

Memorandum

To: University of Delaware

From: Econsult Solutions, Inc.

Date: October 28, 2022

RE: University of Delaware – FY 2022 Economic Impact Update FINAL

1 Introduction

The University of Delaware (UD), a state-assisted, privately governed institution of higher education, is the largest university in Delaware. It is located in Newark, Delaware, with campuses in Dover, Wilmington, Lewes, and Georgetown. UD is dedicated to education, research, service, and innovation, and focused on strengthening partnerships that build on these core aspects of its mission. Through the course of fulfilling its mission, UD graduates scholars, serves its community, and develops life-changing research and innovations that produce a significant return on investment to the City of Newark and the State of Delaware.

In August 2018, Econsult Solutions, Inc. (ESI) completed an economic impact study for UD, which largely covered data from FY 2018. UD seeks updated economic impact figures, using more recent financial data (inclusive of FY 2022). Economic impacts were estimated for four distinct geographies: City of Newark, New Castle County, Delaware, and the Northeast Corridor. Tax revenue impacts were estimated for the State of Delaware government.

Overall, UD is a significant driver of economic impact for Newark, the region, the state of Delaware, and the Northeast Corridor (see Figure 1):

- UD produces a \$3.19 billion economic impact and directly or indirectly supports 26,040 jobs statewide each year.
- UD generates over \$97 million in state tax revenues every year from its direct, indirect, and induced economic impacts.
- UD has undertaken \$515 million in capital investments over the past four years.
- UD students and visitors inject an additional \$167 million a year in spending into the state.
- Alumni living and working in Delaware earn about an additional \$1.2 billion a year due to the education and credential they received from UD.

The following memorandum provides updated estimates of impacts from UD's operations, capital investments, ancillary spending, and the wage premium earned by its alumni.

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Figure 1: Economic Impact Summary on the Delaware Economy, FY 2022

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,476	\$216	\$260	\$1,236	\$3,188
Employment Supported (FTE)	16,700	1,140	2000	6,200	26,040
Earnings (\$M)	\$872	\$71	\$64	\$358	\$1,366
Tax Revenues (\$M)	\$27	\$5	\$7	\$58	\$97

Source: IMPLAN (2022), Econsult Solutions, Inc. (2022)

Figure 1a: Economic Impact Summary on the Delaware Economy, FY 2018

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,424	\$144	\$227	\$1,013	\$2,808
Employment Supported (FTE)	16,100	700	1,750	5,900	24,450
Earnings (\$M)	\$765	\$45	\$57	\$294	\$1,161
Tax Revenues (\$M)	\$25.0	\$3.4	\$6.5	\$50.7	\$85.6

Source: IMPLAN (2015), Econsult Solutions, Inc. (2018)

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2 Impact from Annual Operations

The University of Delaware's most direct and consistent contribution to the economy is through its large annual operations. The impacts from its ongoing operations originate from UD's spending on salaries and wages, goods and services, and activities that help the institution fulfill its mission to cultivate learning, develop knowledge, and foster the free exchange of ideas.

Estimated Economic Impact from Annual Operations

UD's current budget is \$895 million, up four percent from FY 2018. A majority of that operational spending takes place in its main campus in Newark, \$864 million.

Figure 2: Annual Operating Expenditures by Campus at UD, FY2022

Campus	Expenditures (\$M)
Dover	\$5
Georgetown	\$5
Lewes	\$16
Newark	\$864
Wilmington	\$5
Total	\$895

Source: University of Delaware (2022)

Figure 2a: Annual Operating Expenditures by Campus at UD, FY2018

Campus	Expenditures (\$M)
Dover	\$3
Georgetown	\$10
Lewes	\$9
Newark	\$836
Wilmington	\$7
Total	\$864

Source: University of Delaware (2018)

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These annual operating expenditures generate significant indirect and induced impacts to the city, region, and state. The impacts occur because goods and services are procured locally, salaries are spent locally and, in both cases, local businesses are supported. Based on the input-output model constructed for this analysis, the University of Delaware's FY 2022 direct expenditures generated approximately:

- \$1 billion in total output, supporting 14,150 direct, indirect and induced jobs and \$743 million in earnings within the city of Newark;
- \$1.3 billion in total output, supporting 15,650 direct, indirect and induced jobs and \$827 million in earnings within New Castle County;
- \$1.4 billion in total output, supporting 16,700 direct, indirect and induced jobs and \$872 million in earnings within the state of Delaware; and
- \$1.6 billion in total output, supporting 17,600 direct, indirect and induced jobs and \$934 million in earnings within the Northeast Corridor.

Figure 3: Annual Economic Impact of UD Operations, FY2022

Category	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$864	\$869	\$895	\$895
Indirect and Induced Output (\$M)	\$173	\$467	\$581	\$786
Total Output (\$M)	\$1,037	\$1,336	\$1,476	\$1,681
Employment (FTE)	14,150	15,650	16,700	17,600
Earnings (\$M)	\$743	\$827	\$872	\$934

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 3a: Annual Economic Impact of UD Operations, FY2018

Category	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$836	\$843	\$864	\$864
Indirect and Induced Output (\$M)	\$168	\$453	\$561	\$758
Total Output (\$M)	\$1,004	\$1,295	\$1,424	\$1,622
Employment (FTE)	13,700	15,200	16,100	17,000
Earnings (\$M)	\$645	\$727	\$765	\$825

Source: IMPLAN (2015), Econsult Solutions (2018)

The annual economic impact from the operations of each campus to the state of Delaware is:

- Dover: \$8 million in total output, supporting 55 jobs and \$5 million in employee compensation.
- Georgetown: \$8 million in total outputting, supporting 150 jobs and \$5 million in employee compensation.
- Lewes: \$26 million in total output, supporting 190 jobs and \$16 million in employee compensation.

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- Newark: \$1.4 billion in total output, supporting 16,175 jobs and \$842 million in employee compensation.
- Wilmington: \$8 million in total output, supporting 130 jobs and \$5 million in employee compensation.

Figure 4: Annual Economic Impact of UD Operations by Campus to the State of Delaware, FY2022

Category	Dover	Georgetown	Lewes	Newark	Wilmington
Direct Output (\$M)	\$5	\$5	\$16	\$864	\$5
Indirect and Induced Output (\$M)	\$3	\$3	\$10	\$561	\$3
Total Output (\$M)	\$8	\$8	\$26	\$1,425	\$8
Employment (FTE)	55	150	190	16,175	130
Earnings (\$M)	\$5	\$5	\$16	\$842	\$5

Source: IMPLAN (2015), Econsult Solutions (2018)

Annual Tax Revenue Impact from Annual Operations

Although UD is itself a tax-exempt institution, the economic impact of its operations creates significant amounts of tax revenue for the state government annually. The State of Delaware does not levy sales taxes, so UD's impact was analyzed only for income tax and business tax at the state level. Annually, UD generates (see Figure 5):

- \$15.7 million in total income tax revenue for the State of Delaware; and
- \$11.1 million in business tax revenue.

Figure 5: Annual Tax Revenue Impact from UD Operations (\$M), FY2022

Tax Type	State of Delaware
Personal Income Taxes	\$15.7
Business Taxes	\$11.1
Total	\$26.8

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 5a: Annual Tax Revenue Impact from UD Operations (\$M), FY2018

Tax Type	State of Delaware
Personal Income Taxes	\$14.3
Business Taxes	\$10.7
Total	\$25.0

Source: IMPLAN (2015), Econsult Solutions (2018)

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3 Impact from Capital Investments

In addition to its annual operations, UD undertakes significant capital investments each year, including new buildings, major renovations, and maintenance projects. These investments support jobs, create demand for goods and services, and generate statewide tax revenues. Importantly, these investments also help to create a more vibrant community for UD students, employees, and residents to enjoy.

Annual Capital Investments

Over the last four years, UD has spent \$515 million on new construction, new equipment and technology, major renovation, and capital maintenance, which equates to \$129 million each year. It is typical for construction spending to be uneven over time. In order to account for fluctuation in spending, the direct capital investments that made since 2019 have been annualized.

Figure 6: Annual Capital Investments Made by UD by Year, FY2022

Fiscal Year	Capital Investments
2019	\$92
2020	\$178
2021	\$172
2022	\$73
Four-Year Aggregate	\$515
Annual Average	\$129

Source: University of Delaware (2022)

Figure 6a: Annual Capital Investments Made by UD by Year, FY2018

Fiscal Year	Capital Investments
2015	\$106
2016	\$95
2017	\$78
2018	\$89
Four-Year Aggregate	\$368
Annual Average	\$92

Source: University of Delaware (2018)

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Estimated Economic Impact from Annual Capital Investments

UD’s capital spending has created a temporary economic impact on the local economy as UD hired local contractors and vendors. These expenditures have touched a wide base of wholesalers, manufacturers, and professional service providers in addition to construction companies within the state. Each year, UD’s investments have generated approximately (see Figure 7):

- \$159 million in total output, supporting 750 direct, indirect and induced jobs with \$50 million in earnings within the city of Newark;
- \$206 million in total output, supporting 950 direct, indirect and induced jobs with \$65 million in earnings within New Castle County;
- \$216 million in total output, supporting 1,140 direct, indirect and induced jobs with \$71 million in earnings within the state of Delaware;
- \$246 million in total output, supporting 1,170 direct, indirect and induced jobs with \$98 million in earnings within the Northeast Corridor.

Figure 7: Annual Economic Impact of UD’s Capital Investments, FY2022

Economic Impact	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$128	\$129	\$129	\$129
Indirect and Induced Output (\$M)	\$31	\$77	\$87	\$117
Total Output	\$159	\$206	\$216	\$246
Employment (FTE)	750	950	1,140	1,170
Earnings (\$M)	\$50	\$65	\$71	\$98

Source: IMPLAN (2015), Econsult Solutions (2022)

Figure 7a: Annual Economic Impact of UD’s Capital Investments, FY2018

Economic Impact	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$67	\$80	\$90	\$90
Indirect and Induced Output (\$M)	\$16	\$47	\$54	\$72
Total Output	\$83	\$127	\$144	\$162
Employment (FTE)	390	600	700	720
Earnings (\$M)	\$26	\$40	\$45	\$60

Source: IMPLAN (2015), Econsult Solutions (2022)

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Annual Tax Revenue Impact from Capital Investments

The economic impact of these capital investments results in additional tax revenue generation for the State of Delaware. This spending generates approximately (see Figure 8):

- \$5.5 million in total tax revenue, including \$1.7 million in income tax revenue and \$3.7 million in business tax revenue for the State of Delaware.

Figure 8: Annual Tax Revenue Impact from UD Capital Investments (\$M), FY2022

Tax Type	State of Delaware
Income Tax	\$1.7
Business Tax	\$3.7
Total Tax Revenue	\$5.5

Source: Econsult Solutions (2022)

Figure 8a: Annual Tax Revenue Impact from UD Capital Investments (\$M), FY2018

Tax Type	State of Delaware
Income Tax	\$1.1
Business Tax	\$2.3
Total Tax Revenue	\$3.4

Source: Econsult Solutions (2018)

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4 Impact from Student and Visitor Spending

Over and above spending on operating activities and capital investments, UD draws out-of-town spending into the city of Newark and region from students and visitors that would likely not occur without the school's presence. A large category of spending is UD visitors, whose spending on lodging, food, and retail stimulates the local, regional, and statewide economy. Another large share of ancillary spend is generated by University of Delaware students, who primarily spend money in a variety of categories during their academic careers.

Estimated Direct Student and Visitor Spending

Students represent a large category of ancillary spending due to their volume and time spent in Newark. While student spending on tuition, on-campus living, and cafeteria food is already reflected in UD's operating budget, student spending on off-campus food and entertainment, transportation, and personal supplies represent injections of purchasing power into the regional economy. Using information from UD as well as national data on projected total costs for students, ESI has developed updated ancillary spending profiles for its 23,996 on-campus, off-campus, and commuter students. The total annual ancillary spending by students is over \$100 million, although not all of that spending takes place within the local geographies.

The University of Delaware also attracts about 775,000 visitors to Newark each year who bring spending into the region. But the largest category of visitors comes from visitors who attend regional and local events hosted by UD. Like students, these visitors come from all over the region and, therefore, their spending can be considered new to the city, region and state. Such visitors spend a significant amount within the local economy each year, which helps support employment and generate tax revenues for the city and state. In total, it is estimated that visitors to UD spend about \$238 million each year within the state economy.

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Figure 9: Ancillary Spending by UD Students and Visitors by Geography, FY2022

Type	Students or Visitors	Spending within the City of Newark(\$M)	Spending with New Castle County (\$M)	Spending within the State of Delaware (\$M)	Spending within the Northeast Corridor (\$M)
Students	23,996	\$104.1	\$169.6	\$180.0	\$186.1
Visitors	750,900	\$48.9	\$56.8	\$57.9	\$58.7
Total	774,896	\$153.0	\$226.4	\$238.0	\$244.9
<i>Minus Non-Modeled Amount</i>	-	\$45.9	\$67.9	\$71.4	\$73.5
Modeled Amount	-	\$107.1	\$158.5	\$166.6	\$171.4

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 9a: Ancillary Spending by UD Students and Visitors by Geography, FY2018

Type	Students or Visitors	Spending within the City of Newark(\$M)	Spending with New Castle County (\$M)	Spending within the State of Delaware (\$M)	Spending within the Northeast Corridor (\$M)
Students	23,774	\$90.9	\$151.2	\$160.0	\$165.1
Visitors	748,830	\$39.9	\$46.5	\$47.5	\$48.2
Total	770,787	\$130.8	\$197.7	\$207.5	\$213.3
<i>Minus Non-Modeled Amount</i>	-	\$39.6	\$59.9	\$61.9	\$62.9
Modeled Amount	-	\$91.2	\$137.8	\$145.6	\$150.4

Source: IMPLAN (2015), Econsult Solutions (2018)

While this \$238 million in total student and visitor spending takes place outside of UD, not all of it occurs within the geographies of interest (city, county, state, and region). Some of it will occur outside of the select geographies. For instance, a significant amount of retail purchases take place online and similarly a portion of the transportation costs accrue elsewhere. Accounting for these adjustments, it is estimated that UD students and visitors represent about \$167 million in spending within the state of Delaware each year.

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Estimated Economic Impact of Ancillary Spending

Student and visitor spending at UD are estimated to generate (see Figure 10):

- \$114 million in total output, supporting 950 direct, indirect and induced jobs and \$41 million in earnings within the city of Newark;
- \$245 million in total output, supporting 1,850 direct, indirect and induced jobs and \$60 million in earnings within New Castle County;
- \$260 million in total output, supporting 2,000 direct, indirect and induced jobs and \$64 million in earnings within the state of Delaware; and
- \$287 million in total output, supporting 2,050 direct, indirect and induced jobs and \$84 million in earnings within the Northeast Corridor

Figure 10: Annual Economic Impact of UD Student and Visitor Spending, FY2022

Economic Impact	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$107	\$158	\$167	\$171
Indirect and Induced Output (\$M)	\$7	\$87	\$93	\$115
Total Output (\$M)	\$114	\$245	\$260	\$287
Employment (FTE)	950	1,850	2,000	2,050
Earnings (\$M)	\$41	\$60	\$64	\$84

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 10a: Annual Economic Impact of UD Student and Visitor Spending, FY2018

Economic Impact	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Output (\$M)	\$91	\$138	\$146	\$150
Indirect and Induced Output (\$M)	\$6	\$75	\$81	\$102
Total Output (\$M)	\$97	\$213	\$227	\$252
Employment (FTE)	800	1,600	1,750	1,800
Earnings (\$M)	\$35	\$53	\$57	\$74

Source: IMPLAN (2015), Econsult Solutions (2018)

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The economic impact of this ancillary spending results in additional tax revenue generation for the State of Delaware. This spending generates approximately:

- \$7.3 million in total tax revenue, including \$1.6 million in income tax revenue, \$5.2 in business tax revenue, and \$500,000 in hotel tax revenue for the State of Delaware.

Figure 11: Annual Tax Revenue Impact from UD Student and Visitor Spending (\$M), FY2022

Tax Type	State of Delaware
Income Tax	\$1.6
Business Tax	\$5.2
Hotel Tax	\$0.5
Total Tax Revenue	\$7.3

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 11a: Annual Tax Revenue Impact from UD Student and Visitor Spending (\$M), FY2018

Tax Type	State of Delaware
Income Tax	\$1.4
Business Tax	\$4.6
Hotel Tax	\$0.5
Total Tax Revenue	\$6.5

Source: IMPLAN (2015), Econsult Solutions (2018)

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5 Impact from Alumni Wage Premium

The link between educational attainment and earnings power is well-established. A wage premium associated with additional education is often conceptualized and calculated from the perspective of the student, who can compare the costs associated with various educational (or non-educational) options with the expected return. The following analysis utilizes this same framework to estimate the gain not to the student, but rather to the city, state, and regional economies. Additional earnings attributable to UD within these geographies are estimated, and translated into additional spending power within the local economy, which supports local employment and earnings.

Beyond the educational experience attending UD, alumni are able to earn more than they would otherwise earn but for that credential. While the University of Delaware has nearly 200,000 alumni who now live all around the world, many have stayed in the City of Newark, in New Castle County, in the State of Delaware, or in the Northeast Corridor where their higher earning potential infuses more spending into the regional economy. This is another important way UD strengthens the local, state, and regional economy.

UD Alumni Living and Working in the Area

In 2022, University of Delaware had approximately 122,000 alumni in the Northeast Corridor, with about 40 percent of alumni living in Delaware (see Figure 12). The additional earnings UD alumni enjoy because of the education and credential they received at UD is of direct and consequential impact to the local economy. The wage premium experienced by UD alumni produces a spillover impact to the local economies they participate in. This is due in part to the ability alumni have to contribute to those economies at higher level, due to their credentials, and partly because alumni have more disposable income to spend within those economies.

Figure 12: University of Delaware Alumni by Location

	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Alumni with Associate's degree	200	1,830	2,340	5,410
Alumni with Bachelor's degree	3,330	30,620	39,200	90,450
Alumni with Advanced Degree	1,000	9,190	11,760	27,130
Est. Total Working Alumni	4,530	41,640	53,300	122,990

Source: University of Delaware (2022)

Of those living within the respective geographies, it is assumed that approximately 72 percent are employed (as opposed to retired, unemployed, or otherwise out of the workforce).¹ Applying this proportion evenly across geographies, it is estimated that approximately 3,240 are currently employed

¹ This assumption is based on the employment to population ratio reported by the U.S. Bureau of Labor Statistics for adults 25 or older with a college degree, which is 71.6 percent as of June 2022.

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within Newark, 29,840 within New Castle County, 38,140 within Delaware, and 88,040 within the Northeast Corridor.

Figure 13: Estimated Employed UD Alumni by Location

	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Working Alumni with Associate's degree	140	1,340	1,740	3,940
Working Alumni with Bachelor's degree	2,400	21,900	28,000	64,700
Working Alumni with Advanced Degree	700	6,600	8,400	19,400
Est. Total Working Alumni	3,240	29,840	38,140	88,040

Source: University of Delaware (2022), Bureau of Labor Statistics (2022), Econsult Solutions, Inc. (2022)

Direct Wage Premium

Next, it is necessary to estimate the impact of this educational attainment of annual earnings for the UD alumni estimated to be within the workforce.

Median earnings by educational level in Delaware can be derived from the American Community Survey, which illustrates the progression in median income by highest level of educational attainment from approximately \$56,603 for a bachelor’s degree holder to approximately \$70,576 for an advanced degree holder. However, the calculation must account for potential differences in earnings between UD degree holders and the average degree holder in Delaware. To do so, longitudinal data from the Federal Department of Education for UD is compared to private non-profit four-year institutions in Delaware. This data source, part of the “College Scorecard” released publicly by the Department of Education, reports earnings by institution based on unique ranking of tax filings of students who applied for student loans ten years after they enter school.²

The average of the median ten-year earnings of UD graduates is \$67,298 or 125.9 percent of the median ten-year earnings for all private non-profit four-year institutions of \$53,443. Therefore, within this analysis, median earnings for UD graduates at the educational attainment level of bachelor's degree holders are scaled to 125.9 percent of median Delaware-wide earnings for that degree level. Accordingly, the premium observed for UD associates degree holders is \$47,912, for bachelor degree holders is \$71,277, and for advanced holders is \$88,873 (Figure 14).

² This comparison is a proxy for earnings differentials between alumni of UD and non-UD alumni. Notably, it tracks only those students who applied for federal loans, it includes earnings for graduates and non-graduates, and it tracks earnings only at a single point in time (10 years after graduation) rather than throughout a career cycle. However, it is a federal data source that is comprehensive in its coverage of institutions, and its basis in IRS records is far sounder than data sources based on self-reported data. Further this analysis does not use this source to define median earnings (which would be problematic due to the caveats listed above) but rather to estimate the proportional differences between UD and non-UD alumni. Since data weaknesses apply to both groups, the comparison is “apples to apples” and represents a reasonable proxy for this purpose.

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Figure 14: Estimated Earnings by Educational Attainment

Highest Education Level	Delaware Median Earnings	UD Estimated Premium	UD Rescaled Earnings
Associate's Degree	\$38,048	125.9%	\$47,912
Bachelor's Degree	\$56,603	125.9%	\$71,277
Advanced Degree	\$70,576	125.9%	\$88,873

Source: University of Delaware (2022), Bureau of Labor Statistics (2022), Econsult Solutions, Inc. (2022)

In keeping with the “gross impact” modeling approach utilized throughout this report, this analysis assumes that the overall level of employment within each geography of interest is fixed with or without the presence of UD. The impact accruing to the economy is therefore not the full salary earned by UD alumni, but the incremental portion of that salary attributable to a) the level of their degree and b) the “value-add” for that degree level conferred by UD. This approach in effect assumes that the absence of UD would result in a substantial loss in the educational attainment level, and accordingly the productivity, of the regional workforce. In order to absorb this loss (while maintaining a fixed employment level) jobs held by UD alumni are assumed to “filter down” to workers with a lower education level, with jobs held by alumni with bachelor’s degrees absorbed by workers with associate’s degrees, and jobs held by alumni with advanced degrees absorbed by workers with bachelor’s degrees.³

This framework is implemented by comparing estimated earnings for UD graduates by degree level to average earnings for workers of one lower degree level. Estimated earnings for UD bachelor’s degree holders in Delaware are therefore compared to associate’s degree earnings in Delaware to calculate a wage premium for a UD bachelor’s degree. Likewise, estimated earnings for UD associate degree holders are compared to a High School/GED holder and advanced degree holders are compared to a bachelor’s degree earnings to calculate a wage premium.

Based on a combination of federal data sources, the average annual lifetime wage premium attributable to the increased educational attainment for UD alumni is estimated to be +\$14,200 for an associate’s degree over a high school diploma, +\$33,200 for a bachelor’s degree over an associate’s degree, and an additional +\$32,300 for advanced degree over a bachelor’s degree (see Figure 15).

³ Note that this calculation is from the perspective of the national economy, not from the perspective of any individual alumnus. Absent UD, it is likely that the majority of UD alumni would have attained the same level of degree from an alternate institution. However, in doing so, they would have replaced a different student currently at that institution. Ultimately, given a fixed supply of alternative institutions, the reduction of educational attainment applies to the economy (and society) broadly, rather than for any particular student.

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Figure 15: Estimated UD Wage Premium by Educational Attainment

Category	Degree Level	Premium by Degree Level
<i>UD Associate's Degree</i>		
Without UD - Earnings	HS Diploma/GED	\$33,671
With UD - Earnings (rescaled)	Associate's	\$47,912
Wage Premium - Associate's		\$14,200
<i>UD Bachelor's Degree</i>		
Without UD - Earnings	Associate's	\$38,048
With UD - Earnings (rescaled)	Bachelor's	\$71,277
Wage Premium -Bachelor's		\$33,200
<i>UD Advanced Degree</i>		
Without UD - Earnings	Bachelor's	\$56,603
With UD - Earnings (rescaled)	Advanced	\$88,873
Wage Premium -Advanced		\$32,300

Source: University of Delaware (2022), Econsult Solutions, Inc. (2022), American Community Survey Five-Year Estimates (2020), College Scorecard Data (2022)

Aggregate Wage Premium

The aggregate alumni earnings impact from the alumni wage premium in each geography can be derived by combining the estimated volume of alumni in the workforce in each geography with the estimated per alumni premiums. Calculations are undertaken first for alumni in Newark, and then are applied in sequence for each larger geography. These results are then summed to represent the total impact in the larger geography (see Figure 16).

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Figure 16: Regionally Inclusive Aggregate Wage Premium

Degree Level	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Associate's Degree				
Volume of Working Alumni	140	1,340	1,740	3,940
Wage Premium	\$14,200	\$14,200	\$14,200	\$14,200
Total Working Alumni (\$M)	\$2	\$19	\$24	\$55
Bachelor's Degree				
Volume of Working Alumni	2,400	21,900	28,000	64,700
Wage Premium	\$33,200	\$33,200	\$33,200	\$33,200
Total Working Alumni (\$M)	\$79	\$728	\$933	\$2,152
Advanced Degree				
Volume of Working Alumni	700	6,600	8,400	19,400
Wage Premium	\$32,300	\$32,300	\$32,300	\$32,300
Total Working Alumni (\$M)	\$23	\$212	\$272	\$627
Grand Total - Regionally Inclusive (\$M)	\$104	\$959	\$1,228	\$2,834

Source: University of Delaware (2022), Econsult Solutions, Inc. (2022), American Community Survey Five-Year Estimates (2020), College Scorecard Data (2022)

The approximately 88,000 UD alumni living and working in the Northeast Corridor make an additional \$2.8 billion a year as a result of the education and credential received at UD. This represents the higher contribution they make in their occupations, which strengthens the respective local and state economies in key industries. It also makes possible more spending back into these economies, supporting local establishments and local employment.

The following figures summarize the wage premiums by the respective geographies and the results are compared to the study conducted by ESI in 2018.

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Figure 17: Regionally Inclusive Aggregate Annual Wage Premium Associated with UD Alumni in the Workforce (\$M), FY2022

Degree Level	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Associate's	\$2	\$19	\$24	\$55
Bachelor's	\$79	\$728	\$933	\$2,152
Advanced	\$23	\$212	\$272	\$627
Total Wage Premium	\$104	\$959	\$1,228	\$2,834

Source: Econsult Solutions (2022)

Figure 17a: Regionally Inclusive Aggregate Annual Wage Premium Associated with UD Alumni in the Workforce (\$M), FY2018

Degree Level	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Associate's	\$2	\$23	\$29	\$66
Bachelor's	\$60	\$563	\$710	\$1,637
Advanced	\$22	\$212	\$268	\$618
Total Wage Premium	\$85	\$798	\$1,228	\$2,324

Source: Econsult Solutions (2018)

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Estimated Economic Impact from Wage Premium

While the additional earnings by University of Delaware alumni within the local workforce are highly consequential to those households, their impact on economic activity throughout the city, state, and region occurs when it is re-circulated within the economy.

This additional household income represents higher household spending which ripples through these economies, supporting local merchants, local jobs, and the local tax base. Accounting for savings rates, tax withholdings, and spending outside of the city, state and region, not all of this additional household income circulates locally. However, that income which does have a multiplier effect and supports a wide range of jobs.

Each year, the estimated increase in earnings generates significant economic impacts (see Figure 18):

- \$119 million in total output, supporting 540 direct, indirect and induced jobs and \$37 million in earnings within the city of Newark;
- \$1 billion in total output, supporting 5,000 direct, indirect and induced jobs and \$338 million in earnings within New Castle County;
- \$1.2 billion in total output, supporting 6,200 direct, indirect and induced jobs and \$358 million in earnings within the state of Delaware; and
- \$3.2 billion in total output, supporting 14,500 direct, indirect and induced jobs and \$1 billion in earnings.

Figure 18: Annual Economic Impact from Wage Premium Produced by UD, FY2022

Impact Type	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Wage Premium (\$M)	\$104	\$959	\$1,228	\$2,834
Total Impact (\$M)	\$119	\$1,093	\$1,236	\$3,229
Employment Supported (FTE)	540	5,000	6,200	14,500
Earnings (\$M)	\$37	\$338	\$358	\$1,056

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 18a: Annual Economic Impact from Wage Premium Produced by UD, FY2018

Impact Type	City of Newark	New Castle County	State of Delaware	Northeast Corridor
Direct Wage Premium (\$M)	\$85	\$798	\$1,007	\$2,324
Total Impact (\$M)	\$89	\$834	\$1,013	\$2,648
Employment Supported (FTE)	500	4,800	5,900	13,800
Earnings (\$M)	\$26	\$246	\$294	\$866

Source: IMPLAN (2015), Econsult Solutions (2018)

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Tax Revenue Impact Attributable to Wage Premium Effects

Wage premiums attributable to degrees conferred by UD generate additional tax revenues for the state of Delaware. In particular, this activity translates into increased income tax revenue (due to increased earnings) and increased sales and business tax revenue (due to increased household spending). In aggregate, the economic activity attributable to wage premium effects generates an estimated \$57.7 million in tax revenues within the State of Delaware on an annual basis.

Figure 19: Estimated Annual Tax Revenue Impact from University of Delaware Aggregate Wage Premium to the State of Delaware Government (\$M), FY2022

Tax Type	State of Delaware
Personal Income Taxes	\$38.4
Business Taxes	\$19.3
Total	\$57.7

Source: IMPLAN (2022), Econsult Solutions (2022)

Figure 19a: Estimated Annual Tax Revenue Impact from University of Delaware Aggregate Wage Premium to the State of Delaware Government (\$M), FY2018

Tax Type	State of Delaware
Personal Income Taxes	\$31.5
Business Taxes	\$19.2
Total	\$50.7

Source: IMPLAN (2022), Econsult Solutions (2022)

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6 Aggregate Annual Economic Impact

University of Delaware contributes significantly to the regional and state economies through its operations, capital investments, ancillary spending by students and visitors, and the wage premium of UD alumni living and working in the region. It is estimated that UD produces \$3.19 billion in economic impact to the state economy and supports about 26,040 jobs statewide. The economic impact also contributes greatly to the state tax bases, generating a total of \$97 million in tax revenues for the State of Delaware.

While UD exists for educational purposes, fulfilling its mission also produces large and meaningful economic gains. Its investments circulate throughout the economy, spurring additional economic activity and generating considerable tax revenue for local and state governments. In total, UD produces an aggregate economic impact of:

- \$1.4 billion in total output, supporting a total of 16,390 direct, indirect and induced jobs and \$870 million in earnings within the city of Newark;
- \$2.8 billion in total output, supporting a total of 23,450 direct, indirect and induced jobs and \$1.2 billion in earnings within New Castle County;
- \$3.1 billion in total output, supporting a total of 26,040 direct, indirect, and induced jobs, and \$1.3 billion in earnings within the state of Delaware; and
- \$5.4 billion in total output, supporting a total of 35,320 direct, indirect, and induced jobs and \$2.1 billion in earnings within the Northeast Corridor.

Figure 20: Aggregate Annual Economic Impact of UD on the Newark Economy, FY2022

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,037	\$159	\$114	\$119	\$1,428
Employment Supported (FTE)	14,150	750	950	540	16,390
Earnings (\$M)	\$743	\$50	\$41	\$28	\$870

Figure 20a: Aggregate Annual Economic Impact of UD on the Newark Economy, FY2018

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,004	\$83	\$97	\$89	\$1,273
Employment Supported (FTE)	13,700	390	800	500	15,390
Earnings (\$M)	\$645	\$26	\$35	\$26	\$733

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Figure 21: Aggregate Annual Economic Impact of UD on the New Castle County Economy, FY2022

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,336	\$206	\$245	\$1,093	\$2,880
Employment Supported (FTE)	15,650	950	1,850	5,000	23,450
Earnings (\$M)	\$827	\$65	\$60	\$338	\$1,289

Figure 21a: Aggregate Annual Economic Impact of UD on the New Castle County Economy, FY2018

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,295	\$127	\$213	\$834	\$2,469
Employment Supported (FTE)	15,200	600	1,600	4,800	22,200
Earnings (\$M)	\$727	\$40	\$53	\$246	\$1,066

Figure 22: Aggregate Annual Economic Impact of UD on the Delaware Economy, FY2022

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,476	\$216	\$260	\$1,236	\$3,188
Employment Supported (FTE)	16,700	1,140	2,000	6,200	26,040
Earnings (\$M)	\$872	\$71	\$64	\$358	\$1,366
Tax Revenues (\$M)	\$27	\$5	\$7	\$58	\$97

Figure 22a: Aggregate Annual Economic Impact of UD on the Delaware Economy, FY2018

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,424	\$144	\$227	\$1,013	\$2,808
Employment Supported (FTE)	16,100	700	1,750	5,900	24,450
Earnings (\$M)	\$765	\$45	\$57	\$294	\$1,161
Tax Revenues (\$M)	\$25.0	\$3.4	\$6.5	\$50.7	\$85.6

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Figure 23: Aggregate Annual Economic Impact of UD on the Northeast Corridor Economy, FY2022

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,681	\$246	\$287	\$3,229	\$5,443
Employment Supported (FTE)	17,600	1,170	2050	14,500	35,320
Earnings (\$M)	\$934	\$98	\$84	\$814	\$2,172

Figure 23a: Aggregate Annual Economic Impact of UD on the Northeast Corridor Economy, FY2018

Impact Type	Operations	Capital Investments	Student/Visitor Spending	Alumni Wage Premium	Total
Output (\$M)	\$1,622	\$162	\$252	\$2,648	\$4,684
Employment Supported (FTE)	17,000	720	1,800	13,800	33,320
Earnings (\$M)	\$825	\$60	\$74	\$866	\$1,825

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7 Appendix

7.1 Input-Output Modeling

In an inter-connected economy, every dollar spent generates two spillover impacts:

- First, some amount of the proportion of that expenditure that goes to the purchase of goods and services gets circulated back into an economy when those goods and services are purchased from local vendors. This represents what is called the “**indirect effect**,” and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.
- Second, some amount of the proportion of that expenditure that goes to labor income gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This represents what is called the “**induced effect**,” and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating a local economy.

To model the impacts resulting from the direct expenditures ESI developed a customized economic impact model using the IMPLAN input/output modeling system. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the creation of new businesses, and public policy changes within a county or its surrounding area.

IMPLAN has developed a social accounting matrix (SAM) that accounts for the flow of commodities through economics. From this matrix, IMPLAN also determines the regional purchase coefficient (RPC), the proportion of local supply that satisfies local demand. These values not only establish the types of goods and services supported by an industry or institution, but also the level in which they are acquired locally. This assessment determines the multiplier basis for the local and regional models created in the IMPLAN modeling system. IMPLAN takes the multipliers and divides them into 546 industry categories in accordance with the North American Industrial Classification System (NAICS) codes.

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7.2 Glossary of Terms for Input-Output Models

Multiplier Effect – the notion that initial outlays have a ripple effect on a local economy, to the extent that direct output lead to indirect and induced output.

Economic Impacts – total expenditures, employment, and labor income generated.

Fiscal Impacts – local and/or state tax revenues generated.

Direct Output– initial outlays usually associated with the project or activity being modeled; examples: one-time upfront construction and related expenditures associated with a new or renovated facility, annual expenditures associated with ongoing facility maintenance and/or operating activity.

Direct Employment – the number of annual jobs associated with direct output (including full and part-time employment)

Direct Labor income– the salaries and wages earned by employees, contractors, and proprietors as part of the direct output.

Indirect Output– indirect and induced outlays resulting from the direct output; examples: vendors increasing production to meet new demand associated with the direct output, workers spending direct labor income on various purchases within the local economy.

Indirect/Induced Employment – the number of annual jobs associated with indirect/induced output (including full and part-time employment)

Indirect Labor income– the salaries and wages earned by employees, contractors, and proprietors as part of the indirect output.

Total Output– the sum total of direct output and indirect output.

Total Employment – the sum total of direct employment and indirect employment.

Total Labor income– the sum total of direct labor income and indirect labor income.

7.3 Fiscal Impact Modeling

IMPLAN only provides a rough estimate of the combined fiscal impact of increased economic activity on state and local governments. Consequently, ESI has constructed a model that takes the output from the IMPLAN model and generates detailed estimates of the increases in state and local tax collections that arise from the new project. Those revenues are in fact a part of the total economic impact of a new project that is often ignored in conventional economic impact analyses.

The ESI fiscal impact model combines IMPLAN outputs with the relevant tax types and tax bases associated with the jurisdiction or jurisdictions for which fiscal impact is being modeled. Specifically, the estimated labor income supported by the direct, indirect, and induced expenditures generated by the model are used to apportion the net increase in the relevant tax bases and therefore in those tax revenue categories. The resulting estimates represent the projected tax revenue gains to the jurisdiction

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or jurisdictions as a result of the increased business activity and its attendant indirect and induced effects.

7.4 Explanation of Multipliers

The use and application of multipliers are fairly intuitive. Multipliers, in their most basic form, are the result of an algebraic analysis expressing how two inputs are interconnected in the production of an output. The result of the equation generates a multiplier that is broken down into direct, indirect, and induced effects. In a generalized example: if the multiplier for good “X” to good “Y” is 3, then the direct effect of good “X” on “Y” is 1, with indirect and induced effects of 2. Essentially, every unit of good “X” supports 2 units of good “Y”.

When implemented on a large complex scale, such as that of the US economy or any subsection of it, multiplier effects across industries can be complicated. However, the same general concept comes into play. Each industry has largely different and varied inputs into other industries. The quantity of the output is largely decided by the scale and efficiency of the industries involved. As a result, the sum of those inputs equates to an output product plus a value added/component. By arranging these inputs and outputs by industry in a matrix and performing some algebra to find the Leontief inverse matrix, each industry’s effect on final demand can be estimated. Additionally, the direct, indirect, and induced effects can also be determined. Direct effects include direct purchases for production, indirect effects include expenses during production, and induced effects concern the expenditures of employees directly involved with production. Using building construction as an example, the direct effects would include materials, brick, steel, and mortar, the indirect effects would involve the steel fabrication and concrete mixing, and the induced effects would consider purchases by construction workers using their wages. While impacts vary in size, each industry has rippling effects throughout the economy. By using an input-output model, these effects can be more accurately quantified and explained.

IMPLAN is one of several popular choices for regional input-output modeling. Each system has its own nuances in establishing proper location coefficients. IMPLAN uses a location quotient to determine its regional purchase coefficient (RPC). This represents the proportion of demand for a good that is filled locally; this assessment helps determine the multiplier for the localized region. Additionally, IMPLAN also accounts for inter-institutional transfers (e.g. firms to households, households to the government, etc.) through its social account matrix (SAM) multipliers. IMPLAN takes the multipliers and divides them into industry categories in accordance with the North American Industrial Classification System (NAICS) codes, allowing a comprehensive breakdown of a region’s multipliers by industry to be shown.

Despite the usefulness of input-output modeling, there are some shortcomings to the system. Notably, input-output models ignore economies of scale. Input-output models assume that costs and inputs remain proportionate through different levels of production. Further, multipliers are not generally updated on a timely basis; most multipliers are prone to be outdated with the current economy. If the multipliers are sourced from a year of a recession economy, the multipliers may not accurately represent the flows from an economic boom period. Additionally, the multipliers may not capture

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sudden legal or technological changes which may improve or decrease efficiency in the production process. Regardless, I-O models still serve as the standard in the estimation of local and regional impacts.

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