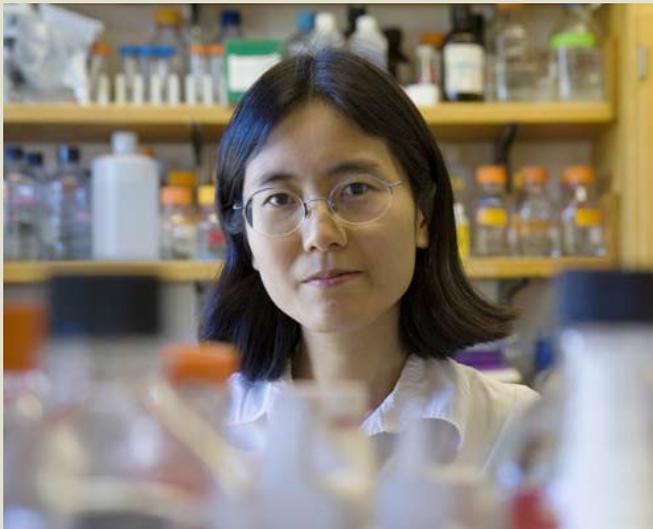


# INVESTING IN INNOVATION

Harvard University's Impact on  
The Economy of the Boston Area



January 2009



# Introduction

As 2009 began, the Commonwealth of Massachusetts and the Boston metropolitan area, like the nation as a whole, were confronting the prospect of a lengthy and potentially severe recession. Throughout much of 2008, the economy of the Boston area had held up relatively well; total private employment in November was still higher than it had been a year earlier. But by year's end, the storm warnings were all too clear – weakening retail sales, rising office vacancy rates, declining orders in the manufacturing sector and a growing number of companies planning layoffs or freezing new hires.

As they seek to fashion an effective response to a complex set of economic problems, the Commonwealth and the region need to focus on two goals simultaneously – limiting the damage to the local economy in the near term, and at the same time ensuring that both Massachusetts and the Boston area are prepared to play a leading role in the next round of economic growth.

In that effort, the region's colleges and universities stand out as being among the Boston area's most valuable resources – because they are particularly well-equipped to help achieve both of these goals. As they have been during the last several recessions, they can be a source of stability at a time when many of the region's other leading industries are shedding jobs – and they are at the same time a vital source of the new talent, new knowledge, new ideas and new businesses that will drive the next round of growth.

This report briefly describes the contributions of one of these institutions, Harvard University, to the economy of the Boston area. It highlights a number of ways in which the University can help the region both to survive the recession and to prosper in its aftermath – both as a major regional enterprise in its own right, and through its mission of education, research, business development and service to the community.

# The role of higher education in the region's economy: stability and growth

Higher education is one of the Boston area's leading industries. In November 2008, private colleges and universities employed 92,300 people in the Boston metropolitan area – 6.0 percent of private payroll employment in the region.

Colleges and universities employed:

- More people than the region's banking, securities and investment industries combined (86,000);
- More people than all computer hardware, software and services businesses combined (81,000).

Comparing regional and national data further highlights the concentration of college and university employment in the Boston area. Private colleges and universities, as noted above, account for 6.0 percent of all private employment in the region – but less than 1.5 percent of all private employment nationwide.

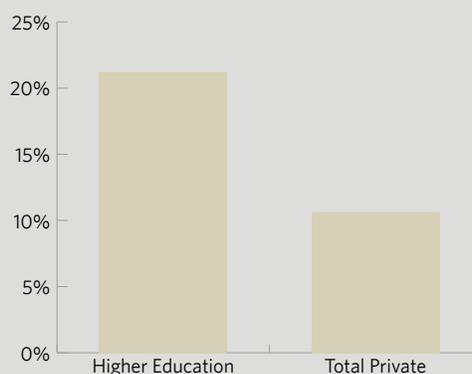
Higher education has for the past two decades been one of the region's growth industries. Between 1990 and 2008, private payroll employment in the Boston area grew by 10.2 percent; during the same period, employment at private colleges and universities rose by 18.4 percent. The

pattern was similar at the state level, where total private employment grew during the same period by 10.6 percent – and private college and university employment by 21.2 percent.

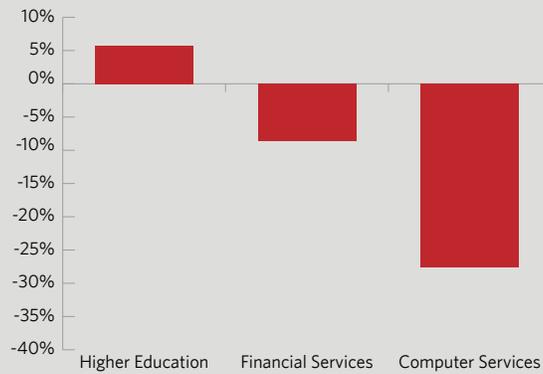
Colleges and universities are notable not only for their contribution to employment growth, but for their relative stability. During past economic downturns they have tended to remain stable – and during some periods have kept growing – even as other leading industries were shedding jobs.

Between 2000 and 2003, for example, employment in financial services in Massachusetts declined by 4.9 percent – a loss of 6,600 jobs. The computer services industry was hit even harder – declining by 27 percent, with a loss of 16,500 jobs. But during the same period, employment at private colleges and universities in the Commonwealth grew by 5.7 percent, gaining 5,600 jobs.

**Figure 1: Total Change in Higher Education Employment and Total Private Employment in Massachusetts, 1990 - 2008**



**Figure 2: Change in Higher Education Employment and Financial and Computer Services Employment in Massachusetts, 2000 - 2003**



The role of higher education in the region's economy, of course, goes well beyond its impact as a major employer. Boston-area colleges and universities are also a major source of the talent, knowledge and innovation that drive the growth of the region's – and the Commonwealth's – economy.

In part as a result of its concentration of colleges and universities, the population of the Boston area is among the best-educated in the U.S. In 2006, nearly 41 percent of all residents of the Boston metropolitan area age 25 or older had at least a four-year college degree; and nearly 18 percent had a graduate or professional degree.

Its concentration of universities also helps make the region, and the Commonwealth, one of the nation's leading research centers. Massachusetts ranks second among the states (just behind Maryland) in academic research spending per capita; and third (behind Maryland and New Mexico) in terms of the overall research-intensiveness of the state's economy (measured by total R & D spending as a percentage of state GDP).

The region's strengths in these areas are reflected in several recent studies that have put Massachusetts at the leading edge of science- and technology-based economic growth. In 2007, for example,

the Information Technology and Innovation Foundation found that:

*The state farthest along the path to the New Economy is Massachusetts. Boasting a concentration of software, hardware and biotech firms, supported by world-class universities such as MIT and Harvard in the Route 128 region around Boston, Massachusetts survived the early 2000's downturn and has continued to thrive, enjoying the fourth-highest growth [among the 50 states] in per capita income.<sup>1</sup>*

In 2008, the Milken Institute released a similar study, aimed at presenting "a comprehensive picture of how well states are performing in this highly competitive knowledge based economy." The Milken study also ranked Massachusetts first among the fifty states, concluding that:

*Massachusetts remains the gold standard for other states to consider when evaluating their own science and technology capabilities.<sup>2</sup>*

1 Robert D. Atkinson, "Measuring Up: Assessing Economic Structure for Success in the New Economy," *Economic Development Journal*, Fall 2007.

2 Ross DeVol and Anita Charuworn, *State Science and Technology Index: Enduring Lessons for the Intangible Economy*, Milken Institute, June 2008.

# Harvard as an enterprise

Harvard is widely recognized as one of the world's leading universities.

But for the Boston metropolitan area and the Commonwealth of Massachusetts, Harvard is also a major regional enterprise. Each year, the University brings billions of dollars from around the U.S. and the world into the Boston area, most of which is then spent within the region.

In the fiscal year ending June 30, 2008, Harvard's revenues totaled approximately \$3.5 billion – about 90 percent of which was derived from sources outside the Boston area (such as tuition paid by students who come from outside the Boston area, federal research grants, private donations and endowment earnings). During the same period, more than 70 percent of all University spending – \$2.6 billion in payroll, purchasing and construction – was concentrated within the region.

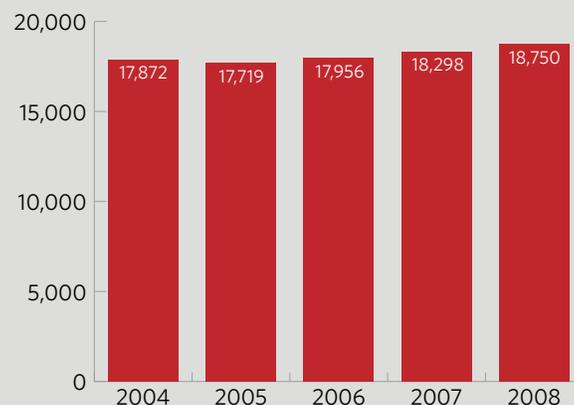
## Harvard as an employer

In the fall of 2008, Harvard had 18,750 full- and part-time employees (excluding students). Of this total, about 18,350 worked in the Boston metropolitan area, making Harvard the region's second-largest private employer, behind Massachusetts General Hospital.

While it is not immune to the effects of the business cycle, Harvard – like the higher education sector generally – has during previous recessions been a source of stability for the local economy. Between 2000 and 2002, total employment in the Boston area declined by 3.3 percent. But in the same two-year period, employment at Harvard grew by 2 percent.

During the recovery that followed, the University continued its recent history of steady growth in employment. Between 2004 and 2008, employment at Harvard grew by 4.9 percent – an increase of about 880 full- and part-time jobs. During this period, the growth in university employment continued to outpace the overall growth (2.8 percent) of private employment in the Boston area.

**Figure 3: Full- and part-time employment at Harvard (excluding students), 2004-2008**



# The impact of purchasing and construction

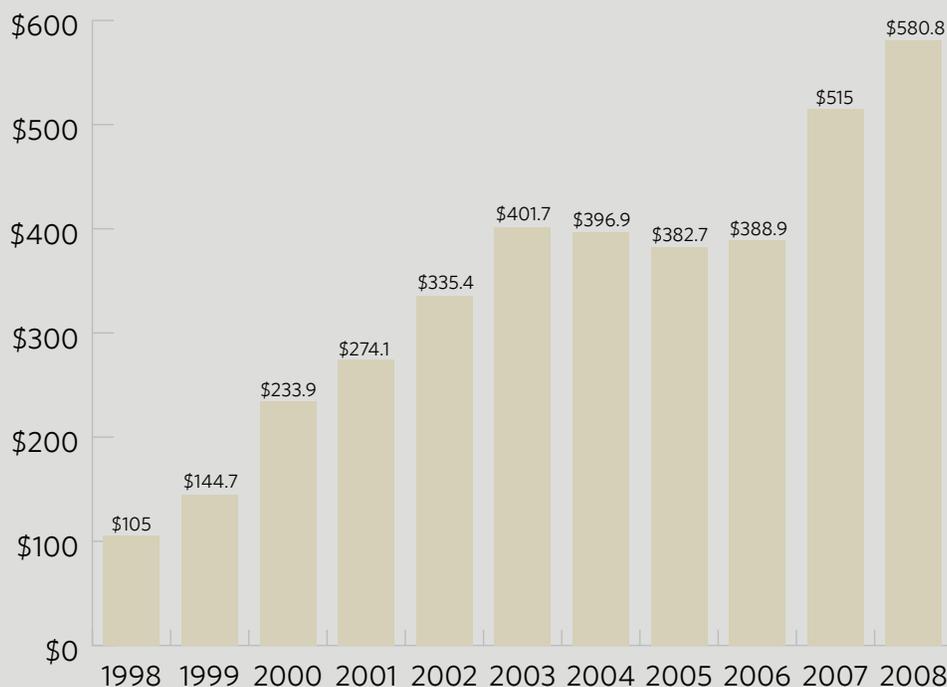
In addition to the people it employs directly, Harvard generates jobs and economic activity in the Boston metropolitan area through its purchases of goods and services from Boston-area businesses, and through its investments in University construction.

In fiscal year 2008, Harvard spent approximately \$1.7 billion on purchases of goods and services (excluding construction), of which about \$850 million was paid to companies located in the Boston area. We estimate that in fiscal year 2008, Harvard's purchases of goods and services directly supported approximately 6,400 full-time-equivalent jobs in the five-county Boston area.

Since the late 1990's, Harvard has greatly increased its investment in new facilities and in the modernization of existing plant. In just the past five years, Harvard has invested more than \$2.26 billion in new construction and renovation – including more than \$580 million in fiscal year 2008. We estimate that in fiscal year 2008, University construction directly supported approximately 2,700 FTE jobs with Boston-area contractors.

Some of what Harvard spends on purchasing and construction is paid to companies that are located in Massachusetts, but outside the five-county Boston area. When payments to these companies are added in, Harvard's payments to vendors and contractors throughout the Commonwealth (including the five-county area) totaled more than \$1.4 billion. We estimate that this spending directly supported approximately 10,165 jobs.

**Figure 4: Construction spending, FY 1998 - FY 2008 (\$ millions)**



## Indirect and induced impacts

Beyond the direct impact of University spending on purchasing and construction, household spending by Harvard's employees, and spending within the Boston area by the University's suppliers and contractors - also generates jobs and economic activity.

We estimate that through this "multiplier effect," spending within the region by Harvard's employees, suppliers and contractors indirectly generated a total of \$1.8 billion in economic output in the five-county Boston area, and 12,880 full-time-equivalent jobs.

For the Commonwealth as a whole, spending by Harvard employees, suppliers and contractors indirectly generated more than \$2.2 billion in economic output, and 16,195 full-time-equivalent jobs.

Table 1 summarizes the impact of University spending on employment and output in the five-county area and in Massachusetts.

## The impact of student spending

In addition to the impact generated by the University's own spending in the Boston area, off-campus spending by Harvard's 20,000 students also generates jobs and economic activity in the region. We estimate that in fiscal year 2008, Harvard's undergraduate and graduate students spent approximately \$289 million in Cambridge, Boston and other local communities for housing, food, transportation and other needs. After adjusting this amount to reflect wages Harvard pays to student employees (which are already included in our analysis of the impact of payroll spending), we estimate that students' off-campus spending directly and indirectly generated approximately \$349 million in economic output in the Boston area, and 3,710 full-time-equivalent jobs.

As with spending by the University itself, the indirect effects of off-campus spending by Harvard students extend beyond the five-county area. For the Commonwealth as a whole, we estimate that student spending directly and indirectly generated \$365 million in economic output, and 3,850 full-time-equivalent jobs.

**Table 1: Economic impact of University spending on employment and output in the Massachusetts five-county area**

	Direct University spending		Indirect and induced impact of spending by vendors, contractors and employees		
	<i>Payroll</i>	<i>Purchasing / construction</i>	<i>Impact of employee spending</i>	<i>Impact of vendor and contractor spending</i>	<i>Total impact</i>
5-County Area	\$1,298,604 18,350 jobs	\$1,326,300 9,125 FTE	\$1,021,215 7,095 FTE	\$826,697 5,791 FTE	\$4,472,816 40,361 FTE
Massachusetts	\$1,298,604 18,365 jobs	\$1,424,365 10,167 FTE	\$1,114,024 8,001 FTE	\$1,142,342 8,195 FTE	\$4,979,335 44,728 FTE

**Table 2: Harvard's total employment impact in the Boston area and Massachusetts, 2008**

	<i><b>Boston area</b></i>	<i><b>Massachusetts</b></i>
Direct University employment	18,350	18,365
Employment with Harvard suppliers and contractors	9,125	10,165
Jobs generated through the multiplier effect	12,885	16,195
Jobs supported by off-campus student spending	3,710	3,850
Jobs at selected companies with "Harvard DNA"	7,500	7,500
<b>TOTAL</b>	<b>51,570</b>	<b>56,075</b>

## Putting it all together

When we combined the impact of Harvard's direct spending on payroll, purchasing and construction - the indirect impact of University spending - and the direct and indirect impact of off-campus spending by Harvard students - we can estimate that Harvard directly and indirectly accounted for nearly \$4.8 billion in economic activity in the Boston area in fiscal year 2008, and more than 44,000 jobs.

Statewide, Harvard directly and indirectly accounted for more than \$5.3 billion in economic activity and more than 48,500 jobs.

And if we add in people who are employed by companies with roots at Harvard

(companies started by Harvard faculty members, or started with the goal of commercializing new technologies first developed at the University, examples of which are discussed below) then we can estimate that Harvard accounts, directly or indirectly, for more than 51,500 jobs in the Boston area, and more than 56,000 throughout the Commonwealth.

## Payments to state and local government

In a variety of ways, Harvard makes a significant contribution to state and local government finances. As shown in Table 3, we estimate that in fiscal year 2008, Harvard directly and indirectly generated more than \$225 million in revenues for the Commonwealth and its local governments.

**Table 3: Taxes and fees generated directly and indirectly by Harvard, 2008**

<i><b>Type of tax/fee</b></i>	<i><b>\$ millions</b></i>
State income taxes withheld	\$ 56.2
Unemployment insurance	\$ 0.4
Real property taxes	\$ 14.3
Voluntary payments in lieu of taxes	\$ 5.6
Fees and other payments	\$ 10.7
Taxes generated through the multiplier effect	\$ 158.6
<b>GRAND TOTAL</b>	<b>\$ 225.8</b>

## Contributing to the region's human capital

Each year, thousands of talented students come to Cambridge and Boston from communities throughout Massachusetts, the U.S. and the world to study at Harvard. In the fall of 2007, more than 20,000 students were enrolled in Harvard's undergraduate and graduate degree programs.

Harvard is known worldwide for the quality of both its undergraduate and graduate programs; and in terms of enrollment, it is also the leading provider of graduate and professional education in the Boston area. The University's graduate and professional programs have grown steadily in recent years, with total enrollment rising by 12.5 percent between 1997 and 2007.

With its high-quality undergraduate programs and a diverse array of graduate and professional programs, Harvard is particularly well-equipped to prepare its graduates to work in the Boston area's leading knowledge intensive industries, including professional and business services, health care, education, information technology, the life sciences, finance and management.

Many of the thousands of students who earn degrees at Harvard each year stay in region after they graduate. In 2008, more than 40,700 Harvard alumni lived within 75 miles from Boston - about 17.5 percent of all University alumni who were living in the U.S.

Harvard also provides opportunities for Boston-area residents to enrich their education and develop their skills through the work of its Extension School - one of the region's largest providers of continuing education. In the fall of 2007 more than 6,400 people took courses at the Extension School - including 700 who were enrolled in career-oriented master's degree and certificate programs in fields such as biotechnology, computer science, museum studies and environmental studies.

**Figure 5: Graduate/professional enrollment, fall 1997 and fall 2007**

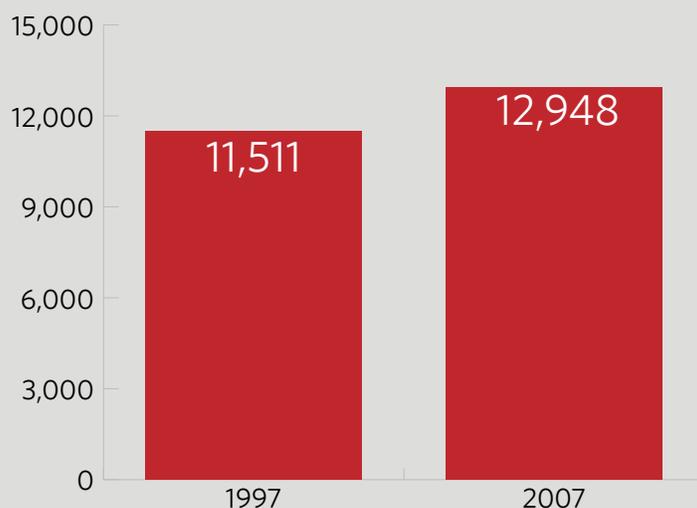
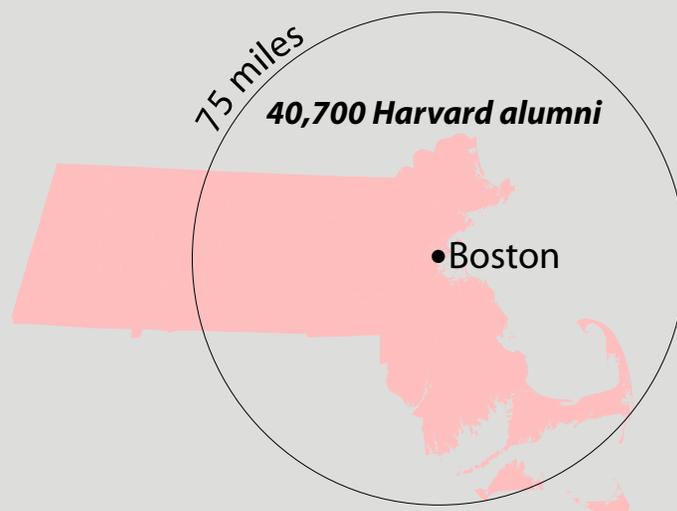




Figure 6: Harvard alumni living in the Boston area



# Research at Harvard

Research conducted at Harvard contributes to the growth of the Boston-area economy in several ways.

It brings in hundreds of millions of dollars each year from federal agencies and other sources outside the Boston metropolitan area - most of which is spent within the region. It helps make the region a magnet for investment in corporate and non-profit research centers. And it is an important source of the new knowledge and new ideas that play a central role in the region's economic growth.

In fiscal year 2008, Harvard spent a total of \$660 million on research funded from external sources - an increase of 22.5 percent during the past five years. Federal agencies accounted for about 82 percent of this total; and corporations and foundations; for about 15 percent.

In fiscal year 2005 (the last year for which comprehensive national data are available) Harvard's affiliates brought in more than \$1 billion in federal research funding.

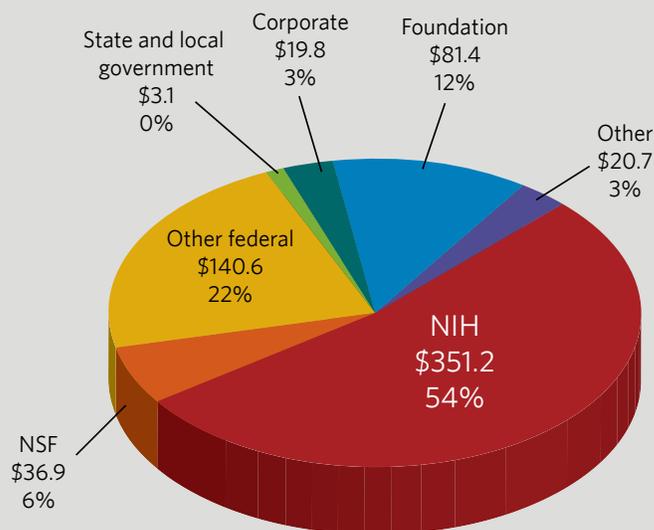
In 2007, Harvard and its affiliates accounted for 61 percent of all NIH funding awards in Massachusetts - a total of nearly \$1.4 billion. Together, they helped make the Boston metropolitan area one of the world's leading centers of biomedical research.

Harvard's position as one of the world's leading research centers is not simply a product of its long history. During the past decade, Harvard has invested heavily in the continued growth of its research enterprise. Between 2003 and 2008, for example, the total volume of research space at Harvard increased by more than 1 million square feet. Harvard has also invested in new faculty, new research initiatives - and in the technological infrastructure needed to support a growing and fast-changing research enterprise.

**Figure 7: Research spending, FY 2003 - FY 2008 (\$ millions)**



**Figure 8: Research expenditures, by source, FY 2008 (\$ millions)**



**Table 4: Science & engineering research funding, Harvard affiliates, FY 2005**

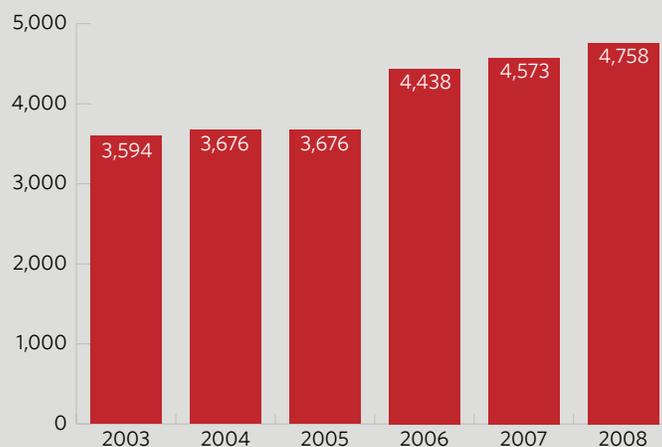
<b>Affiliate</b>	<b>Research funding (\$ thousands)</b>	<b>U.S. Rank</b>
MA General Hospital	\$ 312,358	1
Brigham and Women's Hospital	\$ 250,949	3
Beth Israel Deaconess Medical Center	\$ 125,781	8
Dana-Farber Cancer Institute	\$ 112,519	10
Children's Hospital (Boston, MA)	\$ 101,561	11
McLean Hospital	\$ 36,490	43
Joslin Diabetes Foundation Inc.	\$ 25,195	58
Massachusetts Eye and Ear Infirmary	\$ 16,593	86
Schepens Eye Research Institute	\$ 14,599	92
Forsyth Institute	\$ 10,892	-
Harvard Pilgrim Health Care Inc.	\$ 9,179	-
Cambridge Health Alliance	\$ 2,023	-
Spaulding Rehabilitation Hospital	\$ 1,563	-
Judge Baker Children's Center	\$ 1,259	-
<b>GRAND TOTAL</b>	<b>\$ 1,020,961</b>	

Source: National Science Foundation

The research funding that Harvard and its affiliates attract each year directly and indirectly supports thousands of jobs throughout the Boston area. But even more important, current spending on research represents an investment in the region's future. Harvard's strengths in areas such as genomics, neuroscience, stem cell research, bioengineering and nanotechnology are helping to create a foundation for the region's continued economic vitality.



**Figure 9: Harvard's growth in total lab and studio space, 2003 - 2008 (thousands of sf)**



## A new generation of growth companies

By providing a steady stream of talent, knowledge and ideas, Boston-area colleges and universities are helping to ensure that the region is well-prepared to participate successfully in the next wave of economic growth.

Moreover, many of the region's leading universities – Harvard among them – have in recent years become more actively engaged in supporting the creation and development of the new businesses that could in the years ahead be an important source of growth.

In 2007, for example, Harvard established a new Technology Accelerator Fund, to support the kind of applied research that is so often critical to the first stages of moving new technologies from the lab to the market place. In its first year the fund, which is administered by the University's Office of Technology Development, allocated \$1.3 million to six projects that were judged to have significant potential not only for commercial development, but for benefiting society as well.

Harvard's increased focus on innovation, entrepreneurship and technology transfer is translating into new businesses, new investment and new jobs in the Boston metropolitan area.

In the past two years alone, for example, two dozen young Boston-area companies with roots at Harvard<sup>1</sup> – working in areas as diverse as biotechnology, medical devices, nanotechnology, defense and Internet services – have collectively secured more than \$280 million in venture capital and other private equity financing. As of December 2008, these 24 companies – almost all of which are less than 5 years old – collectively employed a total of about 500 people. Table 5 highlights several notable examples.

Most of these companies are still small. But just as Biogen – launched 30 years ago by Professor Emeritus Walter Gilbert and several colleagues – has grown into one of the region's largest biotech firms, with more than 1,500 employees, any of these more recent start-ups could turn out to be the growth companies of tomorrow.

<sup>1</sup> Including companies created to commercialize technologies first developed at Harvard – or founded by Harvard faculty members, or by Harvard graduates – or by some combination of the three.

**Table 5: Notable start-up companies associated with Harvard**

<b>Company</b>	<b>Location</b>	<b>Founded</b>	<b>Type</b>	<b>Employees</b>
Surface Logix	Brighton	2000	Pharma	45
Pulmatrix	Lexington	2003	Biotech	35
RainDance Technologies	Lexington	2004	Nanotech	55
Codon Devices	Cambridge	2005	Biotech	22
Aileron Therapeutics	Cambridge	2005	Pharma	21
SiOnyx	Beverly	2008	IT	20
Crimson Hexagon	Cambridge	2008	Internet	12

# Helping Boston-area communities meet the challenge of change

The prosperity that the Boston area has enjoyed in recent years can bring challenges as well as benefits.

People who lack the skills required for employment in the region's knowledge-intensive industries can find themselves falling farther and farther behind. The high cost of housing can impose real burdens on low- and moderate-income households.

Harvard has sought in several ways to help Boston-area communities cope with such challenges. A recent study estimated that during 2005-06, more than 400 students from Harvard's Graduate School of Education worked as student teachers in Boston-area schools; and 1,000 Harvard student volunteers worked in after-school programs, as tutors and in other educational enrichment programs. During the same year, at least 8,500 elementary and secondary school students from the Boston area participated in a wide range of enrichment programs at Harvard.

The University has also sought to help local agencies and community organizations increase the supply of affordable housing. Since 2000 Harvard has invested more than \$26 million in the development of affordable housing in Boston and Cambridge.

In times of economic difficulty, of course, the strains felt by local communities can get even worse, with growing numbers of residents facing the loss of their jobs, health care coverage, and even their homes. Here too, the University offers resources that can be used to address community needs. In 2008, for example, several students at Harvard Law School launched a new non-profit group called No One Leaves to provide information, advice and legal assistance to Boston-area tenants who have been threatened with eviction as a result of foreclosure proceedings against their landlords.





## Harvard's endowment: fueling the University's contributions to the region's economy

Discussions of the role that Harvard plays in the economy of the Boston area often turn, sooner or later, to the subject of the University's endowment. Harvard's critics (and indeed, many of its friends as well) suggest that, given the size of its endowment, Harvard should be devoting more of its resources to serving the public interest – locally, nationally and globally. What friends and critics alike may not fully recognize, however, is the extent to which Harvard's endowment is already dedicated to serving the broader public interest.

In fiscal year 2008, funds distributed for operating purposes from the endowment accounted for 34 percent of Harvard's total operating revenues. Between 1998 and 2008, allocations from the endowment to University operations grew by an average of 12 percent annually; they now represent the single largest source of support for the University's ongoing operations.

Endowment earnings, for example, have played an essential role in the University's ongoing effort to ensure that all students who qualify for admission can take advantage of the opportunity Harvard offers, regardless of their economic status. Since 1998, financial aid provided by the University has nearly tripled, from \$125 million to \$363 million.

In the face of declining government support for many types of research, the endowment has also ensured vitally-needed stability and flexibility in the funding of University research. Endowment funds have helped finance the hiring of new faculty in critical areas, as well as investments in new facilities.

Many of the most promising new research initiatives at Harvard are also made possible by major gifts from alumni and other supporters. In 2008, for example, Hansjorg Wyss (MBA '65) donated \$125 million to help fund creation of a new Institute for Biologically-Inspired Engineering. Wyss's gift will allow Harvard to expand greatly its work in bioengineering – an area that had already been identified as one of the University's top research priorities.

Harvard's endowment is thus a vitally important source of investment in the University's future, and in the future of its students – and as a result, in the future of the Boston-area economy.



## Alleviating today's problems – creating tomorrow's opportunities

As a major employer, a buyer of goods and services and a sponsor of construction projects, Harvard – along with other colleges and universities – can help the Boston area weather the current economic storm. And as a source of new talent, new knowledge and new businesses, Harvard can also help the region prepare to take advantage of the next round of economic growth.

The relationship between the University and the Boston area is, of course, not a one-way street. Just as the region's colleges and universities have helped make the Boston area what it is today, the reverse is also true: The communities in which they operate have helped the region's educational institutions sustain a long tradition of excellence. Maintaining that partnership is likely to be one of the keys to the region's future.

