

**The Economic Contribution of
Current Tenants of the Emerging Technology Center and
Maryland ETC Graduate Companies
To the State of Maryland Economy**

**Prepared by:
Shannon Lee, MPA
Research Associate
The Jacob France Institute
University of Baltimore**



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The principal investigator for this report is Richard Clinch, Ph.D., the Executive Director of the Jacob France Institute at the University of Baltimore. He accepts full responsibility for the accuracy of the data presented, statements made, and conclusions reached.

Table of Contents

Introduction and Summary	3
ETC Current Tenants and Graduates – Firm Count and Employment	4
Economic Impact of Current ETC Tenants	5
Economic Impact of ETC In-State Graduates	9
Methodology	13

Introduction and Summary

The Emerging Technology Center (ETC) retained the Jacob France Institute of the Merrick School of Business at the University of Baltimore (JFI) to analyze the economic impact of its current tenants and graduate companies in business, henceforth referred to as graduates, on the Maryland economy. The key findings of this analysis are as follows:

- The ETC's 102 current tenants employ 524 workers in a variety of technology sectors in Baltimore City. These firms directly generate an estimated \$116.5 million in economic activity in Maryland. When multiplier effects are included, the economic activity generated by these firms supports \$208.7 million in economic activity in the state, supports 1,122 jobs earning \$82.7 million in labor income, and generates \$8.2 million in combined state and local tax revenues; and
- Of the ETC's 157 graduate companies, 130 (83%) are located in Maryland. These Maryland graduate companies employ 2,234 workers in a variety of technology sectors and directly generate an estimated \$607.2 million in economic activity in the State. When multiplier effects are included, the economic activity generated by these firms supports \$1.03 billion in economic activity in Maryland, supports 4,943 jobs earning \$384.6 million in labor income, and generates \$39.8 million in combined state and local tax revenues.

Table 1
Emerging Technology Center Incubator
State of Maryland Economic Impact of Current Tenants and Graduates Operating In-State
Economic Impacts of Operations
 (Jobs and 2016\$)

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
<u>Current Tenants</u>				
Economic Output (\$s)	\$116,595,997	\$43,458,358	\$48,622,791	\$208,677,147
Employment (# of Jobs)	524	262	336	1,122
Labor Income (\$s)	\$48,721,732	\$17,424,831	\$16,600,795	\$82,747,359
Average Labor Income per Job (\$s)	\$92,980	\$66,467	\$49,387	\$73,731
State and Local Government Revenue Impacts (\$s)	--	--	--	\$8,264,345
<u>ETC Graduates Operating in Maryland</u>				
Economic Output (\$s)	\$607,165,986	\$196,142,957	\$226,587,453	\$1,029,896,396
Employment (# of Jobs)	2,234	1,143	1,565	4,943
Labor Income (\$s)	\$229,011,663	\$78,242,906	\$77,328,871	\$384,583,440
Average Labor Income per Job (\$s)	\$102,512	\$68,429	\$49,408	\$77,811
State and Local Government Revenue Impacts (\$s)	--	--	--	\$39,812,258

Source: JFI and IMPLAN

ETC Current Tenants and Graduates – Firm Count and Employment

The ETC provided the JFI with data that included a list of current tenants and graduate companies in business as of April 2016. This report quantifies the economic contributions to the State of Maryland from graduates of the incubator that are located in the state are indicated as still in business.¹ The ETC provided data on the industry and employment of its current tenants and its in-state graduates. The ETC has a total of 102 current tenants and 157 graduate companies in business. Of those 157 companies, 130 (83%) were located in Maryland and 79 (50%) were located in Baltimore City. The number of firms and their associated employment are presented in Table 2. Using the methodology described in the forthcoming report, the JFI analyzed the economic contribution of both ETC’s current tenants and graduates located in Maryland using the IMPLAN model.²

Table 2
Current Emerging Technology Center Incubator Tenants and In-State Graduates
By Sector

Sector	<u>Current Tenants</u>		<u>Maryland Graduates</u>	
	# of Companies	# of Employees	# of Companies	# of Employees
Total	<u>102</u>	<u>524</u>	<u>130</u>	<u>2,234</u>
Utilities	1	1	0	0
Manufacturing	5	18	0	0
Information	37	202	57	1,493
Finance & Insurance	1	13	1	68
Professional				
Scientific and Technical Services	57	283	72	673
Educational Services	1	7	0	0

Source: ETC

¹ All ETC current tenants are located in Baltimore City.

² IMPLAN is one of the most widely used input-output models for economic impact analysis. For more information on the model, see www.implan.com

Economic Impact of Current ETC Tenants

As presented in Table 3, the ETC's 102 current tenants employ 524 workers in a variety of technology sectors in Baltimore City. These firms directly generate an estimated \$116.5 million in economic activity in Maryland. When multiplier effects are included, the economic activity generated by these firms supports \$208.7 million in economic activity in the state, supports 1,122 jobs earning \$82.7 million in labor income, and generates \$8.3 million in combined state and local tax revenues.

Table 3
Emerging Technology Center Incubator
State of Maryland Economic Impact of Current Tenants
 (Jobs and 2016\$)

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Economic Output (\$s)	\$116,595,997	\$43,458,358	\$48,622,791	\$208,677,147
Employment (# of Jobs)	524	262	336	1,122
Labor income (\$s)	\$48,721,732	\$17,424,831	\$16,600,795	\$82,747,359
Average Labor Income per Job (\$s)	\$92,980	\$66,467	\$49,387	\$73,731
State and Local Government Revenue Impacts (\$s)	--	--	--	\$8,264,345

Source: JFI and IMPLAN

The output impacts of the operations of the ETC current tenants are presented by sector in Table 4, the employment impacts by sector in Table 5 and the labor income impacts are presented in Table 6. As presented in these tables, the impacts of the ETC current tenants are concentrated in the information, professional scientific and technical services, and manufacturing sectors of the Baltimore City economy.

Table 4
State of Maryland Economic Output Impact of
Current Emerging Technology Center Incubator Tenants
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Total	<u>\$116,595,997</u>	<u>\$43,458,358</u>	<u>\$48,622,791</u>	<u>\$208,677,147</u>
Natural Resources	\$0	\$7,759	\$65,448	\$73,207
Mining	\$0	\$21,758	\$45,267	\$67,025
Utilities	\$433,422	\$683,438	\$1,215,945	\$2,332,805
Construction	\$0	\$461,183	\$667,501	\$1,128,684
Manufacturing	\$11,803,035	\$883,857	\$1,033,726	\$13,720,619
Wholesale Trade	\$0	\$2,181,823	\$2,161,089	\$4,342,912
Retail Trade	\$0	\$210,151	\$4,147,913	\$4,358,065
Transportation & Warehousing	\$0	\$2,215,163	\$1,345,384	\$3,560,546
Information	\$56,602,787	\$8,521,394	\$2,947,706	\$68,071,886
Finance & Insurance	\$2,900,917	\$3,174,966	\$5,230,067	\$11,305,949
Real Estate	\$0	\$5,994,409	\$3,746,054	\$9,740,463
Professional Scientific & Technical Services	\$44,491,259	\$9,683,409	\$2,114,419	\$56,289,088
Management of Companies Administrative & Waste Services	\$0	\$2,239,594	\$458,998	\$2,698,592
Educational Services	\$0	\$4,554,284	\$1,334,937	\$5,889,222
Health & Social Services	\$364,576	\$17,274	\$1,221,501	\$1,603,351
Arts, Entertainment & Recreation	\$0	\$621	\$8,116,812	\$8,117,433
Accommodation & Food Services	\$0	\$530,407	\$964,495	\$1,494,903
Other Services	\$0	\$1,035,687	\$2,685,701	\$3,721,388
Government and Non-NAICs	\$0	\$852,316	\$2,207,302	\$3,059,618
Government and Non-NAICs	\$0	\$188,865	\$6,912,526	\$7,101,391

Source: JFI and IMPLAN

Table 5
State of Maryland Employment Impact of the
Current Emerging Technology Center Incubator Tenants
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
<u>Total</u>	<u>524</u>	<u>262</u>	<u>336</u>	<u>1,122</u>
Natural Resources	0	0	1	1
Mining	0	0	0	0
Utilities	1	0	1	2
Construction	0	3	4	6
Manufacturing	18	3	2	23
Wholesale Trade	0	9	9	18
Retail Trade	0	3	51	54
Transportation & Warehousing	0	17	9	27
Information	202	18	5	225
Finance & Insurance	13	16	24	53
Real Estate	0	20	15	35
Professional Scientific & Technical Services	283	67	15	365
Management of Companies Administrative & Waste Services	0	9	2	11
Educational Services	0	59	19	78
Health & Social Services	7	0	15	22
Arts, Entertainment & Recreation	0	0	77	77
Accommodation & Food Services	0	10	12	22
Other Services	0	18	42	60
Government and Non-NAICs	0	9	33	42
	0	1	2	3

Source: JFI and IMPLAN

Table 6
State of Maryland Labor Income Impact of the
Current Emerging Technology Center Incubator Tenants
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
<u>Total</u>	<u>\$48,721,732</u>	<u>\$17,424,831</u>	<u>\$16,600,795</u>	<u>\$82,747,359</u>
Natural Resources	\$0	\$2,930	\$21,146	\$24,075
Mining	\$0	\$2,319	\$3,981	\$6,300
Utilities	\$230,189	\$74,433	\$136,594	\$441,216
Construction	\$0	\$171,611	\$240,016	\$411,627
Manufacturing	\$1,226,485	\$205,568	\$126,092	\$1,558,145
Wholesale Trade	\$0	\$787,552	\$780,067	\$1,567,619
Retail Trade	\$0	\$79,215	\$1,840,694	\$1,919,909
Transportation & Warehousing	\$0	\$972,092	\$529,320	\$1,501,412
Information	\$16,896,289	\$2,753,129	\$604,952	\$20,254,370
Finance & Insurance	\$1,295,649	\$1,300,241	\$1,789,693	\$4,385,584
Real Estate	\$0	\$556,712	\$438,317	\$995,029
Professional Scientific & Technical Services	\$28,806,099	\$5,447,814	\$1,125,743	\$35,379,656
Management of Companies Administrative & Waste Services	\$0	\$1,131,319	\$231,861	\$1,363,180
Educational Services	\$0	\$2,657,040	\$729,236	\$3,386,276
Health & Social Services	\$267,022	\$10,433	\$737,054	\$1,014,508
Arts, Entertainment & Recreation	\$0	\$362	\$4,536,811	\$4,537,173
Accommodation & Food Services	\$0	\$225,813	\$311,855	\$537,668
Other Services	\$0	\$458,898	\$1,051,855	\$1,510,753
Government and Non-NAICs	\$0	\$451,615	\$1,213,846	\$1,665,461
Government and Non-NAICs	\$0	\$135,734	\$151,662	\$287,396

Source: JFI and IMPLAN

Economic Impact of ETC In-State Graduates

As presented in Table 7, the 130 ETC graduate companies in business located in Maryland employ 2,234 workers and directly generate an estimated \$607.2 million in economic activity in Maryland. When multiplier effects are included, the economic activity generated by these firms supports \$1.03 billion in economic activity in the state, supports 4,943 jobs earning \$384.6 million in labor income, and generates \$39.8 million in combined state and local tax revenues.

Table 7
Emerging Technology Center Incubator
State of Maryland Economic Impact of Graduates Operating In-State
 (Jobs and 2016\$)

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Economic Output (\$s)	\$607,165,986	\$196,142,957	\$226,587,453	\$1,029,896,396
Employment (# of Jobs)	2,234	1,143	1,565	4,943
Labor Income (\$s)	\$229,011,663	\$78,242,906	\$77,328,871	\$384,583,440
Average Labor Income per Job (\$s)	\$102,512	\$68,429	\$49,408	\$77,811
State and Local Government Revenue Impacts (\$s)	--	--	--	\$39,812,258

Source: JFI and IMPLAN

The output impacts of the operations of the ETC's Maryland graduates are presented by sector in Table 8, the employment impacts by sector in Table 9, and the labor income impacts are presented in Table 10. As presented in these tables, the impacts of the ETC graduate companies located in Maryland are concentrated in the information and professional scientific and technical services sectors of the state economy.

Table 8
State of Maryland Economic Output Impact of
Emerging Technology Center Incubator Graduates
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Total	<u>\$607,165,986</u>	<u>\$196,142,957</u>	<u>\$226,587,453</u>	<u>\$1,029,896,396</u>
Natural Resources	\$0	\$33,998	\$305,399	\$339,398
Mining	\$0	\$65,166	\$211,815	\$276,981
Utilities	\$0	\$2,342,949	\$5,698,820	\$8,041,769
Construction	\$0	\$1,331,228	\$3,111,830	\$4,443,057
Manufacturing	\$0	\$2,441,793	\$4,827,139	\$7,268,932
Wholesale Trade	\$0	\$11,375,006	\$10,051,381	\$21,426,388
Retail Trade	\$0	\$652,444	\$19,283,222	\$19,935,666
Transportation & Warehousing	\$0	\$7,695,288	\$6,238,247	\$13,933,535
Information	\$478,285,896	\$49,927,281	\$13,791,400	\$542,004,577
Finance & Insurance	\$12,328,296	\$17,258,009	\$24,305,395	\$53,891,700
Real Estate	\$0	\$24,701,731	\$17,574,045	\$42,275,776
Professional Scientific & Technical Services	\$116,551,794	\$41,592,510	\$9,845,933	\$167,990,237
Management of Companies	\$0	\$6,244,707	\$2,138,570	\$8,383,277
Administrative & Waste Services	\$0	\$20,595,984	\$6,223,715	\$26,819,699
Educational Services	\$0	\$22,326	\$5,600,915	\$5,623,241
Health & Social Services	\$0	\$3,648	\$37,959,593	\$37,963,241
Arts, Entertainment & Recreation	\$0	\$1,988,190	\$4,476,774	\$6,464,964
Accommodation & Food Services	\$0	\$4,252,871	\$12,515,962	\$16,768,834
Other Services	\$0	\$2,952,371	\$10,270,229	\$13,222,599
Government and Non-NAICs	\$0	\$665,456	\$32,157,069	\$32,822,525

Source: JFI and IMPLAN

Table 9
State of Maryland Employment Impact of the
Emerging Technology Center Incubator Graduates
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
<u>Total</u>	<u>2,234</u>	<u>1,143</u>	<u>1,565</u>	<u>4,943</u>
Natural Resources	0	1	3	3
Mining	0	0	1	1
Utilities	0	2	4	6
Construction	0	7	17	24
Manufacturing	0	12	9	21
Wholesale Trade	0	46	41	87
Retail Trade	0	8	239	247
Transportation & Warehousing	0	60	43	103
Information	1,493	121	23	1,637
Finance & Insurance	68	86	110	264
Real Estate	0	84	71	155
Professional Scientific & Technical Services	673	284	69	1,026
Management of Companies	0	26	9	34
Administrative & Waste Services	0	270	88	358
Educational Services	0	0	67	67
Health & Social Services	0	0	360	360
Arts, Entertainment & Recreation	0	36	55	91
Accommodation & Food Services	0	72	197	269
Other Services	0	24	154	178
Government and Non-NAICs	0	6	7	13

Source: JFI and IMPLAN

Table 10
State of Maryland Labor Income Impact of the
Emerging Technology Center Incubator Graduates
By Sector

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
<u>Total</u>	<u>\$229,011,663</u>	<u>\$78,242,906</u>	<u>\$77,328,871</u>	<u>\$384,583,440</u>
Natural Resources	\$0	\$13,230	\$98,636	\$111,866
Mining	\$0	\$6,145	\$18,597	\$24,742
Utilities	\$0	\$251,749	\$640,050	\$891,799
Construction	\$0	\$494,408	\$1,119,004	\$1,613,412
Manufacturing	\$0	\$673,194	\$588,196	\$1,261,390
Wholesale Trade	\$0	\$4,105,927	\$3,628,150	\$7,734,077
Retail Trade	\$0	\$249,186	\$8,557,016	\$8,806,202
Transportation & Warehousing	\$0	\$3,294,378	\$2,455,788	\$5,750,166
Information	\$162,897,889	\$17,915,207	\$2,825,084	\$183,638,180
Finance & Insurance	\$4,426,089	\$6,625,368	\$8,319,323	\$19,370,780
Real Estate	\$0	\$2,311,850	\$2,054,678	\$4,366,528
Professional Scientific & Technical Services	\$61,687,685	\$22,416,430	\$5,242,792	\$89,346,908
Management of Companies	\$0	\$3,154,482	\$1,080,288	\$4,234,769
Administrative & Waste Services	\$0	\$12,106,496	\$3,399,952	\$15,506,447
Educational Services	\$0	\$13,747	\$3,380,153	\$3,393,900
Health & Social Services	\$0	\$2,114	\$21,216,700	\$21,218,813
Arts, Entertainment & Recreation	\$0	\$864,695	\$1,447,724	\$2,312,419
Accommodation & Food Services	\$0	\$1,801,628	\$4,901,896	\$6,703,524
Other Services	\$0	\$1,435,769	\$5,650,383	\$7,086,152
Government and Non-NAICs	\$0	\$506,904	\$704,461	\$1,211,365

Source: JFI and IMPLAN

Methodology

The JFI analyzed the economic impact of both the current ETC tenants and its graduate companies located in Maryland using the methodology laid out in the November 2007 *Maryland Incubator Impact Analysis and Evaluation of Additional Incubator Capacity* report released by the Maryland Technology Development Corporation.³ The JFI analyzed the economic activity generated by the tenant companies located in the incubator and graduate companies that have exited the incubator but remained in the state of Maryland and are indicated as still in business.⁴ The ETC provided data on the employment and sector of its current tenants and employment, sector and location of its graduates. This data was analyzed using the IMPLAN input-output model, one of the most widely used models in the nation and the same model used in the TEDCO study.⁵ The IMPLAN model can be used to estimate economic activity based on either company revenues or employment. As the revenues of the current and graduate companies were not known, this analysis was based on their reported employment; and IMPLAN can then estimate revenues based on average revenues per employee using Baltimore City, State of Maryland, and national data.⁶

This report employed the IMPLAN economic model⁷ to estimate the economic activity generated by and economic impact of the tenant companies located ETC's current incubators as well as its graduate companies located in Maryland. This analysis focuses on three measures of economic impact: economic output (a figure similar to business volume); employment; and labor income (including salaries and wages, benefits and self-employment income). Four measures of the economic activity and impact of the incubator are included in this report:

- 1) Direct effects, which represent the change in economic activity being analyzed – in this case the employment and estimated revenues of tenant and graduate companies;
- 2) Indirect effects, which represent the changes in inter-industry purchases, for example the purchase of goods or services to support company operations, in response to the change in demand from the directly affected industries;
- 3) Induced effects, which represent the changes in spending from households as income and population increase due to changes in production; and
- 4) Total effects, which are the combined total of direct, indirect and induced effects.

³ See "Maryland Incubator Impact Analysis and Evaluation of Additional Incubator Capacity" November 2007. <http://tedco.md/>

⁴ This analysis does not attempt to address the issue of the role of the ETC in creating these companies. It was outside of the scope of this analysis to determine the extent to which the incubator facilitated the start-up or growth of these companies. This analysis is simply of the jobs located in the current ETC incubator facilities or graduate companies located in Maryland. Because the number of these jobs that would have existed in the City and the State without the incubator is unknown, this analysis can be viewed as measuring the linkages between these companies and the larger City and State economy – not a true economic impact analysis, where the economic activity would need to be net, new and incremental. It can be assumed that the ETC's start up support services, affordable rent levels and relationship with the major City universities that are the core generators of technology, have all contributed to the decision of these companies to locate in Maryland.

⁵ See <http://www.implan.com> for a description of the model.

⁶ The extent to which the reliance on estimated revenues based on employment biases this analysis is unknown. While younger, early stage companies in an incubator would generally have lower revenues per employee than more mature firms, they may also have higher levels of expenditures as they spend investment capital to develop their products and services. Thus, the level of potential bias is an area for future research.

⁷ All impact figures are in year 2016 dollars and totals may not sum due to rounding.

An input-output analysis examines the relationships among businesses, and among businesses and final consumers. Input-output analysis is based on the use of multipliers, which describe the response of an economy to a change in demand or production. Multipliers measure the effects on an economy from a source of economic activity, in this case the revenues and employment of ETC's tenant and graduate companies. The economic activity generated in a region is greater than the simple total of spending associated with the event or activity being studied. This is because as this money is earned it is, in turn, spent, earned and re-spent by other businesses and workers in the regional economy through several successive cycles. However, the spending in each successive cycle is less than in the preceding cycle because a certain portion of spending "leaks" out of the economy in each round of spending. Leakages occur through purchases of goods or services from outside of the region. The multipliers used capture the effects of these multiple rounds of spending.