THE ECONOMIC IMPACT OF THE UNIVERSITY SYSTEM OF MARYLAND:

A FISCAL PERSPECTIVE

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Executive Summary

Background

In July 2001, the University System of Maryland (USM or System) commissioned the Jacob France Institute to study the economic impact of the USM on the Maryland economy. Similar analyses were conducted in 1994 and 1998. The earlier studies and this latest one provide ample evidence of the System's significant contribution to the health of the state's economy.

It is generally believed that the current economic recession has not been as harsh for Maryland as it has been for other states. The quality of the institutions that make up the USM and the fit between the institutions and the economic strengths of the state are often cited as reasons for the state's economic resilience.

The goal of the 2002 report is to quantify the System's contribution to the state's economy and measure it against the state's investment in the System.

The 2002 Report

The study provides an in-depth analysis of the System's impact in three specific, key areas:

1) The System's **economic and fiscal impact** on the state as measured by the increased taxes paid by graduates of System institutions and the new spending attracted into Maryland from sources such as federal research support and out-of-state students and by the top quality research and educational capabilities of USM institutions;

2) The System's contribution to **workforce development**, including its ability to produce graduates in areas of workforce shortages and its accessibility to workers who are upgrading their skills or changing careers; and

3) The System's contribution to **economic development** through its research, partnerships with the private sector, and technology transfer

It should be noted that the System's estimated fiscal impact is very conservative in that it does not account for graduates whose earnings information were not available to the state (e.g., federal employees, self-employed persons, and Maryland residents commuting out-of-state).

Fiscal Impact

The System's fiscal impact was determined by a detailed analysis of two representative USM graduating classes: 1986 and 1989. Actual earnings information of the graduates were examined and compared to the estimated earnings of high school graduates in the same years. Using this earnings information, the difference in the actual average earnings of the respective graduates - the incremental increase in earnings when moving from one degree level to the next - was determined. For example:

- Average 2000 earnings of 1986 USM bachelor's degree recipients were $51,397, $26,225 more than a person whose highest level of educational attainment was a high school degree only. Average 2000 earnings of 1986 master's degree recipients were $53,449, $2,052 more than USM bachelor's degree recipients.
- Average 2000 earnings for 1986 master's degree recipients were $53,449, with incremental earnings of $2,052 more than the average USM bachelor's degree recipient.
- Average 2000 earnings of 1986 USM doctoral degree recipients were $62,599, $9,150 more than USM master's degree recipients.
- Average 2000 earnings of 1986 professional school graduates were $88,769, $37,371 more than USM bachelor's degree recipients.

Similar incremental increases are found in the 1989 cohort of USM graduates. The cumulative impact of these increased earnings on state revenues is considerable. Over the course of their working lives, the 1986 and 1989 graduates will have increased earnings, and pay increased taxes, as follows:

- For 1986 graduates, lifetime incremental earnings are $10.2 billion, generating income and sales tax revenues of $651 million.
- For 1989 graduates, lifetime incremental earnings are $11.5 billion, generating income and sales tax revenues of $735 million.

In addition to increasing state tax revenues, the incremental earnings of USM graduates have multiplier effects: when the earnings are spent, other economic activities are supported that result in jobs.

- Economic activity generated by the lifetime incremental earnings of 1986 graduates will support an average of 2,698 annual jobs, earning $3.2 billion in salaries and wages, and resulting in a total of $854 million in additional state taxes.
- Economic activity generated by the lifetime incremental earnings of 1989 graduates will support an average of 3,051 annual jobs, earning $3.6 billion in salaries and wages, and resulting in a total of $966 million in additional state taxes.

The System also contributes to Maryland's economic base by attracting students and spending into Maryland from outside of the state. This spending is also subject to multiplier effects. Three sources of out-of-state spending were considered in this report:

1) Non-resident student tuition and living expenditures.
2) Federal government sponsored grants to USM institutions to perform research, training, or other services; and
3) Out-of-state visitors to USM institutions.

In 2000, these three sources contributed the following to the state's economy:

- $830 million in out-of-state spending associated with the USM.

- $1.76 billion in economic activity in the state, supporting 21,420 jobs earning nearly $580 million in fiscal year 2000.
- $27 million in state income and sales taxes.

A comparison of the positive economic impact of the USM to state appropriations for the System demonstrates the soundness of the state's investment:

- The ratio of state revenue to state cost for the 1986 cohort of USM graduates is 3.2 to 1, with the state receiving $3.20 in revenue for each $1 invested.
- Using the discounted present value of future tax revenues, the state revenue/cost ratio for the 1986 cohort of USM graduates is 1.9, with the state receiving $1.90 in revenue for each $1 invested.
- Revenue/cost ratios for the 1989 cohort were lower due to higher levels of state appropriations, but the net fiscal return to the state remains positive at $2.60 for every $1 invested in undiscounted terms and $1.50 for every $1 invested in discounted terms.

Workforce Development

Maryland has the distinction of having one of the most well educated resident populations in the nation. The presence of the University System of Maryland makes the most significant contribution to Maryland's "industrial competitive advantage" in terms of a highly qualified workforce which enables businesses to compete more effectively regionally, nationally, and globally. The USM is critical to the maintaining this competitive advantage.

In 2000, among Maryland's four-year degree granting institutions, the USM accounts for the following:

- 66% of total enrollment
- 69% of full-time undergraduates
- 77% of part-time undergraduates
- 64% of full-time graduate/professional students
- 52% of part-time graduate/professional students

In 2000, among all public and private colleges and universities in Maryland, the USM awarded:

- 65% of all bachelor's, master's, doctoral, and professional degrees, and 100% of all graduate students in agriculture, architecture, law, library sciences, and public affairs.
- 61% of all doctoral degrees and 100% of all doctoral degrees in agriculture, business, communications, library sciences, and public affairs.
- 80% of all professional degrees, including 76% of the professional health degrees, 100% of the professional law degrees, and 100% of the professional degrees in dentistry and pharmacy.

While the USM has a very wide variety of programs it has a strong focus in training and educating persons in science, health, engineering, and computer related fields critical for Maryland's high technology future. In 2000, of Maryland's four-year public and private institutions, the USM awarded:

- 64% of the computer science degrees
- 56% of the engineering degrees
- 58% of the health related degrees

Economic Development

The USM is a core element of Maryland's academic and scientific infrastructure, containing four of the five research universities in the state and playing a vital role in the generation of new technologies, basic research, and the commercialization of research discoveries in Maryland.

According to the National Science Foundation, in FY 1999, the USM had over $462 million in total research and development expenditures, accounting for almost one-fourth (24%) of all federal sponsored R&D expenditures in Maryland and for 22% of all industry R&D expenditures in fiscal 1999.

USM member institutions are among the leading research institutions in several important scientific fields vital to Maryland. For example:

- The University of Maryland, Baltimore is ranked 20th nationally in total medical science R&D expenditures and 36th nationally in total life science R&D expenditures.
- The University of Maryland, College Park is ranked 8th nationally in total computer science R&D expenditures and 33rd nationally in total agriculture science R&D expenditures.

The USM is also an important generator of commercializable technology, accounting for:

- 43% of invention disclosures
- 38% of new patent applications
- 23% of patents issued to major Maryland universities in FY1999.

According to the Association of University Technology Managers (AUTM), which collects information annually on the licensing activities of major research universities, from 1994 to 1999, a total of 14 start-up companies have formed based on technology developed at USM institutions. In fact, the System is more successful in creating start-up companies *per total research expenditures* based on university formed technology than Johns Hopkins University.

Conclusion

The USM contributes to the state's economy in a variety of ways. The USM enhances the skills of its students, significantly increasing their opportunities in the workplace; the increased earnings of USM graduates, which are directly attributable to their level of education, generate additional state revenues; and the System is a source of educated and skilled workers for Maryland employers, provides valuable services to businesses, generates new technologies through research and development and contributes to the quality of life in Maryland through

community service activities. The USM's positive economic impact on the state of Maryland considerably exceeds the state's investment in the System.

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1.0 Introduction

This report offers a conservative estimate of the contribution made by the University System of Maryland (the "System" or USM) to the Maryland economy. The report examines economic and fiscal impacts that can be traced directly to the System as it provides education, research, and public service to Maryland.

The USM impacts the state of Maryland in numerous ways. The System is a source of economic activity; it enhances the skills and education of its students; it is a source of educated and skilled workers for Maryland employers; it provides valuable services to new and expanding businesses; it generates new technologies through research and development; and it contributes to the quality of life in Maryland through its community service activities.

This report takes an in-depth look at the economic impact of the USM in three key areas:

1) The economic and fiscal impact of the System using a "human capital" approach;

2) The workforce development role of the System; and

3) The economic development impact of the System.

The "human capital" methodology used to measure the fiscal impact (#1 above) deserves explanation. This approach was first used by economist Barry Bluestone to analyze the economic impact of the University of Massachusetts, Boston on the state of Massachusetts[1] and was adapted by the Jacob France Institute of the University of Baltimore in its 1994 and 1998 studies of the economic impact of the University System of Maryland on the state of Maryland.[2]

The human capital model differs from the traditional ACE-Caffrey and Isaacs model[3], which treats a university as an "export base," and measures the impact only of university-derived spending. The human capital model treats a university as an investment instrument of the state, and calculates the impact of the public's investment by examining the most important outcome of higher education - better educated, more skilled workers. More specifically, this model compares the state's expenditures on higher education to the tax revenues derived from the increased earnings power of its graduates.

In addition to the USM's economic and fiscal impact on Maryland, two additional analyses were conducted. The workforce development impact of the USM is presented in Chapter 3.0 and the economic development impact of the System is presented in Chapter 4.0.

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[1] Barry Bluestone, UMASS/Boston An Economic Impact Analysis, University of Massachusetts at Boston, 1993.
[2] David Stevens, Kristy Wilson Axeness, Liping Chen, Daniel Gerlowski, and Lyn Zhao, The Economic Importance of the University of Maryland System to the state of Maryland, the Jacob France Center, University of Baltimore, 1994 and Daniel Gerlowski and David Stevens, The Economic Impact of the University System of Maryland: A Fiscal Perspective, the Jacob France Center, University of Baltimore, 1998.
[3] John Caffery and Herbert Isaacs, Estimating the Impact of a College or University on the Local Economy, American Council on Education, 1971.

2.0 The Economic and Fiscal Impact of the University System of Maryland

Measuring the USM's economic and fiscal impact on the state using the human capital approach involves the following steps:

1) The earnings of a cohort of USM graduates are derived;

2) These earnings are compared to estimates of what the graduates would have earned had they not obtained a degree. The difference is the incremental earnings effect of their degree;

3) The increased economic and state revenues derived from the incremental earnings and the economic activity they generate are then calculated;

4) The increased economic activity and state revenues attributable to the expenditures of out-state-students and visitors, and of grants originating out-of-state are also calculated by modeling the economic activity the expenditures generate; and

5) The total increased state revenues are then compared to the state's cost of producing the graduates, to determine the net fiscal impact of the state's investment.

These steps were conducted for two representative classes of the USM, the 1986 and 1989 classes. Incremental earnings of these graduates were determined by making the following comparisons for each of the two graduating classes:

1) The earnings of bachelor's degree recipients are compared to the estimated earnings of a person with only a high school diploma;

2) The earnings of master's degree recipients are compared to the earnings of USM graduates with only a bachelor's degree;

3) The earnings of doctorate degree recipients are compared to the earnings of a USM graduate with a master's degree; and

4) The earnings of professional degree recipient are compared to the earnings of a USM graduate with only a bachelor's degree.

In analyzing the incremental increase in earnings three data sources were used:

1) The USM provided information on all graduates in the 1986 and 1989 academic years;

2) The Maryland Department of Labor, Licensing, and Regulation (DLLR) provided longitudinal data on earnings in Maryland by these graduates, excluding the self-employed, independent contractors, and federal workers; and

3) Income for individuals with a high school degree were estimated from the Maryland 1990 U.S. Bureau of the Census Five-percent Public Use Micro Sample Data, which identified over 17,000 Maryland residents for whom a high school diploma represented the highest level of educational attainment.[4]

[4] See Daniel Gerlowski and David Stevens 1998 for a more complete description of the methodology used to estimate the earnings of high school graduates.

These three data sources made it possible to identify average earnings for each step of educational attainment for the two cohorts. Individual incremental incomes for all the graduates of a cohort holding a particular degree were then calculated and aggregated. Thus, the actual earnings for the two cohorts of USM graduates can be compared to their estimated incomes had they not attended a USM institution.

It is important to note some exclusions from this analysis. The DLLR data on earnings only includes persons working in Maryland in positions covered by unemployment insurance. Therefore, the earnings USM graduates who are self-employed workers, independent contractors, federal workers, or out-of-state commuters are not included in the report. Given the integrated nature of the regional employment market, with high levels of commuting from Maryland to Washington, D.C. and Northern Virginia, and the high concentration of federal government employment in Maryland, this is likely to ***significantly*** undercount the post graduation earnings for each cohort.

It is also important to note that the earnings data used were available through 2000. As a result, 14 years of actual earnings was used for the 1986 cohort and 11 years of actual earnings were used for the 1989 cohort. Forecasts were made to estimate lifetime earnings. In forecasting future cohort earnings, the following conservative assumptions were made:

- All graduates were assumed to work until the age of 66. Bachelor's degree recipients work for 44 years, master's degree recipients for 41 years, doctorate degree recipients for 39 years and professional school graduates for 40 years.
- All historical cohort earnings were converted into year 2000 dollars.
- For the future years in which actual earnings data were unavailable, the earnings of each level of higher educational attainment were assumed to increase by 4% annually in constant dollar terms.
- It is assumed that graduates begin to work the year after they graduate. Thus, the 1986 cohort of graduates is assumed to begin working in 1987 and the 1989 cohort in 1990. Given that many students graduate in the fall and summer, this is likely to undercount post graduation earnings.
- Over the projection period, the pool of employed graduates is assumed to shrink by 2% per year due to graduates leaving the state, leaving the workforce, or becoming self-employed, independent contractors, or federal employees.
- Because the income flows estimated take place well into the future, discounting was used to estimate the present value of all projected income flows. Discounting is a technique used in financial analysis to equate the value of a dollar received in some future period with today's dollars.

2.1 The Incremental Earnings of University System of Maryland Graduates

Figures 1 through 4 are graphical representations of the average incremental earnings for the 1986 cohort of University of Maryland System graduates. The year 2000 average earnings and the incremental earnings effect for each of the four degree levels are as follows:

- Figure 1 - The average earnings of a 1986 University System of Maryland bachelor's degree recipient in 2000 were $51,397, with incremental earnings of $26,225 more than a person whose highest level of educational attainment was a high school degree.
- Figure 2 - The average 2000 earnings for 1986 master's degree recipients were $53,449, with incremental earnings of $2,052 more than the average USM bachelor's degree recipient.
- Figure 3 - The average 2000 earnings for 1986 doctoral degree recipients were $62,599, with incremental earnings of $9,150 more than the average USM master's degree recipient.
- Figure 4 - The average 2000 earnings for a 1986 professional school graduate were $88,769, with incremental earnings of $37,371 more than the average USM bachelor's degree recipient.

Figures 5 through 8 provide graphical representations of the average incremental earnings for the 1989 cohort of University System of Maryland graduates. The year 2000 average earnings and the incremental earnings effect for each of the four degree levels are as follows:

- Figure 5 - The average earnings of a 1989 University System of Maryland bachelor's degree recipient in 2000 were $46,899, with incremental earnings of $23,680 more than a person whose highest level of educational attainment was a high school degree.
- Figure 6 - The average 2000 earnings for 1989 master's degree recipients were $51,589, with incremental earnings of $5,950 more than the average USM bachelor's degree recipient.
- Figure 7 - The average 2000 earnings for 1989 doctoral degree recipients were $57,539, with incremental earnings of $5,950 more than the average USM master's degree recipient.
- Figure 8 - The average 2000 earnings for a 1989 professional school graduate were $73,852, with incremental earnings of $26,954 more than the average USM bachelor's degree recipient.

The education-based incremental earnings of the 1986 and 1989 graduates described above will continue over their entire working lives. The graduates will benefit from this additional income and the state will benefit from the increased economic activity, income taxes and sales taxes supported by this income. [5] The lifetime increased earnings and the increased state income and sales tax revenues were estimated and are shown in Tables 1 and 2.

The average individual lifetime earnings and additional state income and sales taxes paid by the 1986 cohort of graduates are presented in Table 1. As described in Table 1:

[5] Income tax revenues are computed as incremental earnings multiplied by the state's income tax rate of 4.75% (after planned reductions are phased in). Sales tax revenues are calculated as incremental earnings multiplied by 33% and then by the state's sales tax of 5%. Past France Institute research found that approximately one-third of income is spent on items subject to the Maryland sales tax. Graduates will also pay a variety of other state and local taxes – but it was outside of the scope of this project to estimate all potential fiscal impacts. Thus, the tax figures can be viewed as very conservative estimates that are likely to undercount actual fiscal impacts.

- A 1986 USM bachelor's degree recipient can expect to earn nearly $2.5 million in additional income over his/her lifetime ($1.4 million in discounted terms). The average bachelor's degree recipient will pay $158,348 in additional state income and sales taxes over his/her lifetime ($87,614 in discounted terms).
- A 1986 USM master's degree recipient can expect to earn $183,932 in additional income over his/her lifetime ($130,463 in discounted terms) and pay over $11,732 in additional state income and sales taxes over his/her lifetime ($8,350 in discounted terms).
- A 1986 USM doctoral degree recipient can expect to earn $517,872 in additional income over his/her lifetime ($330,573 discounted terms) and pay over $33,144 in additional state income and sales taxes over his/her lifetime ($21,157 in discounted terms).
- A 1986 USM professional degree recipient can expect to earn over $2.0 million in additional income over his/her lifetime ($1.3 million in discounted terms) and pay $132,533 in additional state income and sales taxes over his/her lifetime ($80,716 in discounted terms).

The average individual lifetime earnings and additional state income and sales taxes paid by the 1989 cohort of graduates are presented in Table 2. As described in Table 2:

- A 1989 USM bachelor's degree recipient can expect to earn nearly $2.6 million in additional income over his/her lifetime ($1.4 million in discounted terms). The average bachelor's degree recipient will pay $163,559 in additional state income and sales taxes over his/her lifetime ($90,484 in discounted terms).
- A 1989 USM master's degree recipient can expect to earn $367,403 in additional income over his/her lifetime ($240,041 in discounted terms) and pay over $23,514 in additional state income and sales taxes over his/her lifetime ($15,363 in discounted terms).
- A 1989 USM doctoral degree recipient can expect to earn $370,225 in additional income over his/her lifetime ($233,780 discounted terms) and pay over $23,694 in additional state income and sales taxes over his/her lifetime ($14,962 in discounted terms).
- A 1989 USM professional degree recipient can expect to earn over $1.7 million in additional income over his/her lifetime ($1.1 million in discounted terms) and pay $110,335 in additional state income and sales taxes over his/her lifetime ($67,934 in discounted terms).

Figure 1
Individual Incremental Income
Bachelor's Degree Recipients vs. High School Graduates
1986 USM Graduate Cohort

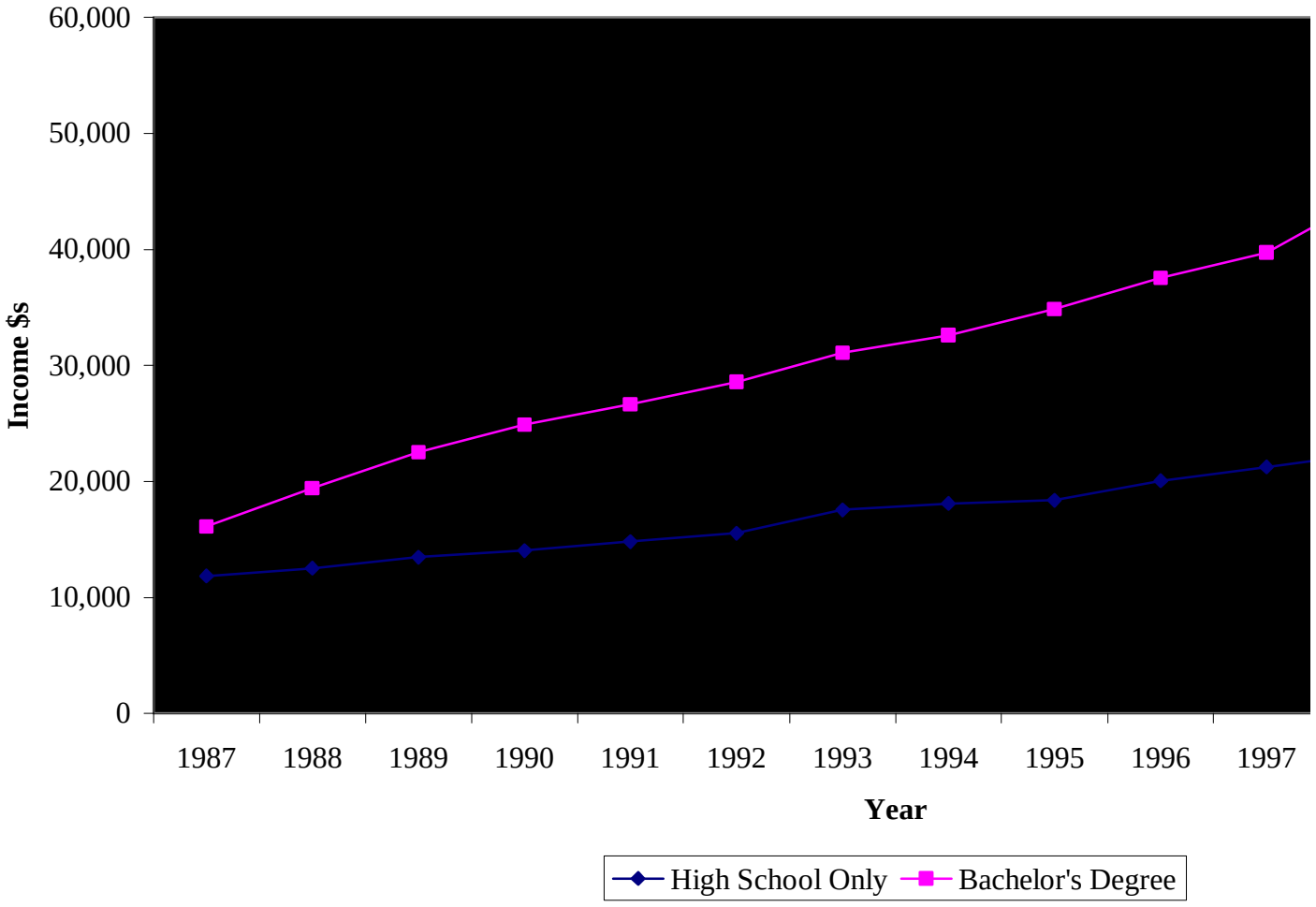

Figure 2
Individual Incremental Income
Master's Degree Recipients vs. Bachelors Degree Recipients
1986 USM Graduate Cohort

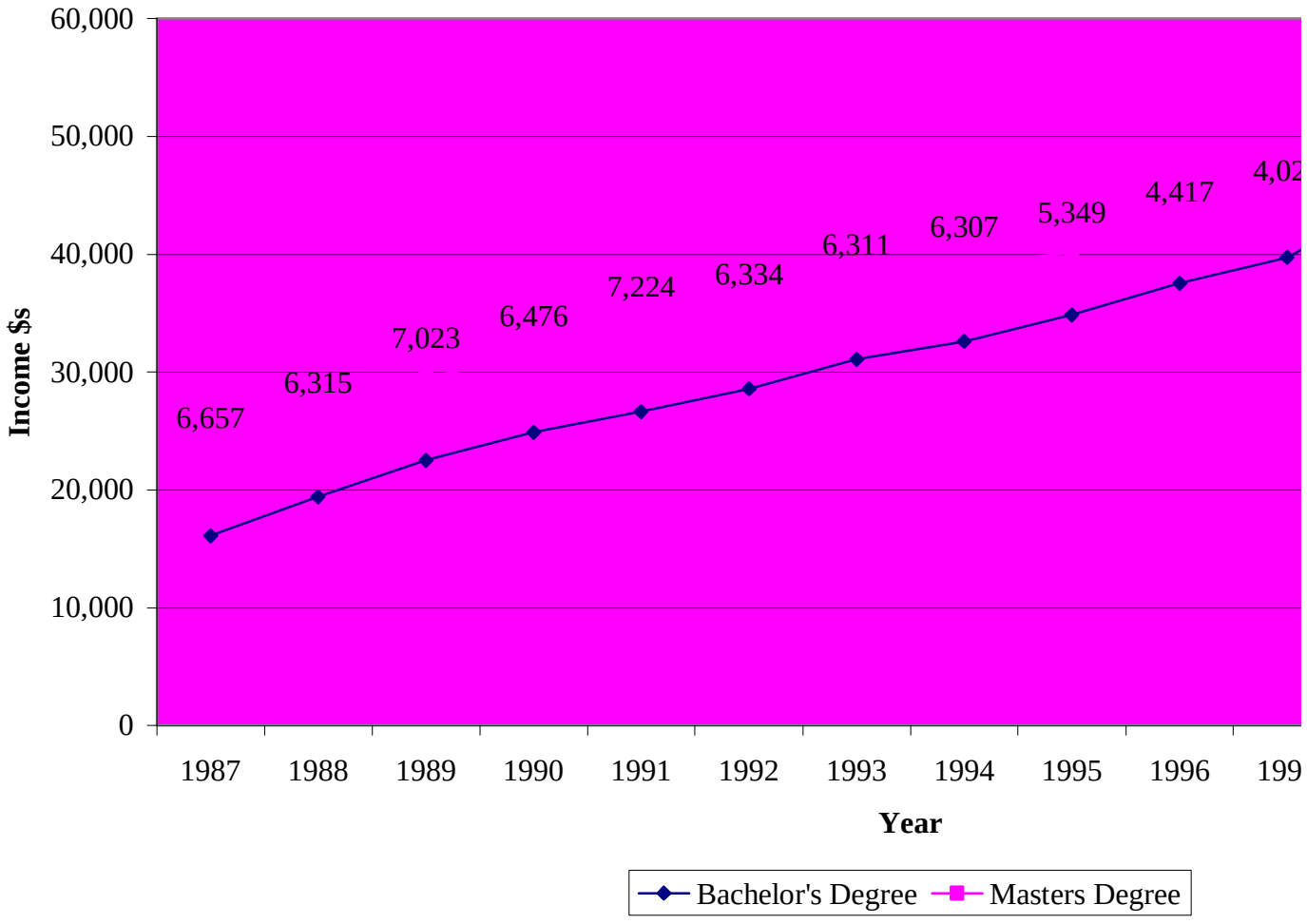

Figure 3
Individual Incremental Income
Doctoral Degree Recipients vs. Masters Degree Recipients
1986 USM Graduate Cohort

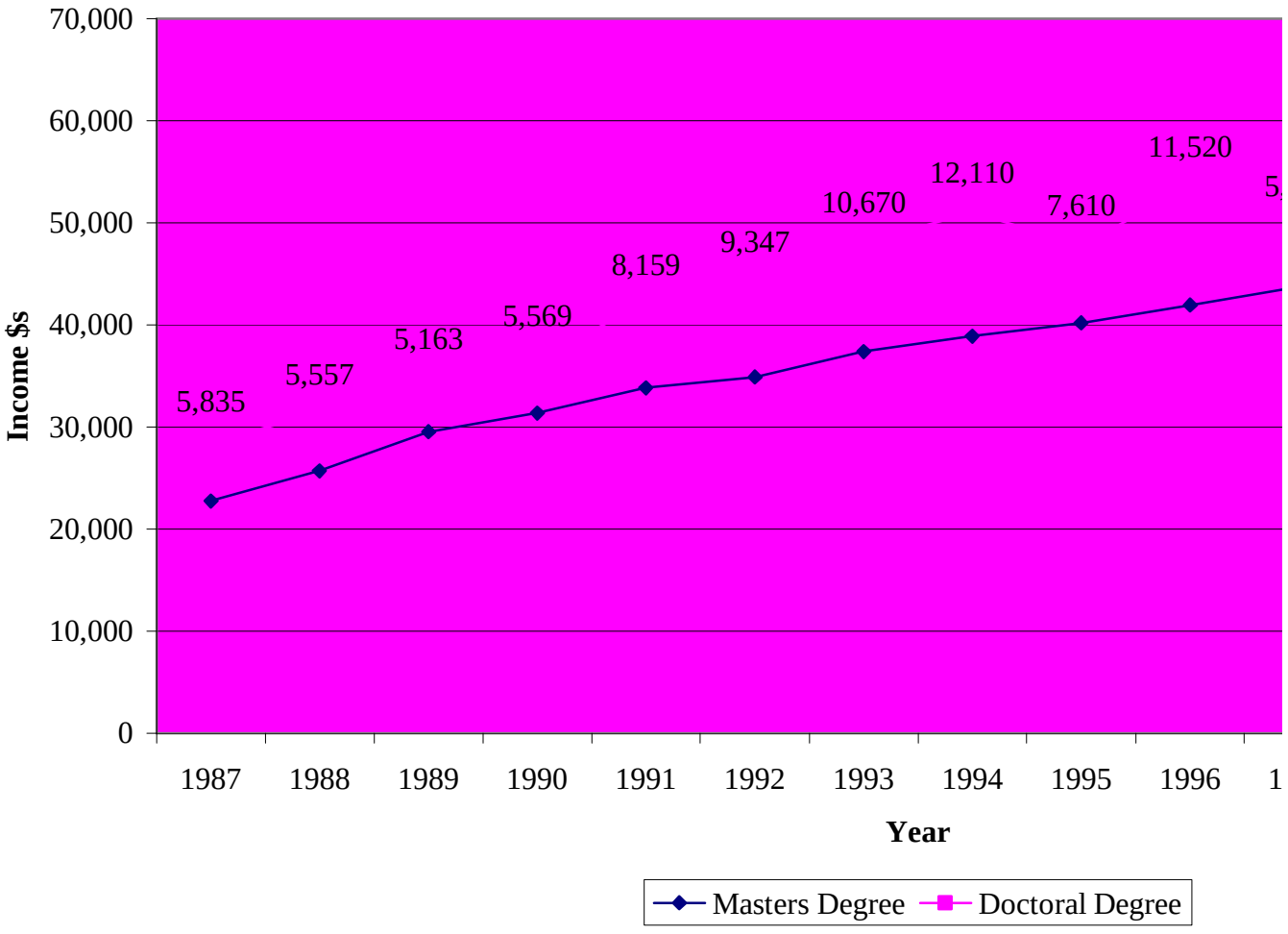

Figure 4
Individual Incremental Income
First Professional Degree Recipients vs. Bachelor's Degree Recipients
1986 USM Graduate Cohort

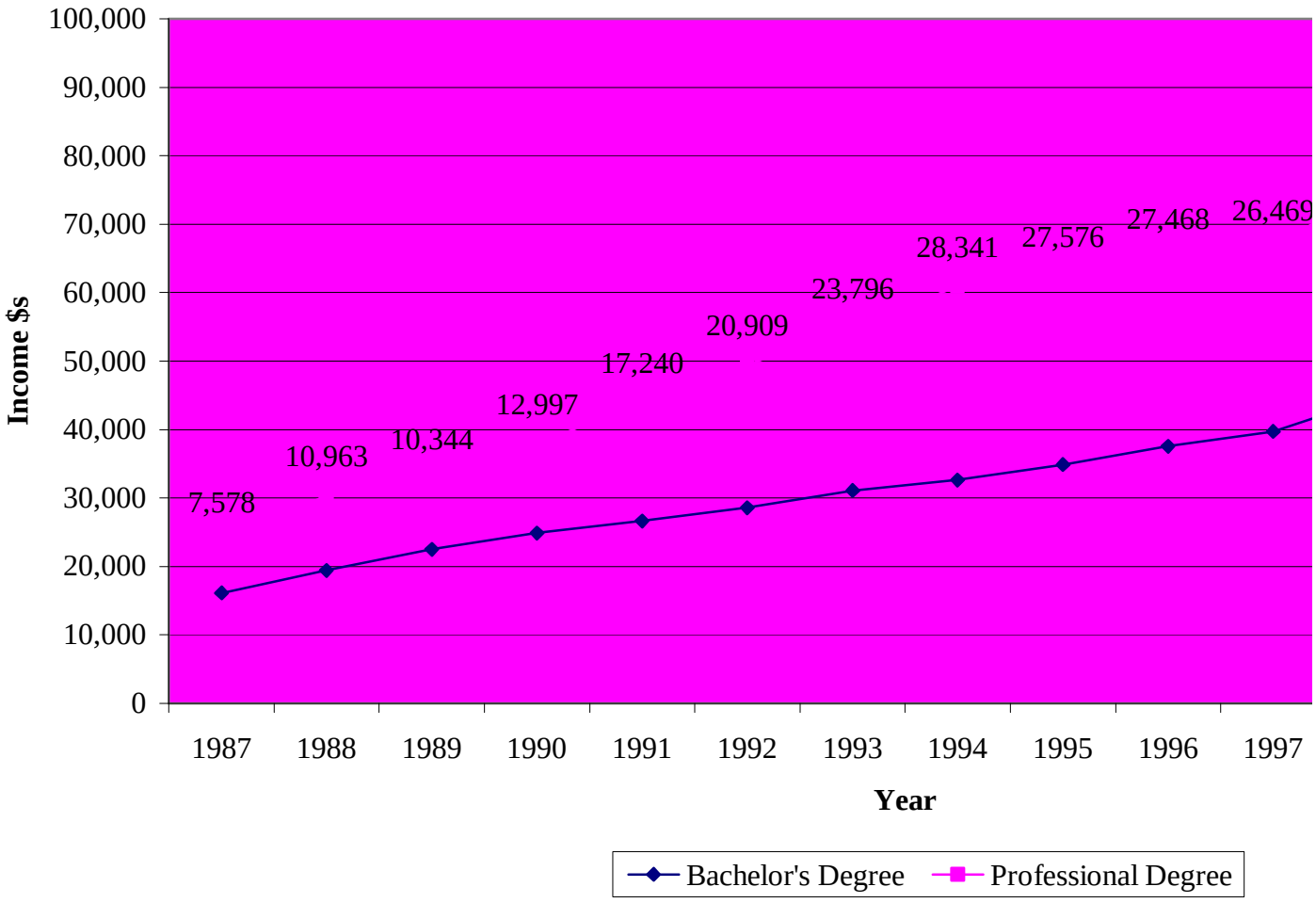

Figure 5
Individual Incremental Income
Bachelor's Degree Recipients vs. High School Graduates
1989 USM Graduate Cohort

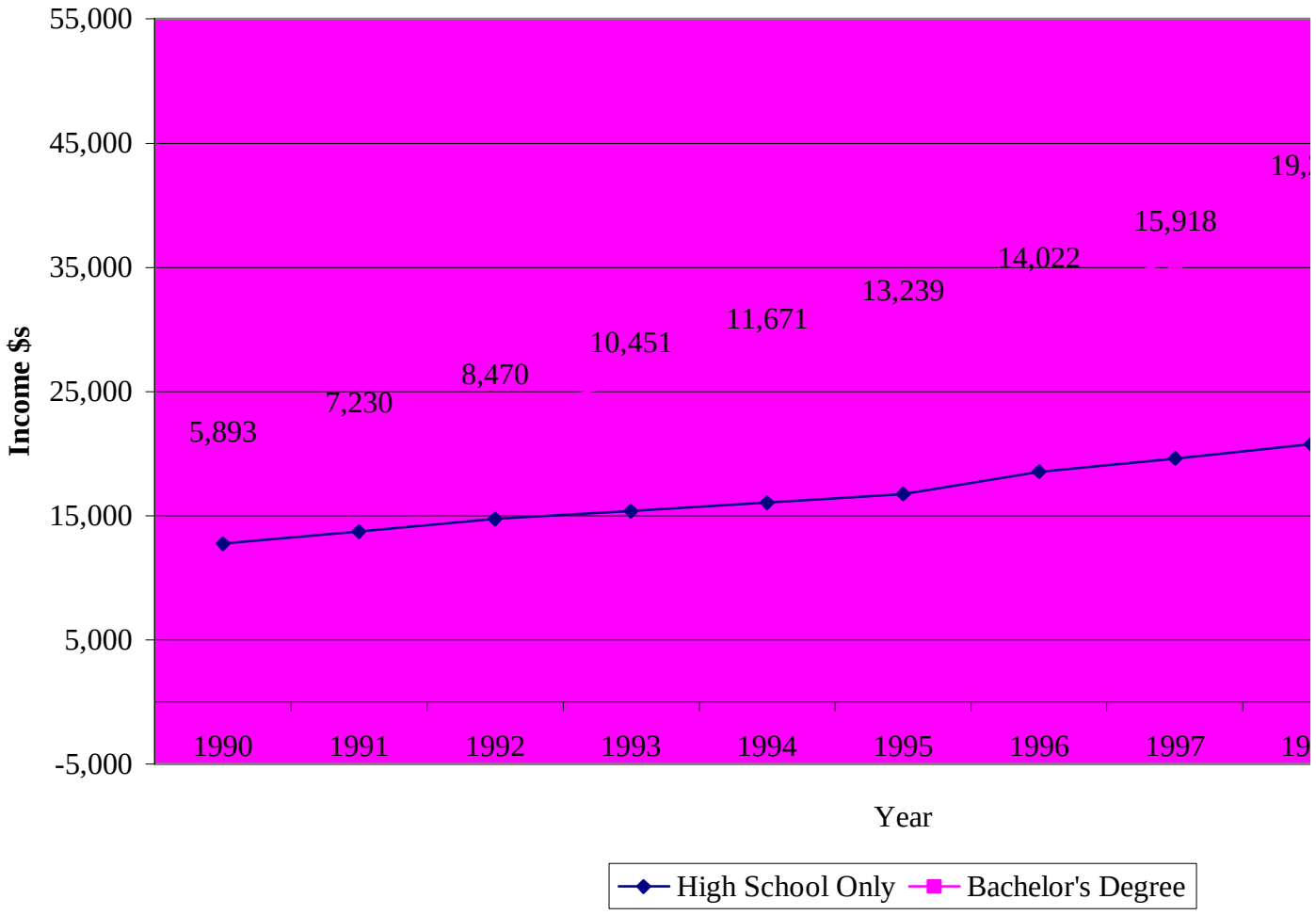

Figure 6
Individual Incremental Income
Master's Degree Recipients vs. Bachelors Degree Recipients
1989 USM Graduate Cohort

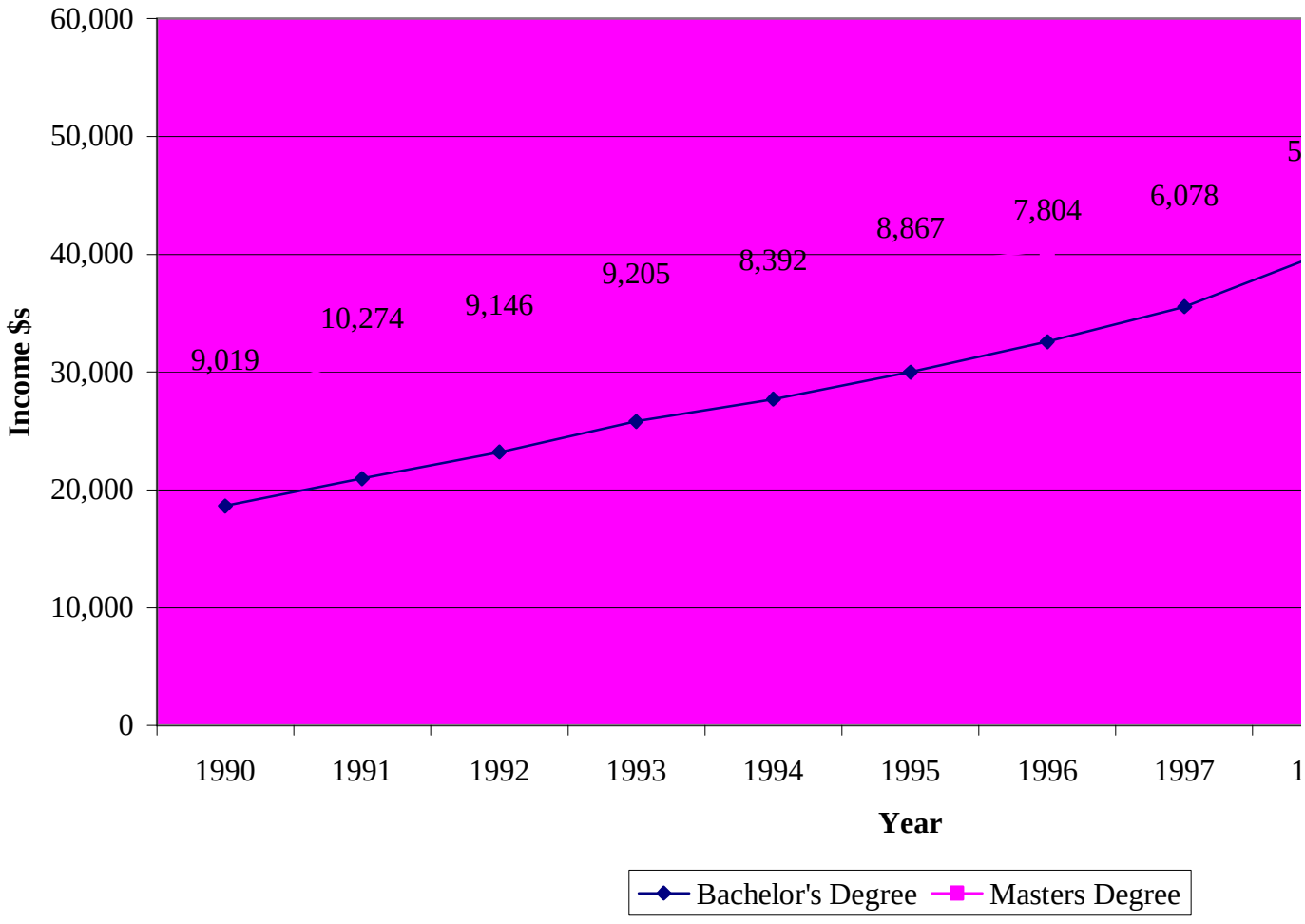

Figure 7
Individual Incremental Income
Doctoral Degree Recipients vs. Masters Degree Recipients
1989 USM Graduate Cohort

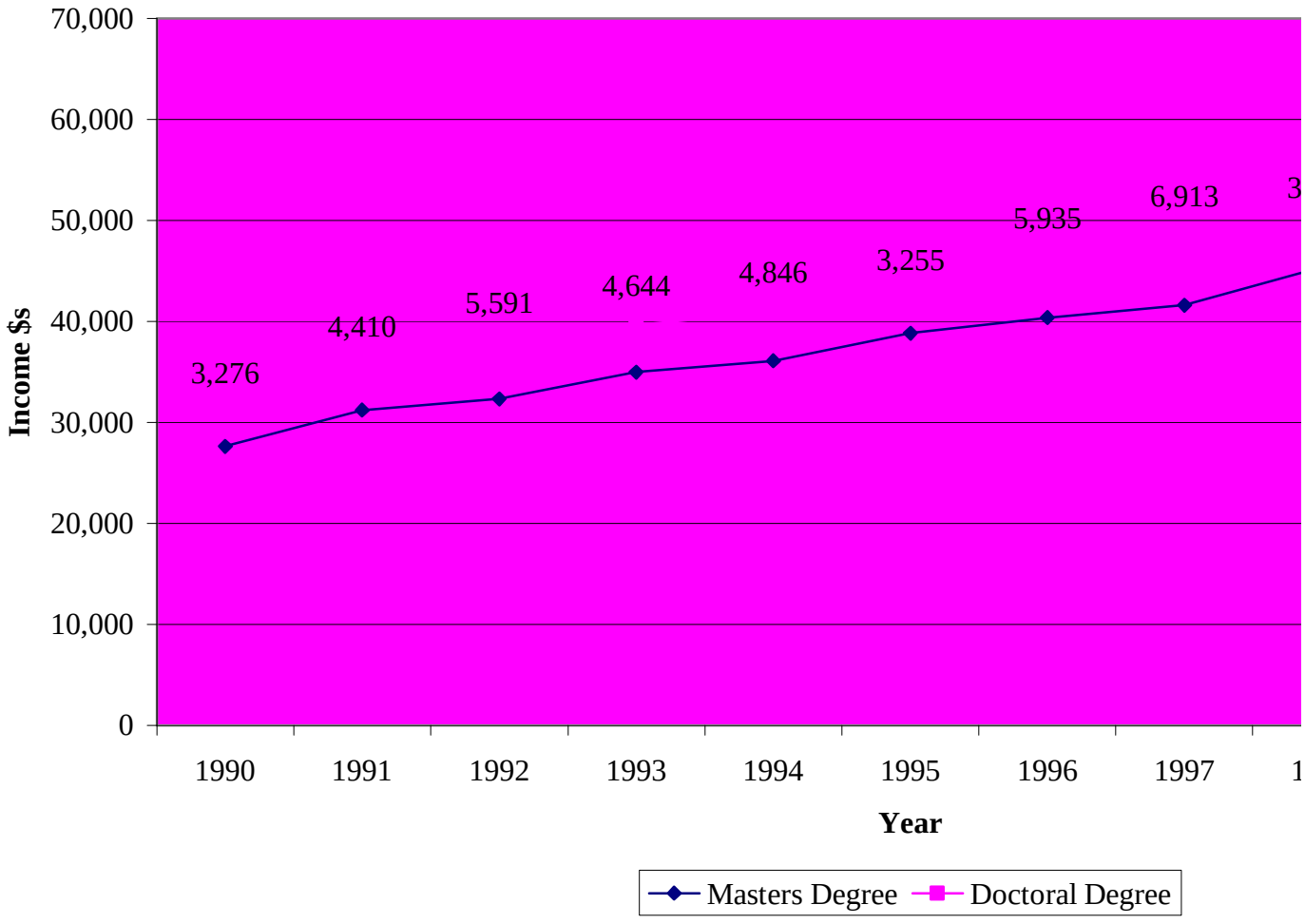

Figure 8
Individual Incremental Income
First Professional Degree Recipients vs. Bachelor's Degree Recipients
1989 USM Graduate Cohort

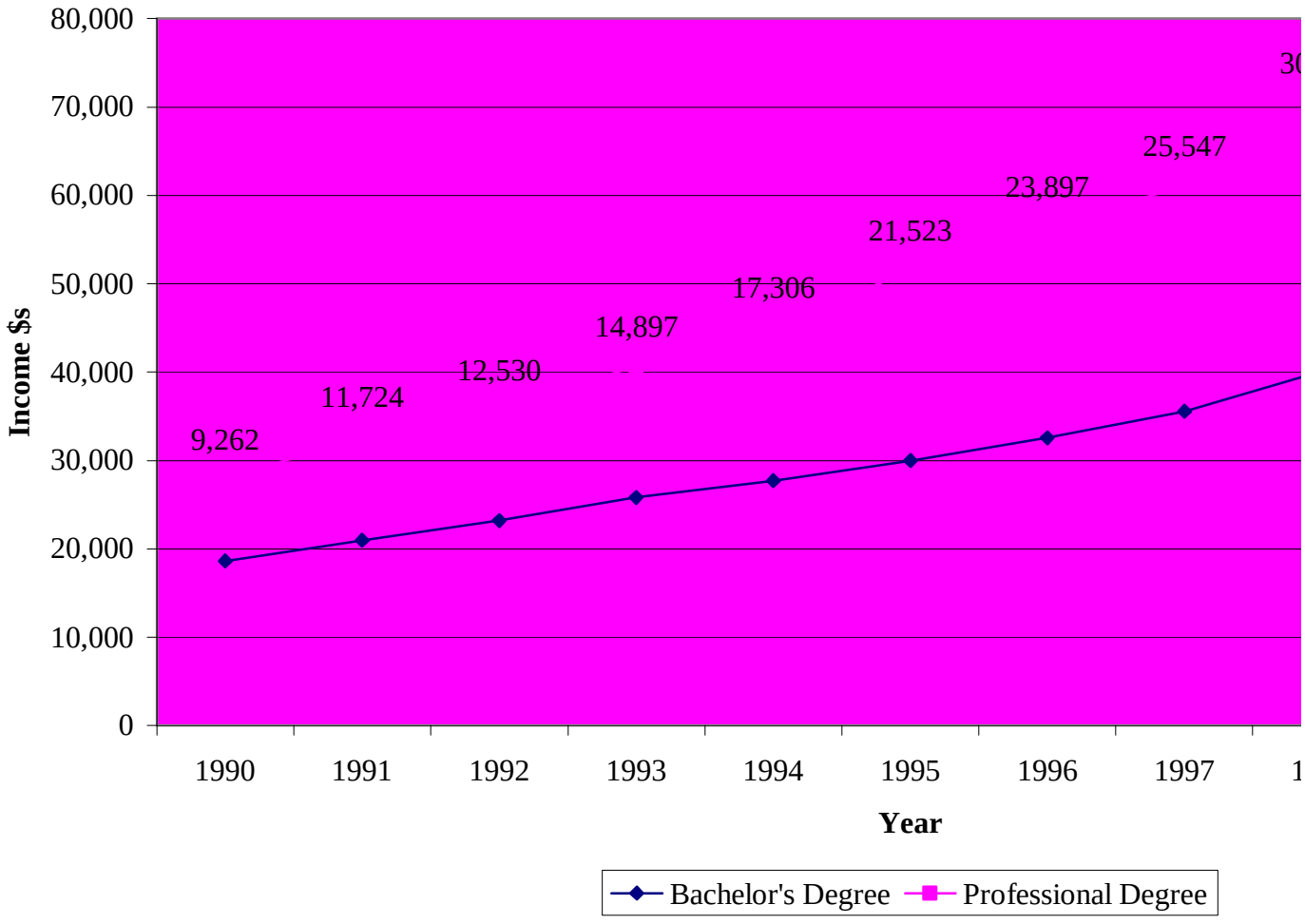

Table 1
Individual Incremental Lifetime Earnings and Taxes Paid
1986 Cohort of USM Graduates, By Type of Degree
(Non-Discounted and Discounted Dollars)

	Earnings		Tax Impact	
Type of Degree	Non-Discounted	Discounted	Non-Discounted	Discounted
Bachelor's	$2,474,185	$1,368,967	$158,348	$87,614
Master's	$183,932	$130,463	$11,772	$8,350
Doctorate	$517,872	$330,573	$33,144	$21,157
First Professional	$2,070,822	$1,261,188	$132,533	$80,716

Source: USM, DLLR, and The Jacob France Institute

Table 2
Individual Incremental Lifetime Earnings and Taxes Paid
1989 Cohort of USM Graduates, By Type of Degree
(Non-Discounted and Discounted Dollars)

	Earnings		Tax Impact	
Type of Degree	Non-Discounted	Discounted	Non-Discounted	Discounted
Bachelor's	$2,555,609	$1,413,806	$163,559	$90,484
Master's	$367,403	$240,041	$23,514	$15,363
Doctorate	$370,225	$233,780	$23,694	$14,962
First Professional	$1,723,983	$1,061,463	$110,335	$67,934

Source: USM, DLLR, and The Jacob France Institute

2.2 Total Cohort Incremental Earnings and Taxes Paid of University of Maryland System Graduates

The additional earnings of USM graduates working in Maryland is earned and spent in the Maryland economy. The increase in individual incomes can be aggregated for each of the two cohorts to estimate the total increase in earnings, and the resulting increase in economic activity in the state attributable to each cohort. As shown in Table 3 the 1986 cohort of USM graduates will earn $10.2 billion in additional income over their lifetimes ($6.0 billion in discounted terms). The 1986 graduates will pay nearly $650.8 million in additional Maryland income and sales taxes ($383.8 million in discounted 2000 dollars). Table 4 shows that the 1989 cohort of University System of Maryland graduates will earn nearly $11.5 billion in additional income over their lifetimes ($6.8 billion in discounted terms) and pay $735.9 million in additional Maryland income and sales taxes ($433.9 million in discounted terms).

Table 3
Total Cohort Incremental Lifetime Earnings and Taxes Paid
1986 Cohort of USM Graduates, By Type of Degree
(Non-Discounted and Discounted Dollars)

	Earnings		Tax Impact	
Type of Degree	Non-Discounted	Discounted	Non-Discounted	Discounted
Total	$10,170,721,790	$5,997,009,834	$650,926,195	$383,808,629
Bachelor's	$9,381,822,973	$5,470,977,262	$600,436,670	$350,142,545
Master's	$169,990,861	$129,030,231	$10,879,415	$8,257,935
Doctorate	$48,056,547	$32,710,750	$3,075,619	$2,093,488
First Professional	$570,851,409	$364,291,590	$36,534,490	$23,314,662

Source: USM, DLLR, and The Jacob France Institute

Table 4
Total Cohort Incremental Lifetime Earnings and Taxes Paid
1989 Cohort of USM Graduates, By Type of Degree
(Non-Discounted and Discounted Dollars)

	Earnings		Tax Impact	
Type of Degree	Non-Discounted	Discounted	Non-Discounted	Discounted
Total	$11,498,595,708	$6,780,205,180	$735,910,125	$433,933,132
Bachelor's	$10,675,163,632	$6,225,078,583	$683,210,472	$398,405,029
Master's	$364,545,431	$256,601,389	$23,330,908	$16,422,489
Doctorate	$30,071,971	$20,125,817	$1,924,606	$1,288,052
First Professional	$428,814,674	$278,399,391	$27,444,139	$17,817,561

Source: USM, DLLR, and The Jacob France Institute

2.3 The Economic Impact of University System of Maryland Graduates on Maryland

The incremental earnings of University System of Maryland graduates working in Maryland are more than just a source of new state revenues; they also are a source of **new economic activity** in the state. This activity has multiplier effects as the incremental earnings are spent and then re-spent by other businesses and individuals in the state economy. However, because of economic "leakages" due to out-of-state spending, these multiplier effects do not continue infinitely. This analysis estimates the multiplier effects using the RIMS II economic model developed by the U.S. Bureau of Economic Analysis.

The RIMS II model allows the estimation of three economic impacts: economic output (a measure similar to gross domestic product that measures economic activity in the state), employment, and earnings. The economic impacts of the incremental earnings of the 1986 and 1989 cohorts of System graduates are shown in Tables 5 and 6.[6] It is important to note that these figures represent the impacts of only the two cohorts being studied. The actual economic impacts on the state would be the aggregate effect of all USM graduates working in Maryland.

As presented in Table 5, the 1986 cohort of University System of Maryland graduates will generate $11.3 billion in economic activity over their estimated work-life ($6.7 billion in discounted terms). The economic activity generated by these incremental earnings supports an average of 2,698 annual jobs earning $3.2 billion in salaries and wages. In turn, these salaries and wages will generate a total of $854 million in additional state income and sales taxes ($504 million in discounted terms).

[6] All economic impact data are in 2000 dollars. Incremental earnings were adjusted to reflect disposable personal income before multipliers were applied. The multipliers for the household sector of the economy were employed. Incremental earnings for the first year of each cohort were negative.

Table 5
Statewide Economic Impact of
Incremental Income Earned by 1986 USM Cohort
By Year, Selected Years

Year	Economic Output (2000$)	Earnings (2000$)	Employment (# of Jobs)	Fiscal (2000$)
1987	71,809,845	20,247,860	755	5,433,026
1988	94,982,672	26,781,785	998	7,186,248
1989	108,694,147	30,647,940	1,142	8,223,638
1990	119,340,193	33,649,752	1,254	9,029,102
1991	121,280,965	34,196,982	1,274	9,175,938
1992	123,749,829	34,893,115	1,300	9,362,729
1993	122,040,507	34,411,146	1,282	9,233,404
1994	126,567,214	35,687,519	1,330	9,575,888
1995	137,267,435	38,704,606	1,442	10,385,451
1996	135,143,583	38,105,754	1,420	10,224,763
1997	136,008,633	38,349,668	1,429	10,290,212
1998	155,543,816	43,857,905	1,634	11,768,215
1999	160,768,914	45,331,200	1,689	12,163,538
2000	169,645,973	47,834,219	1,783	12,835,163
2005	215,139,106	60,661,688	2,261	16,277,106
2010	262,425,591	73,994,820	2,758	19,854,731
2015	311,948,061	87,958,421	3,278	23,601,528
2020	364,167,967	102,682,604	3,827	27,552,409
2025	419,569,886	118,304,004	4,409	31,744,036
2030	447,413,947	126,155,053	4,701	33,850,676
Total	11,298,298,862	3,185,724,333		854,812,552
		Average Annual Employment	2,698	
Discounted Total				
Total	6,661,868,329	1,878,413,405		504,027,087

Source: USM, DLLR, and The Jacob France Institute

The economic and fiscal impacts of the 1989 cohort of USM graduates are presented in Table 6. The 1989 cohort of University System of Maryland graduates will generate $12.8 billion in economic activity over their estimated work-life ($7.5 billion in discounted terms). The economic activity generated by these incremental earnings supports an average of 3,051 annual jobs earning $3.6 billion in salaries and wages. In turn, these salaries and wages will generate a total of $966 million in additional state income and sales taxes ($570 million in discounted terms).

Table 6
Statewide Economic Impact of
Incremental Income Earned by 1989 USM Cohort
By Year, Selected Years

Year	Economic Output (2000$)	Earnings (2000$)	Employment (# of Jobs)	Fiscal (2000$)
1990	97,371,855	27,455,451	1,023	7,367,010
1991	104,056,173	29,340,194	1,093	7,872,736
1992	106,804,017	30,114,990	1,122	8,080,634
1993	120,329,239	33,928,629	1,264	9,103,932
1994	124,364,630	35,066,467	1,307	9,409,244
1995	139,001,705	39,193,610	1,461	10,516,663
1996	136,157,462	38,391,633	1,431	10,301,472
1997	142,631,274	40,217,021	1,499	10,791,271
1998	163,881,212	46,208,759	1,722	12,399,010
1999	168,659,859	47,556,170	1,772	12,760,555
2000	177,059,638	49,924,613	1,861	13,396,070
2005	212,587,000	59,942,084	2,234	16,084,017
2010	264,170,353	74,486,782	2,776	19,986,738
2015	317,981,037	89,659,509	3,341	24,057,974
2020	374,521,654	105,601,981	3,936	28,335,753
2025	434,318,003	122,462,456	4,564	32,859,857
2030	479,567,521	135,221,234	5,039	36,283,368
2033	506,973,678	142,948,811	5,327	38,356,877
Total	12,773,387,521	3,601,647,641		966,415,574
	Average Annual Employment		3,051	
Discounted Total				
	7,531,892,627	2,123,729,767		569,851,837

Source: USM, DLLR, and The Jacob France Institute

2.4 The Economic and Fiscal impact of the University System of Maryland on Maryland's Economy – Effect of Expenditures Originating from Out-of-State

In addition to the economic effects of the incremental earnings of University System of Maryland graduates discussed above, the System contributes to Maryland's economic base by attracting students and spending from outside of the state. This spending is also subject to multiplier effects. Three sources of out-of-state spending were considered in this analysis:

1. Non-resident student spending comprising the tuition[7] and estimated living expenditures[8] of out-of-state and international students attracted by the high quality of USM institutions;
2. Non-Maryland sponsored research comprising federal government grants to USM research centers and faculty or staff to perform research, training, or other services; and
3. Spending of out-of-state visitors to USM institutions.

These three sources of spending total nearly $830 million in out-of-state supported economic activity associated with the USM.[9] As shown in Table 7, this spending creates a total of $1.76 billion in economic activity in the state and supports 21,420 jobs earning nearly $580 million in fiscal year 2000. These economic impacts occur in addition to the increases in economic activity associated with the incremental earnings of System graduates. These activities generate an estimated $27 million in state income and sales taxes.

Table 7
Economic Base Approach
Economic Impact
(Fiscal 2000)

Item	Direct Impacts	Economic Impact Output	Earnings	Employment
Total	**829,786,39**	**1,757,098,82**	**579,297,19**	**21,42(**
Non-Resident Student	**340,896,91**	**719,687,88**	**215,637,57**	**9,177**
Tuition and Fees	157,438,34	372,939,95	123,132,53	5,126
Living	169,555,57	319,585,63	84,061,75	3,656
Books	13,903,00	27,162,29	8,443,29	394
Federal Grants and Contracts	**391,979,10**	**839,305,65**	**304,959,74**	**9,254**
Out-of-State Visitors	**96,910,37**	**198,105,29**	**58,699,88**	**2,989**

Source: USM, The Jacob France Institute, U.S. Bureau of Economic Analysis

[7] Estimates of tuition revenues from out-of-state students were provided by USM.

[8] The number of full-time out-of-state students enrolled in each USM institution was provided by USM. Average living expenses were based on financial aid estimates from each institution's website. The living expenses of part-time students are excluded from this analysis because it is not possible to know whether they live in Maryland or commute to a USM institution from out-of-state. The use of the living expenses of full-time students only provides a conservative estimate of the total economic impact of the System since the living, commuting, and educational purchases of part-time students are excluded.

2.5 The Fiscal Impact of The University System of Maryland

The increased income and associated economic impacts of University System of Maryland graduates is an important source of economic activity for Maryland. However, a central goal of this analysis is to compare the state subsidies received by the System to the state revenues derived from the increased earnings of USM graduates. This is done in two analyses.

The first analysis, described in Table 8, compares the state subsidy[10] received by the average USM graduate to the incremental tax revenues derived from each graduate. As presented in Table 8, the average state subsidy for a 1986 Bachelor's degree recipient is $18,002 while the increase in state revenues is $158,348 for a revenue/cost ratio of nearly 9 to 1. The revenue/cost ratio for a 1986 master's degree recipient was 1.1 to 1, for a doctoral degree recipient 1.5 to 1, and for a professional degree recipient was 9.4 to 1. The revenue/cost ratios for the 1989 cohort of graduates ranged from a low of 0.8 to 1 for a doctoral degree recipient to 7.2 to 1 for a bachelor's degree recipient.

Table 8
Fiscal Impact of University System of Maryland
Per Student Revenues and Costs

Item	Bachelor's	Master's	Doctorate	Professional
1986 Cohort				
Increase in Tax Revenues ($s)	158,348	11,772	33,144	132,533
State per Student Tax Subsidy ($s)	18,002	10,311	21,600	14,053
Revenue/Cost Ratio	8.8	1.1	1.5	9.4
1989 Cohort				
Increase in Tax Revenues ($s)	163,559	23,514	23,694	110,335
State per Student Tax Subsidy ($s)	22,871	12,059	27,915	17,604
Revenue/Cost Ratio	7.2	1.9	0.8	6.3

Source: USM, Jacob France Institute

[9] This analysis excludes private gifts, grants and contracts from out-of-state sources and endowment revenues based on out-of-state contributions because no data were available. Thus, the overall economic contribution made by the USM is likely to be higher.

[10] The state subsidy was derived dividing the state appropriation received by the USM by total enrollment for the years being analyzed in order to derive the state per student subsidy for each year of operation. This ignores differences between institutions and programs within institutions, but provides a reasonable estimate of the average cost of a USM student. These figures were then summed for each year for the number of years at a USM institution for each class of the two cohorts. Bachelor's degree recipients were assumed to spend 4 years at a USM institution, master's degree recipients 2 years, doctoral degree recipients 5 years, and professional degree recipients 3 years.

The revenue-cost figures in Table 8 include only the income and subsidy received by graduates appearing in the DLLR data. This analysis overestimates the actual revenue benefits to the state because it does not include the subsidy costs for USM graduates who leave Maryland or the subsidy received by students who do not complete their degree. Nor does that analysis include the multiplier effects of the incremental income derived from a USM degree. Several steps were undertaken to derive a more complete estimate of the state revenue cost ratio for the University System of Maryland. The state subsidy for each cohort of students was increased to reflect: the effects of graduates not appearing in the DLLR data[11] and the costs of students who do not complete their degree at the university;[12] by developing an estimate total subsidy received by each cohort. The total number of graduates in each degree cohort was multiplied by the average subsidy received per degree for each cohort of graduates to derive a total cohort subsidy. State revenue estimates were also increased to include the economic multiplier effects. These adjustments make it possible to compare the total cost of each cohort to the economic benefits derived from each cohort. This provides the most complete measure of the fiscal revenue/cost ratio for the University System of Maryland.

The results of this analysis are presented in Table 9 using both aggregate and discounted tax revenues. The state fiscal revenue cost ratio for the 1986 cohort of USM graduates is 3.2 to 1, signifying that the state receives $3.20 in revenue for each $1 invested. Using the discounted present value of future tax revenues, the state fiscal revenue cost ratio for the 1986 cohort of USM graduates is 1.9 to 1 signifying that the state receives $1.90 in revenue for each $1 invested. The revenue/cost ratio for the 1989 cohort was lower – due to higher levels of state appropriations, but the net fiscal return to the state remains positive at $2.60 for every $1 invested in undiscounted terms, and $1.50 for every $1 invested in discounted terms.

[11] As described above, only a portion of USM graduates appeared in the DLLR data. Many graduates move out-of-state to find employment. Others may reside in Maryland but work in neighboring states, for employers (such as the federal government) not included in the DLLR data used, or are self employed or independent contractors (and, thus, also not in the DLLR data used). The omission of these latter types of graduates undercounts the actual incremental wage and related impacts of the USM. However, there was no means to obtain information on these graduates. Thus, the estimates presented here can be viewed as very conservative.

[12] The state appropriation was divided by total enrollment to estimate the state subsidy received by USM per student year. Thus, the state subsidy covers both graduates and those students who leave before they complete their degree. No estimates were available for the number of students not completing their degree. It is important to note that many of these students gain valuable skills and knowledge at System institutions that can translate into higher earnings. The increase in earnings by these former USM students also represent potential economic and fiscal benefits not included in this analysis, further reinforcing the conservative nature of these estimates.

Table 9
Fiscal Impact of University System of Maryland
Undiscounted and Discounted Cohort Costs and Benefits,
Including Multiplier Effects and Attrition

	Undiscounted		Discounted	
Item	1986 Cohort	1989 Cohort	1986 Cohort	1989 Cohort
Increase in Tax Revenues ($s)	854,812,552	966,415,574	504,027,087	569,851,837
State Cohort Subsidy ($s)	268,614,190	373,690,768	268,614,190	373,690,768
Revenue/Cost Ratio	3.2	2.6	1.9	1.5

Source: USM, Jacob France Institute

The tax benefits computed above do not include any tax effects from the contributions of USM institutions to Maryland's economic base described in Section 2.4 and Table 7 of this report. Thus, the fiscal and economic benefits to the state are even greater than presented above.

3.0 Workforce Development Impact of the University System of Maryland

In addition to the earnings impacts described above, the University System of Maryland also improves Maryland's competitiveness by providing a better-educated local workforce for the Maryland employer community. The availability of a skilled labor force is frequently cited by businesses as a major consideration in deciding where to locate.

By preparing new entrants to the workforce and upgrading the skills of the existing workforce, the USM is essential to ensuring the high-quality, highly skilled workforce needed by Maryland's businesses. The presence of highly educated and skilled workers in an area creates an "industrial competitive advantage" which enables businesses to compete more effectively regionally, nationally, and globally.

a. Importance of Higher Education

Maryland has the distinction of having one of the most well educated resident populations in the nation. According to the Bureau of the Census' Educational Attainment in the United States, 2000, 32% of Maryland's population 25 years old and over has completed a bachelor's degree or higher. This places Maryland fourth in educational attainment compared to all fifty states and the District of Columbia. Massachusetts (33%), Colorado (35%), and the District of Columbia (38%) are the only other states that rank above Maryland.

i. USM's High Quality

The quality of USM institutions allows them to attract increasing numbers of top students. The System's highly recognized universities provide the most current and technology driven education and training. Examples of this national recognition include:

- *U.S. News & World Report* ranks the University of Maryland, College Park among the top 25 national, public universities. Among all ranking surveys, UMCP has a total of 61 programs ranked in the top 25. In graduate rankings, the College of Computer, Mathematical and Physical Sciences, the School of Engineering, the School of Public Affairs and the College of Education all ranked in the top 25. Additionally, *U.S. News & World Report* ranked the School of Business' undergraduate specialization in management information systems 7th in the nation.
- The University of Maryland, Baltimore's School of Nursing is ranked in the top ten, the School of Pharmacy is ranked 7th, the School of Law is ranked in the top tier with three programs in the top six, and the School of Social Work is ranked 25th by *U.S. News and World Report.*
- According to the Association of American Medical Colleges, the University of Maryland, Baltimore's School of Medicine is ranked 9th among all U.S. public medical schools, and its faculty ranks 5th in clinical research productivity per clinical faculty.
- NASA and the National Science Foundation have designated Bowie State University as a Model Institution for Excellence -- one of only six such designations nationwide -- for their curricula in science, engineering, mathematics, and computer science.
- *U.S. News & World Report* ranks Salisbury University and Towson University in the top 10 of public, master's level universities in the Northeast.

- *U.S. News & World Report* ranks the University of Baltimore's webMBA as one of the best online programs in the country and the Clinical Law Training Program as one of the top twenty in the nation.
- The University of Maryland, Baltimore County is ranked in the top tier of the nation's research universities--Doctoral/Research Universities-Extensive--by the Carnegie Foundation and is the only Maryland university rated a "Best Value" by *Kaplan/Newsweek 2001 College Catalog*.

These and other types of recognition will result in the System producing an even greater percentage of the state's degree recipients. The contribution of the System is evident at all degree levels.

b. University System of Maryland's Role in Maryland Higher Education

Increasing the number of well-educated residents in Maryland is a key goal of the System. The System accounted for two-thirds (66%) of the total enrollment of Maryland's four-year degree granting institutions in 2000, including 69% of the full-time undergraduates; 77% of the part-time undergraduates; 64% of the full-time graduate/professional students; and over half (52%) of the part-time graduate/professional students (see Table 10).

Table 10
University System of Maryland's Share of Total Maryland Enrollment at Four-Year Degree Granting Institutions, Fall 2000 (Number of Students)

	All Maryland Institutions	University System of Maryland	Percent of Total
Full-time Undergraduate	85,329	58,484	69%
Part-time Undergraduate	28,806	22,237	77%
Full-time Graduate/Professional	18,038	11,472	64%
Part-time Graduate/Professional	31,514	16,292	52%
Total	**163,687**	**108,485**	**66%**

i. Undergraduate Education

System schools awarded 14,952 bachelor's degrees (71% of total bachelor's degrees issued) in 2000 (see Table 11). Of those degrees, 500 were in engineering, 776 were in computer science, 870 were in health, 920 were in biological sciences, 1,296 were in education, and 1,917 were in social sciences. Of all degrees in these fields, System schools graduated 59% of the undergraduate engineering majors, 64% of the health majors, 64% of the social science majors, 68% of the biological science majors, 71% of the business majors, 73% of the computer science majors, and 85% of the education majors.

Table 11
Bachelor's Degrees Awarded by University System of Maryland, Morgan/St. Mary's, and Independent Colleges and Universities in Maryland in 2000

	All Maryland Institutions	University System of Maryland	Percent of Total	Morgan State & St. Mary's	Percent of Total	Independent Colleges and Universities	Percent of Total
Total Degrees	**33,689**	**21,842**	**65%**	**1,224**	**4%**	**10,623**	**32%**
Total Bachelor's Degrees	**21,139**	**14,952**	**71%**	**1,093**	**5%**	**5,094**	**24%**
Agriculture	166	166	100%	0	0%	0	0%
Architecture	63	50	79%	0	0%	13	21%
Area Studies	68	52	76%	0	0%	16	24%
Bio Sciences	1,359	920	68%	113	8%	326	24%
Business	2,896	2,050	71%	149	5%	697	24%
Communications	958	739	77%	49	5%	170	18%
Computer Science	1,056	776	73%	60	6%	220	21%
Education	1,523	1,296	85%	87	6%	140	9%
Engineering	851	500	59%	66	8%	285	33%
Chemical Engineering	53	32	60%	0	0%	21	40%
Civil Engineering	90	50	56%	23	26%	17	19%
Electrical Engineering	239	155	65%	32	13%	52	22%
Mechanical Engineering	156	129	83%	0	0%	27	17%
Other Engineering	313	134	43%	11	4%	168	54%
Arts	978	500	51%	49	5%	429	44%
Languages	244	186	76%	6	2%	52	21%
Health	1,367	870	64%	12	1%	485	35%
Nursing	795	476	60%	0	0%	319	40%
Other Health	572	394	69%	12	2%	166	29%
Home Economics	174	165	95%	9	5%	0	0%
Law	62	20	32%	0	0%	42	68%
Letters	1,026	655	64%	80	8%	291	28%
Mathematics	216	143	66%	17	8%	56	26%
Physical Sciences	237	138	58%	31	13%	68	29%
Psychology	1,384	949	69%	117	8%	318	23%
Public Affairs	635	438	69%	47	7%	150	24%
Social Sciences	2,990	1,917	64%	190	6%	883	30%
Theology	110	0	0%	0	0%	110	100%
Interdisciplinary	2,776	2,422	87%	11	0%	343	12%

ii. Graduate Education

The University System of Maryland offers master's degrees in twenty-three major areas. As seen in Table 12, System schools awarded over half (52%) of all master's degrees awarded by all public and private universities in Maryland in 2000. The University System of Maryland graduated 42% of graduate biological science students, 48% of graduate health students, 49% of graduate computer science students, 51% of graduate engineering students, and 62% of graduate business students in Maryland. The

University System of Maryland also graduated 100% of all graduate students in several programs, including agriculture, architecture, law, library sciences, and public affairs.

Table 12
Master's Degrees Awarded by University System of Maryland, Morgan/St. Mary's, and Independent Colleges and Universities in Maryland in 2000

	All Maryland Institutions	University System of Maryland	Percent of Total	Morgan State & St. Mary's	Percent of Total	Independent Colleges and Universities	Percent of Total
Total Degrees	**33,689**	**21,842**	**65%**	**1,224**	**4%**	**10,623**	**32%**
Total Master's Degrees	**10,520**	**5,439**	**52%**	**86**	**1%**	**4,995**	**47%**
Agriculture	41	41	100%	0	0%	0	0%
Architecture	16	16	100%	0	0%	0	0%
Area Studies	18	1	6%	0	0%	17	94%
Bio Sciences	226	94	42%	0	0%	132	58%
Business	2,717	1,679	62%	41	2%	997	37%
Communications	53	53	100%	0	0%	0	0%
Computer Science	638	311	49%	0	0%	327	51%
Education	2,442	1,023	42%	21	1%	1,398	57%
Engineering	660	338	51%	8	1%	314	48%
Mechanical Engineering	80	52	65%	0	0%	28	35%
Chemical Engineering	16	9	56%	0	0%	7	44%
Civil Engineering	52	44	85%	0	0%	8	15%
Electrical Engineering	245	98	40%	0	0%	147	60%
Other Engineering	267	135	51%	8	3%	124	46%
Arts	251	126	50%	0	0%	125	50%
Languages	23	21	91%	0	0%	2	9%
Health	1,001	482	48%	0	0%	519	52%
Nursing	290	231	80%	0	0%	59	20%
Other Health	711	251	35%	0	0%	460	65%
Home Economics	24	14	58%	0	0%	10	42%
Law	37	37	100%	0	0%	0	0%
Letters	166	78	47%	3	2%	85	51%
Library Sciences	101	101	100%	0	0%	0	0%
Mathematics	51	23	45%	0	0%	28	55%
Physical Sciences	171	46	27%	0	0%	125	73%
Psychology	421	269	64%	0	0%	152	36%
Public Affairs	486	486	100%	0	0%	0	0%
Social Sciences	658	160	24%	10	2%	488	74%
Theology	83	0	0%	0	0%	83	100%
Interdisciplinary	236	40	17%	3	1%	193	82%

iii. Doctoral Education

As seen in Table 13, System schools awarded 61% of all doctoral degrees awarded by public and private colleges and universities in Maryland in 2000. University System of Maryland schools issued 56% of biological science doctoral degrees, 65% of the doctoral mathematics degrees, 65% of physical science doctoral degrees, 67% of

doctoral computer science degrees, and 67% of doctoral engineering degrees. Additionally, System schools issued 100% of all doctoral degrees in several programs in 2000, including agriculture, business, communications, library sciences, and public affairs.

Table 13
Doctoral Degrees Awarded by University System of Maryland, Morgan/St. Mary's, and Independent Colleges and Universities in Maryland in 2000

	All Maryland Institutions	University System of Maryland	Percent of Total	Morgan State & St. Mary's	Percent of Total	Independent Colleges and Universities	Percent of Total
Total Degrees	**33,689**	**21,842**	**65%**	**1,224**	**4%**	**10,623**	**32%**
Total Doctoral Degrees	**946**	**581**	**61%**	**10**	**1%**	**355**	**38%**
Agriculture	4	4	100%	0	0%	0	0%
Area Studies	5	4	80%	0	0%	1	20%
Bio Sciences	165	93	56%	0	0%	72	44%
Business	15	15	100%	0	0%	0	0%
Communications	13	13	100%	0	0%	0	0%
Computer Science	24	16	67%	0	0%	8	33%
Education	87	75	86%	10	11%	2	2%
Engineering	138	92	67%	0	0%	46	33%
Chemical Engineering	16	12	75%	0	0%	4	25%
Civil Engineering	11	8	73%	0	0%	3	27%
Electrical Engineering	47	38	81%	0	0%	9	19%
Mechanical Engineering	12	9	75%	0	0%	3	25%
Other Engineering	52	25	48%	0	0%	27	52%
Arts	39	25	64%	0	0%	14	36%
Languages	16	5	31%	0	0%	11	69%
Health	144	34	24%	0	0%	110	76%
Nursing	14	10	71%	0	0%	4	29%
Other Health	130	24	18%	0	0%	106	82%
Letters	37	30	81%	0	0%	7	19%
Library Sciences	1	1	100%	0	0%	0	0%
Mathematics	31	20	65%	0	0%	11	35%
Physical Sciences	78	51	65%	0	0%	27	35%
Psychology	33	31	94%	0	0%	2	6%
Public Affairs	5	5	100%	0	0%	0	0%
Social Sciences	105	67	64%	0	0%	38	36%
Theology	4	0	0%	0	0%	4	100%
Interdisciplinary	2	0	0%	0	0%	2	100%

iv. Professional Education

In 2000, System schools issued 80% of all professional degrees awarded by public and private colleges and universities in Maryland in 2000 (see Table 14). The University of Maryland, Baltimore and the University of Baltimore are the only two schools in Maryland that offer a professional law degree. The University of Maryland,

Baltimore is one of two schools in Maryland that offers a professional degree in Medicine and is the only school to offer professional degrees in pharmacy, dentistry, and social work. System schools issued 76% of the professional health degrees and 100% of the professional law degrees. Of the professional health degrees, the University System of Maryland awarded over half (55%) of the professional degrees in medicine, and 100% of the professional degrees in both dentistry and pharmacy. The professional degrees that are awarded by the USM have a significant impact on the state's economy by providing advanced candidates for numerous high-wage occupations for which there is great demand by Maryland businesses, non-profits, and government.

Table 14
Professional Degrees Awarded by University System of Maryland, Morgan/St. Mary's, and Independent Colleges and Universities in Maryland in 2000

	All Maryland Institutions	University System of Maryland	Percent of Total	Morgan State & St. Mary's	Percent of Total	Independent Colleges and Universities	Percent of Total
Total Degrees	**33,689**	**21,842**	**65%**	**1,224**	**4%**	**10,623**	**32%**
Total Professional Degrees	**1,084**	**870**	**80%**	**35**	**3%**	**179**	**17%**
Health	469	357	76%	0	0%	112	24%
Dentistry	93	93	100%	0	0%	0	0%
Medicine	251	139	55%	0	0%	112	45%
Pharmacy	125	125	100%	0	0%	0	0%
Law	513	513	100%	0	0%	0	0%
Theology	102	0	0%	35	34%	67	66%

v. Continuing Education

The System not only provides degree programs, but also offers a wide variety of continuing education programs. These programs give employees the ability to gain new skills or upgrade existing skill sets. Each university within the USM offers programs to supplement the skill set of residents of Maryland, the region, and even the world.

Many schools offer programs with flexible class schedules, evening classes, weekend classes, and internet classes. These internet classes allow people from all over the world to receive certificates or degrees from System schools. Examples of these internet degrees include the University of Baltimore's webMBA and the University of Maryland, College Park's online Masters of Life Sciences. Several schools offer programs geared to the teaching of computer and technology skills. The University of Maryland, Baltimore County's Computer Certification Training Center addresses the shortage of technical workers by providing technology training and industry standard certification programs.

The University of Maryland University College is the world's leader in distance education, with 60,000 course enrollments.

c. Occupational Demand for University System of Maryland Graduates

The USM draws students not only from Maryland, but also from across the United States and around the world. Upon graduation, most of these students choose to remain in Maryland. Table 15 lists University System of Maryland graduates compared to estimated occupational openings for key degree areas.

Compared to total average openings for these occupations in Maryland, System schools meet 62% of the occupational demand. Table 16 lists the occupations that were compiled to create the total occupational demand for a degree area. In awarding degrees in business and computer science, System schools meet 44% of the estimated demand for all business-related and computer science-related occupations. The System meets over half of the estimated demand for education occupations (51%), engineering occupations (52%), agricultural science (54%), and health-related occupations (60%). Finally, the University System of Maryland exceeds the total occupational demand for three major areas. These areas are social science/government planning (225%), law (227%), and physical/biological sciences (285%). By exceeding the demand for these occupations in Maryland, the USM of Maryland plays an important role in supplying educated and skilled workers to both the regional and national markets.

Table 15

Occupational Demand for University System of Maryland Graduates

Occupational Category[1]	Maryland Occupational Demand	University System of Maryland Graduates, 2000	Graduates as a % of Demand[2]
Total	**22,453**	**13,946**	**62%**
Business	8,556	3,744	44%
Education	4,735	2,394	51%
Social Science/Government Planning	952	2,144	225%
Health	2,900	1,743	60%
Physical/Biological Sciences	388	1,107	285%
Computer Science	2,505	1,103	44%
Engineering	1,772	930	52%
Law	251	570	227%
Agricultural Science	394	211	54%

Source: Maryland Department of Labor, Licensing and Regulation

Industry and Employment Projection program

[1] Each category of occupations consits of numerous occupations which are listed in Table 7

[2] The University System of Maryland is an important institution providing education and training both regionally and nationally. Graduates may take their skill sets to other occupations and locations. Thus, the total number of graduates may exceed state demand.locations.

Table
Occupational Category and Corresponding Occupations, University

Agricultural	**Busines**	**Educatio**
Food & Agri.	Account &	Educ.
Animal	Admin. Serv	Instructers/
Dieticians &	Adjustment	Instruct.
Farm	Advertising	Teachers Aids/Assts.
Forest Conserv.	Bill and Acct.	Teachers,
Forest Con.	Billing, cost rate	
Nursery & Greenhouse	Brokerage	**Engineerin**
Superv. Farm and	Real Estate	Aeronautical/Astron.
Vet.	Budget	Flight
Vet	Claims	Chemical
Vets and Vet	Clerical	Civil
	Comm., Trans.	Elec.
Social Science/Govt	Cost	Eng. Scien.
Counsele	Credit	Indus.
Director	Credit	Mechanical
Economis	Driver/Sal	Material
Govt/Legi	Financial	Operations
Human	Industrial Prod.	Stationary
Social Workers	Insurance	Nucleur
Urban	Insurance	Agriculture
	Manag.	Safety
Biological/Earth	Loan	Marine
Bio.	Marketing & Sales	
Chemist	Marketing and PR	**Healt**
Dieticians/Nutriti	New Accts.	Chiropracto
Geologists/Oce	Oper. Research	Dentis
Science/Math	Paroll	Health
Meteorologis	Prop. & Real Est.	Licensed Practical
Phycists/Astr	Paurchasing	Registered
	Real Est.	Physician
Computer	Sales Agent	Physical
Computer	Securities Financial	Physicia
Comput.	Tax Exam.	Podiatri
Comput.	Underwriter	Medical
Database	Tax	Medical & Health
Computer Support	Financial	Optomitri
	Sales,	Pharmaci
Law	Sales,	
Lawyer		
Judges/Magistra		
Court		

Source: Maryland Department of Labor, Licensing and

4.0 The Business and Economic Development Impact of the University System of Maryland

The state of Maryland has recognized the important role of university technology in its economic development strategic plan, *Strategic Directions for Increasing Maryland's Competitiveness*. This plan recognizes that Maryland's technology infrastructure represents one of the state's greatest strengths, yet this asset has not been well leveraged to support business. The state strategic plan goes on to identify enhancing linkages between the private sector and the state's educational institutions to accelerate business development and the commercialization of technology as a primary means of creating, retaining, and attracting new jobs into the state.

The USM has become an important engine for growth for state and local economies through its research and development activities, the transfer of technology to the private sector, the creation of companies based on university developed technology, and direct assistance to existing businesses.

4 University System of Maryland Research, Development, and Technology Transfer Activities

The University System of Maryland is a core element of Maryland's academic and scientific infrastructure. USM contains four of the five research universities in the state, and plays a vital role in the generation of new technologies, basic research, and the commercialization of research discoveries in Maryland.

4.1.1 The University System of Maryland's Role in Maryland Research and Development

USM institutions form the core of Maryland's academic research infrastructure. As presented in Table 17, in fiscal 1999, the System had a total of over $462 million in total research and development expenditures according to the National Science Foundation. USM member institutions are among the leading research institutions in several important scientific fields vital to Maryland. For example, the University of Maryland, Baltimore is ranked 20th nationally in total medical science R&D expenditures and 36th nationally in total life science R&D expenditures. The University of Maryland, College Park is ranked 8th nationally in total computer science R&D expenditures and 33rd nationally in total agriculture science R&D expenditures.

Table 17
Total Research and Development Expenditures
by University System of Maryland Institutions, FY1999
(Thousand of Dollars)

	Total R&D Expenditure
University of Maryland, College Park	$257,628
University of Maryland, Baltimore	$140,903
University of Maryland Biotechnology Institute	$31,172
University of Maryland, Baltimore County	$25,854
Bowie State University	$2,675
University of Maryland, Eastern Shore	$2,508
Towson University	$1,452
Coppin Sate College	$11

Source: National Science Foundation, WebCaspar

The Association of University Technology Managers (AUTM) [13], tracks the research and technology transfer activities at major research universities: four USM institutions - the University of Maryland, Baltimore, the University of Maryland, Baltimore County, the University of Maryland Biotechnology Institute, and the University of Maryland, College Park participate in the survey.

As shown in Table 18, the University System of Maryland accounted for 26% of all university research and development expenditures occurring in Maryland in fiscal 1999. The University System of Maryland accounts for almost one-fourth (24%) of all federally sponsored R&D expenditures in Maryland and for 22% of all industry R&D expenditures in fiscal 1999. It is important to note that the Applied Physics Lab of Johns Hopkins University, which does contract research and testing primarily for government clients and not academic research, substantially increases the Johns Hopkins University figures.

[13] Association of University Technology Managers, AUTM Licensing Survey: FY1999

Table 18

Research Expenditures in FY 1999 by the University System of Maryland and Johns Hopkins University

(Millions of Dollars)

	Total Research Expenditure	Percent of Total	Federal Sponsored Expenditure	Percent of Total	Industry Sponsored Expenditure	Percent o Total
Total	**1,368.9**	**100%**	**1,055.0**	**100%**	**58.2**	**100%**
University System of Maryland	**358.8**	**26%**	**251.4**	**24%**	**12.7**	**22%**
UM, College Park	185.0	52%	134.1	53%	9.1	72%
UM, Baltimore	131.5	37%	84.5	34%	N/A	N/A
UM, Baltimore County	21.9	6%	15.6	6%	2.6	20%
UM, Biotechnology Institute	20.4	6%	17.1	7%	1.0	8%
Johns Hopkins University	1,010.1	74%	803.6	76%	45.5	78%

4.1.2 The University System of Maryland's Role in New Technology Development

As seen in Table 19, the University System of Maryland is an important generator of commercializable technology. After a technology is developed through research at a university, the first phase of the commercialization process is the filing of an invention disclosure. If a technology is then considered to have commercial potential, the university may seek to protect its intellectual property rights over the technology by filing for a patent. For a patent to be awarded, the technology must be judged to be novel, non-obvious, and useful.

The number of invention disclosures, patent applications filed, and patents awarded can all serve as indicators of the number of commercializable technologies being developed by universities in Maryland. The University System of Maryland accounted for 43% of invention disclosures, 38% of new patent applications, and 23% of patents issued to major Maryland universities in FY1999.

Table 19

Patenting/Disclosure Activity in FY 1999 by University System of Maryland and Johns Hopkins Universi

(Number of Patents or Disclosures)

	Invention Disclosures	Percent of Total	New Patent Applications Filed	Percent of Total	U.S. Patents Issued	Percent of Total
Total	**439**	**100%**	**292**	**100%**	**145**	**100%**
University System of Maryland	**189**	**43%**	**111**	**38%**	**34**	**23%**
UM, College Park	84	44%	75	68%	12	35%
UM, Baltimore	62	33%	24	22%	12	35%
UM, Baltimore County	26	14%	5	5%	6	18%
UM Biotechnology Institute	17	9%	7	6%	4	12%
Johns Hopkins University	250	57%	181	62%	111	77%

Source: Association of University Technology Managers and the Jacob France Institute

4.1.3 The University System of Maryland's Role in University Technology Transfer

A principal economic development contribution of a research university is the commercialization of university technologies and discoveries. Once a new technology is developed in a university it is often licensed to a private sector firm to then be developed into a product. Universities can offer companies either exclusive or non-exclusive rights to then develop those particular technologies.

The Association of University Technology Managers collects information annually on the licensing activities of major research universities. The number of licenses and options executed, the number of active licenses and options generating revenues, and the royalty payments received can all serve as indicators of the levels of actual technology commercialization occurring at a university. As seen in Table 20, the universities within the University System of Maryland account for 13% of licensing royalties paid to major Maryland research universities in 1999, 48% of the total number of licenses and options generating revenues, and 41% of all licenses and options executed in FY1999.

According to AUTM data, from 1994 to 1999, a total of 14 start-up companies have formed based on technology developed at University System of Maryland institutions since 1994 (See Table 21). Considering that Johns Hopkins University's total research expenditures are over 2.5 times that of the University System of Maryland, the USM is more successful in creating start-up companies per total research expenditures based on university formed technology than Johns Hopkins University.

Table 20

Technology Transfer Activity in FY 1999 by University System of Maryland and Johns Hopkins University (Number of Licenses/Options and Thousand of Dollars)

	Gross License Income Received $1,000's	Percent of Total	License/ Options Generating Revenue	Percent of Total	Licenses and Options Executed	Percent of Total
Total	**11,844**	**100%**	**266**	**100%**	**179**	**100%**
University System of Maryland	**1,491**	**13%**	**129**	**48%**	**73**	**41%**
UM, College Park	1,000	67%	109	84%	61	84%
UM Biotechnology Institute	335	22%	2	2%	4	5%
UM, Baltimore	117	8%	16	12%	7	10%
UM, Baltimore County	39	3%	2	2%	1	1%
Johns Hopkins University	10,353	87%	137	52%	106	59%

Source: Association of University Technology Managers and the Jacob France Institute

Table 21

Start-Up Companies Formed by the University System of Maryland and Johns Hopkins University FY 1994 to 1999 (Number of Companies)

	1994	1995	1996	1997	1998	1999	Total	Percent of Total
Total	**4**	**5**	**2**	**4**	**9**	**12**	**36**	**100%**
University System of Maryland	**1**	**3**	**0**	**1**	**4**	**5**	**14**	**39%**
UM, College Park	1	1	0	0	2	3	7	50%
UM, Baltimore	0	2	0	1	2	2	7	50%
UM, Baltimore County	N/A	N/A	0	0	N/A	N/A	0	0%
UM Biotechnology Institute	N/A	N/A	N/A	N/A	N/A	N/A	0	0%
Johns Hopkins University	3	2	2	3	5	7	22	61%

Source: Association of University Technology Managers and the Jacob France Institute

4.2 Assistance and Support for Business

In addition to directly influencing Maryland's economic development through research and commercialization activities, the faculty, staff, and students of the University System of Maryland promote economic development in the state by providing technical assistance and support to businesses. There are numerous formal and informal ways in which faculty, staff, and students interact with businesses within Maryland. Because of the depth and breadth of these interactions, it is impossible to list all of the ways in which USM programs assist businesses.

Several programs sponsored by individual institutions within the University System of Maryland will be discussed in their efforts to aid businesses in entrepreneurship and business formation, their small business assistance, and their technical assistance and training due to their significant impact on Maryland businesses and economic development.

4.2.1 Assistance in Entrepreneurship and Business Formation

The institutions within the University System of Maryland play a vital role in assisting entrepreneurship in Maryland. Promoting business formation is a central element in any state's economic development strategy. According to the Corporation for Enterprise Development (CFED), Maryland ranks 17th nationally in the rate of new business formation.[14] The universities within the University System of Maryland support the state's success in business development through several different programs geared to entrepreneurship and start-up companies, including the University of Maryland, College Park's Dingman Center for Entrepreneurship and Technology Advancement Program, the University of Maryland, Baltimore County's Technology Center and bwtech@UMBC Research Park, and Frostburg State University's Allegany Business Center.

The **University of Maryland, College Park's** Dingman Center of Entrepreneurship is run through the Robert H. Smith School of Business and was established to assist emerging growth companies in the mid-Atlantic region with mentoring, seminars, business plan reviews, and structured networking between entrepreneurs and capital providers. The Center also supports the undergraduate, MBA and joint Ph.D. academic programs in entrepreneurship at the University of Maryland, including joint academic programs with the School of Engineering. Programs and initiatives operated by the Dingman Center include the following:

- *Market and Technology Assessment*: The newest service area at the Center, this provides area entrepreneurs and capital providers with an in-depth analysis of industry sectors, current technology advances, and market opportunities. The Center works closely with UMCP's Technology Commercialization Office and Engineering Research Center to improve the commercialization of University technologies and spin-offs of related new businesses in Maryland.
- *Mentor Program*: The Dingman Center offers high quality, affordable mentor services to new and emerging growth companies in the region. Areas of assistance include business planning, marketing strategies, financing, legal issues, and corporate partnering. Mentors are successful entrepreneurs, accountants, attorneys, and consultants.
- *Baltimore-Washington Venture Group (B-WVG)*: The B-WVG is a forum managed by the Dingman Center whereby entrepreneurs and companies meet with providers of capital and

[14] Corporation for Enterprise Development, *Development Report Card for the States*, 2000

management team candidates, leading to transactions such as financing, joint ventures, consulting relationships, and management team additions. The B-WVG holds bimonthly networking breakfasts along the Baltimore-Washington corridor and in Northern Virginia. These meetings are designed to facilitate interaction among entrepreneurs, professional service providers, and management team candidates.

- *Private Investors Network (PIN)*: The Dingman Center screens business plans and helps entrepreneurs prepare for presentation to the PIN, an organization comprised of the region's active private equity investors. The partnership provides young companies the maximum opportunity to gain financing through this network of angel investors.
- *Business Plan Review*: The Dingman Center provides an opportunity for start-up companies to present their business plan to a panel of experts in industry, marketing, finance, banking, and venture capital. Participants receive valuable advice on content, presentation, and strategic direction for the company.
- *Inner Circle*: The Inner Circle is made up of the region's business leaders who provide the Dingman Center with strategic guidance and financial assistance.
- The Dingman Center offers a series of educational seminars and programs directed toward entrepreneurs.
- In FY 2001, the activities carried out under the auspices of the Dingman Center accounted for 161 deals presented to investors, 860 attendees to the Dingman Center programs and seminars, 700 attendees to the Baltimore-Washington Venture Group programs, and 669 attendees to the Venture Capital Forum.

Several institutions within the University System of Maryland operate business incubators geared toward assisting in the start-up of new companies or research parks to help retain expanding or recruit new businesses.

The Technology Advancement Program (TAP) within the **University of Maryland, College Park** provides a dynamic environment for technology based start-up companies. Located on the University's campus, TAP is at the center of activity for large and small companies in biotechnology, information technology, medical equipment, telecommunications, aerospace, electronics and environmental sciences. As of the 2001 fiscal year, 12 companies are currently participating in the TAP program, and 37 more companies have "graduated" from TAP since its inception in 1985.

The **UMBC** Technology Center offers a dynamic, fully equipped facility for start-up and growing technology companies. Much more than a real estate development, the UMBC Technology Center complex is a magnet for high-technology business development. Its specialized environment and services provide start-up and growing technology businesses with a competitive edge.

Current tenants include InVitro Technologies, Athena Environmental Sciences and Epitaxial Technologies. The Technology Center has 170,000 square feet of space including 75,000 square feet of specialized laboratory space. The Technology Center currently houses 24 companies, including one business owned by a UMBC undergraduate. Additional 18 companies have been housed in the Technology Center in the past, but have moved on. The current resident companies employ a total of 250 individuals. More than 400 jobs have been created by

Technology Center companies during the past five years. Almost every company in the Technology Center has established significant business interactions with UMBC. Current tenant companies have hired 35 students among their workforces. Twenty-two UMBC staff and faculty are engaged in projects with current tenants.

The UMBC Technology Center, under its Best Practice Grant from TEDCO, established an Idea Lab and Help Desk in early 2001. The Idea Lab supports UMBC students and faculty as they develop their ideas and technologies in the pre-start up stage. The Idea Lab provides support for prospective UMBC Incubator clients through assisting with development of business plans as well as technology transfer and commercialization. The Help Desk is staffed with business professionals from accounting, marketing and law, as well as representatives of institutional and venture capital. These service providers are available at the Technology Center twice monthly to provide pro-bono information, advice and consultation for companies. This is a regional service available to incubator companies throughout Maryland.

bwtech@UMBC is a one-acre master-planned research and technology park with major economic development implications for the state and region, as well as for UMBC. The park will contain 350,000 square feet of research and development space for technology companies with project costs for the five sites estimated at $50 million with annual taxes to Baltimore County of $750,000 and the creation of 1,250 jobs.

Companies locating at bwtech@UMBC are required to have significant collaborative relationships with UMBC that will enhance the research mission at UMBC and provide strategic value to tenants at the Park. The first tenant for bwtech@UMBC is RWD Technologies' new division, Latitude 360. RWD Foundation has contributed one million dollars to UMBC's efforts in computer science and information systems, hired interns and graduating students, sponsored UMBC's Forum for Visionaries in IT and provided technical briefings.

bwtech@UMBC is located just minutes from BWI airport in the fast developing Baltimore-Washington corridor. Regional resources, transportation and access to Baltimore City, Washington, DC and federal locations help make bwtech@UMBC a successful project.

Allegany Business Center at **Frostburg State University** is the first business park development on University land. It is a collaborative effort between Allegany County Economic Development Department and Frostburg State University. ABC@FSU is targeted at new technology companies that would find a university location attractive for their business and employees. The major objective is to attract new technology companies because they offer jobs to better-educated and/or trained employees. Therefore, the real vision of this project is to create a business location environment that is attractive to new technology companies and their better-than-average job opportunities.

4.2.2 Small Business Assistance

While the formation of new businesses is important to create new technologies and jobs, small businesses are already established and have the potential to grow and add jobs. Several universities within the University System of Maryland provide assistance to Maryland's small businesses, for example:

- The Maryland Small Business Development Center Network (SBDC) of the **University of Maryland, College Park** assists entrepreneurs in establishing, managing, and expanding their businesses through four regional offices in the state.

According to the impact study UMCP commissioned in FY 2001, the Maryland SBDC is working with approximately 700 companies scattered throughout the state.

- The Western Maryland Small Business Development Center (SBDC) at **Frostburg State University** collaborates with Allegany College of Maryland, Garrett Community College, and Hagerstown Community College in the operation of the Western Maryland SBDC. This Center provides individual counseling and educational workshops to owners and operators of new and existing small businesses in Maryland's four westernmost counties. The College of Business provides a faculty member (50% of workload) and a graduate assistant to the SBDC to support its operations and services to small businesses in the region.
- The **Salisbury University** Sub-center of the Maryland Small Business Development Center Network is a partnership between the U.S. Small Business Administration and the University of Maryland, College Park. This partnership links private enterprise, government, higher education and local economic development organizations to provide management training and technical assistance to Maryland's small businesses. The Maryland network is part of a national SBDC network that delivers assistance to strengthen small and medium-sized businesses, thereby contributing to the growth of local, state and national economies. The Salisbury University SBDC provides counseling, training, and a resource library to small business enterprises.
- The **University of Baltimore's** Center for Technology Commercialization was created as an outgrowth of the Lab to Market Program, an award-winning program of the Merrick School of Business, University of Baltimore. The main objective of the UB-CTC is to facilitate the process of bringing products to market by assisting entrepreneurs, investors, scientists, lab researchers, patent attorneys, and others through education, consultation, research, and support.
- **Towson University** operates a Small Business Development Center that provides assistance and consulting services to existing small and medium-sized businesses. The Towson SBDC has certified business counselors and offers access to the University's faculty and students.
- **Coppin State College** offers small business development seminars and runs the Coppin Community Development Corporation.

4.2.3 Technical Assistance and Training

Maryland businesses also benefit from several programs created by institutions within the University System of Maryland that are specifically chartered to provide technical assistance and training to businesses. These programs include, but are not limited to:

- The Maryland Technology Extension Service (MTES) of the **University of Maryland, College Park,** operating from five regional offices throughout the state, offers on-site technical assistance to Maryland companies to improve manufacturing processes, develop new products and increase overall productivity. MTES completed 418 major projects with 324 Maryland companies from 1997 to 2000. Working with MTES has provided these Maryland manufacturers with the following results and benefits, based upon impact data collected by the NIST-MEP U.S. Census survey: increases in sales of $9 million; cost savings in labor and material of $2.2 million; 62

jobs created and many more jobs retained; and a customer satisfaction rating of 4.46 on a scale of up to 5.0.

- The Maryland Industrial Partnership Program (MIPS) of the **University of Maryland, College Park** provides matching grants of up to $100K per year (for one to two years) to support research designed to help Maryland companies develop products or processes. The research focus may be any area of engineering, physical sciences, life sciences, or computer science, and may be conducted by faculty from any University of Maryland campus. Also provided by MIPS is assistance in matching companies with researchers who are working in an area of particular technical interest. According to the economic impact study UMCP commissioned in FY 2001, over 612 awards have been made since the creation of the program, for a total project value of $94.2 million. Broken down by type of companies, approximately 35% of these awards have gone to small businesses, 34% have gone to start-up companies, and 31% have gone to large companies (such as Northrup Grumman, and Lockheed Martin).
- The focus of the **University of Maryland, College Park's** Technology Initiatives Program (TIP) is on increasing the University's own research capacity in areas of technical importance to industries in the state, including biotechnology, electronics, composite materials technology, manufacturing technology, computer engineering, reliability engineering, and computer aided life cycle engineering. TIP currently operates a Bioprocess Scale-Up Facility, a Communications and Signaling Processing Laboratory, and a Composites Laboratory. In FY 01, research funding attracted by the TIP laboratories totaled almost $13 million, with government sector sponsors accounting for $9 million of that amount and industry sponsors accounting for the remaining $4 million. Cumulatively (from fiscal years 1984-2001), TIP labs have attracted approximately $85 million from governmental sponsors and $38 million from industrial sponsors to total over $123 million is research funding.
- The Workforce Skill Enhancement Workshops provided by **Frostburg State University** include both computer workshops for community organizations to better develop computer skills and management development workshops customized for Allegany County Government.

5.0 Conclusion

The USM is a powerful force in Maryland's economy and is central to the state's future. The USM significantly increases its students' opportunities; supplies Maryland employers with the workers needed to sustain and increase the state's competitiveness; helps new and existing businesses grow; and generates new technologies through research and development.

The educational services provided by USM institutions represent an investment in the human capital and earnings ability of Maryland's residents and workforce. Moreover, the state gains more in additional tax revenues from the incremental earnings of USM graduates than it spends in supporting higher education. In addition to this positive return on the state's investment in Maryland's human capital, the operations of the USM institutions themselves attract new money into Maryland that stimulates increased economic activity, creates jobs, and increases tax revenues.

The University System of Maryland also makes significant contributions to Maryland's competitiveness by providing a highly educated workforce, new technologies, and resources for Maryland business.

The USM's economic impact on the state of Maryland considerably exceeds the state's investment in the System. The USM is key to the state's economic fortunes – both its resilience to economic downturns and its capacity for economic growth.

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