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Current Federal Issues

For this section, briefs on selected federal policy and other issues of current interest will be provided.

MIT: The Impact of Innovation

A Special Report of the BankBoston Economics Department

MIT Graduates Have Started 4,000 Companies With 1.1 Million Jobs, $232 Billion in Sales in 1994

In the first national study of the economic impact of a research university, the BankBoston Economics Department reports that graduates of the Massachusetts Institute of Technology have founded 4,000 firms which, in 1994 alone, employed at least 1.1 million people and generated $232 billion of world sales.

The report "represents a case study of the significant effect that research universities have on the economies of the nation and its 50 states."

Wayne M. Ayers, chief economist of BankBoston, said, "MIT is not the only university that has had a national impact of this kind, but because of its historical and continuing importance, it illustrates the contribution of research universities to the evolving national economy."

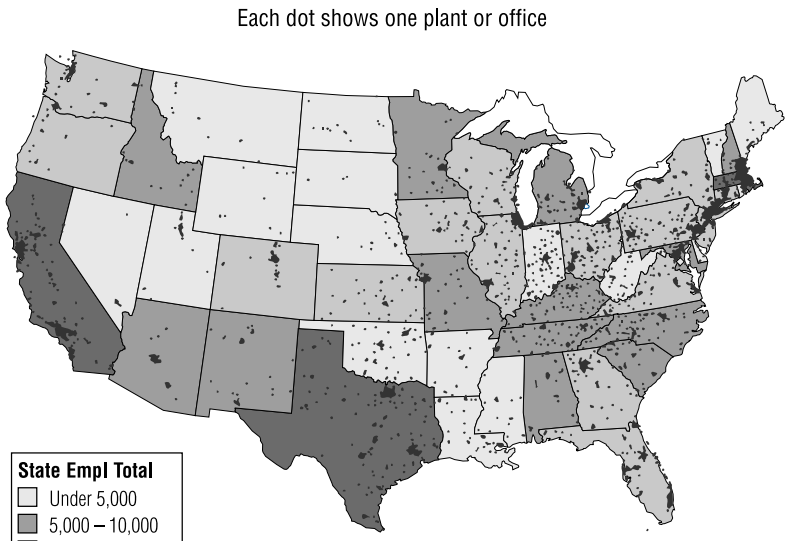
MIT President Charles M. Vest, commenting on the report, said, "About 90 percent of these companies have been founded in the past 50 years, in the period of the great research partnership between the federal government and the research universities. The development of these business enterprises is one of the many beneficial spinoffs of federally funded research, which has brought great advances in such fields as health care, computing and communications."

The companies employed a total of 733,000 people in 1994 at more than 8,500 U.S. plants and offices in the 50 states — equal to one out of every 170 jobs in America.

• Eighty percent of the jobs in the MIT-related firms are in manufacturing (compared to 16 percent nationally), and a high percentage of products are exported.

• The MIT-related companies, if they formed a nation, would rank as the 24th largest world economy in 1994 because the $232 billion in world sales "is roughly equal to a gross domestic product of $116 billion, which was a little less than the GDP of South Africa and more than the GDP of Thailand."

EMPLOYMENT AT ALL PLANTS OF MIT-RELATED COMPANIES



• The five states benefiting most from MIT-related jobs are California (162,000), Massachusetts (125,000), Texas (84,000), New Jersey (34,000) and Pennsylvania (21,000).

Thirteen other states have more than 10,000 MIT-related jobs — from west to east, Washington, Oregon, Colorado, Kansas, Iowa, Wisconsin, Illinois, Ohio, Virginia, Georgia, Florida, New York and Connecticut. Another 25 states have 9,000 to 1,000 jobs from MIT-related companies. Only seven low-population states and the District of Columbia had less than 1,000 jobs from MIT-related companies.

• The study also looked at employment around the nation and the world from MIT-related companies. Massachusetts firms related to MIT had 353,000 worldwide jobs; California firms had 348,000 world jobs.

• Other major world employers included firms in Texas, 70,000; Missouri, 63,000; New Jersey, 48,000; Pennsylvania, 41,000; and New Hampshire, 35,000.

• In determining the location of a new business, the 1,300 entrepreneurs surveyed said the quality of life in their community, proximity to key markets and access to skilled professionals were the most important factors, followed by access to skilled labor, low business cost and access to MIT and other universities.

• More than 2,400 companies have headquarters outside the Northeast. The report noted, "MIT-related companies have a major presence in the San Francisco Bay area (Silicon Valley), southern California, the Washington-Baltimore-Philadelphia belt, the Pacific Northwest, the Chicago area, southern Florida, Dallas and Houston, and the industrial cities of Ohio, Michigan and Pennsylvania."

• The MIT-related companies "are not typical of the economy as a whole; they tend to be knowledge-based companies in software, manufacturing (electronics, biotech, instruments, machinery) or consulting (architects, business consultants, engineers). These companies have a disproportionate importance to their local economies because they usually sell to out-of-state and world markets, and because they so often represent advanced technologies." Other industries represented include manufacturing firms in chemicals, drugs, materials, aerospace; energy, publishing and finance.

• MIT graduates and faculty have been forming an average of 150 new firms a year since 1990.

• MIT graduates, in interviews, cited several factors at MIT which spurred them to take the risk of starting their own companies — faculty mentors, cutting-edge technologies, entrepreneurial spirit and ideas.

• In Massachusetts, the 1,065 MIT-related companies represent five percent of total state employment and ten percent of the state's economic base (sales in other states and the world). MIT-related firms account for about 25 percent of sales of all manufacturing firms and 33 percent of all software sales in the state.

• The companies include 220 companies based outside the United States, employing 28,000 people worldwide.

• Some of the earliest known MIT-related companies still active are Arthur D. Little, Inc. (1886), Stone and Webster (1889), Campbell Soup (1900) and Gillette (1901).

The report notes that many of the MIT-related founders also have degrees from other universities, and these entrepreneurs maintain close ties with MIT or other research universities and colleges. The report is the result of an MIT survey of 1,300 founders and two years of fact-gathering by MIT and BankBoston.

Companies Founded by MIT Graduates/Faculty Are in All 50 States

More than $1 Billion in Annual Sales in Each of 26 States
More than 5,000 Jobs in Each of 31 States

State	Jobs, MIT-Related	Sales, MIT-Related Plants & Offices (in millions)*	State	Jobs, MIT-Related	Sales, MIT-Related Plants & Offices (in millions)*
Alabama	9,300	$1,091	Missouri	9,200	$1,143
Alaska	360	$56	Montana	60	$18
Arizona	7,600	$1,163	North Carolina	8,100	$1,680
Arkansas	2,500	$493	North Dakota	110	$64
California	162,000	$19,216	Nebraska	1,900	$1,048
Colorado	15,600	$3,164	Nevada	1,300	$36
Connecticut	10,300	$890	New Hampshire	8,800	$1,574
District of Columbia	770	$88	New Jersey	33,700	$1,834
Delaware	2,100	$306	New Mexico	5,300	$1,035
Florida	15,500	$2,521	New York	15,100	$3,092
Georgia	14,800	$2,852	Ohio	18,300	$3,327
Hawaii	400	$79	Oklahoma	4,800	$843
Idaho	5,300	$1,133	Oregon	10,200	$2,891
Illinois	12,100	$1,899	Pennsylvania	21,000	$2,360
Indiana	4,700	$489	Rhode Island	3,900	$308
Iowa	13,300	$960	South Carolina	9,200	$1,101
Kansas	13,900	$526	South Dakota	380	$56
Kentucky	5,600	$772	Tennessee	6,600	$890
Louisiana	2,100	$562	Texas	84,200	$13,001
Maine	2,100	$410	Utah	4,200	$524
Maryland	6,800	$958	Vermont	650	$47
Massachusetts	125,000	$16,669	Virginia	15,300	$1,626
Michigan	7,600	$1,073	West Virginia	1,260	$128
Minnesota	5,500	$2,445	Washington	10,300	$1,327
Mississippi	1,030	$158	Wisconsin	12,000	$1,373
			Wyoming	130	$19

**Does not include headquarters-related sales of most multi-state companies*

For the full report, including maps and tables, see the Web page at <http://web.mit.edu/newsoffice/founders>

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Value, Quality and Cost at America's Research Universities

The Value of Advanced Education and Research

Research universities generate new or improved technologies and industries that fuel the engines of economic growth. Case in point: According to a recent study by the BankBoston Economics Department, MIT graduates have founded or co-founded 4,000 firms which, in 1994 alone, employed 1.1 million people and generated $232 billion of world sales. Within the United States, these companies employed a total of 733,000 people equal to one out of every 170 jobs in America. MIT is not unique in this respect: similar studies conducted at other research universities would also yield impressive results.

For individual graduates, college degrees offer a greater likelihood of significantly higher lifetime earnings. Between 1975 and 1995, the gap between incomes for college graduates and high-school graduates more than doubled in size. Today, college-educated Americans 25 years or older enjoy average annual incomes 57 percent higher than those holding only high-school diplomas. Advanced degrees add even more value: each additional year of college provides a future return in income of 11 to 13 percent.

Maintaining Quality in a Time of Expanding Knowledge and Growing Complexity

Scientific and technological knowledge base is growing at about 4 to 8 percent per year, with a doubling of the knowledge base every 12 to 15 years. This increase in the amount and complexity of new knowledge requires universities to invest in new courses, improved libraries and information technology (computers, networks, etc.), and more complex and sophisticated research equipment.

Quality and Productivity: Research universities strive to be optimally productive while maintaining high quality. New technologies and teaching practices such as distance and distributed learning can augment and enhance the educational process, but cannot replace direct contact with faculty as teachers, mentors, advisors and research supervisors. Thus, providing quality in an era of increasing complexity and specialization requires research universities to maintain a relatively high faculty-to-student ratio.

Talent costs money. To maintain quality and attract talented students, universities must compete aggressively for the very best faculty. In most sectors of the American economy, compensation for the most senior and most successful professionals has risen much faster than for the working population as a whole. The field of education is no different, although senior faculty still make less than their opposite numbers in business, industry, medicine, law and other professions.

What It Costs to Obtain a College Education

Americans overestimate what college students must pay to receive a high-quality education. In the fall of 1996, the average tuition and fees at public colleges and universities was just under $3,000. Over 60 percent of *all* colleges and universities in the United States charge tuition of $3,000 or less. Only 12 percent of U.S. undergraduates attend schools with annual tuition bills of $14,000 or more.

The number of college students nationwide who actually pay out $20,000 or more each year for college tuition is less than one-half of one percent of the total college student population.

Between 1980 and 1990 the average tuition at private universities rose at a rate averaging 4.5 percent per year, but was partially offset by substantial increases in

need-based private financial aid. When this aid is factored into the rate of net tuition increases, the average rate of tuition increase between 1980 and 1990 falls to 0.6 percent annually. Since 1990, increases in financial aid have kept net tuition costs close to the rate of inflation.

Case in point: At MIT, only 1 out of 4 students pays the full amount of tuition, without relying on scholarships or loans of any kind. Half of MIT's undergraduates receive enough aid to cut their tuition bills by 50 percent or more.

Beyond Tuition: Endowment, Gifts and Federal Aid

At most private universities, tuition pays for only about half of the cost of education. The balance is made up by the universities from their endowment income and gifts. Items included in the cost of education include classroom instruction, libraries, computer resources, lab equipment and materials, academic advising, research supervision, athletics programs, student activities, medical and counseling services, campus and building maintenance. (Students are billed separately for room and board.)

Over the past two decades, the federal government has reduced the amount of constant-dollar scholarship aid it provides, shifting the burden to colleges and universities. In the 1978/9 academic year, the maximum federal Pell Grant covered, on average, 54 percent of tuition costs at private, four-year colleges. By 1995/6, it covered only 20 percent of tuition at such schools. This shift in the role of the federal government has meant that, for the past several years, one of the fastest growing elements in college and university budgets is the amount of money dedicated to financial aid. Congress has begun to address this problem, but the decline has had a considerable impact.

State contributions to higher education have declined. Between 1985 and 1997, the share of state budgets devoted to higher education declined from 14 percent to 12 percent, placing additional pressures on state universities to cover costs through tuition increases. (During the same period, the share of state spending devoted to Medicaid and correctional facilities rose from 14 to 19 percent.)

Managing Cost Factors

The biggest pressures on college and university budgets come from the need to provide competitive salaries for faculty, adequate financial aid for students, new information technology, and sophisticated research equipment and health insurance. In addition, federal regulations, especially changing policies regarding reimbursement of research costs and graduate student support, have put dramatic pressures on university budgets.

Administrative costs, as a share of college budgets nationwide, have increased only slightly in recent years, from 12.9 percent of total spending in 1980 to 13.7 percent in 1992. Research universities have worked to increase their endowments (and thus their investment income), have reduced the size of their academic and administrative staffs, have reduced operating costs by streamlining administrative procedures, by adopting aggressive energy conservation programs, and many other means. Institutions such as MIT have also begun working with business and industry to develop collaborative research and education agreements which have brought millions of additional dollars on campus to invest in research and teaching programs.

The savings achieved by these methods, however, have been more than offset by the real-dollar decline in public funding and by continuing increases in other cost factors. For the most part, universities must therefore reinvest their savings in meeting other obligations rather than in rolling back tuition. Still, recent statistics show that the nationwide average rate of annual tuition increase is moderating.