' Freshman Day of Service, the entire incoming class participates in community service projects across Hoboken. During the 2018-19 academic year, Stevens freshman participated in community service projects with a variety of Hoboken organizations including Hoboken Grace Community Church, Hoboken Shelter, True Mentors, Hoboken Community Center and St. Matthew Trinity Lutheran Church.

- Since 1988, the university's Center for Innovation in Engineering and Science Education (CIESE) has served 35,000 teachers and their students throughout New Jersey (and more than 250 in Hoboken alone), in 27 other states and in a dozen countries. In 2019, CIESE provided two, 1-week summer camps featuring hands-on exploration of energy topics for middle school students in Hoboken and Union City.

- Through a partnership with NJ Symphony Orchestra (NJSO), *OnStage@Stevens* brings three performances per year of NJSO ensembles to campus for the enjoyment of the Hoboken and Stevens communities.

- Stevens periodically makes its facilities available for a variety of community uses, including municipal, civic and non-profit organization events, small business innovation programming, graduation and school programs, and others. In 2018-19, Stevens provided space for the Mayor of Hoboken to address residents at the annual State of the City Address, mayoral meetings with the business community, Special Improvement District meetings, and Rebuild by Design public meetings at no or low cost to the City.

- Each summer since 2014, Stevens participates is Hoboken's annual National Night Out in which Stevens volunteers engage the community in sports demonstrations, hands-on STEM activities, and provide general information about Stevens' events that are open to the public.

A growing impact

As significant as Stevens' contributions to Hoboken's and to New Jersey's economy have been, they may be even greater in the years ahead. This is so for several reasons.

- Stevens is in the midst of a multi-year construction program that in the next five years will see more than $334 million invested in new and renovated campus facilities. This investment will create employment and contracting opportunities for New Jersey residents and businesses – and even more important, it will greatly enhance the university's capacity to fulfill its mission of education, research, innovation and service to the community.

- The university is similarly in the midst of a multi-year process of increasing its enrollment at both undergraduate and graduate levels. From the fall of 2016 through the fall of 2025, Stevens plans to increase its total enrollment by more than 2,000 students to 8,645 – an increase of more than 30 percent. In the near term this increase will translate directly into increased student spending in Hoboken and other nearby communities. Even more important in the long run, it will increase the number of highly-skilled graduates Stevens produces in areas such as engineering, computer science, artificial intelligence and

finance that are likely to play a central role in the growth of New Jersey's economy in the years ahead.

- Stevens has in recent years introduced a number of new programs – such as the Stevens Venture Center, opened in 2016 – designed to encourage and support innovation and entrepreneurship among members of the university community, including students, faculty, staff and alumni. Over time, these programs will have a cumulative impact, as more new businesses are launched – many of which will locate in Hoboken and other nearby communities, and many of which, with the support they receive from Stevens, will survive and thrive.

- As it has been for 150 years, Stevens today is a noteworthy contributor to the life of the City of Hoboken, and to the continued growth of New Jersey's economy. With its particular combination of strengths – in engineering and applied science, in ocean science and engineering, in finance and in emerging areas such as artificial intelligence and machine learning – and its location in the heart of the New York metropolitan area, Stevens is especially well-equipped to be a valuable partner in the city's, the state's and the region's efforts to address the challenges and seize the opportunities that the next decade will present.

Introduction

Stevens Institute of Technology, located in Hoboken, New Jersey, is an independent, not-for-profit research university. Founded in 1870, Stevens was America's first college of mechanical engineering and is among the oldest universities in the U.S. specializing in engineering, science and technology. It offers bachelor's, master's and doctoral degrees in science, engineering, business and arts and letters.

As a leading technological university, Stevens has for 150 years been contributing to the economic life of Hoboken, other Hudson County communities, the State of New Jersey and the region. Moreover, the agenda for growth set out in the university's strategic plan suggests that it is likely to continue to do so in the years ahead. This report describes, assesses and where possible quantifies the multiple ways in which Stevens contributes to the economic vitality of the city, the county, the state and the region. The report was prepared by Appleseed, a New York City-based consulting firm with twenty-five years' experience in analyzing the economic impact of U.S. universities and other research institutions.

Part One of the report considers the impact of Stevens as an enterprise – as one of Hoboken's largest employers, a buyer of goods and services, a sponsor of construction projects, and a source of student and visitor spending. Part Two examines Stevens' contributions to the development of the state's human capital – the accumulation of skills, knowledge and experience that are so critical to the future of New Jersey's economy.

Part Three of the report describes Steven research enterprise, and discusses how research conducted at Stevens contributes to the vitality of the region's economy. Part Four discusses the university's growing role in fostering technological innovation, entrepreneurship and new business development. Part Five describes Stevens' engagement in various efforts to serve and strengthen its local community, in Hoboken and in other New Jersey communities.

Finally, Part Six of the report briefly explores several reasons why Stevens' impact on the economy of the city, the state and the region is likely to keep growing in the years ahead, highlighting in particular the impact of major investments in university facilities that have recently been completed or are now under way.

Part One: Stevens as an Enterprise

As a major enterprise in its own right, Stevens Institute of Technology contributes to the economic vitality of Hoboken, Hudson County and New Jersey in several ways: as one of the largest private employers in Hoboken; as a buyer of good and services from businesses located in Hoboken, Hudson County and elsewhere in New Jersey; and as a sponsor of construction projects. This part of the report assesses Stevens' impact as an enterprise, including the economic impact of off-campus spending by its students and by visitors to the university. It also assesses Stevens' impact on New Jersey state and local government revenues.

Taking into account Stevens' spending on payroll, purchasing and construction, along with spending by students and by visitors to the university, we estimate that during fiscal year 2019, Stevens directly and indirectly accounted for:

- 1,449 jobs in Hoboken, with earnings totaling nearly $119.6 million
- Nearly $141.3 million in citywide economic output

Based on data published by the New Jersey Department of Labor and Workforce Development, we estimate that in 2018, Stevens directly and indirectly accounted for approximately 6.3 percent of all private-sector jobs in Hoboken.

In Hudson County (including Hoboken), we estimate that university, student and visitor spending directly and indirectly accounted for:

- 1,822 jobs in Hudson County, with earnings totaling nearly $139.5 million
- Nearly $201.1 million in countywide economic output

Statewide (including Hudson County), university, student and visitor spending directly and indirectly accounted for:

- 2,492 jobs in New Jersey, with earnings totaling $182.5 million
- $320.7 million in statewide economic impact

These combined impacts in Hoboken, Hudson County (including Hoboken) and New Jersey (including Hudson County) are summarized below in Tables 1, 2 and 3.

Table 1: Total impact of spending by Stevens, students and visitors in Hoboken, FY 2019 (wages and output in $000s)

	Jobs	Wages	Output
Impact of university spending			
Direct	1,259	$110,915.7	$117,216.1
Indirect/induced	70	$4,008.7	$10,611.3
Subtotal, university spending impact	*1,329*	*$114,924.4*	*$127,827.5*
Impact of student spending			
Direct	87	$3,123.2	$9,639.3
Indirect/induced	14	$855.0	$2,339.5
Subtotal, student spending impact	*102*	*$3,978.2*	*$11,978.8*
Impact of visitor spending			
Direct	16	$556.6	$1,103.3
Indirect/induced	2	$132.9	$361.1
Subtotal, visitor spending impact	*18*	*$689.6*	*$1,464.4*
Total impact	**1,449**	**$119,592.2**	**$141,270.7**

Table 2: Total impact of spending by Stevens, students and visitors in Hudson County, FY 2019 (wages and output in $000s)

	Jobs	Wages	Output
Impact of university spending			
Direct	1,282	$112,643.5	$121,185.5
Indirect/induced	197	$12,772.8	$34,554.1
Subtotal, university spending impact	*1,479*	*$125,416.3*	*$155,739.6*
Impact of student spending			
Direct	231	$7,648.5	$28,805.3
Indirect/induced	72	$4,717.8	$12,798.3
Subtotal, student spending impact	*303*	*$12,366.4*	*$41,603.5*
Impact of visitor spending			
Direct	32	$1,113.3	$2,206.7
Indirect/induced	8	$559.4	$1,502.9
Subtotal, visitor spending impact	*40*	*$1,672.7*	*$3,709.5*
Total impact	**1,822**	**$139,455.4**	**$201,052.6**

Table 3: Total impact of spending by Stevens, students and visitors in New Jersey, FY 2019 (wages and output in $000s)

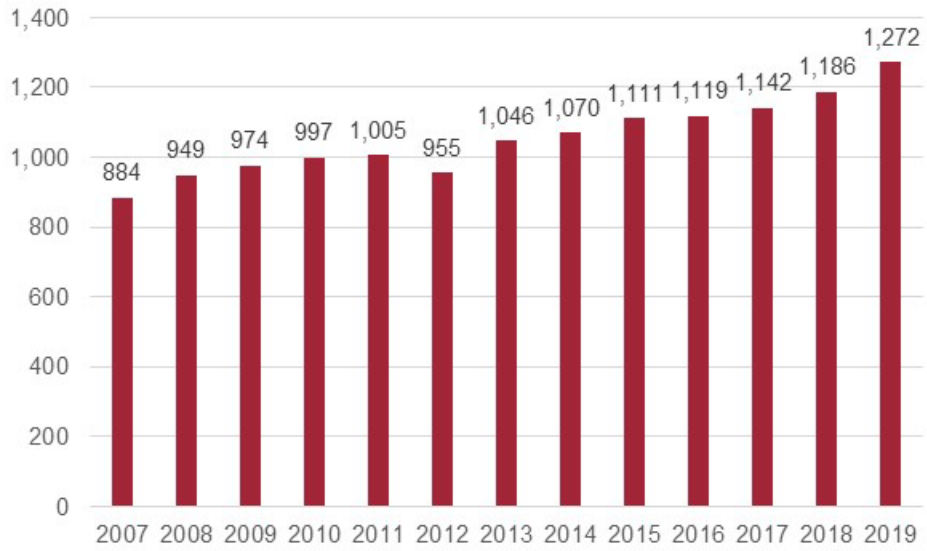
	Jobs	Wages	Output
Impact of university spending			
Direct	1,475	$128,143.8	$160,221.9
Indirect/induced	637	$39,694.9	$109,068.4
Subtotal, university spending impact	*2,112*	*$167,838.7*	*$269,290.3*
Impact of student spending			
Direct	256	$7,680.6	$33,116.0
Indirect/induced	84	$5,327.8	$14,586.9
Subtotal, student spending impact	*340*	*$13,008.4*	*$47,703.0*
Impact of visitor spending			
Direct	32	$1,113.3	$2,206.7
Indirect/induced	8	$559.4	$1,502.9
Subtotal, visitor spending impact	*40*	*$1,672.7*	*$3,709.5*
Total impact	**2,492**	**$182,519.8**	**$320,702.7**

Employment at Stevens

In the fall of 2018, Stevens directly employed 1,186 people (excluding student employees), of whom 74.5 percent worked full-time. In addition to these regular full- and part-time employees, the university employed 1,299 students in a variety of part-time, on-campus jobs.

As shown in Figure 1, between the fall of 2007 and the fall of 2019, total non-student employment at Stevens increased by 43.9 percent, to 1,272.

Figure 1: Total non-student employment at Stevens, fall 2007 – fall 2019



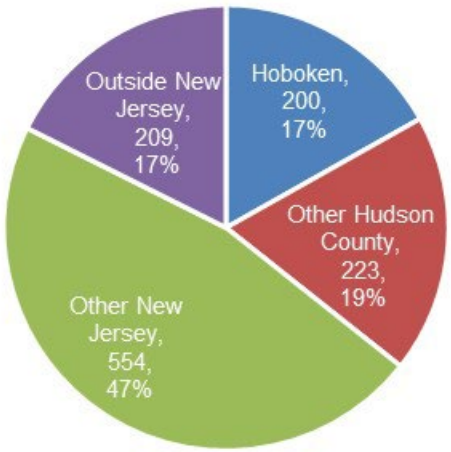
According to data published by the Hudson County Economic Development Corporation, Stevens ranks among the top ten largest private employers in Hoboken.[9] Based on data published by the New Jersey State Department of Labor and Workforce Development, we estimate that in 2018, Stevens directly accounted for approximately 5.2 percent of the city's private-sector jobs.[10]

In fiscal year 2019, Stevens paid a total of $105.3 million in salaries and wages to its regular full- and part-time non-student employees. In addition, Stevens paid nearly $13.1 million in student wages in fiscal year 2019.

Where Stevens employees live

In the fall of 2018 (as shown in Figure 2), 200 Stevens non-student employees (16.9 percent of all non-student employees) lived in Hoboken, and an additional 223 employees (18.8 percent of all non-student employees) lived elsewhere in Hudson County. An additional 554 employees (46.7 percent of all non-student employees) lived elsewhere in New Jersey.

Figure 2: Stevens non-student employees by place of residence, fall 2018



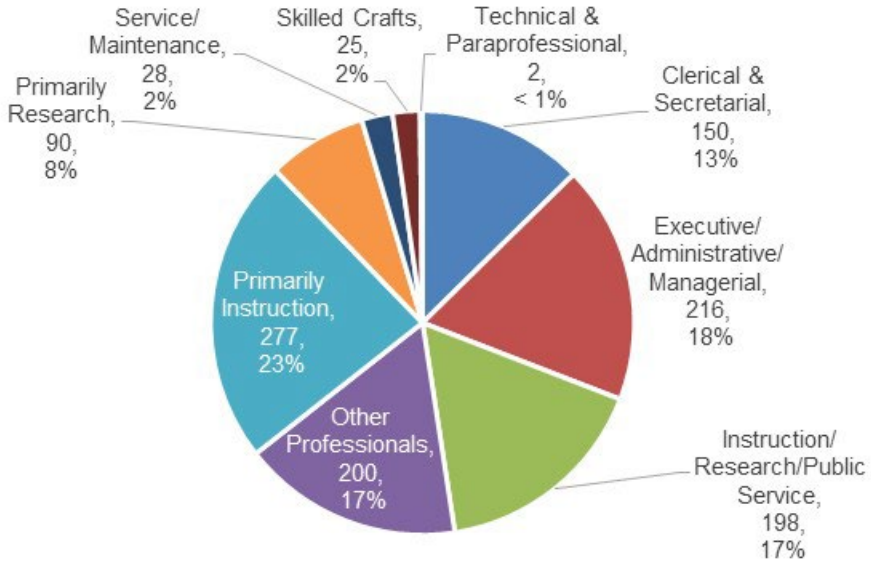
Salaries and wages paid by Stevens to New Jersey residents in fiscal year 2019 totaled $87.7 million (83.3 percent of the total payroll for non-student employees), including nearly $19.9 million (18.9 percent of total non-student payroll) paid to Hoboken residents and $16.5 million (15.7 percent) paid to non-student employees living elsewhere in Hudson County.

[9] Hudson County Economic Development Corporation, *Major Employer's List*, 2019.
[10] New Jersey Department of Labor and Workforce Development, Quarterly Census of Employment and Wages.

Diversity and quality of Stevens employment

Stevens offers a variety of high-quality jobs. As shown in Figure 3, during the fall of 2018, instructional and research staff accounted for 47.6 percent of total non-student employment at Stevens; executive, administrative and managerial staff for 18.2 percent; clerical and secretarial staff for 12.6 percent; service and maintenance staff for 2.4 percent; skilled crafts staff for 2.1 percent; and technical and paraprofessional staff for less than 1 percent.

Figure 3: Stevens non-student employment by occupational category, fall 2018



Stevens also provides a wide range of benefits to its employees. They include:

- Health, dental and vision insurance
- Life and disability insurance
- Flexible spending accounts
- Retirement plans

Stevens also provides its employees with training and education opportunities. During the 2018-19 academic year, Stevens provided nearly $3.8 million in education benefits to their employees and their employees' dependents through the university's tuition reimbursement and remission programs.

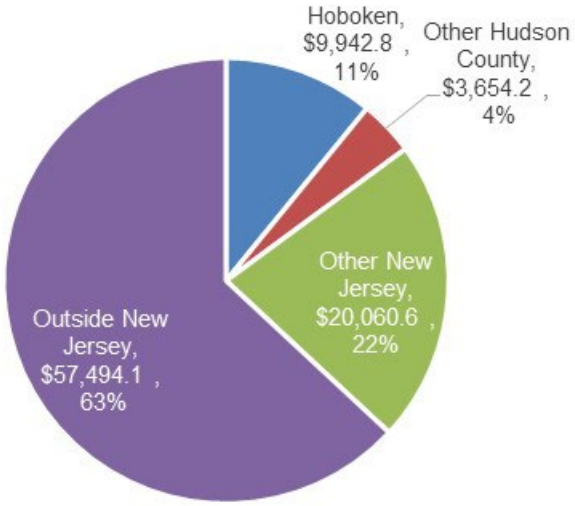
The impact of purchasing and construction

In addition to the people it employs directly, Stevens supports Hoboken's and New Jersey's economies through its purchases of goods and services from local businesses, and through its investments in campus facilities.

Purchasing goods and services

In fiscal year 2019, Stevens spent nearly $91.2 million on the purchase of goods and services. Of this total (as shown in Figure 4), approximately $9.9 million (10.9 percent of total purchasing) was spent on goods and services provided by businesses in Hoboken, an additional $3.6 million (4.0 percent) was spent on goods and services provided by businesses located elsewhere in Hudson County, and nearly $20.1 million (22.0 percent) was spent on goods and services provided by businesses located elsewhere in New Jersey.

Figure 4: Stevens purchasing by location of vendor, FY 2019 (in $000s)



Leading categories of goods and services purchased from New Jersey businesses in fiscal year 2019 include employee health insurance, professional and technical services, building services and facilities support, utilities and transportation.

Using the IMPLAN input-output economic modeling system – a modeling tool commonly used in economic impact analyses – we estimate that in fiscal year 2019, Stevens' spending on purchases of goods and services directly supported:

- 62 jobs in Hoboken;
- 82 jobs in Hudson County (including Hoboken); and
- 198 jobs in New Jersey (including Hudson County).

Investing in university facilities

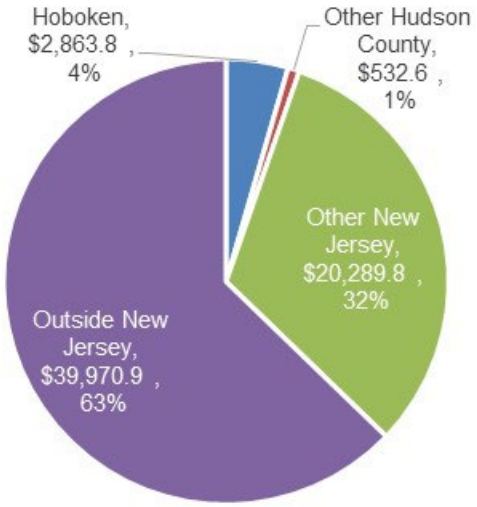
In addition to generating jobs and economic activity through its purchases of goods and services, Stevens also does so through its investments in its university facilities. As shown in Figure 5, between fiscal year 2015 and fiscal year 2019, Stevens invested a total of more than $146.8 million in facility construction and renovation.

Figure 5: Stevens construction spending, FY 2015 – FY 2019 (in $ millions)



In fiscal year 2019 (as shown in Figure 6), Stevens spent more than $63.6 million on construction and renovation of facilities, of which nearly $2.9 million (4.5 percent of total construction spending) was paid to contractors and other vendors located in Hoboken, and an additional $20.8 million (32.7 percent of total construction spending) was paid to contractors and other vendors located elsewhere in New Jersey.

Figure 6: Stevens construction spending by location of contractor, FY 2019 (in $000s)



Using IMPLAN, we estimate that in fiscal year 2019, Stevens' spending on construction and renovation of facilities directly supported:

- 11 jobs in Hoboken;
- 13 jobs in Hudson County (including Hoboken); and
- 91 jobs in New Jersey (including Hudson County).

Examples of recently completed major projects include:

- The ***Gateway Academic Center***, a new 89,500-square-foot academic building that includes 10 technology-enhanced smart classrooms, 45 faculty offices and 13 teaching and research labs. The $68 million facility, opened in 2019, consists of two buildings, South Hall and Gianforte Family Hall, connected by a two-story glass sky bridge.

  The new center greatly enhances and expands the research and learning space available to Stevens students and faculty. It will be home to the Department of Computer Science, and to research labs working in areas such as cybersecurity and health-related applications of artificial intelligence.

- The ***Student Wellness Center***, a 7,200-square-foot facility located in the university's newly renovated Pond House. Opened in the spring of 2019, the new center houses the university's student health services, counseling and psychology services and disability support services, making it a "one-stop wellness center" for Stevens students.

- The $14.8 million ***Babbio Garage Extension***, completed in 2018, that adds 266 parking spots, 60 bicycle parking spaces, electric vehicle charging stations and a new riverfront plaza space.

These investments not only translate into new businesses and jobs for New Jersey contractors and construction workers, but more importantly in the long term, will greatly enhance Stevens' ability to fulfill its mission.

A new center for the Stevens campus

Since 2011, the Stevens campus has been undergoing a gradual transformation, with investments through 2019 in projects such as those cited above totaling nearly $160.5 million, and other projects to be completed in the years ahead.

The largest of these projects is a 392,000-square-foot complex that will be comprised of two student residential towers built above a three-story university center. This $256 million project, to be completed in 2022, will house nearly 1,000 students; and provide an array of spaces where students, faculty and staff can work together, socialize and relax, including new dining facilities, a fitness center, and conference and meeting spaces.

Using IMPLAN, Appleseed estimates that spending on construction of the two student residential towers and the university center will, over the next four years, directly support 417 person-years of employment with New Jersey firms in construction and related industries, with a total of $38.5 million in wages. Through the multiplier effect, the university's direct investment in the project will also support 564 person-years of work with other businesses throughout the state.

Beyond the near-term impact of construction spending, the new residential space and university center will support the planned growth of enrollment at Stevens; enhance the university's ability to attract talented students and faculty; and relieve pressure on Hoboken's housing market.

Measuring the multiplier effect

The jobs and economic activity generated by Stevens' spending on payroll, purchasing and construction are not limited to the direct impacts cited above. Using a tool of economic analysis called an input-output model, we can also estimate the indirect and induced (or "multiplier") effects of spending by Stevens. For example:

- Some of the money that Stevens pays to its local suppliers and contractors is used to buy goods and services from other local companies, which in turn buy goods and services from other local businesses (the indirect effect).
- Stevens employees, and the employees of its suppliers and contractors, similarly use part of their earnings to buy a wide variety of goods and services, such as housing, utilities, food, and other personal services, from local businesses; the employees of those businesses do the same (the induced effect).

Using IMPLAN, we estimate that in fiscal year 2019, spending by Stevens on non-student payroll, purchasing and construction indirectly accounted for:

- 70 jobs in Hoboken, with earnings totaling $4.0 million
- $10.6 million in citywide economic output

In Hudson County (including Hoboken), Stevens' spending indirectly accounted for:

- 197 jobs in Hudson County, with earnings totaling nearly $12.8 million
- Nearly $34.6 million in countywide economic output

Statewide (including Hudson County), Stevens' spending indirectly accounted for:

- 637 jobs in New Jersey, with earnings totaling nearly $39.7 million
- Nearly $109.1 million in statewide economic output

Combining these indirect and induced effects with the direct effects cited previously, we estimate that in fiscal year 2019, spending by Stevens on non-student payroll, purchasing and construction directly and indirectly accounted for:

- 1,329 jobs in Hoboken, with earnings totaling $114.9 million
- $127.8 million in citywide economic output

In Hudson County (including Hoboken), Stevens' spending directly and indirectly accounted for:

- 1,479 jobs in Hudson County, with earnings totaling $125.4 million
- $155.7 million in countywide economic output

Statewide (including Hudson County), Stevens' spending directly and indirectly accounted for:

- 2,112 jobs in New Jersey, with earnings totaling $167.8 million
- Nearly $269.3 million in statewide economic output

Tables 4, 5 and 6 summarize the total impact of Stevens' spending on non-student payroll, purchasing and construction in Hoboken, Hudson County (including Hoboken) and New Jersey (including Hudson County).

Table 4: Direct, indirect and induced impacts of Stevens' spending in Hoboken, FY 2019 (wages and outputs in $000s)

	Jobs	Wages	Output
Direct spending impact			
Payroll	1,186	$105,317.6	$105,317.6
Purchasing/construction	73	$5,598.2	$11,898.6
Subtotal, direct impact	*1,259*	*$110,915.7*	*$117,216.1*
Indirect and induced effects			
Employee spending	45	$2,425.3	$6,693.2
Contractor and vendor spending	25	$1,583.4	$3,918.1
Subtotal, indirect/induced effects	*70*	*$4,008.7*	*$10,611.3*
Total impact	**1,329**	**$114,924.4**	**$127,827.5**

Table 5: Direct, indirect and induced impacts of Stevens' spending in Hudson County, FY 2019 (wages and outputs in $000s)

	Jobs	Wages	Output
Direct spending impact			
Payroll	1,186	$105,317.6	$105,317.6
Purchasing/construction	96	$7,325.9	$15,867.9
Subtotal, direct impact	*1,282*	*$112,643.5*	*$121,185.5*
Indirect and induced effects			
Employee spending	138	$8,559.3	$23,827.4
Contractor and vendor spending	60	$4,213.5	$10,726.7
Subtotal, indirect/induced effects	*197*	*$12,772.8*	*$34,554.1*
Total impact	**1,479**	**$125,416.3**	**$155,739.6**

Table 6: Direct, indirect and induced impacts of Stevens' spending in New Jersey, FY 2019 (wages and outputs in $000s)

	Jobs	Wages	Output
Direct spending impact			
Payroll	1,186	$105,317.6	$105,317.6
Purchasing/construction	289	$22,826.2	$54,904.3
Subtotal, direct impact	*1,475*	*$128,143.8*	*$160,221.9*
Indirect and induced effects			
Employee spending	403	$24,305.6	$67,766.7
Contractor and vendor spending	233	$15,389.4	$41,301.7
Subtotal, indirect/induced effects	*637*	*$39,694.9*	*$109,068.4*
Total impact	**2,112**	**$167,838.7**	**$269,290.3**

The impact of student and visitor spending

In addition to the impact of its spending on non-student payroll, purchasing and construction, Stevens contributes to the economic vitality of Hoboken and elsewhere in New Jersey through off-campus spending by Stevens students and by out-of-town visitors to the university's campus.

The impact of student spending

The impact of student spending is determined in part by whether students live on campus, in off-campus housing owned or leased by the University, or elsewhere in Hoboken and the surrounding communities. During the fall of 2018, approximately 57 percent of undergraduate students lived in university-owned or leased housing on and around the Stevens campus, while nearly all graduate students lived off-campus in Hoboken and the surrounding communities.

Based on data provided by Stevens on the average annual cost of living for students – on housing, food, personal expenses, transportation, books, entertainment and other purposes – we estimate that during fiscal year 2019, off-campus spending in Hoboken by Stevens students totaled approximately $12.9 million. This figure includes off-campus spending by full-time undergraduate and graduate students from outside of Hoboken who reside in Hoboken.[11]

Using IMPLAN, we estimate that in fiscal year 2019, off-campus spending by students from outside of Hoboken who reside in Hoboken directly and indirectly accounted for:

- 102 jobs in Hoboken, with earnings totaling nearly $4.0 million
- Nearly $12.0 million in citywide economic output

In Hudson County (including Hoboken), we estimate that off-campus spending by Stevens students totaled approximately $36.0 million in fiscal year 2019. This figure includes off-campus spending by full-time undergraduate and graduate students from outside of Hudson County who reside in Hudson County.

Using IMPLAN, we estimate that in fiscal year 2019, off-campus spending by students from outside of Hudson County who reside in Hudson County directly and indirectly accounted for:

- 303 jobs in Hudson County, with earnings totaling nearly $12.4 million
- $41.6 million in countywide economic output

At the state level, we estimate that off-campus spending in New Jersey (including Hudson County) by Stevens students totaled approximately $40.9 million in fiscal year 2019. This figure includes off-campus spending by full-time undergraduate and graduate students from outside of New Jersey who live in Hudson County (including Hoboken) or elsewhere in New Jersey.

[11] The number of students living off-campus in non-university-owned or leased housing in Hoboken, elsewhere in Hudson County or elsewhere in New Jersey was estimated using data collected by Stevens on student living arrangements.

Using IMPLAN, we estimate that in fiscal year 2019, off-campus spending by students from outside of New Jersey who reside in Hudson County or elsewhere in New Jersey directly and indirectly accounted for:

- 340 jobs in New Jersey, with earnings totaling $13.0 million
- $47.7 million in statewide economic output

The impact of visitor spending

Every year, Stevens attracts out-of-town visitors to its campus who then spend money within the local economy. As shown in Table 7, Stevens estimates that during the 2018-19 academic year, approximately 55,900 people visited the Stevens campus – for admissions visits, commencement-related activities, academic conferences, athletic events, alumni events and other purposes.

Table 7: Out-of-town visitors to Stevens by purpose of visit, 2018-19 academic year

Purpose of visit	Out-of-town visitors
Prospective applicants	15,933
Commencement	1,750
Academic/other conferences	1,300
Summer programs	4,068
Athletic events	27,562
Performances, exhibits, etc.	2,300
Student Affairs events	2,060
Alumni & Development events	930
Total	**55,903**

In fiscal year 2019, we estimate that off-campus spending in Hoboken and the Hudson County area by out-of-town visitors to Stevens – on hotel accommodations, food, shopping, entertainment and transportation – totaled approximately $2.8 million, including approximately $1.4 million in Hoboken. Using IMPLAN, we estimate that this spending directly and indirectly accounted for:

- 18 jobs in Hoboken, with earnings totaling $689,559
- Nearly $1.5 million in citywide economic output

In Hudson County (including Hoboken), off-campus spending by out-of-town visitors to Stevens directly and indirectly accounted for:

- 40 jobs in Hudson County, with earnings totaling nearly $1.7 million
- $3.7 million in countywide economic output

Contributing to state and local revenues

Despite its tax-exempt status, Stevens contributes to state and local government finances in a variety of ways. As shown in Table 8, in fiscal year 2019, Stevens paid $5.1 million in New Jersey state taxes, fees and other payments, and nearly $3.2 million in taxes, fees and other payments to the City of Hoboken and other local governments in New Jersey, including:

- Nearly $4.9 million in state income taxes withheld from the salaries and wages of Stevens employees;
- $147,792 in unemployment insurance payments;
- $108,163 in fees to various state agencies;
- $450,880 in taxes and fees to the City of Hoboken; and
- $2.7 million to the North Hudson Sewerage Authority.

Overall, in fiscal year 2019, Stevens directly accounted for a total of $8.3 million in state and local government revenues.

Table 8: Taxes and fees paid by Stevens to New Jersey state and local governments, FY 2019

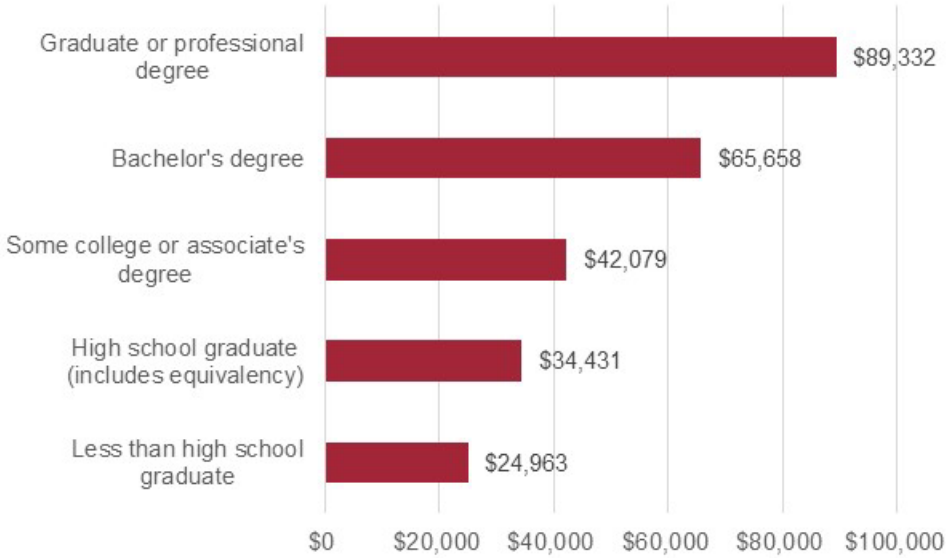
Type of tax/fee	Amount
State revenues	
State income taxes withheld	$4,886,314
Unemployment insurance payments	$147,792
Fees paid to NJ state agencies	$108,163
Subtotal, state revenues	*$5,142,269*
Local government revenues	
Fees paid to the City of Hoboken	$450,880
North Hudson Sewage Authority	$2,734,065
Other payments to local governments	$2,348
Subtotal, local government revenues	*$3,187,293*
Total state and local revenues	**$8,329,561**

Part Two: Developing Human Capital

Human capital – the accumulated knowledge, skills and experience of a community's or a region's workforce – plays a central role in determining whether cities or states succeed or fall behind in an increasingly knowledge-based global economy.

One of the more important measures of human capital is the level of education achieved by a city's or a state's residents. As shown in Figure 7, in 2018, the median annual earnings of New Jersey residents who had completed four-year college degrees were 90.7 percent higher than the median earnings of those who had only a high school diploma; and the median earnings of those with graduate or professional degrees were 159.5 percent higher than the earnings of those with no education beyond high school.

Figure 7: Median earnings by educational attainment for New Jersey residents age 25 years and older, 2018



Source: 2018 American Community Survey (1-Year Estimates), U.S. Census Bureau; Social Explorer

The economic benefits of higher education, however, are not limited to those who earn degrees. A study published by the Milken Institute in 2013 found that in U.S. metropolitan areas, adding one year of schooling to the educational attainment of workers who already had a high school diploma increased average GDP per capita by 17.4 percent and average real wages by 17.8 percent.[12]

[12] Ross DeVol et al., *A Matter of Degrees: The Effect of Educational Attainment on Regional Economic Prosperity*, The Milken Institute, February 2013, p.1.

Even non-college educated workers benefit from this effect. University of California economist Enrico Moretti has shown that "the earnings of a worker with a high school education rise by about 7 percent as the share of college graduates in his [metropolitan area] increases by 10 percent."[13]

Part Two of this report examines Stevens' role in the development of New Jersey's human capital.

Student enrollment at Stevens

In the fall of 2018, a total of 6,929 students were enrolled in for-credit programs at Stevens Institute of Technology, including 3,431 undergraduates and 3,498 graduate and professional students. As shown in Table 9, 74.3 percent of all Stevens undergraduates were enrolled in the Schaefer School of Engineering and Science (SES), 16.0 percent were enrolled in the School of Business, 4.8 percent in the School of Systems and Enterprises (SSE), and 4.6 percent in the College of Arts and Letters (CAL). Among graduate students, 44.2 percent were enrolled in the School of Engineering and Science, 41.5 percent in the School of Business, and 14.2 percent in the School of Systems and Enterprises.

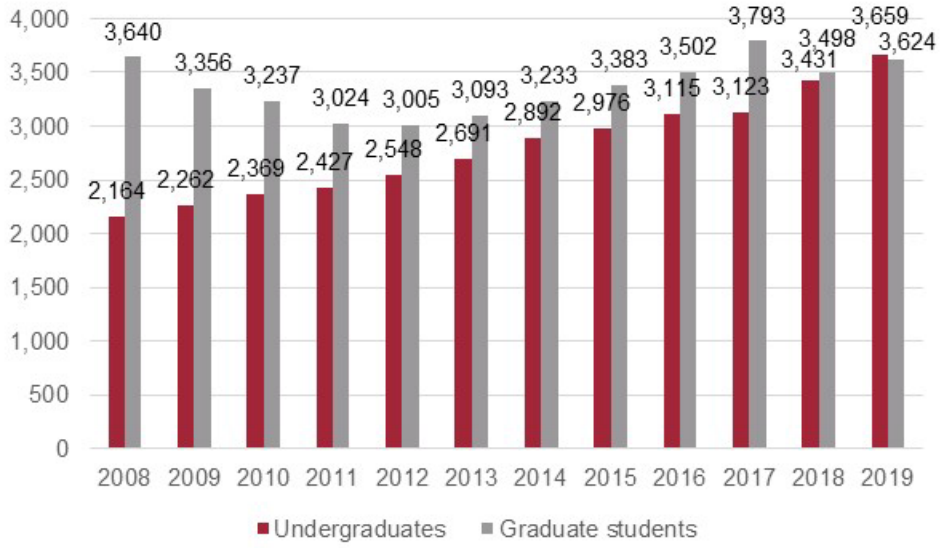
Table 9: Total for-credit enrollment at Stevens by school, fall 2018

School/College	Undergraduates	Graduate students
Schaefer School of Engineering and Science	2,548	1,547
School of Business	549	1,450
School of Systems and Enterprises	165	498
College of Arts and Letters	158	3
Non-matriculated	11	–
Total	**3,431**	**3,498**

Between the fall of 2008 and the fall of 2019, total enrollment at Stevens grew by 25.5 percent – an increase of 1,479 students. However (as shown in Figure 8), this overall increase masks divergent trends. During this period, undergraduate enrollment grew by 69.1 percent (an increase of 1,495 students). Graduate student enrollment in contrast decreased by 17.4 percent between the fall of 2008 and the fall of 2012 (a decrease of 635 students) before growing again by 20.6 percent between the fall of 2012 and the fall of 2019.

[13] Enrico Moretti, *The New Geography of Jobs,* (New York: Houghton Mifflin Harcourt, 2012), p. 98.

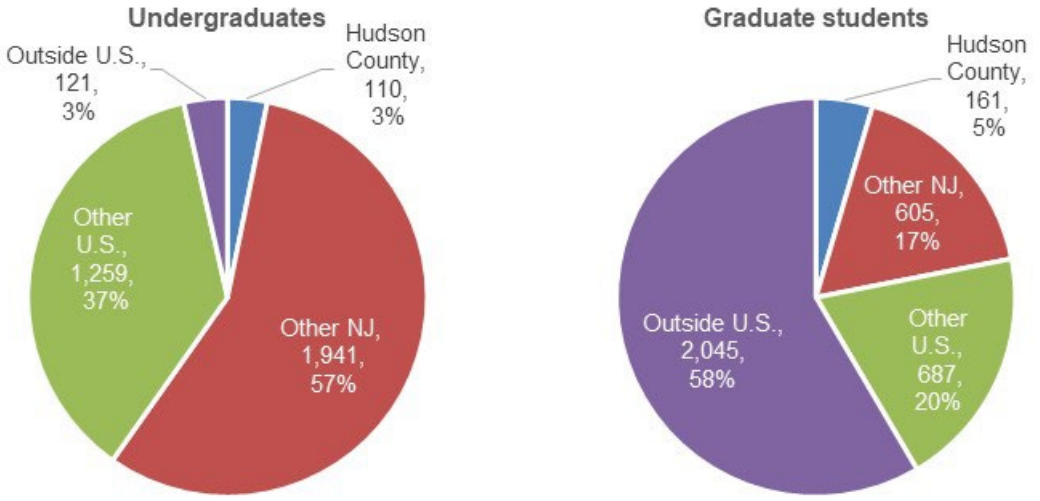
Figure 8: Undergraduate and graduate enrollment at Stevens, fall 2008 – fall 2019



In the fall of 2018, 2,051 of Stevens' undergraduates (59.8 percent of total undergraduate enrollment) were residents of New Jersey, as were 766 graduate students (21.9 percent of total graduate enrollment). Figure 9 shows the distribution of Stevens undergraduates and graduate students by place of residence.

Although most students come to Stevens from elsewhere in New Jersey or other states or countries, the majority of them live in the local area while they are enrolled at the university. These students thus contribute substantially, as described in Part One, to the impact of student spending on the local economy.

Figure 9: Total enrollment at Stevens by student's permanent place of residence, fall 2018



During the 2018-19 academic year, Stevens awarded 766 undergraduate degrees, 1,677 graduate degrees and 520 graduate certificates. Approximately 58.5 percent of all undergraduate degrees and 20.4 percent of all graduate degrees and certificates were awarded to residents of New Jersey.

The role that Stevens plays in the development of New Jersey's human capital – especially in engineering – is evident in statewide statistics. According to data published by the U.S. Department of Education (as shown in Table 10), in 2017-2018, Stevens ranked:

- Third among all New Jersey colleges and universities in the number of bachelor's degrees awarded in engineering; and
- First in the number of graduate degrees awarded in engineering in New Jersey.

In 2017-2018, Stevens accounted for 34.5 percent (595 of 1,724) of all master's and doctoral degrees in engineering awarded in New Jersey.[14]

The development of a stronger, fairer economy for New Jersey depends on investments in workforce development and, in particular, a robust science, technology, engineering, and mathematics talent pool. STEM disciplines fuel innovation and economic growth; therefore, developing a larger and more diverse STEM workforce is crucial to achieving the goals articulated in the Governor's economic plan for New Jersey. Stevens is exceptionally well-positioned to contribute to this effort.

[14] U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. IPEDS: Integrated Postsecondary Education Data System.

Table 10: Undergraduate and graduate degrees in engineering awarded by New Jersey institutions, 2017-2018

Rank	Bachelor's degrees	Degrees awarded	Rank	Master's/doctoral degrees	Degrees awarded
1	Rutgers University	890	1	Stevens Institute of Technology	595
2	New Jersey Institute of Technology	687	2	New Jersey Institute of Technology	441
3	Stevens Institute of Technology	426	3	Rutgers University	382
4	Princeton University	382	4	Princeton University	223
5	Rowan University	313	5	Fairleigh Dickinson University	52
6	The College of New Jersey	98	6	Rowan University	19
7	Monmouth University	14	7	Monmouth University	12
8	Fairleigh Dickinson University	8	–	–	–
Total		**2,818**	**Total**		**1,724**

Source: U.S. Department of Education; Institute of Education Sciences, National Center for Education Statistics; IPEDS: Integrated Postsecondary Education Data System

Making a Stevens education more affordable

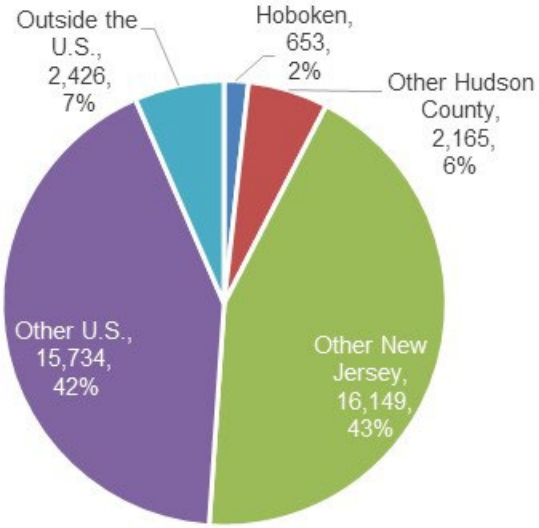
Financial aid that Stevens Institute of Technology provides from its own resources helps to ensure that students can get access to the education opportunities Stevens offers. In fiscal year 2019, Stevens provided more than $75.9 million in university-funded financial aid to undergraduate students, including nearly $2.6 million to students from Hudson County and more than $43.1 million to students from elsewhere in New Jersey.

In addition, Stevens provided nearly $12.2 million in university-funded financial aid to graduate students in fiscal year 2019, including nearly $3.5 million to students from New Jersey.

Where Stevens alumni live

The majority of Stevens students remain in New Jersey after they graduate. As of the summer of 2019 (as shown in Figure 10), 51.1 percent of all Stevens alumni whose addresses are known – 18,967 Stevens alumni – lived in New Jersey, including 653 who lived in Hoboken and 2,165 who lived elsewhere in Hudson County.

Figure 10: Stevens alumni by place of residence (for alumni whose addresses are known), as of summer 2019



Preparing Stevens students for today's (and tomorrow's) economy

As one of the nation's leading technological universities, Stevens prepares students to work in professions and industries that are at the core of New Jersey's economy today, and that could play a key role in its development during the next decade. Here we cite just a few examples.

- Combining studies in biology and physiology with fundamentals of engineering, the university's ***bachelor's degree in biomedical engineering*** prepares students to meet the challenge of using the concepts and tools of engineering to solve problems affecting human and other living systems.
- Demand for qualified software engineers has for years exceeded the available supply, both in the New York-New Jersey area and nationwide. The university's ***B.E. in software engineering*** prepares students to work in this high-demand field through a combination of classroom learning, internships and other opportunities for hands-on learning. Students can also choose to concentrate in areas such as financial systems, health care systems and sustainable energy systems.
- Events during the past few years have provided powerful evidence on the importance of data protection for both personal and national security. Founded in 2006, Stevens' ***B.S. in cybersecurity*** program was one of the first of its kind in the U.S. It combines studies in mathematics and computer science with more specialized courses on topics such as cryptography, information security and network forensics. Demand for graduates with cybersecurity degrees is extremely strong, and is likely to increase.
- The School of Business offers a ***B.S. in quantitative finance***. Through the university's Hanlon Financial Systems Center, students can gain hands-on experience in using technology to explore problems and opportunities. Students can also hone their skills by

participating in the management of the Stevens Student-Managed Investment Fund – a portfolio of assets valued at approximately $500,000.

- The School of Business' ***B.S. in marketing innovation and analytics*** emphasizes the use of big data, analytics and digital media to develop innovative marketing strategies.

Graduate programs at Stevens are similarly geared to changing needs in business, engineering and technology. For example:

- Launched in 2019, Stevens' ***master's program in applied artificial intelligence*** is one of the first graduate programs in the U.S. to explore A.I. applications for engineering. Through a mix of fundamental theory, applied skills and hands-on project work, the program provides students with a background in the theoretical foundations of artificial intelligence and its use across a wide range of engineering applications, such as intelligent communication networks, autonomous robots, Internet of Things (IoT), smart health, information systems security, biomedical engineering, civic and environmental engineering, "big data" and others.

- The Schaefer School of Engineering and Science's ***master's degree in machine learning*** provides students with the theoretical foundations and practical skills necessary to succeed in the rapidly expanding field of machine learning. With applications in a wide variety of areas – such as intelligent systems, bioinformatics, finance, robotics and healthcare, to name a few – machine learning is one of today's fastest growing fields, and it's predicted to continue to grow.

- The School of Business offers a ***master's degree in business intelligence and analytics***. Students are trained to understand the business implications of "big data," and gain hands-on experience in using the analytic tools and technologies that make that data useful.

- Stevens offers an ***M.S. in sustainability management***, launched in the fall of 2016, that aims to bridge the gap between scientific and technical understanding of issues such as climate change and the effective implementation of practical solutions.

- Stevens offers both ***master's and PhD degrees in ocean engineering***, a field that has become increasingly critical for addressing the effects of climate change and restoring the health of marine ecosystems, both locally and worldwide. Graduate students at Stevens can focus on areas such as urban oceanography, shoreline design and management, and naval architecture, taking advantage of Stevens' 80-year history in the field, and its location on the Hudson River and New York Harbor.

StevensOnline

Stevens is a longtime leader in using online education to expand working professionals' access to advanced education in high-demand fields. As of the fall of 2019, Stevens offered a total of 19 master's degrees available entirely online, and more than 35 graduate certificates in business, science and engineering, and systems and enterprises. For example:

- Stevens' School of Business offers eight master's degree programs available completely online, including its MBA program. Other areas include:
    - Business intelligence and analytics
    - Financial analytics
    - Enterprise project management
    - Financial engineering
    - Information systems
- The Schaefer School offers seven master's degree programs available entirely online, in areas such as applied artificial intelligence, computer engineering, computer science, machine learning, electrical engineering, construction management and pharmaceutical manufacturing.
- The School of Systems and Enterprises offers five fully online master's degree programs, including Master of Engineering degrees in engineering management, space systems engineering, systems analytics and systems engineering, as well as an M.S. in software engineering.

Stevens' commitment to online education contributes to the continued development of New Jersey's economy in two ways: It helps improve the availability of high-quality, high-impact graduate and professional programs to New Jersey residents who, because of distance or scheduling conflicts, might not otherwise be able to take advantage of these programs; and it creates a new delivery system through which a high-value service and the Stevens name can be exported from New Jersey to students around the world.

Education through experience

Experiential learning plays an important role in undergraduate education at Stevens. Programs that combine real-world experience with academic learning include co-operative education, internships, externships, research projects and service learning.

Established in 1986, the ***Stevens Cooperative Education Program (or Co-op)*** is a five-year academic program that combines on-campus learning with full-time paid work. Undergraduate engineering and science students in the Co-op program spend their first two semesters completing academic requirements on-campus, then alternate between full-time study and paid, full-time professional work in areas related to their academic majors and career interests during the following three years. The fifth year is then spent back on campus.

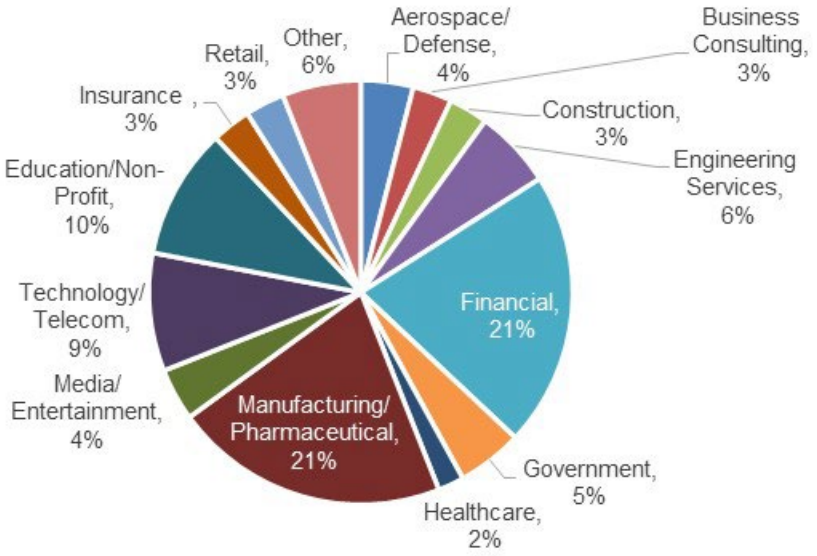
From 25 students in its first year, Co-op has grown to include 750 undergraduate students in the fall of 2018 (approximately 30 percent of all undergraduate students enrolled in engineering and science programs). Co-op employers range from small consulting firms to major international corporations – most located in the New York metropolitan area.

In 2018-19, Co-op students' salaries ranged from $14.00 to $48.00 per hour, with an average salary of $19.90 per hour. Even more important than earnings, however, is the practical experience they gain, and the advantage that experience provides when they enter the job market.

Stevens students also gain professional experience through the ***Stevens Summer Internship Program***. In the summer of 2019, 424 undergraduate students (approximately 12 percent of all enrolled undergraduate students) completed full-time summer internships. Of those internships, approximately 51.4 percent were located in New Jersey, 28.1 percent were located in New York and 20.5 percent took place elsewhere.

As shown in Figure 11, the financial services industry and the manufacturing and pharmaceutical industries accounted for the largest shares of summer internships (21 percent each), followed by education and non-profit (10 percent), technology and telecommunications (9 percent), engineering services (6 percent), government (5 percent), aerospace and defense (4 percent) and media and entertainment (4 percent).

Figure 11: Distribution of undergraduate summer internships by industry, summer 2018



The value of a Stevens education

Stevens' effectiveness in providing its students with the skills and knowledge they need to succeed is shown by its consistently high graduation rates. As the National Center for Education Statistics reports, 87 percent of all full-time first-year students who enrolled at Stevens in 2012 had graduated by 2018. For all U.S. institutions granting bachelor's degrees, the six-year graduation rate was 60 percent.[15]

The value of the education that Stevens provides is further evident from the earnings of the university's graduates. According to PayScale's annual reports on the earnings of graduates of more than 4,000 U.S. colleges and universities, in 2019, Stevens:

- Ranked 13th in the U.S., measured by the average mid-career salary of its alumni who only received a bachelor's degree ($139,900); and
- Ranked 16th in the U.S., measured by the average early career salary of its alumni who only received a bachelor's degree ($75,100).[16]

When measured by students' return on investment (ROI), Stevens ranked 15th in the U.S. in 2018, with an average net return after twenty years of $832,000 (for students living on campus and not receiving financial aid).[17]

Stevens' impact on the earnings of its graduates endures long after they have left the university. A study published in 2019 by the Georgetown University Center on Education and the Workforce also rated Stevens 14th in the nation among colleges and universities awarding four-year degrees (ahead of such elite institutions as Cal Tech, Yale and Columbia) and first in New Jersey, based

[15] National Center for Education Statistics
[16] PayScale, *2019-20 College Salary Report*.
[17] PayScale, *2018 College ROI Report*.

on students' ROI over 40 years.[18] The study found that over a 40-year period, a Stevens degree had a net present value to students of more than $1.83 million.

The value of a Stevens education is also reflected in survey data on post-graduation experiences of Stevens undergraduate students. Within six months of graduation, 96 percent of the undergraduate Class of 2019 reported that they were either employed (71 percent), continuing their education (21 percent), returning to their home country or traveling, or in military service.[19] Among those who were employed, starting salaries averaged $76,400 – the highest ever for a Stevens graduating class, and 49 percent higher than the nationwide average starting salary of $51,347[20] for spring 2019 college graduates. Notably, 59 percent of employed graduates had been hired by a company where they had worked as interns or co-op students during their time at Stevens.

Developing and attracting human capital

Hoboken's working-class roots have helped shape the city's character. At the same time, with more than 78 percent of all residents age 25 and older having at least a bachelor's degree, Hoboken today is one of New Jersey's best-educated communities.[21] Stevens graduates directly account for only 2.0 percent of Hoboken's college-educated population; but the university's presence in the community helps to sustain the kind of environment that makes the city an attractive place for highly-skilled young workers to live. Programs and partnerships that engage Hoboken and Hudson County residents – in areas ranging from technology and entrepreneurship to arts and culture – contribute to the vibrancy of the community.

Building the skills of working professionals

In addition to its graduate degree and certificate programs, Stevens provides continuing and professional education opportunities through its Office of Continuing and Professional Education (OCPE). Geared towards working professionals, OCPE offers a variety of programs designed to help professionals gain the technical knowledge, skills and tools they need to excel in their fields.

Stevens' OCPE also partners with companies to build custom learning solutions that are tailored to meet a company's specific business and technical challenges. During the 2018-19 academic year, Stevens provided custom learning solutions to 16 corporate partners that involved 538 participants.

[18] Anthony Carnevale, Ban Cheah and Martin Van der Werf, *A First Try at ROI: Ranking 4,500 Colleges* (Georgetown University Center on Education and the Workforce, 2019) p. 107.
[19] Stevens Career Center*, Class of 2019: Career Outcomes*.
[20] Korn Ferry, "Salaries for 2019 College Graduates Flat, According to Korn Ferry Pay Analysis," press release, May 16, 2019
[21] U.S. Census Bureau, 2017 American Community Survey (ACS) (5-Year Estimates), Social Explorer.

Part Three: The Impact of Research at Stevens

Since the mid-twentieth century, university research has been an important source of economic growth in the United States. Universities – with strong financial support from the federal government – have in recent years accounted for about 51 percent of all spending on basic scientific research in the U.S.[22]

Scientific discovery, however, does not by itself drive growth. Economic growth occurs only as new knowledge is translated into new technologies, products, processes, services, businesses and jobs. In the last 30 years, universities have become more actively involved in this part of the process as well.

At the local and regional level, university research contributes to the strength of the economy in several ways:

- By attracting millions of dollars each year in external (primarily federal) research funding, most of which is spent within the local area;
- By providing a better understanding of – and helping to craft solutions to – problems of critical importance to the local community;
- By creating new knowledge in areas that are particularly relevant to local industries;
- By providing students with opportunities for hands-on learning; and
- By providing a basis for the development of new technologies, new businesses and new jobs.

This part of the report focuses on Stevens Institute of Technology's contributions to local economic growth in the first four of these areas, while Part Four focuses on the development of new businesses that are based on the results of university research.

Trends in research spending

Between fiscal year 2010 and fiscal year 2019 (as shown in Figure 12), Stevens Institute of Technology spent a total of $330.3 million on research. In fiscal year 2019, research spending at Stevens totaled nearly $32.3 million.

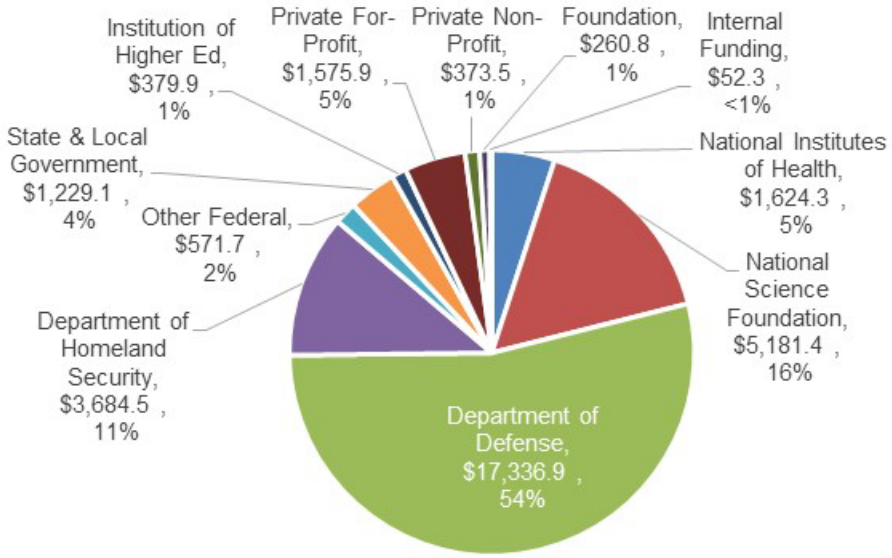
[22] The Science Coalition, *Sparking Economic Growth, Vol 3*, April 2017, p. 3.

Figure 12: Total research spending by Stevens, FY 2010 – FY 2019 (in $ millions)



As shown in Figure 13, approximately 88.0 percent (nearly $28.4 million) of all Stevens research spending in fiscal year 2019 was funded by federal agencies, including the Department of Defense, the National Science Foundation, the Department of Homeland Security and the National Institutes of Health. Research conducted for private for-profit organizations accounted for 4.9 percent (nearly $1.6 million); private non-profit, institutions of higher education and foundation funding for 3.1 percent ($1.0 million); state and local governments for 3.8 percent ($1.2 million); and internal funding for less than 1.0 percent ($52,316).

Figure 13: Stevens research expenditures by source of funding, FY 2019 (in $000s)



The Schaefer School of Engineering and Science accounted for 59.4 percent (nearly $19.2 million) of total research expenditures at Stevens in fiscal year 2019; the School of Systems and Enterprises accounted for 31.6 percent ($10.2 million); and all other divisions of the university for 9.0 percent (nearly $2.9 million).

Research that meets societal needs

Through its combination of basic and applied research, Stevens is helping to develop solutions to some of society's most pressing issues. Research at Stevens is currently organized around six "fundamental pillars":

- Artificial intelligence, machine learning and cybersecurity
- Biomedical engineering, health care and life sciences
- Complex systems and networks
- Data science and information systems
- Financial systems and technology
- Resilience and sustainability

The following are just a few recent examples of work done at Stevens in these areas.

- The ***Stevens Institute for Artificial Intelligence (SIAI)*** was launched in November 2018. More than 50 faculty members from all across the university are now involved in SIAI's work, exploring the foundations of AI and machine learning, and applications in areas such as cognitive computing, robotics, human-machine interactions and financial technology.

- Through the ***Center for Healthcare Innovation (CHI)*** 60 faculty members and other researchers are seeking to address the challenges of healthcare access, quality and cost through collaborations that bring together experts in biology, engineering, computer science and health care. Current projects include work on drug discovery and delivery systems, tissue engineering, biosensors and medical devices.

- The ***Center for Complex Systems and Enterprises*** seeks to improve the performance of large organizations and systems by providing the tools and resources needed to support evidence-based decision-making, with a particular focus on four sectors – health care, urban systems, finance and security.

- The ***Hanlon Financial Systems Center (HFSC)*** provides tools and resources Stevens researchers need to explore the multiple ways in which technology has transformed (and continues to transform) financial systems, institutions and markets.

- The ***Davidson Laboratory*** has long been a leader in exploring issues related to climate change and resilience in marine and coastal environments. The Davidson Lab's projects are designed to be "discrete, actionable and to change the status quo." Recent work includes:

    - Managing the Stevens Flood Advisory System, which integrates real-time data from multiple sources to improve localized flood forecasting during extreme weather events.

- Using drones to more accurately and efficiently monitor changes in beach topography after major storms.
- Using machine learning to better assess the vulnerabilities of Hoboken's aging storm sewers.

Student participation in university research

As noted previously, undergraduate education at Stevens is notable for its emphasis on learning through hands-on, practical experience. Along with the university's cooperative education and internship programs, participation in research projects is an integral part of the undergraduate curriculum at Stevens.

Each year, many Stevens faculty members, as well as graduate students, engage undergraduate students in their research work, accompanied either by academic credit or a stipend. Research topics range from sustainable energy, green infrastructure, and wastewater management to robotics, artificial intelligence, and quantum computing. The university also offers several courses and seminars that allow undergraduates to earn academic credit while conducting research. Stevens also offers several more formal programs that support undergraduate research. For example:

- In partnership with the Clark Foundation, the ***A. James Clark Scholars Program*** at Stevens provides financial support and enhanced academic and research opportunities to undergraduate students who are pursuing degrees in engineering, computer science or cybersecurity. Clark Scholars are provided with a $5,000 stipend for up to three summers to be used to support participation in either a faculty-guided research project or an international experience involving study, service or research abroad. Students selected for the Clark Scholars Program are traditionally underrepresented in the STEM fields, particularly engineering and receive an annual financial aid package for up to four years.
- The ***Pinnacle Scholars Program*** offers undergraduates the opportunity to undertake original, advanced research or entrepreneurial projects with a faculty member during the academic year and over the summer. Recent projects include a biorobotics surgical robotics system, smart sensors and home automation, neural tissue engineering, and ambient energy harvesting among many others. This is an "invitation-only" program for which students are selected during the admissions process.

  Pinnacle Scholars receive an annual $5,000 stipend that can be used to support participation in either a faculty-guided research project or an international experience (such as study abroad or an internship). Program participants are also awarded a scholarship toward the university's Accelerated Master's Program.
- In the ***Innovation and Entrepreneurship (I&E) Summer Research Program***, undergraduate students work with faculty mentors on research, design or business projects during a ten-week summer session. This work is often carried on throughout the student's academic career and integrated into the student's senior capstone projects (discussed below). Students are selected for the program on the basis of specific project

proposals, which are reviewed by the Research Program Committee. The projects are funded by Stevens' Office of Innovation and Entrepreneurship.

In addition to special programs such as these, most Stevens undergraduate students are required to complete a year-long ***Senior Capstone Project***, in which they get to apply what they've learned during the course of their studies to real world problems. Students works in teams of two to six on multi-disciplinary projects – many of which are sponsored or mentored by corporate partners – that range from feasibility studies to design and redesign problems. The capstone program culminates with the ***Senior Design Exposition***, a part of the annual Stevens Innovation Expo (discussed in Part Four), during which students have the opportunity to present their projects to the Stevens community, invited guests and industry sponsors.

Student inventions the public saw up close at the Stevens Annual Innovation Expo in 2019 included a solar-powered boat, a smart contact lens for monitoring glaucoma patients, a school security system capable of detecting active shootings, and an actual rocket set to launch into space. The eight-person Castle Point Rocketry team is one of several collegiate teams around the world working on projects to surpass the Karman line – an imaginary line 100 km from the Earth, considered the boundary between the planet's atmosphere and outer space.

Hands-on research experience – whether within an academic setting with a faculty member or within a business environment aimed at meeting a practical industry need – strengthens undergraduate education in several ways. It allows students to explore in greater depth topics that are of particular interest to them. It also helps them develop skills in project planning, working through unanticipated problems, time management, teamwork and written and oral communication. These lessons are of real value, regardless of whether students pursue careers that involve formal scientific or engineering research.

Part Four: Technological Innovation and Entrepreneurship at Stevens

The new knowledge derived from university research in most cases does not lead directly to economic growth. Instead it must first be translated into concepts for new products, new processes or new services, which must then be brought to market.

Technological innovation and commercialization are among the most important drivers of economic growth. A report prepared for the National Research Council in 2005 cited research showing that in the half-century following the Second World War, improvements in technology accounted for half of all growth in gross domestic product in the U.S., and about two-thirds of all growth in productivity.[23]

The translation of university research into new products, processes and services, new businesses and new jobs can occur in any of several ways:

- Through the licensing of technologies first developed in university labs to companies interested in using these technologies for commercial purposes;
- Through licenses of technologies to start-up companies (often involving university faculty or graduates) created by entrepreneurs specifically for the purpose of commercializing the results of university research; and
- Through other companies started by faculty members, staff, students and alumni that, while not based on licensed technologies, are in some way rooted in their experience at the university.

While the benefits derived from innovation and entrepreneurship at Stevens are by no means limited to the local community or the state, research has shown that start-up companies that emerge from university research labs tend to cluster disproportionately around the institutions from which they emerge. The Association of University Technology Managers reports that of 1,080 U.S. university technology start-ups launched in 2017, more than 72 percent were located in their university's home state.[24]

Strengthening the university's capacity to generate these new ventures, and providing them with the space, services and support they need to succeed, can thus be an especially effective way for Stevens to contribute to the growth and development of Hoboken's (and New Jersey's) economy.

Moreover, by creating an "ecosystem" that supports innovation and entrepreneurship within the university community, Stevens is also contributing to the development of an infrastructure that can support the growth of start-ups that emerge from the local community, and that can attract promising young companies from elsewhere.

---

[23] Committee on prospering in the Global Economy in the 21st Century, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,* National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2005, p. 205.
[24] Association of University Technology Managers, *2017 U.S. Licensing Survey.*

This part of the report examines the role that Stevens plays in the commercialization of new technologies and the development of new businesses. We focus first on the formal process of technology transfer, including the licensing for commercial use of technologies first developed at Stevens; then on the work of the Stevens Venture Center and the university's role in educating and assisting the next generation of Stevens entrepreneurs; and finally on examples of New Jersey companies founded by Stevens alumni, students, faculty and staff.

Technology transfer at Stevens

The process of translating Stevens research into new products, services and businesses has grown by several measures in recent years. Between fiscal year 2016 and fiscal year 2019 (as shown in Table 11):

- The number of invention disclosures filed by researchers at Stevens rose by 35.1 percent (from 37 to 50);
- Gross licensing income rose by 16.0 percent, to $29,000; and
- 39 new ventures were started to further develop and bring to market technologies first developed at Stevens.

Table 11: Technology transfer activity at Stevens, FY 2016 – FY 2019

	2016	2017	2018	2019
Gross licensing income	$25,000	$12,500	$3,000	$29,000
Invention disclosures	37	36	29	50
New patent applications filed	14	14	15	16
Patents issued	12	15	9	5
Licenses/options executed	–	–	–	4
Start-up companies formed	11	14	9	5

Stevens is especially noteworthy for the intensity of its technology transfer activity relative to the size of its research enterprise. Table 12 compares ratios of technology transfer activity to research spending at Stevens in fiscal year 2019 with the average ratios for 193 U.S. universities, hospitals and other research institutions surveyed by the Association of University Technology Managers (AUTM) in 2017. As the Table shows, the rate at which new knowledge is made available for commercial use is higher at Stevens (relative to its level of research spending) than is typical of other U.S. research universities. This suggests that Stevens has been particularly effective in moving the results of it research from the lab to the marketplace.

Table 12: Ratio of research spending to technology transfer at Stevens and at other U.S. universities, hospitals and other research institutions

Indicator	Stevens (FY 2019)	AUTM survey institutions (2017)
Total research spending	$32.3 million	$68.2 billion
Research spending per:		
Invention disclosure	$645,407	$2.73 million
New patent application filed	$2.02 million	$4.45 million
U.S. patent issued	$6.45 million	$9.14 million
License or option agreement executed	$8.07 million	$8.75 million
Start-up company formed	$6.45 million	$63.15 million

Source: Appleseed calculations based on AUTM data (AUTM, AUTM U.S. Licensing Activity Survey: 2017)

The pace of technology transfer at Stevens is partly a product of its specialization in engineering and applied science. But it also reflects an institutional commitment to research that addresses real-world problems, and to ensuring that the new knowledge the university produces is put to use.

Nurturing an "innovative entrepreneurship ecosystem" at Stevens

Formal technology transfer is not the only means by which the intellectual capital developed at Stevens is translated into new products and services, new businesses and new jobs. Stevens also provides services and resources to help members of the Stevens community explore the commercialization of their ideas.

Opened in 2016, the ***Stevens Venture Center (SVC)*** is among the newest additions to the university's suite of programs and services for aspiring student, faculty and alumni entrepreneurs. The SVC helps aspiring Stevens-affiliated entrepreneurs turn promising concepts and technologies into thriving businesses. In addition to providing space to work on their new ventures, the SVC offers technology support, opportunities to share best practices and experiences, access to angel investors, venture capital firms and experts in law and accounting, and education in building a successful business. Located at 221 River Street in Hoboken, the Stevens Venture Center's space includes 29 work stations, a conference room and prototyping equipment. The SVC also hosts workshops, speakers and networking events; and through its "entrepreneurs-in-residence," provides its members with advice, counseling and valuable connections. The Stevens Venture Center is currently home to 13 companies.

Educating a new generation of innovators and entrepreneurs

Along with its research and technology transfer activity, Stevens supports innovation and entrepreneurship by helping its students acquire the knowledge, skills and experience they need as entrepreneurs. Both through the university's formal curriculum and other programs and activities, Stevens offers students multiple opportunities to learn the basics of creating and growing a business, including product design, prototyping, sales, marketing, teamwork and fundraising.

- The School of Business offers an ***undergraduate business minor in entrepreneurship***, consisting of six courses that focus on areas such as the discovery and commercialization of technical business opportunities, marketing and operations, assessment and financing, and an entrepreneurial business practicum. The entrepreneurship minor is open to undergraduates majoring in business, engineering, science or arts and letters.

- The Charles V. Schaefer, Jr. School of Engineering and Science requires all freshman undergraduate engineering students to take ***Introduction to Entrepreneurial Thinking***, an interactive course aimed at creating "an entrepreneurial mindset in freshman undergraduate students," that features seminars and guest lectures with industry professionals, computer simulations of start-up companies, and case studies.

  The course is one of eight core design courses that make up the Schaefer School's "Design Spine" – a series of undergraduate courses geared towards "developing a set of competencies to meet educational goals in areas such as creative thinking, problem solving, teamwork, economics of engineering, project management, communication skills, ethics, and environmental awareness."

- In the School of Business' ***master's degree in technology management***, technical professionals with at least five years of professional experience develop skills in the effective management and use of technology in technology-intensive businesses. The two-year, part-time program combines courses in general business skills with courses geared towards the development of entrepreneurial thinking, including corporate entrepreneurship, design thinking, and managing emerging technology.

- The ***Innovation, Design and Entrepreneurship at Stevens (IDEaS)*** program provides an innovation spine within the undergraduate experience through curricular- and project-focused learning modules, and provides opportunities for students to interact with professional mentors who will guide them towards design outcomes that maximize their potential value to society.

- Established in 2019, ***iSTEM@Stevens*** is an exclusive, four-year entrepreneurship training program in which selected incoming freshman have the opportunity to design and build a fully developed product, company or nonprofit during their undergraduate studies at Stevens. Admission to the program requires student participation in iSTEM@Stevens Evaluation Day – an invitation-only event in which students who have been nominated by their high school teacher or counselor are evaluated on their ability to complete a series of technology challenges.

  The multi-year program features an "innovation spine" that was "designed to help students perform original work, file patents, build products and systems, and start and scale entire

companies." During freshman year, iSTEM@Stevens students work on a series of projects to help identify their areas of interest and cultivate a technology or business idea. Students then move onto the Lanchpad@Stevens (discussed below) portion of the curriculum, during which they learn important technical skills and begin to build their inventions. Lastly, students focus on the launch of their technology. Throughout the program, iSTEM@Stevens students receive professional mentorship and branding and marketing coaching, personal academic tutors, invitations to networking events and exclusive courses, access to labs and equipment specific to their project's needs, legal incorporation for the student's company, as well as project-related funding.

- Stevens undergraduate students have the opportunity to apply to ***Launchpad@Stevens***, a 12-month program in which students work with real-world entrepreneurs to turn their technology-based innovations into a viable business. The program features a two-semester, 6-credit course in which participants learn the steps involved in building a start-up, all while incubating a technological innovation of their own. Approximately 20 students are selected to participate in the program each year.

  Since the program was started in 2014, students who have participated in Launchpad@Stevens have created enterprises with a combined valuation of $36 million.

- A hallmark of the Stevens educational experience is the ***Innovation Expo***, an annual showcase of Stevens student senior design projects. The day-long program also features lectures from faculty and invited industry leaders and a student pitch competition (discussed below), and attracts venture capitalists, entrepreneurs, and professionals in the tech industry and beyond. In May 2019, over 140 interdisciplinary student senior design projects were presented in areas ranging from renewable energy to medical devices, from defense and security technologies to consumer products, and from mobile applications and software design to innovations in transportation and manufacturing.

  Often, student senior design projects address the real-world interests of corporate sponsors, which simultaneously provide sponsors with opportunities to explore new concepts or solutions and students with practice in developing professional skills and addressing client needs. The Innovation Expo has also become a launching pad for student start-ups. Many projects with commercial potential result in the filing of patent applications on innovations that students can continue to develop after completion of their senior capstone design course.

- When choosing their senior design projects, students are encouraged to consider projects that have potential commercial applications. Those that choose to do so have the opportunity to compete for investment funding for innovative business ideas in the ***Ansary Entrepreneurship Competition***. After two preliminary competitions, ten teams are selected out of an initial pool of more than 180 teams to compete in the final competition at the Innovation Expo. Participating teams each have three minutes to pitch their senior design projects to a panel of eight judges (made up of industry, academic and community leaders) who then evaluate the project based on the quality of the pitch and the feasibility of the proposed business product or service. In 2019, the winning entries included:

  - ***Castle Point Rocketry***, a team of eight students who designed and built a single-stage bi-propellant rocket for spaceflight, tied for first place for their pitch for a

rocket that aims to make sending experiments to space more affordable and accessible;
    - ***LifeSkills Software***, a team of five students who tied for first place for their software product for students with disabilities that uses games to teach employment and life skills that will help with the transition to real-world jobs and independent living after school; and
    - ***REDCap Reimagined***, a team of three students who won third place for their clinical trial management system that helps hospitals streamline data collection.

  The first-place winners each took home $7,500, and the third-place winner took home $2,500, for a total of $17,500 in prizes. Prizes for the competition are provided by the Cy and Jan Ansary Foundation, which in 2018 established an endowed fund to support the competition and prizes.

- Stevens' highly competitive ***Innovation and Entrepreneurship (I&E) Doctoral Fellowship*** program provides tuition and stipends for two years to Ph.D. students who aspire to become entrepreneurs, and whose research could potentially result in the development of significant technological innovations. I&E Fellows' work has in recent years covered topics as diverse as technologies for improving power grid management, early-stage detection of skin cancer, enhancing the body's ability to regenerate nerve tissue, human-robot interaction, and improving public agencies' emergency management capabilities by developing systems that allow them to monitor through social media how people in affected areas are reacting to both man-made and natural disasters.

  While pursuing their research, I&E Fellows also take courses on entrepreneurship and related topics. I&E doctoral fellowships can be extended to three or four years in selected cases where the student's research has resulted in the creation of potentially high-value intellectual property and is moving toward commercialization.

Stevens faculty, staff, student and alumni entrepreneurs

As a result of programs such as those described above, Hoboken and other nearby communities are now home to a growing number of start-up businesses founded by Stevens faculty, staff, students and alumni. The following are just a few examples:

- ***Castle Point Learning Systems***, founded in 2014 by two Stevens faculty members, provides an online learning platform called Gradarius, designed to help students master calculus. Gradarius is now widely used in the U.S.; and in 2019, the company, which is headquartered in Hoboken, opened an office in London to market its program in Europe.

- ***FinTech Studios***, founded in 2014 by a Stevens alumnus, has developed an AI-based search and analytic platform used by Wall Street firms, banks and other financial services companies. As of the end of 2019 the Manhattan-based company had attracted $6.1 million in venture capital funding.

- ***Bonbouton***, a medical technology company founded in 2015 by a Stevens alumnus, has developed a "smart insole" that can provide early detection of conditions associated with the development of diabetic foot ulcers, helping patients and clinicians avoid the need for

amputation. To date the Manhattan-based company has attracted $1.1 million in seed funding.

- ***DexterityDB*** has developed a high-speed database engine that when "plugged in" to widely-used transactional or storage databases such as MySQL or MongoDB can transform them into analytical databases. The company, which was founded in 2015, is based at the Stevens Venture Center.

- ***Noteworth***, founded in 2015 by a team of three Stevens students participating in Launchpad@Stevens, has developed an online platform used by health care providers to collect and analyze clinical data, to manage the delivery of care by multiple team members, to monitor patients remotely and to engage them more actively in management of their own care. The company, which is based in Hoboken, has to date raised $2.1 million in seed capital.

- ***Coin Complex***, started in 2018 by a team of Stevens students, has developed a cryptocurrency trading platform that supports crypto-to-crypto trading by retail investors, and provides market data as well as analytic and trading tools. The company is based at the Stevens Venture Center.

Part Five: Community Engagement at Stevens

Since the 1980s, colleges and universities throughout the United States have acknowledged the importance of being actively engaged in the life of their home communities. These institutions recognize that their effectiveness as centers for learning, research and innovation depends in part on the strength, stability and overall attractiveness of the communities in which they operate.

At the same time, both students and practitioners of urban and regional development recognize that strong, attractive neighborhoods and communities are essential to sustainable economic growth. Constructive engagement with their home communities thus helps colleges and universities fulfill their mission, and at the same time contributes to the overall health of the local economy.

Stevens' projected growth during the next decade (discussed in Part Six) should be viewed in part in terms of its impact on the university's capacity for engagement with its local community. Growth at Stevens will mean an increase in the number of students, faculty and staff engaged in community service work; increased capacity to conduct research on issues of concern to the community; and the development of new facilities that can in some cases serve both the university and the community.

This part of the report focuses on two aspects of community engagement at Stevens:

- The university's engagement in efforts to improve education in science, technology, engineering and mathematics at the elementary and secondary level, both in Hoboken and other New Jersey communities; and
- Making a variety of university resources available to the City of Hoboken, its residents and local community organizations.

Strengthening K-12 STEM education

Through the Center for Innovation in Engineering and Science Education (CIESE) and internal and other partners with the university, Stevens provides in-kind and material support to enhance and expand access to science, technology, engineering and math (STEM) education in Hoboken schools, and throughout Hudson County and the State of New Jersey. The following are just a few examples of Stevens' commitment to strengthening K-12 STEM educational experiences.

- ***Stevens ACES (Accessing Careers in Engineering and Science)*** provides full scholarships for underserved and underrepresented students from New Jersey and New York to attend Stevens' Pre-College programs, and provides financial and other support to underrepresented undergraduate students. Launched in 2017, Stevens ACES is part of the university's strategic goal of increasing the number and percentage of underrepresented minority students pursuing STEM degrees and careers. The ACES program partners with high schools in underserved communities in New Jersey and New York to recruit talented students to the Stevens Pre-College Program – a residential summer program in which high school students explore STEM degrees and experience

campus life while living at Stevens. During the summer of 2018, 26 high school students participated in Stevens ACES, including three from Hoboken High School.

- ***Center for Innovation in Engineering and Science Education (CIESE)***, a White House-recognized STEM education and research center with programs in 27 states and a dozen countries, is the principal focal point at Stevens for efforts to strengthen elementary and secondary STEM education. CIESE's work at Stevens has included a series of externally funded projects, as well as an array of services provided to local school districts on an ongoing basis. Overall, more than 250 teachers and administrators from Hoboken, and thousands of Hoboken students have directly benefited from CIESE programs over more than 30 years. Examples of recent projects include:
    - ***MI: Multimedia Immersion Inspires STEM Learning***, an NSF-supported project in which Stevens faculty and CIESE educators developed and piloted a STEM-based multimedia production course aimed at increasing the interest of girls and groups historically underrepresented in STEM fields. Hoboken Public Schools piloted this program with high school students.
    - ***PNC Engineering Adventures***, a professional development program that teaches after-school STEM curricula to educators at Boys and Girls Clubs in New Jersey. During the 2018-19 academic year, 25 educators participated in these workshops, and an estimated 750 youth from Hoboken, Hudson County and elsewhere in New Jersey benefited from this program.
    - ***PSEG Energy Camps***, week-long summer day camps in which middle school students from underserved communities gain hands-on exploration of energy topics such as harnessing renewable natural resources. During the summer of 2018, 31 middle school students attended these camps, including 10 students from Hoboken and 21 students from Union City in Hudson County.
- ***Math Circles***, launched in 2017, is an after-school program in which faculty and students from Stevens' Department of Mathematical Sciences introduce important mathematical concepts to elementary students through the use of games, stories and hands-on activities. The program is a result of collaboration between Stevens faculty members, Hoboken public school district officials and teachers from the participating schools. Since its launch, more than 80 Hoboken students in grades 3-6 have participated in the program.
- ***Hoboken High School-Stevens Scholarship*** is a full-tuition scholarship awarded each year to the top graduating senior from Hoboken High School who chooses to attend Stevens. Since 1992, over $2 million in scholarships have been awarded to nearly 50 students through this program.

In addition to these programs, a large number of recurring and ad hoc programs to benefit local K-12 students and teachers occur regularly, including Stevens' annual STEM-a-thon that engages all of Hoboken's Grade 8 students in a STEM-exploration day each spring, STEM competitions such as the annual Math Olympiad, SATMax: New Horizons for College and Careers, a practical workshop designed specifically for high school students who are planning to take or retake the PSAT or SAT, school board service by Stevens faculty and staff at local schools, fraternity tutoring programs in schools, youth summer camps, and more.

A resource for Hoboken and its residents

Stevens also serves in multiple ways as a resource for Hoboken and its residents – through community engagement and volunteer efforts by students, faculty and staff; through access to university programs and resources; and through partnerships with local organizations, businesses and government. For example:

- Each year during Freshman Orientation, the entire incoming class participates in community service projects in Hoboken during ***Freshman Day of Service***. During the 2018-19 academic year, Stevens freshman participated in community service projects with a variety of Hoboken organizations including Hoboken Grace Community Church, Hoboken Shelter, True Mentors, Hoboken Community Center and St. Matthew Trinity Lutheran Church.

- The university's athletic teams host sports clinics and tournaments for local children and youth teams, and in 2018, Stevens hosted ***Field Day*** with the Hoboken Boys and Girls Club.

- Stevens provides access to its tennis courts and swimming pool during the summer to Hoboken residents.

- Stevens provides meeting and event space and planning support for a variety of public forums and community events, such as Rebuild by Design forums, Special Improvement District (SID) meetings, graduation ceremonies for local schools, monthly NJ Tech Meetup events and TedX conferences.

- In 2018, the university launched the ***Hoboken Innovation Leadership Roundtable***, a series of meetings co-hosted by Stevens President Nariman Farvardin and Mayor Ravinder Bhalla in which local business executives "discuss ideas to enhance Hoboken's technology innovation ecosystem."

- Many undergraduate students at Stevens use their ***Senior Capstone Project*** to build products and find solutions to issues facing Hoboken and other surrounding communities. For example, at the 2019 Innovation Expo, a team of students from the School of Business worked with the Hoboken Volunteer Ambulance Corps (HVAC) to help develop a marketing strategy to help increase HVAC's number of volunteers and donations.

- Stevens hosts a variety of arts, cultural and intellectual events open to the public including the ***President's Distinguished Lecture Series***, which brings prominent thought-leaders in science and technology to campus; ***OnStage at Stevens***, a series of premier arts and cultural events, including performances by the New Jersey Symphony Orchestra; theatre, music and dance performances by Stevens performing arts students at the university's DeBaun Performing Arts Center; and talks sponsored by Stevens' Center for Science Writings, which feature prominent writers discussing science-related issues.

- Since 2014, Stevens has participated in the Hoboken Police Department's annual ***National Night Out*** in Hoboken's Church Square Park – an event to promote neighborhood safety and a community-police partnership. During the event, Stevens volunteers host STEM-related activities, athletic demonstrations by Stevens student-athletes and other family and youth-oriented activities.

- Each summer, Stevens' campus hosts the ***Hoboken Junior Police Academy***, a free camp for Hoboken children ages 12 through 15, which provides hand-on experience with the role of a police officer and helps to prepare children for future entry into the law enforcement field. Stevens also provides on-campus space for local police and fire department training exercises and recreational events.

Through these and other forms of engagement with Hoboken and other nearby communities, Stevens contributes to a "triple bottom line" – directly benefiting the community and its residents, enhancing the university's ability to fulfill its own goals, and strengthening the communal foundation on which economic growth and opportunity depend.

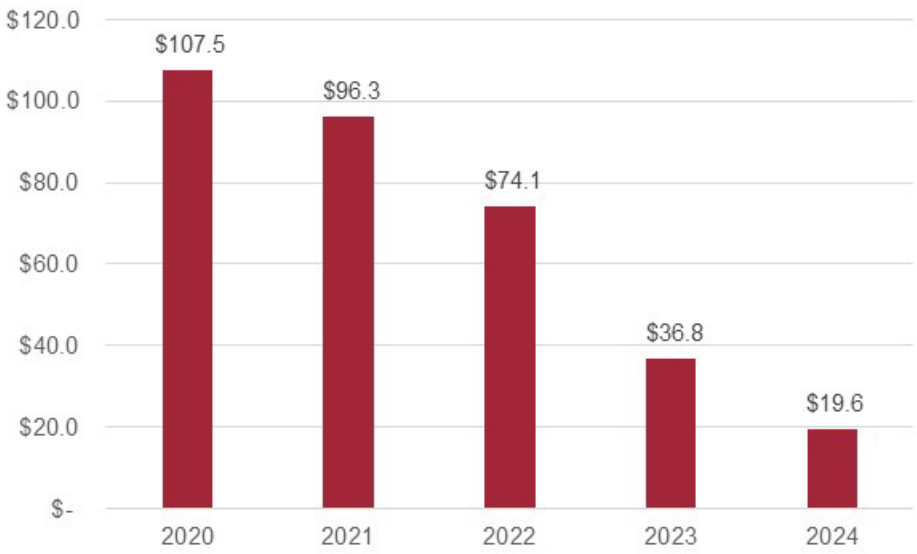
Part Six: Stevens' Growing Impact

As the report shows, Stevens Institute of Technology contributes in multiple ways to the economic vitality of the City of Hoboken, other communities in Hudson County and the State of New Jersey – as a significant enterprise in its own right, through the education of scientists, engineers and other professionals, through its research, by its support for innovation and entrepreneurship, and through engagement with Hoboken and other communities. Moreover, for the reasons discussed below, the university's impact is likely to increase during the next five years.

Investment in new facilities

As shown in Figure 14, from fiscal year 2020 through fiscal year 2024, Stevens estimates that it will spend a total of $334.3 million on construction and renovation projects – an average of approximately $66.9 million per year. This total includes construction of a new university center and two student residence towers (described in Part One), as well as renovation of existing buildings and upgrades to campus infrastructure.

Figure 14: Stevens projected construction spending, FY 2020 – FY 2024 (in $ millions)



Using IMPLAN, we estimate that this investment will directly support 457 jobs in construction and related industries in New Jersey, with earnings totaling nearly $44.3 million (in 2021 dollars). Taking into account indirect and induced effects, we estimate that this investment will directly and indirectly account for:

- 984 jobs in New Jersey, with earnings totaling more than $79.1 million (in 2021 dollars)
- Nearly $219.5 million (in 2021 dollars) in statewide economic output

Beyond the jobs and contracting opportunities this spending creates for local residents and businesses, the university's projected total investment of $480 million in campus facilities between 2015 and 2024 will enhance Stevens' ability to fulfill its mission. It will support continued growth in enrollment (discussed below), help Stevens attract the most talented students and faculty members, and provide space for new academic programs and new research initiatives.

Growth in enrollment

From the fall of 2016 through the fall of 2019, the number of undergraduate and graduate students enrolled at Stevens grew from 6,617 to 7,283 – an increase of 10 percent. By the fall of 2025, Stevens expects that undergraduate and graduate enrollment will increase to 8,645, for a cumulative increase of more than 30 percent since 2016.

In the near term, this increase in Stevens' student population will translate into increased off-campus spending, with an immediate impact on the local economy. Using IMPLAN, we estimate that in 2025, increased off-campus spending by Stevens students would directly and indirectly account for:

- 124 jobs in Hoboken, with earnings totaling $4.9 million (in 2025 dollars)
- $15.1 million (in 2025 dollars) in citywide economic output

In Hudson County (including Hoboken), we estimate that in 2025, increased off-campus spending by Stevens students would directly and indirectly account for:

- 372 jobs in Hudson County, with earnings totaling nearly $15.6 million (in 2025 dollars)
- Nearly $52.9 million (in 2025 dollars) in countywide economic output

The long-term effects of increased enrollment are likely to be even greater. More Stevens students will be available to work in co-op education jobs or as interns with companies in Hoboken or elsewhere in the region. And Stevens will be producing growing numbers of highly skilled graduates in fields such as engineering, computer science, artificial intelligence and finance – the talent that New Jersey will need to fuel the continued growth of its increasingly knowledge-based economy.

Increased support for innovation and entrepreneurship

Stevens has a long history of working to see that the results of research conducted at the university can be put to good use. During recent years the university has built on this commitment with a series of initiatives aimed at expanding the resources and opportunities available to help students develop the skills, knowledge and experience they will need to succeed as entrepreneurs. Several of these programs – such as iSTEM@Stevens and Lauchpad@Stevens – are described in Part Four.

The Stevens Venture Center (SVC), located at 221 River Street in Hoboken, has since its opening in 2016 become a hub for entrepreneurial activity, with a wide range of resources that are available to Stevens students, faculty, staff and alumni. As of the fall of 2019, SVC was home to

13 start-up companies. A new strategic plan for the SVC has recently been developed, with a focus on greater growth and impact.

Over time, these and other programs described in Part Four will have a cumulative impact, as more new businesses are launched – many of which will locate in Hoboken and other nearby communities, and many of which, with the support they receive from Stevens, will survive and thrive.

Conclusion: Building the future

As Stevens enters its sesquicentennial year in 2020, the university's impact as an economic engine – locally, statewide, and to the nation, is expected to expand and deepen. By virtue of its spending, its important role as an employer, its development of human capital, its technology innovation and commercialization efforts, and its contributions to the local community via intellectual, cultural and volunteer activities, Stevens is an important contributor to the life of the City of Hoboken, and to the continued growth and development of New Jersey's economy. Moreover, with its particular combination of strengths – in engineering and applied science, in ocean science and engineering, in finance and in emerging areas such as artificial intelligence and machine learning – and its location in the heart of the New York metropolitan area, Stevens is especially well-equipped to be a valuable partner in the city's, the state's and the region's efforts to address the challenges and seize the opportunities that the next decade will present.