

# MASSACHUSETTS BENCHMARKS

• the quarterly  
review of  
economic  
news &  
insight

• fall '98 volume one issue 4

- Economic Currents
- Massachusetts Leading Economic Index
- Information Technology: The New Foundation
- From the Field: Boston Metro

A PUBLICATION OF  
THE UNIVERSITY  
OF MASSACHUSETTS

IN COOPERATION WITH  
THE FEDERAL RESERVE  
BANK OF BOSTON





a publication of  
the massachusetts  
benchmarks project  
at the university  
of massachusetts  
in cooperation with  
the federal reserve  
bank of boston

## EDITORS

LYNN BROWNE  
Federal Reserve Bank of Boston

CRAIG MOORE  
University of Massachusetts

## EXECUTIVE EDITOR

ROBERT NAKOSTEEN  
University of Massachusetts Amherst

## FEATURES EDITOR

RALPH WHITEHEAD, JR.  
University of Massachusetts

## EDITORIAL BOARD

MICHAEL BEST  
University of Massachusetts Lowell

KATHARINE BRADBURY  
Federal Reserve Bank of Boston

KARL CASE  
Wellesley College

ALAN CLAYTON-MATTHEWS  
University of Massachusetts Boston

RICHARD DEKASER  
BankBoston

PETER DOERINGER  
Boston University

WILLIAM HOGAN  
University of Massachusetts Dartmouth

ADAM JAFFE  
Brandeis University

DAPHNE KENYON  
Simmons College

YOLANDA KODRZYCKI  
Federal Reserve Bank of Boston

FRANK LEVY  
Massachusetts Institute of Technology

JIM STOCK  
Harvard University

ANDREW SUM  
Northeastern University

## TABLE OF CONTENTS

2

letter from the president

WILLIAM M. BULGER

3

excerpts from the board

4

economic currents

The State of the State Economy

ALAN CLAYTON-MATTHEWS

9

from the field  
boston metro

Greater Boston — Hub of the  
Commonwealth's Economy

DAVID TERKLA

II

at the center

The Measure of Massachusetts

18

information technology:  
the new foundation

CRAIG MOORE

23

street signs

LOU DINATALE AND

RALPH WHITEHEAD, JR.

24

endnotes

New Current and Leading  
Indexes for Massachusetts

25

regional map: boston metro

The editors would like to thank KATHARINE BRADBURY and PETER DOERINGER for helping to ensure the accuracy and integrity of *Benchmarks*.

# Letter

FROM THE  
PRESIDENT

With this issue, *Massachusetts Benchmarks* inaugurates its Leading Economic Index. The index takes several measures that have been shown to anticipate the condition of the state economy and reduces them to a single number. It appears on page 11 and is explained in Endnotes, on page 24. It suggests that economic growth in the state will slow somewhat, but remain solid.



Members of the Editorial Board met to discuss the economy from their varied vantage points. They find that even the bad news is not all bad: slower growth might be sustainable over a longer period of time.

Alan Clayton-Matthews (Economic Currents) has been tracking the shock waves that began emanating from the Asian nations more than a year ago. He saw them on the horizon, monitored them in the middle distance, and now finds them at our shores. He discusses the effects of the Asian crisis — to the extent that they allow one to reach reliable conclusions at this stage.

David Terkla looks at Greater Boston, the region that contains a larger share of the state's economic activity than any other. Many of its industries are well-positioned for future growth, Terkla finds. But he cautions that expansion is jeopardized by a scarcity of workers with the necessary skills to fill new jobs.

Twenty years ago, the phrase "high tech" began to make its way into common usage. It referred chiefly to the minicomputer industry. The technology sector has grown since then in size and diversity, and our language is beginning to reflect the change. "High tech" has been joined by "infotech," which is shorthand for a cluster of information technology activities. Indeed, it is now considered to be the foundation for the state's economic activity in the next century. Its defining traits are described by Craig Moore in *The New Foundation*.

We believe that this issue provides a clear view of how the state is faring economically and a reasonable evaluation of what is likely to come.

WILLIAM M. BULGER  
President  
University of Massachusetts

## E X C E R P T S

---

### F R O M     T H E     B O A R D

**F**or the past three quarters, the Editorial Board has been anticipating the impact of the Asian economic crisis on the nation and on the commonwealth. That expectation is now being realized. Other significant developments have now begun to rock financial markets around the globe. The descent of the Russian economy has been breathtaking; there is rising concern about the stability of South America and the Latin American economies, as well.

The international economic environment has triggered wide swings in the world's financial markets, but so far the impact on Massachusetts has been mild. Perhaps the crises have even served as a safety valve for unsustainable growth. Within the generally benign aggregate picture, however, some specific areas of the state's economy are feeling a squeeze.

Employment in the manufacturing sector has fallen, because of the impacts of the Asian situation (some manufacturers have experienced close to a 100 percent drop-off in Asian business). The effects of Asia's turmoil are likely to persist or even worsen. The weakening of the Russian and Latin American economies will probably have little direct impact on the Massachusetts economy. Russia is not among the most important export partners for Massachusetts, and only Mexico appears among the top twelve South American or Latin American countries. Asian countries, on the other hand, represent five of our top twelve export destinations.

There is concern that a stock market correction such as the one we have recently witnessed, followed by a lengthy bear market, would have serious repercussions for the state's financial services industry. A contrary point of view sees the ongoing need for money management, regardless of the behavior of the financial markets, and anticipates little impact on industry employment. Financial market instability can also have a nationwide wealth effect, reducing consumption expenditures as consumers become more cautious.

The board voiced concern this quarter that imbalances are emerging in the economy, reflecting the differential impact of Asia's recession: the state's tradable goods sector is experiencing a slowdown, while non-tradable goods continue to grow.

Another issue that has piqued speculation by the board in the past may also be about to unfold: The state's labor market is extremely tight. Recent increases in employment have been outpacing growth in the local labor force. The board expects that the impact of these tighter labor markets will become more manifest over the next months.

More and more, we are feeling the effects of interconnectedness among the world's economies. Slowed growth appears to lie ahead for Massachusetts, especially in manufacturing industries. The financial services sector may be victimized by the current flux in the world's financial markets, but this is not a foregone conclusion. The real results remain to be seen.



# Economic currents

ALAN CLAYTON-MATTHEWS



ILLUSTRATION: NAOMI SHEA

THE ASIAN CRISIS ARRIVES  
ON MASSACHUSETTS SHORES

WHAT WILL THE  
DAMAGE BE?



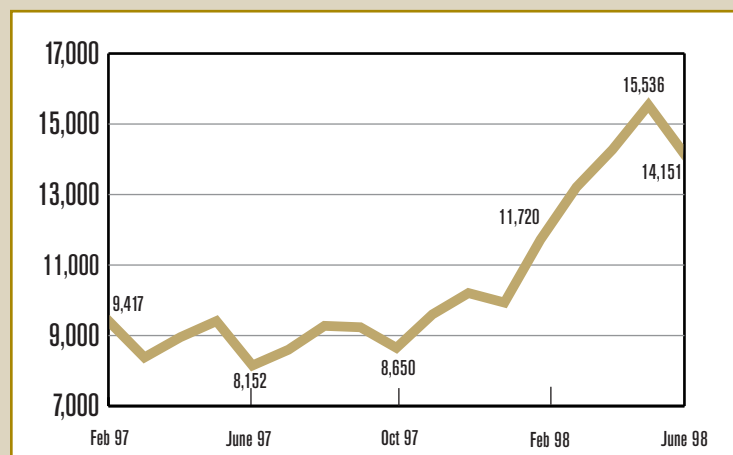
## ECONOMIC UPS AND DOWNS

The rising trade deficit that originated in the Pacific Rim Tiger economies in the summer of 1997 and then spread to Japan is now inundating the Massachusetts economy. For months we felt its benefits: lower import prices due to the relatively strong dollar; lower raw materials prices, thanks to the drop in worldwide demand; and lower interest rates because of the

ter of the year, a glut in the semiconductor market, and the General Motors Corporation/United Auto Workers strike. These are less worrisome than the events in Asia, as their effects are expected to be temporary. The strike is over, and strong consumer spending should eradicate the inventory problem. Also, the rapid pace of technological change limits the duration of the chip cycle downturn, as obsolete chips depress neither the price nor demand for new ones. The length and depth of the Asian crisis, however, are still uncertain, and the magnitude of its effects on our economy, difficult to predict.

### U.S. Deficit: International Trade in Goods and Services

Millions of Dollars  
The trade deficit has increased dramatically in recent months as imports rise and exports fall.



Source: U.S. Bureau of the Census

### IN SPITE OF THIS,

### THE ECONOMY REMAINS STRONG

So far, the only sector feeling the brunt of these shocks is manufacturing. In fact, the rest of the state's economy seems untouched by the crisis. In the 12-month period ending in July, the Massachusetts jobs engine continued to outperform both the region and the nation. The number of jobs in the state grew 2.9 percent, compared to 2.5 percent for the nation and 2.1 percent for New England. The commonwealth's growth rate exceeded that of all other New England states during this time.

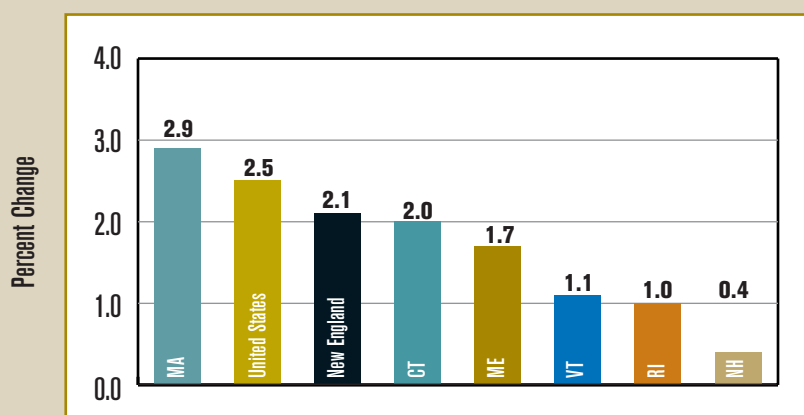
The unemployment rate is still low. At 3.1 percent in July, it was well below the national 4.5 percent rate. The only wrinkle in the state's unemployment

flight to quality U.S. securities. Now the flip side has become evident. East Asian purchases of American goods have plummeted; they are simply too expensive for these countries to afford. The strong dollar is causing American-made goods to be more expensive compared to foreign-made goods, not only for our trading partners, but for our domestic firms as well. As a consequence, exports are falling and imports are rising, catapulting trade deficits, slowing output growth, and reversing the recent growth in manufacturing employment.

Other recent economic currents adversely impacting the U.S. and Massachusetts economies, particularly manufacturing, include a build-up of excess inventories during the first quar-

### Employment Growth Rates Compared, Year Ending July 1998

Massachusetts grew faster than the nation and all other New England states.



Source: U.S. Bureau of Labor Statistics



situation is in initial unemployment claims, which have stopped declining. On a seasonally adjusted basis, they are up in the second quarter over the first quarter, probably a reflection of the downturn in manufacturing.

Another overall indicator of the economy, state tax revenues, grew 8.9 percent in the fiscal year ending in June, substantially exceeding expectations and resulting in a surplus of \$1 billion.

**SHOCK IN  
MANUFACTURING  
SECTOR**

Despite the overall growth, manufacturing lost jobs in the second quarter at an annualized rate of 2.5 percent from the first quarter of the year. This is a sharp reversal from the positive annualized growth rate of 4.3 percent in the first quarter. Both durable and nondurable goods manufacturers were affected. So far, the year-over-year employment growth in total manufacturing is still positive, at 1.4 percent from July 1997 to July 1998, but as recently as March, the year-over-year growth rate had been 2.4 percent.

The state's largest export industry, industrial machinery (which includes computers) lost jobs in the second quarter, wiping out most of the employment gains of the past year. The same can be said for the state's second largest export industry, electronics. A good portion of the slowdown can be attributed to Asia's declining demand for machinery and computers. Part of the problem, however, resulted from a fall-off in the computer chip market. Many of the machines that make these chips are built in Massachusetts. Companies are facing reduced shipments and orders and are cutting back on overtime and employment. Other export sectors have not been overwhelmed by these prob-

lems, at least as of July. Employment in both the transportation equipment and instruments sectors is still expanding, as sales of aircraft components, power equipment, and medical and pharmaceutical equipment have been brisk.

In the textile mill products industry, several companies that produce specialized fabrics or products continue to fare well. Even this sector, however, was hit by employment declines in the second quarter as a result of events and conditions beyond its control. First, the General Motors Corporation/United Auto Workers strike hurt those companies that supply upholstery products to the automaker. Second, the warm winter of 1997-98 hurt sales of specialized fabrics, such as Malden Mills' POLARTEC®.<sup>1</sup>

The problems in manufacturing are reflected in a small decline in average weekly hours worked and in surveys conducted by the Federal Reserve Bank of Boston, the Associated Industries of Massachusetts, and BankBoston. These surveys are consistent with recent employment trends. The Fed's *Beige Book* reports mixed results from its informal survey of manufacturers, with several companies citing "double-digit reductions in sales to Asian markets." Both AIM's Business Confidence Index and BankBoston's Instant Reading Index have exhibited sharp declines.

**INCOMES, CONSUMER SPENDING, AND TRADE**  
Strong income and earnings growth are keeping households confident and consumption spending growing. In the first quarter of 1998, personal income was 6.5 percent higher than in the prior year, and wages and salaries were

Employment Growth in Manufacturing: Selected Sectors in Massachusetts		
	Annualized Growth Rates (seasonally adjusted, percent)	
	First quarter 1998	Second quarter 1998
Major Divisions		
Manufacturing	4.3	-2.5
Durable Goods	4.6	-1.5
Nondurable Goods	3.8	-4.1
Detailed Sectors		
Fabricated Metals	4.1	-3.0
Industrial Machinery and Equipment	5.6	-5.6
Computer and Office Equipment	6.7	-6.9
Electronic and Electric Equipment	4.1	-4.9
Transportation Equipment	5.0	5.6
Instruments	6.3	3.5
Food and Kindred Products	9.3	-0.6
Textile Mill Products	6.8	-22.1
Apparel	-1.5	-9.6
Paper and Allied Products	5.7	-4.4
Printing and Publishing	3.4	1.3
Rubber and Miscellaneous Plastic Products	7.1	-1.0
Source: Massachusetts Division of Employment and Training; author's calculations. Detailed sectors seasonally adjusted by author.		



8.2 percent higher. In real terms, adjusting for inflation as measured by the Boston Consumer Price Index, these growth rates were 4.4 percent and 6.1 percent, respectively. Consumer spending appears to be growing hand-in-hand with income. The Massachusetts sales tax base, a proxy for consumer spending, is up sharply in recent months, and is consistent with national retail sales growth of over 6 percent in the year ending in June. Consumer confidence surveys by Mass Insight for Massachusetts and the Conference Board for New England reflect consumers' income and spending levels. Both indicate substantially higher confidence about present conditions than those a year ago.

Consumers are tempering their enthusiasm about the future, though. The Mass Insight index shows a significant decline in expectations about future conditions since January, and the Conference Board index for New England indicates a consistent, though less striking pattern, as future expectations in the second quarter are 6.8 percent below the first quarter average. In addition to the impact of the Asian crisis, consumers may also be worried about the increasing volatility in the stock market.

#### INFLATION IS STILL AT BAY

The expectation that labor market shortages will lead to a burst of wage inflation that will lead to higher general inflation has still not materialized, at least as far as one can tell from the available data. Consumer price inflation in the Boston area has been higher than in the average U.S. city recently, but does not appear to be accelerating. The Boston Consumer Price Index grew by 2.2 percent in the year ending in July, while the average for U.S. cities was 1.7 percent over the same period. Prices rose moderately faster here than in the nation for food purchases and transportation services, and substantially faster for apparel and medical services. It is difficult to discern any trend in overall inflation in the Boston area. However, the higher recent inflation in Boston versus the nation is consistent with a relatively tighter labor market here than in the nation as a whole.

The primary transmission of labor market shortages to inflation is through wage rates. Data on wage rates at the state level are meager, but are consistent with the view that wage rates are rising faster than prices and are therefore contributing to inflationary pressures. The Massachusetts manufacturing hourly wage rate grew by 3.1 percent in the year ending in June. The Boston Fed's *Beige Book* (June 17), based on a small, informal survey of employers in the New England region, reports wage rate growth of 2 to 4 percent in manufacturing, 3 to 5 percent in retailing, and 10 percent in temporary employment.

Another source of information is the Department of Employment and Training's census of employers contributing to the unemployment insurance system (commonly referred to as the "202" data), which represents roughly 95 percent of establishment employment and wages and salaries paid in the state. The average annual wage in the private sector rose 4.9 percent in 1997 over the prior year.<sup>2</sup> The growth varied by industry: 11.3 percent in the small mining sector, 8.6 percent in

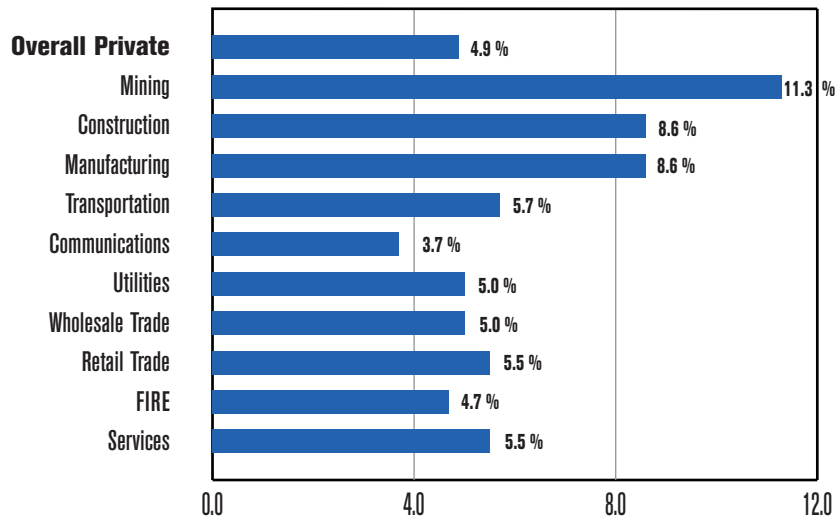
#### BENCHMARKS LEADING ECONOMIC INDEX

This issue marks the introduction of the Benchmarks Leading Economic Index. The leading index for July projects an annualized rate of increase of 4.5 percent in the current economic index over the next six months. This follows a value of 3.6 percent for the leading index in June. These growth rates are lower than those that prevailed in 1997 or earlier in 1998, suggesting a slowing in growth in the coming months. Although slower, a 4.5 percent rate is substantial, and close to the 5 percent average rate of growth of the current index during this long expansion. For more details about the index, see pages 11 and 24.

construction, 8.6 in manufacturing, 5.5 percent in retail trade, and 5.5 percent in the large service sector. These include increases in hours worked as well as wage rate growth, so the numbers don't reflect just wage inflation — but they are consistent with the anecdotal evidence of



### Annual Wage Growth in Massachusetts Industry Sectors 1996 – 1997



Sources: Massachusetts Department of Employment and Training and author's calculations

the *Beige Book*, and with the view that wage rates have been rising faster than prices.

#### SLOWER GROWTH AND HIGHER INFLATION LIKELY

For several reasons, growth is likely to slow in the near future. First, the labor supply shortage should constrain employment growth markedly. Even with employment growth slowing to a rate consistent with population growth, the Massachusetts economy could still grow at a healthy rate of 2 to 3 percent in real terms, the sum of productivity and population growth. This is somewhat slower than the annual average growth in real gross state product of 3.7 percent during the 1992–96 period (1997 is not yet available).

Second, many of the circumstances keeping business costs and, therefore, inflation low — in spite of rising wage rates — are temporary. Falling import prices, raw material costs, and interest rates will reverse direction as Asia recovers. Nearly all the potential savings in non-wage employment costs, such as health insurance, have been realized.

Until now, these falling business costs have offset rising wage rates, but when these temporary circumstances

abate, the underlying latent inflation due to wage rate growth will be unmasked. Indeed, these other business costs may even rise proportionately faster than wages. When, and if, this happens, the Fed will apply the monetary brakes to slow the economy until costs come back in line.

Third, Massachusetts, with its concentration in the mutual fund and money management industries, is vulnerable to a sharp correction in the stock market. The effects would be felt primarily through wealth-induced reductions in consumer expenditures, and through reductions in bonuses paid to securities industry workers.

Finally, there is the demand shock of the Asian crisis-induced trade deficit. If we are lucky, the shock will simply cancel what might

have been a wage-induced reemergence of inflation. If we are less lucky, the Fed has room to offset imbalances in either direction. There is a remote possibility that the trade shock will be too big for the Fed to overcome, tipping the nation and Massachusetts into recession. Less remote is the possibility of an imbalance between the manufacturing and nonmanufacturing sectors that could lead to both increases in unemployment and inflation. So far, the consensus of firms and economists both is that the economy can withstand the Asian crisis with a temporary slowdown in the second half of 1998. Thereafter, inflation may be a problem, but one the Fed can handle. This seems to be the most likely scenario for Massachusetts as well. ▀

1. Source: Andre Mayer, Associated Industries of Massachusetts (AIM).

2. The annual wage growth rates reported here are weighted by 1996 average employment at the three-digit SIC level, in order to control for the influence of employment shifts among industries.

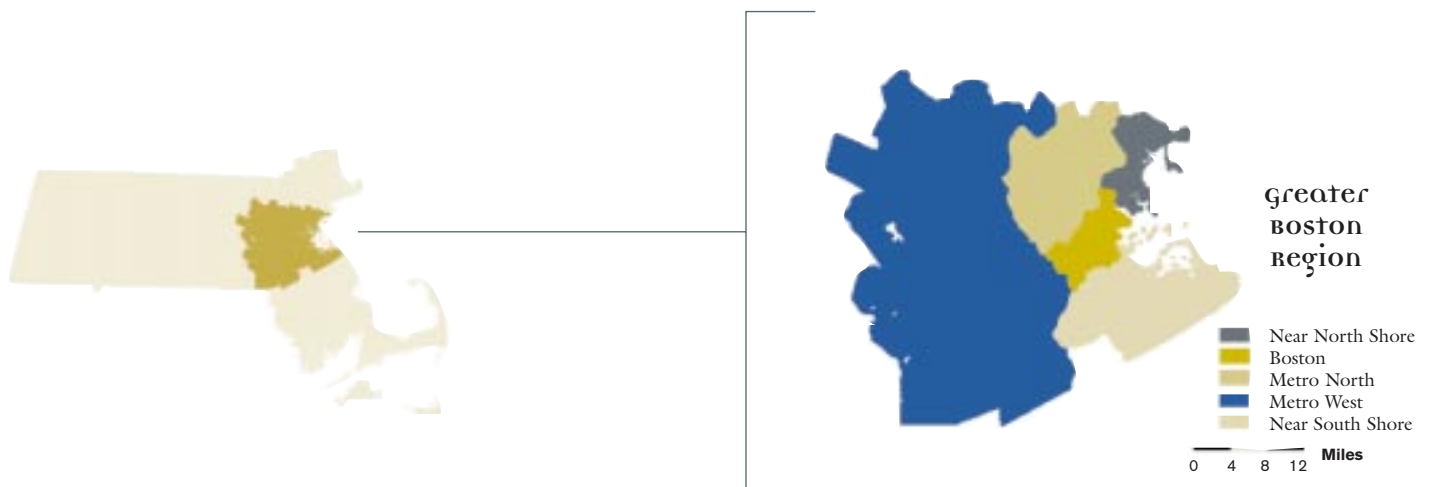
ALAN CLAYTON-MATTHEWS is assistant professor and director of quantitative methods in the public policy program at the University of Massachusetts Boston. He is also vice president and forecast coordinator for the New England Economic Project.



ILLUSTRATION: NAOMI SHEA

# Greater Boston – Hub of the Commonwealth's Economy

DAVID TERKLA



*The map inside the back cover of this issue  
provides additional information on the Greater Boston region.*

## A REGION WELL POSITIONED FOR GROWTH

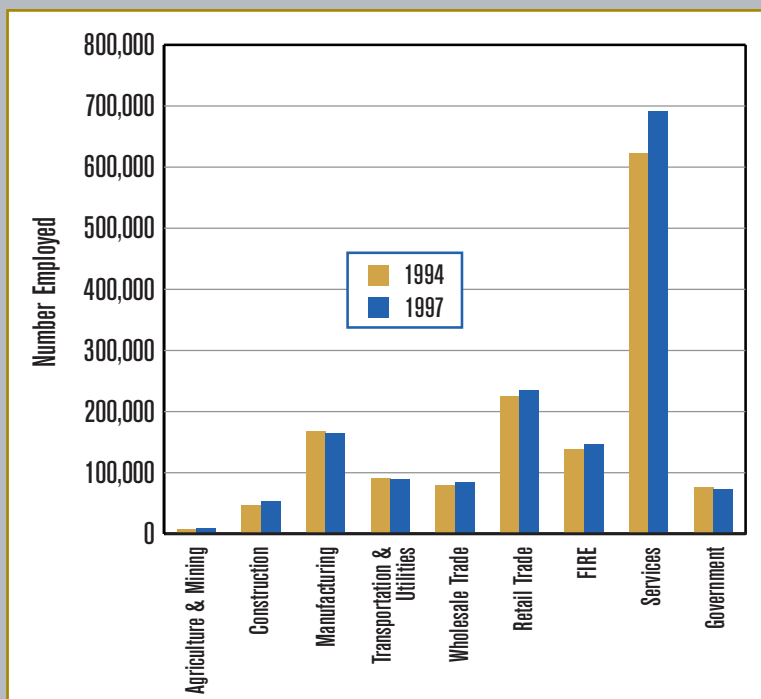
In terms of its economy, the Greater Boston region is impressively healthy. Unemployment is low, and a number of the area's industries are likely to give rise to considerable job growth. More than half of the state's employment in 1997 was in this region, as were many of the state's highest growth and high-wage industries.<sup>1</sup> Tempering this assessment somewhat is the prospect of a shortage of skilled labor, as well as pockets of poverty and relatively high unemployment in the region. A key to a strong future is Greater Boston's ability to reduce a labor shortage at the high end of the skills ladder and the

jobless rate among those with less advanced skills.

Greater Boston is made up of five subregions: the Near North Shore (including the older industrial cities of Lynn, Saugus, and Revere); Metro North (containing Cambridge, bedroom communities north of Boston, and industrial parks on Route 128); Metro West (the area between 128 and 495, with older, wealthier communities as well as new bedroom communities and industrial and commercial developments); the Near South Shore (the area immediately south of Boston, including the cities of Quincy and Braintree and several bedroom communities); and Boston itself, with its concentration of service and finance industries (see map above).<sup>2</sup>



**Figure 1: Employment in Major Industries, Greater Boston, 1994 – 1997**



Source: Massachusetts Division of Employment and Training

Overall, Greater Boston's industry mix is well positioned for substantial growth over the next ten years, being concentrated in service industries with expected high growth rates. The region faces potentially severe labor supply constraints, though, because of slow population growth and a mismatch between the skills required in growth industries and those of the currently unemployed. The region is expected to sustain further losses in high-wage manufacturing employment, concentrated in the Near North Shore and Near South Shore subregions, along with substantial growth in low-wage retail and service jobs.<sup>3</sup> Moreover, it continues to have nagging areas of unemployment and is home to some of the poorest residents of the state.

#### LEADING THE SHIFT TO A SERVICE ECONOMY

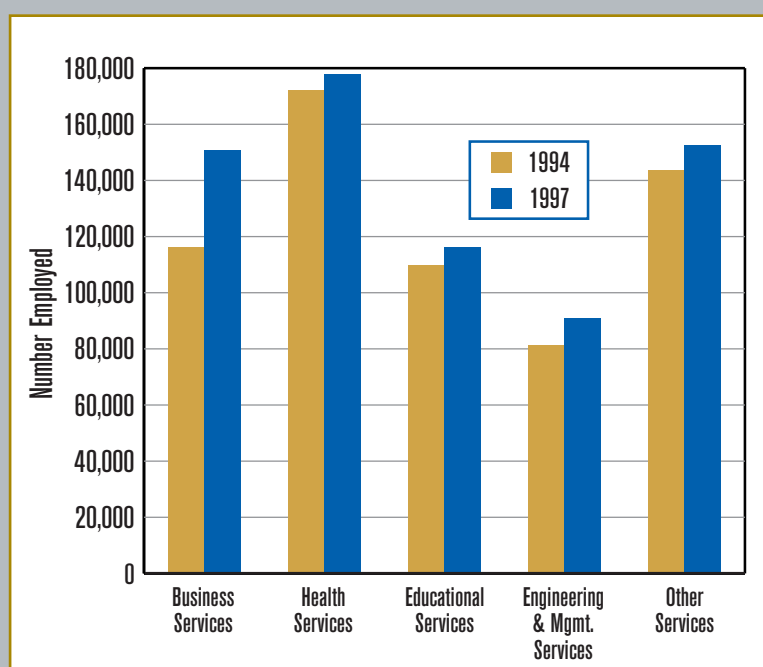
In the last two decades, the Greater Boston region has led the state in a move from manufacturing to services. Much of the shift away from manufacturing occurred during the 1980s, as employment in services and FIRE (finance, insurance, and real estate) increased by almost 41 percent and 35 percent, respectively, while manufacturing employment fell by over 26 percent. During the 1990–92 recession, Greater Boston's employment fell by 7.1 percent (compared to a statewide decline of 7 percent), but this was concentrated in the con-

struction industry (down almost 29 percent) and the manufacturing industry (down 13 percent). Employment in services declined by less than 2 percent.

Between 1994 and 1997, overall employment in the region increased by over 91,000, or 6.3 percent, compared to a statewide increase of 6.8 percent. The Greater Boston region has continued the shift from manufacturing to services, with services now accounting for almost 45 percent of total regional employment and manufacturing falling to less than 11 percent. During the 1994–97 period, employment in services grew by almost 11 percent, while manufacturing employment fell by over 2 percent. Construction and agriculture and mining grew by approximately 15 percent, though they represent less than 5 percent of total regional employment.<sup>4</sup> The region has a disproportionately large share of the state's employment in FIRE, and to a lesser degree in services, government, and transportation and utilities (see Figure 1).

Although this gives a general picture of the health of the Greater Boston economy, it is useful to take a closer look at some of its key industrial sectors in order to develop a clearer understanding of likely future trends. Employment continues to grow most rapidly in the business services sector, particularly in high-wage

**Figure 2: Employment in Services Industries, Greater Boston, 1994 – 1997**



Source: Massachusetts Division of Employment and Training

CONTINUED ON PAGE 15

# AT THE CENTER:

## THE MEASURE OF MASSACHUSETTS

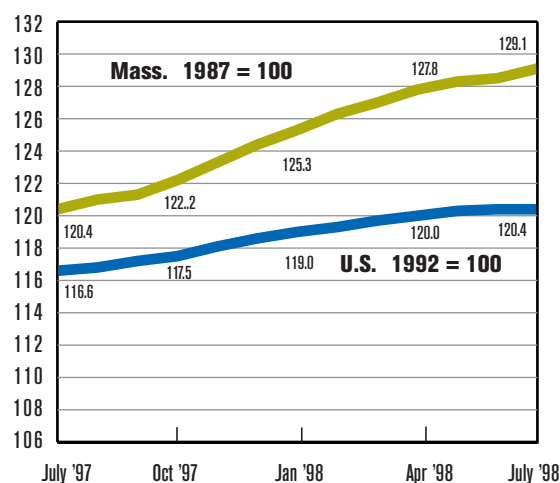
### The university of massachusetts economic benchmarks: july 1998

	Value	Change from Year Earlier
Employment (thousands of jobs)	3,210.7	2.9%
Manufacturing	455.1	1.4%
Services	1,150.9	4.0%
Current Economic Index	129.1	7.2%
Leading Economic Index	4.5%	July '97 value: 5.3%
Unemployment Rate	3.1%	July '97 value: 4.0%

Sources: Federal Reserve Bank of Boston; Massachusetts Division  
of Employment and Training; University of Massachusetts

### Current Economic Indexes U.S. and Massachusetts

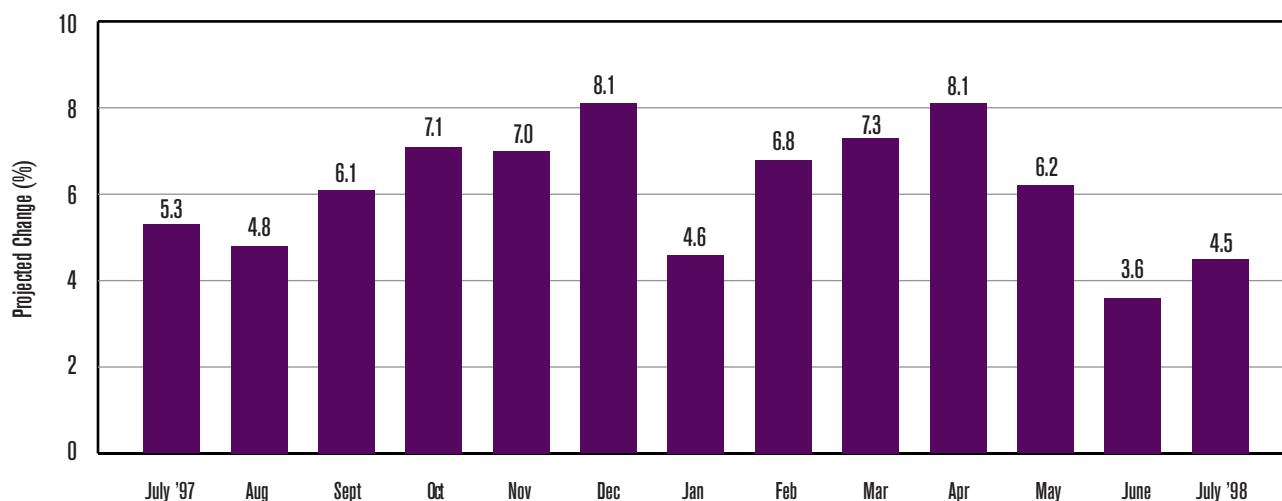
The trends rather than the levels  
of these indexes should be compared,  
due to different formulations and base points.



Sources: The Conference Board;  
University of Massachusetts; Federal Reserve Bank of Boston

### Massachusetts Leading Economic Index

Recent leading index growth rates suggest a slowing  
in growth in the coming months (see page 24).



(Annualized 6-month projected percent change in Massachusetts Current Economic Index)  
Sources: The Conference Board; University of Massachusetts; Federal Reserve Bank of Boston

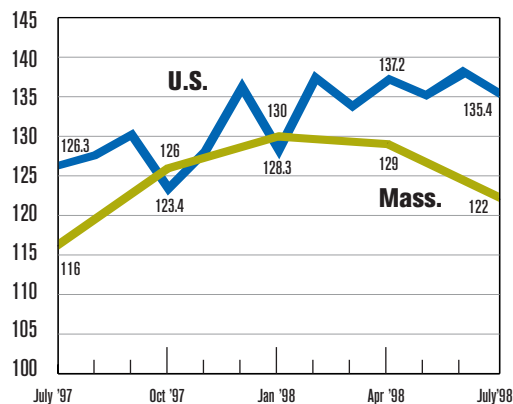
## massachusetts indicators

	Period	Value	Change from Year Earlier
Monthly Initial Unemployment Claims (12-month average)	Year ending July '98	27,792	-2.7%
Help Wanted Advertising Index, Boston (1987 = 100)	June '98	49	-14.0%
New Housing Permits (12-month average)	Year ending June '98	1,482.1	-3.3%
Personal Income (\$M)	1998 Q1	201,895	6.5%
Real Personal Income (\$M 1982-'83)	1998 Q1	118,679	4.4%
Housing Price Index (1987: Q1 = 100)	1998 Q1	117.0	5.9%
Boston Consumer Price Index (1982-'84 = 100)	July '98	170.7	2.2%

Sources: The Conference Board; Fannie Mae and Freddie Mac; Massachusetts Division of Employment and Training; United States Bureau of Economic Analysis; United States Department of Commerce; University of Massachusetts

### Consumer Confidence Indexes U.S. and Massachusetts

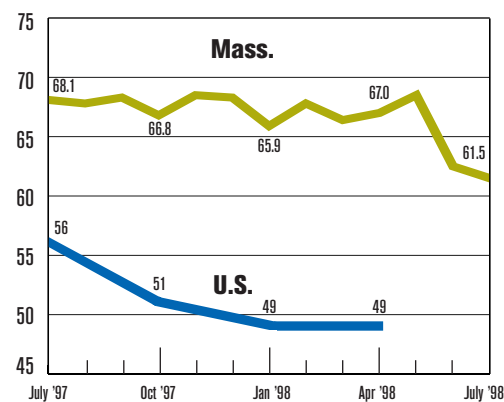
The Massachusetts index is measured quarterly; the U.S. index is measured monthly.



Sources: The Conference Board;  
Mass Insight/New England Economic Project

### Business Confidence Indexes U.S. and Massachusetts

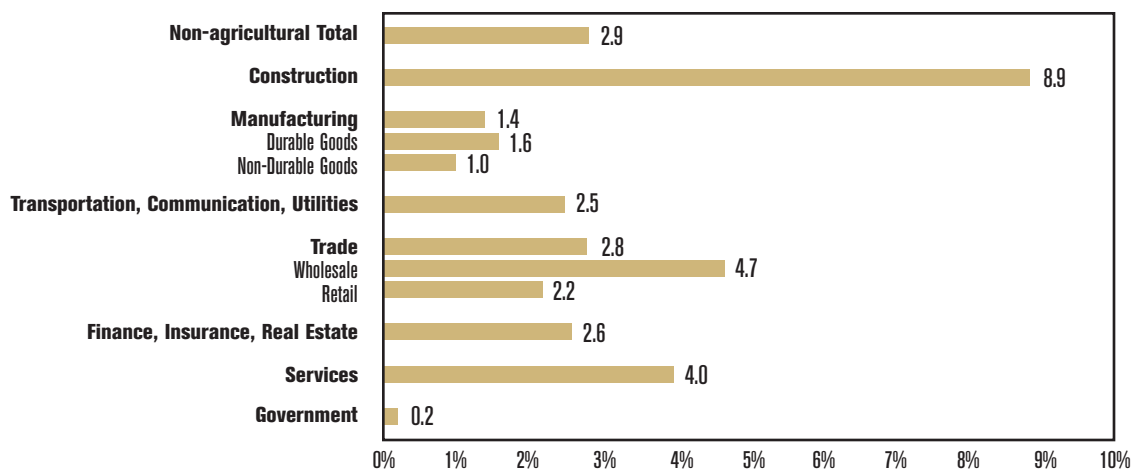
Employers have generally positive views on current and prospective business conditions when the index is above 50.



Sources: The Conference Board;  
Associated Industries of Massachusetts

### Massachusetts Employment Growth by Division Year Ending July 1998

Employment grew in all divisions, even in manufacturing.



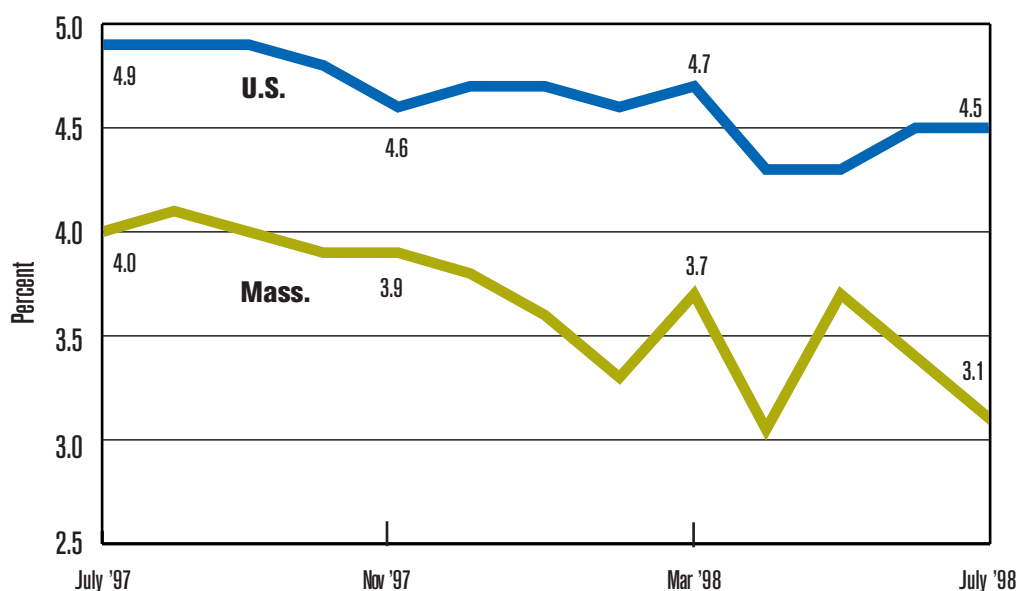
(Establishment-based data)

Source: Massachusetts Division of Employment and Training



### Unemployment Rates U.S. and Massachusetts

Greater volatility of the Massachusetts unemployment rate is at least partially due to the smaller sample size in its measurement.



Sources: U.S. Bureau of Labor Statistics; Massachusetts Division of Employment and Training

## MASSACHUSETTS EMPLOYMENT: PROJECTIONS FOR THE PERIOD 1994 - 2005

	Projected % Change 1994 - 2005
<b>MASACHUSETTS</b>	<b>12.0</b>
<b>SERVICES</b>	<b>31.0</b>
Business Services	57.0
Personnel Services	51.2
Computer Processing	71.9
Health Services	27.3
Educational Services	8.0
Engineering & Management Services	36.1
<b>MANUFACTURING</b>	<b>-12.3</b>
Printing & Publishing	-1.7
Industrial Machinery & Equipment	-19.5
Computer Equipment	-28.8
Electrical Equipment	-11.0
Instruments	-10.1
<b>OTHER INDUSTRIES</b>	
Construction	18.0
Transportation & Utilities	5.9
Wholesale Trade	7.0
Retail Trade	8.7
Finance, Insurance & Real Estate	6.5
Government	2.2

Source: Massachusetts Division of Employment and Training

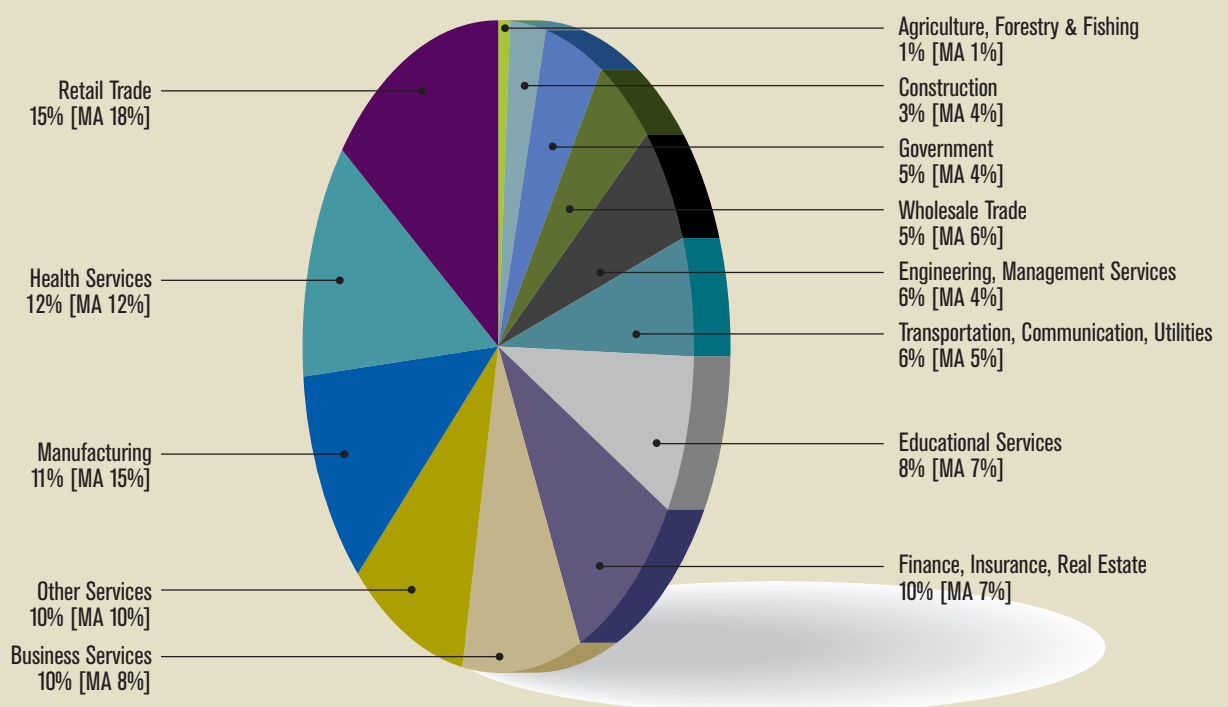
## REGIONAL ECONOMIC PERFORMANCE

Employment				Unemployment Rate (%)	
	July '98	July '97	Change	July '98	July '97
<b>CENTRAL</b>					
Fitchburg-Leominster PMSA	67,600	68,029	-0.6%	4.0	5.4
Worcester, MA-CT PMSA (MA only)	236,842	237,495	-0.3%	3.3	3.8
<b>CAPE AND ISLANDS</b>					
Barnstable-Yarmouth MSA	80,564	80,925	-0.4%	2.6	3.4
<b>BOSTON METRO</b>					
Boston, MA-NH PMSA (MA only)	1,786,320	1,769,354	1.0%	2.7	3.5
<b>NORTHEAST</b>					
Lowell, MA-NH PMSA (MA only)	153,318	151,931	0.9%	3.4	4.0
Lawrence, MA-NH PMSA (MA only)	117,221	119,125	-1.6%	4.7	5.6
<b>SOUTHEAST</b>					
Brockton PMSA	126,755	126,236	0.4%	3.9	5.0
New Bedford PMSA	76,959	76,910	0.1%	6.1	7.8
Providence-Fall River-Warwick, RI-MA MSA (MA only)	109,448	110,155	-0.6%	4.4	7.0
<b>PIONEER VALLEY</b>					
Greenfield LMA	30,431	30,455	-0.1%	3.0	3.6
Springfield MSA	272,393	271,747	0.2%	3.6	4.2
<b>BERKSHIRE</b>					
North Adams LMA	12,746	12,854	-0.8%	3.3	4.5
Pittsfield MSA	39,599	39,887	-0.7%	3.8	4.5

(Household-based data)

Source: Massachusetts Division of Employment and Training

## Boston metro Region

Average Monthly Employment: 1,545,500  
3rd Quarter 1997

(Establishment-based data)

Source: Massachusetts Division of Employment and Training

computer and data processing areas that generally require higher education and special training. This is followed by the engineering and management services sector, which also requires a highly educated labor force. Growth in both sectors is projected to continue over the next decade.

**Services.** As measured by volume of employment, this is the most important sector in the Greater Boston economy, accounting for nearly half of the region's employment. As Figure 2 shows, most of these jobs are in health services, followed by business, educational, and engineering and management services.

Though employment in the health sector accounts for more than one in four services jobs, this was one of the slowest growing services sectors during the 1994–97 period, as hospital employment declined. The fastest growing areas of the health sector are offices and clinics, which saw employment increases of almost 30 percent and now account for one-fifth of health sector employment; and home health care, which grew by just under 15 percent.

Within this sector there is a high variance in incomes. While doctors' offices and clinics represent the highest average annual wages in the health field (\$50,771),<sup>5</sup> home health care has the lowest (\$20,929). The expected expansion of employment in offices, home health care, and nursing homes (average annual wage of \$23,647) is supposed to contribute equally to most of the expected growth in the health sector (27.3 percent) over the 1994–2005 period. Therefore, most new employment in the health field will be in low-wage jobs.

Business services account for a little over one-fifth of service-sector employment and grew at over twice the rate of any other sector during the 1994–97 period. Growth here by 2005 is expected to lead all sectors, increasing at more than twice the rate of health services. While the average wage in this sector is about the same as that for the region, it includes the high-wage computer and data processing industry and the very low wage building and personnel supply services. Much of the growth in personnel supply services reflects the increasing use of temporary employees with lower wages and benefits that are less generous than in other sectors.

The engineering and management services sector is expected to experience considerable employment growth. Greater Boston accounts for three-fourths of state employment in the high-paying sectors of data processing and engineering, both of which are expected to continue their rapid expansion.

**Finance, insurance, and real estate.** Greater Boston is known for its concentration of jobs in

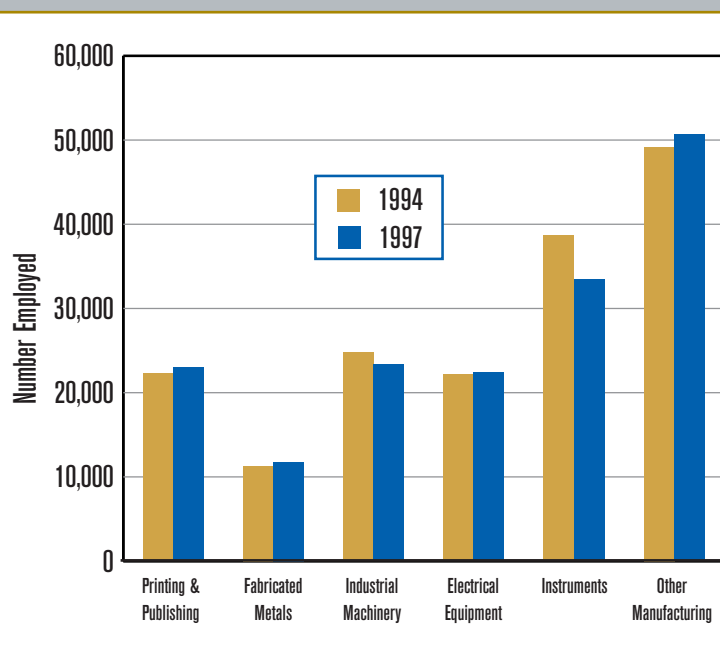
this sector. At 10 percent of the region's employment, this does not represent a large share of jobs regionally, but it does account for a large portion of FIRE employment in the state. Within this sector, banking accounts for a little over one-fourth of employment, having lost nearly 4 percent of its jobs from 1994 to 1997. In contrast, the security and commodities brokers segment grew by over 40 percent and now accounts for almost one-fifth of this sector's employment and 94 percent of statewide jobs in the brokerage industry. This reflects the rapid expansion of the mutual fund industry, which has one of its national centers in Boston and represents one of the highest paying sectors (\$79,753) in the region. However, employment is expected to grow slowly if at all over the next three years.

**Retail Trade.** Retail has the lowest average annual wage of any major industry sector (\$19,042). It is the second largest employer in the region, and is expected to grow steadily.

**Transportation and Utilities.** This sector represents only about 6 percent of the Boston area's total employment but accounts for 54 percent of employment in this sector statewide. This reflects a particularly high demand for these services in the metropolitan area.

**Manufacturing.** Although a distant third in terms of its share of regional employment, manufacturing is a high-wage employer in the region. Overall employment numbers dropped 2.1 percent from 1994 to 1997, however, and if they continue to decline, some workers will have difficulty finding jobs that pay comparably and match their skills.

**Figure 3: Employment in Manufacturing, Greater Boston, 1994 – 1997**



Source: Massachusetts Division of Employment and Training

Most of the region’s manufacturing jobs are in printing and publishing or in the high-technology sectors of machinery, electronic equipment, and instruments (see Figure 3). In many of the instrument sectors, the Greater Boston region accounts for more than two-thirds of statewide employment, and on average, these sectors pay 50 percent above (and in some cases almost double) the average regional wage. Unfortunately, employment in most of these

**Figure 4: Unemployment Rates for Selected Cities (percent)**

	1980	1990	June 1998
Boston PMSA (MA only)	5.1	5.3	3.0
Boston	6.9	5.7	3.8
Chelsea	8.8	8.3	5.9
Everett	7.7	6.7	4.2
Lynn	5.7	7.5	4.5
Revere	7.6	7.2	4.6

Source: Massachusetts Division of Employment and Training

industries declined between 1994 and 1997 or increased by far less than region-wide employment. One exception was medical instruments and supplies, which is expected to grow between 1994 and 2005.

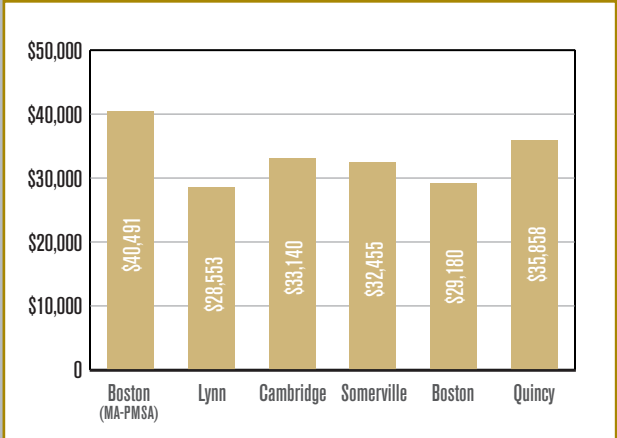
The overall reduction in manufacturing employment is not a great concern for the region as a whole. For the Near North Shore and Near South Shore subregions, where many of the more traditional manufacturing industries are concentrated, these declines will be felt more dramatically. Printing and publishing, which is expected to decline very little, tends to be concentrated in the immediate Boston area, while most of the instruments and electronics industries that are expected to decline are located in Metro North and Metro West.<sup>6</sup>

If projections are accurate, there will be a reduction of 17,000 relatively high paying jobs in the manufacturing sector over the next seven years. All other sectors are expected to grow, however, with services adding more than 125,000 jobs, divided equally among low-, medium-, and high-paying industries.

**WHERE WILL THE FUTURE WORKFORCE COME FROM?**

Overall, the Greater Boston region is characterized by slow population growth, a very tight labor market, and a slightly wealthier and better-educated populace than elsewhere in the state. Although there are no unemployment data for the Greater Boston region as defined here, the larger Boston

**Figure 5: Median Income for Selected Cities**



Source: U.S. Census Bureau, 1990 Census of Population

PMSA had a June 1998 unemployment rate of 3 percent, which was almost half a percentage point below the state’s 3.4 percent (see Figure 4). Thus, while the region faces increasing labor supply need, expectations of slow population growth mean that greater labor force participation from the existing population, increased in-migration, increased non-resident commuting, and retraining workers to fill jobs in high-growth sectors will be required to sustain economic growth.

Between 1980 and 1990, populations in over one-third of the region’s communities declined, while others grew by less than 5 percent. The state’s average growth rate was 8.5 percent.<sup>7</sup> Moreover, it is estimated that most of the communities within Route 128 have lost population in the last five years, and very slow growth is expected for the entire region over the next decade.<sup>8</sup>

The Greater Boston population is slightly better educated than the population of the state as a whole; 83 percent of those older than 25 have high school diplomas, compared with 80 percent statewide, and one-third have four-year college degrees or higher, compared to 27 percent statewide. Median household incomes in the larger Boston PMSA are over 9 percent above those of the state as a whole.

**Poverty Amid Plenty.** Healthy overall regional averages mask pockets of poverty, low education, and higher unemployment rates. The mean income of the region’s whites (\$53,563 per household) is more than 66 percent above the mean income for blacks (\$32,187) and almost 77 percent above that for Hispanics (\$30,265). In 1989, Boston had a poverty rate of 18.7 percent and Chelsea, 24.1 percent, compared to the commonwealth’s 8.9 percent.<sup>9</sup>

While most of the region suffers from a tight labor market, several cities have unemployment rates significantly above the regional average, which has been the case for the past two decades. The median incomes of households in a number of core cities were significantly below the median income for the Boston PMSA (see Figure 5). High poverty rates and lower household incomes in the larger cities are partially due to higher unemployment rates in these areas.

#### CONCERNS FOR THE FUTURE

With its low unemployment rate and mix of strong growth industries, the Greater Boston region, at least for the time being, has a healthy economy. There are some areas that merit concern, however, for the future ability of the region to sustain healthy economic growth.

**Labor Supply.** Given a high workforce participation rate, expectations of little population growth, continued out-migration, and a cost of living (even after accounting for higher average wages) that makes Boston one of the nation's most expensive cities to live in, it is no wonder that availability of labor is a major concern for area employers.<sup>10</sup> Efforts are beginning to focus on increasing workforce participation and tapping the pockets of unemployed or under-employed labor in the central cities.

Unfortunately, many who are currently unemployed lack the skills required for the better paying jobs in the services sector. Moreover, federal job training monies for the commonwealth's jobless have declined by over 30 percent in the past two years.<sup>11</sup> In some cases, industry coalitions, such as the Northeast Semiconductor Workforce Development Council, are taking the initiative to join with local colleges and universities to start developing the workforce they will need in the next decade.<sup>12</sup> Estimates that 80 percent of new job openings in the next ten years will require some level of post-secondary education suggest a need to increase high school and college completion rates in communities like Boston and Chelsea, which have some of the lowest rates in the state.<sup>13</sup>

**Distressed Areas.** Further efforts must be made to help spread the success of the Greater Boston regional economy to the older cities, where poverty rates continue to be high and per capita incomes lag considerably behind. As one recent report states: "Starting at the City of Lynn on the northern shore of the district, and stretching southward through 11 municipalities, including the City of Boston, into the City of Quincy, lies a contiguous region of economic hardship."<sup>14</sup> Part of this region coincides with the Near North Shore and Near South Shore subregions, which will continue to be hurt by declines in traditional manufacturing employment. These subregions also include the bulk of the unemployed and under-employed labor force. Thus,

a key challenge is to attract some of the expanding industries to these cities, while at the same time developing the skills of the local populations to fill more specialized and better paying jobs. ▀

DAVID TERKLA is a professor and chair of the economics department at the University of Massachusetts Boston, and a faculty member of the Environmental Coastal and Ocean Sciences Program.

The author gratefully acknowledges the research assistance of Vandana Rao in preparing this article.

#### ENDNOTES

1. Unless otherwise noted, 1994 and 1997 employment refer to third-quarter employment, as reported by the Division of Employment and Training.
2. This roughly approximates the Metropolitan Area Planning Council (MAPC) region, excluding most of the North Shore and South Shore members of the council.
3. Massachusetts Division of Employment and Training projections for growth and decline in employment are based on predictions for the entire state. A table of numbers appears on page 13 of this journal.
4. Agricultural employment is almost entirely in landscaping services, which are booming with the strong economy.
5. All wage data are average annual wages for 1997. Source: Massachusetts Division of Employment and Training.
6. *Choosing to Compete*, op. cit., pp. 153-161. Precise employment breakdowns by type of industry in these subregions are not yet available.
7. Notable exceptions were Chelsea, which grew by almost 13 percent (largely from foreign immigration), and communities in the southwest section of the region, which grew anywhere from 10 percent to over 20 percent (*Choosing to Compete*, p.154).
8. Again, exceptions are the faster-growing southwest part of the region concentrated around I-495 and the far northwestern suburbs also near I-495 (MISER website: <http://www.umass.edu/miser/index.html>). The population of the larger MAPC region is projected to increase by only a little over 4 percent between 1990 and 2010, with continued net out-migration from the region also forecast (MAPC, "Update of the Overall Economic Development Program 1997-1998," June 1997, and MAPC, "Population & Household Forecast" April 1996).
9. *Choosing to Compete*, op. cit., p. 162.
10. Boston average annual wage adjusted for the cost of living in 1996 ranks 23 out of 25 major U.S. cities, "Indicators of Progress, Change and Sustainability: A Comparison of Metropolitan Boston with its Peers," MAPC, May 29, 1998.
11. Unpublished data, U.S. Dept. of Labor.
12. Diane E. Lewis, "Chip Firms Plan Jobs Program," *The Boston Globe*, June 16, 1998, C16.
13. *Choosing to Compete*, op. cit., p.162. Only 70 percent of blacks and 59 percent of Hispanics over 25 have graduated from high school (U.S. Census 1990).
14. MAPC, "Update of the Overall Economic Development Program 1997-1998," June 1997.





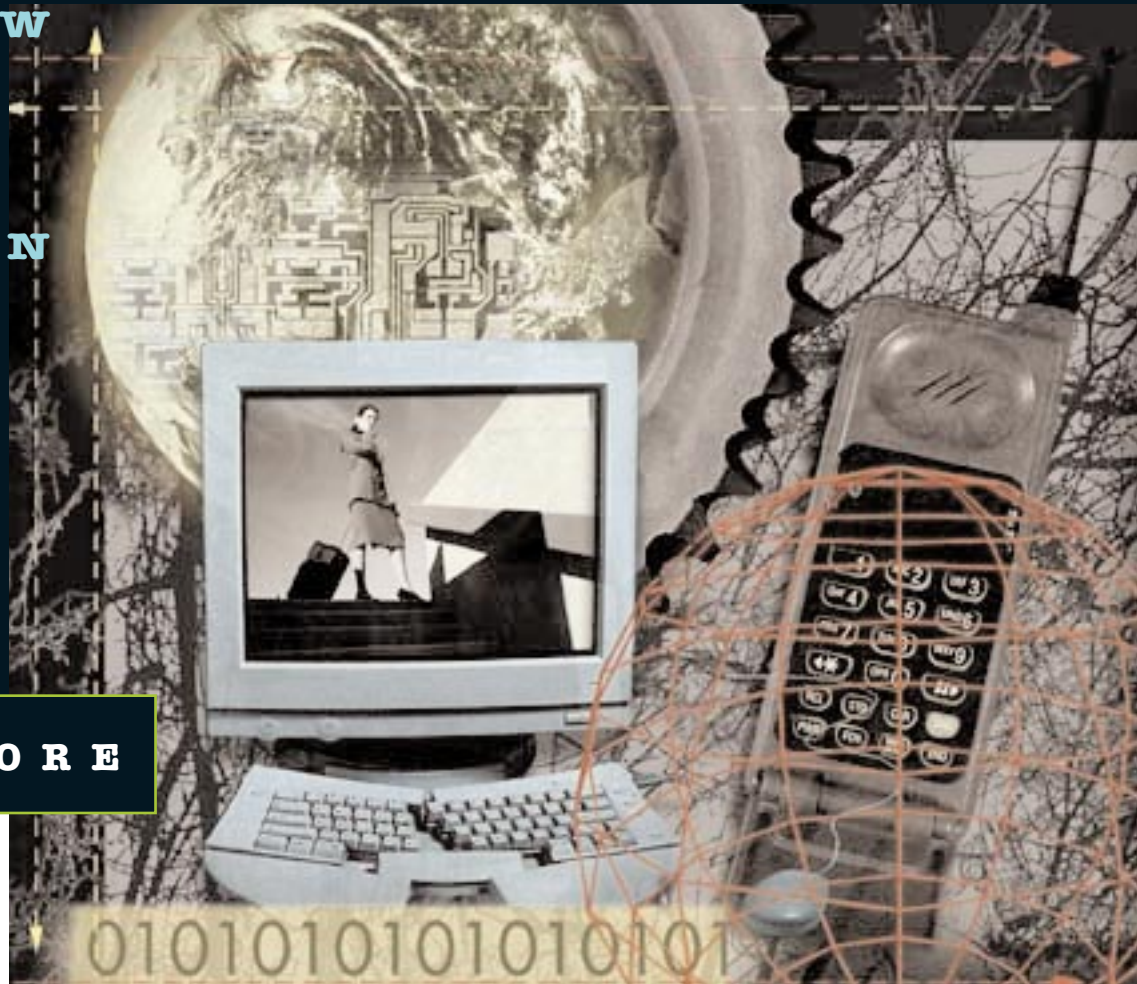
# *Information* T E C H N O L O G Y

THE

NEW

FOUNDATION

CRAIG MOORE



O ur nation's development has been characterized by massive public investment. We spend hundreds of billions of dollars each year expanding and improving networks of railroads, canals, highways and bridges, pipelines, airports and public utilities. No one has to look further than the central artery in Boston to grasp the scope of this phenomenon. We depend on these vital links to communicate, govern and trade. While moving products from the farm or factory to the market has always been the lifeblood of economic growth, today moving information, money, and ideas has become essential to successfully compete in a global economy.





What we consume today is information, and our appetite for it is growing at a geometric rate. The development of computers and high-speed digital telecommunications has made it possible to tap into a vast worldwide reservoir of knowledge in seconds and to gather new information about events almost as they happen. Much of the technology at the heart of the information age is produced in Massachusetts, which is a world-class center of innovation and entrepreneurship.

Defense contracts and minicomputer production were the basis of the “Massachusetts Miracle” of the eighties. With the end of the Cold War, defense firms had to lay off tens of thousands of workers. The minicomputer business also dropped off, adding to the ranks of talented engineers and computer specialists looking for opportunities. This available pool of human resources played a key role in the economic recovery of the 1990s that was driven largely by the information technology sector and by service sectors that rely on information systems, such as financial management, health care, and education.

**DEFINING THE INFORMATION  
TECHNOLOGY CLUSTER**

The IT cluster includes over 40 separate categories of products and services, from information itself to the communications network; the hardware used to send, receive, and transmit information; the software that transforms and manages it; and the technical support to keep it going (see Figure 1).

Hardware includes computer and communications equipment. Software provides everything from the interactive games we play on the Internet to managing complex networks. Communications includes wireless technology, telephone services, cable networks, and other services, such as satellite access. Support services employ a vast army of technicians who do everything from installing products to providing troubleshooting over the telephone. Systems integration (or network technology) links people together across organizations with local area networks (LANs) or over larger geographic areas with wide area networks (WANs), as well as in other ways. Companies combine hardware, software, technical support and consulting services in integrated, complex product/service bundles. Many firms in the IT sector provide products or services that are variations on these themes, blurring the lines of distinction more and more all the time.

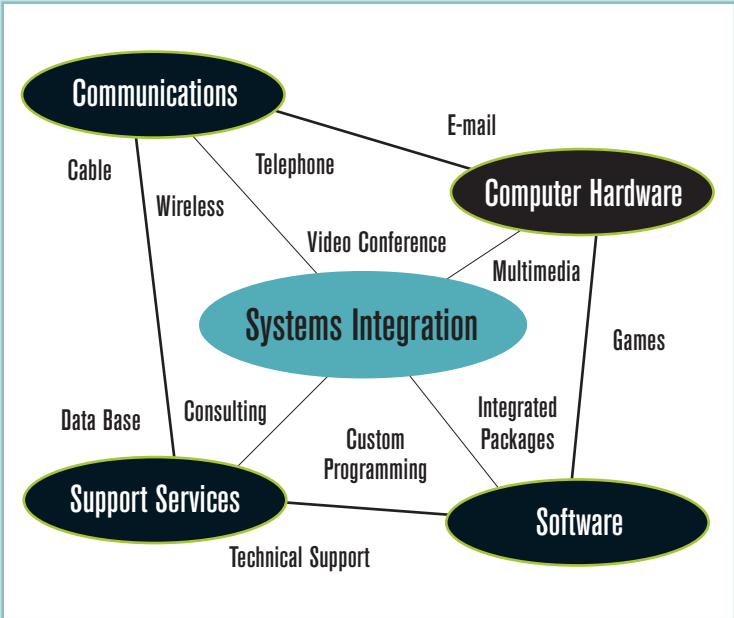
**THE RELATIVE SIZE AND COMPOSITION OF THE  
INFORMATION TECHNOLOGY CLUSTER<sup>1</sup>**

The IT cluster in the commonwealth directly employs approximately 169,000 people. The greatest share of these, 26 percent, is in manufacturing, compared to a national fig-

ure of 19 percent. This sector consists of several computer and communications hardware groups (see Figure 2). Software is second, with 22.3 percent of employment, or some 37,635 jobs. Communications (wireless services, telephone, cable, and other services) follows, with 18.4 percent, which includes just over 31,000 jobs. Integrated systems follows with 10.6 percent or 17,912 employees. Data processing services, wholesale and retail trade, and construction round out the cluster.<sup>2</sup>

The IT cluster is important not only for its absolute size but for its rate of growth (see Figure 3). From 1995 to 1998, IT employment had a net increase of 24.5 percent, or 28,783 new jobs. Software accounted for 11,216 of these jobs, growing 42.5 percent. Integrated systems companies

**Figure 1: Information Technology Cluster Overview**

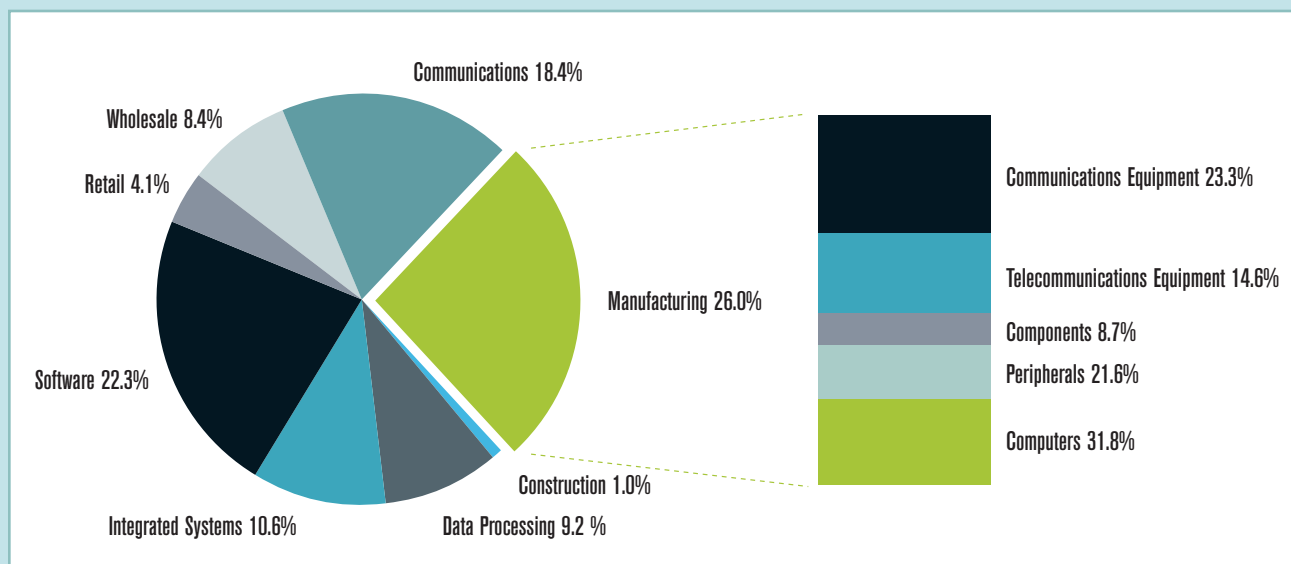


added 11,386 new jobs and grew by 174.5 percent during the same period. The expanded demand for telephone service, including fax, cell phone, and Internet lines, brought 6,616 new jobs, an increase of 58.2 percent since 1995.

On the down side, computer hardware manufacturing slowed, shedding 734 jobs, or 2.7 percent of its workforce, during the past three years. Communications hardware experienced a stronger decline, losing 3,874 jobs, or 19.2 percent of its workforce.

The IT cluster plays a key role in the state economy. Annual sales currently total about \$47.5 billion, approximately 13 percent of all sales in the state economy. About \$33.5 billion of these sales are primarily regional exports or

**Figure 2: Information Technology Employment in Massachusetts,  
Second Quarter 1998**



Source: Dun & Bradstreet *MarketPlace*

sales outside the region, reflecting an increase from \$28.8 billion in 1995. Many IT products and services tend to be highly value-added, bring very high short-term profits, and have relatively short life spans. Almost 100,000 jobs in this cluster are linked to regional exports. A breakdown of employment in each major export category is shown in Figure 4, followed by a detailed discussion of each.

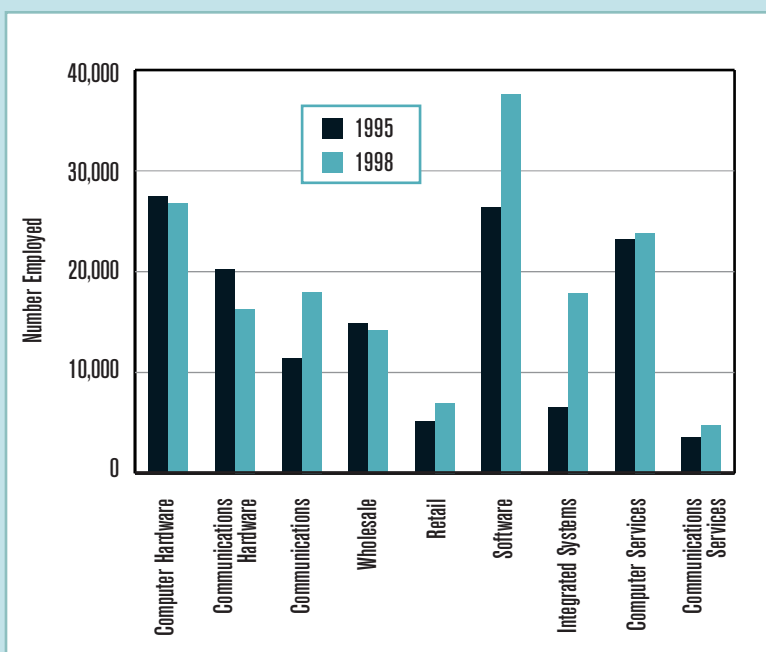
**Software.** Software companies are involved in a wide variety of applications, from Internet security to network management. Software firms are typically small and young. There are only four companies in the state with more than 500 employees; 59 percent have four or fewer. A surprising 38 percent of all software companies are less than three years old and added almost 9,000 new jobs in this industry.

While Massachusetts is clearly a nationally recognized software center, employment here has not been growing as fast as it has in the rest of the nation. Between 1995 and 1998, jobs in the software industry grew by 51.5 percent in the national economy, compared to 42.5 percent in the Bay State. This is explained, in part, by the fact that Massachusetts began with a larger employment base than other states had.

California leads the nation in IT employment, at 134,419 jobs and sales of \$24.3 billion. Texas now ranks second in employment,

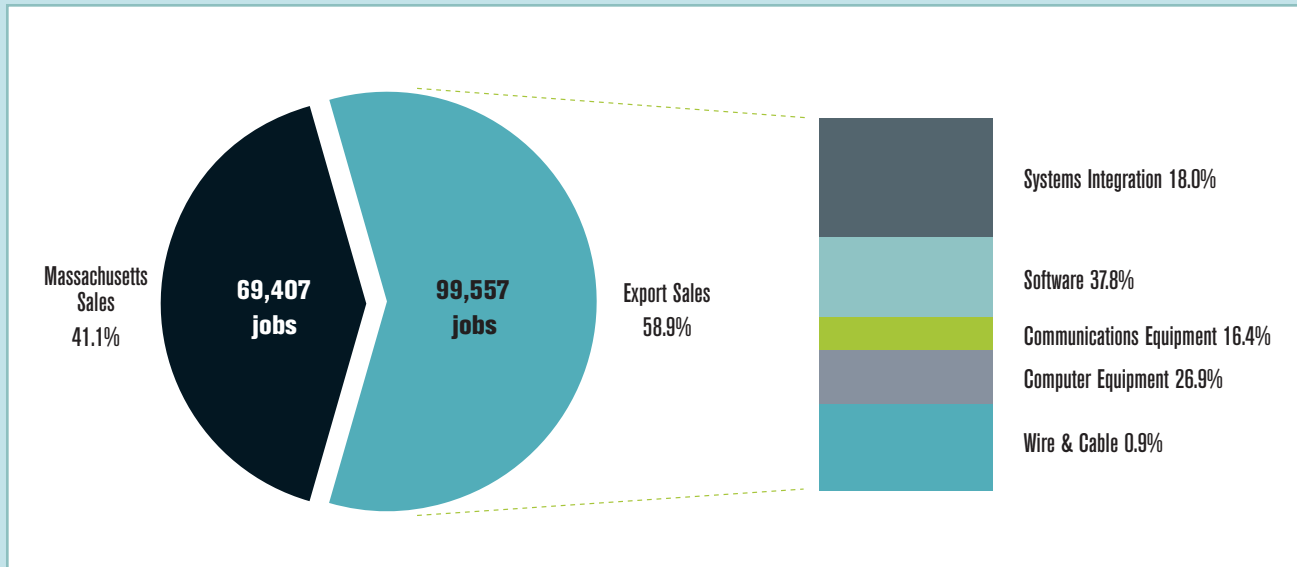
with 56,778 employees, and third in sales with \$7.8 billion. Massachusetts is third in employment (36,640 jobs) and fourth in sales (\$5.7 billion). The state of Washington ranks

**Figure 3: Change in Information Technology  
Employment in Massachusetts  
Second Quarter 1995 to Second Quarter 1998**



Source: Dun & Bradstreet *MarketPlace*

**Figure 4: Information Technology Employment in Massachusetts  
Second Quarter 1998**



Source: Dun & Bradstreet *MarketPlace*

fourth in employment with 34,708, but, thanks to Microsoft, it is second in sales, with \$13.3 billion. Other leaders include New York, Florida, New Jersey, Virginia, and Illinois.

**Systems Integration.** Massachusetts has been the cradle of network technology. Systems integration uses communications networks to link computers, information, and people together in a synergistic way. It relies on specialized hardware and software combined with consulting services and technical support. One of the keys to the rapid growth and real success of integrated systems may be our strong experience in designing integrated defense systems. Many of those who worked in defense were experts at combining hardware, software, and communications into complex weapons systems. It may be no accident that the other leading states in this area, such as California, Virginia, Maryland and Texas, also have strong backgrounds in defense research.

This element in the IT cluster is growing faster than any other, having increased employment to 17,912 jobs from a base of 6,526 in 1995. Employment grew by 57.1 percent nationally during this same period. The state is currently fourth in sales with \$3.5 billion, having increased by a meteoric 188.7 percent in the past three years.

About 25 percent of the state's companies are less than three years old, and only five companies have more than 500 employees. Like the software segment, systems integration is made up of small, young businesses that are growing fast, many of which are prime targets for acquisition.

#### CHALLENGES AND OPPORTUNITIES

What is a reasonable expectation about future growth in this cluster? It is amazing that a state with such a small population continues to be ranked among the top producers in every aspect of IT. Our high-technology orientation and research strengths seem to give us the edge over larger states.

**Human Resources.** The most often cited constraint on future growth by industry executives is clearly the shortage of people with the skills and technical background to take jobs in the industry. Nationally, the demand for people with computer science, electrical engineering, software, and communications training is very high. The direction of future investment will be greatly influenced by the availability of high-quality human resources, rather than cheaper production costs.

Many technical occupations in this cluster require only two years of training beyond high school. Others could be accomplished with a technical high school curriculum focused on applied math and science, communication skills, and effective school-to-work programs. Without a serious effort to expand the supply of people with training for this industry, it cannot continue to grow as it has, nor will the other key growth industries in the state that depend on employees with similar skills.

The participation rate of workers is already high and cannot be expected to provide much more in the way of labor resources. Increased productivity may continue to help, but in the short-run there are limits, limits some

# TELECOM CITY ECONOMIC GATEWAY TO THE FUTURE

Straddling the Malden River is a 200-acre plot that connects Everett, Malden, and Medford. It is the site of the proposed TeleCom City, a comprehensive statewide development initiative designed to leverage the clusters of strength inherent in the state's telecommunications industry. The project's recently completed master plan indicates that more than 7,000 new jobs will be created on site, another 16,000 in the region, and up to 30,000 throughout the commonwealth. The private market will build out a \$400 million, 1.8 million-square-foot campus designed to attract strategic business units and start-up companies and help fuel the industry's continued expansion.

TeleCom City's vision will serve today's increasing demands to deliver competitive new product quickly through a series of five "anchor institutions": an applied research institute, a product commercialization center, an advanced manufacturing center, a strategic business services center, and a lifelong skills center.

It is the inter-relationships among these institutions and corporate, academic, and government interests that will distinguish the project and establish TeleCom City as a unique economic gateway to the entire state.

An important goal for TeleCom City is to create business and program relationships with colleges and research universities as well as with other development initiatives and institutions throughout the commonwealth. Colleges and universities will develop a focused research agenda, providing the industry with student interns and making available education and training to upgrade the skills of the Massachusetts workforce.

Massachusetts is home to the highest concentration of higher educational facilities in the world. Our workforce is highly skilled, and access to venture funding and global markets is part of our economic heritage. TeleCom City, linked with other regional initiatives and institutions, will together market Massachusetts as the telecommunications innovation center of the world.

GREGORY M. SHELDON  
*President, Sheldon Collaborative, Inc.*

believe we have already reached. Any further growth in employment will have to come from a workforce of highly educated and well trained individuals. Retaining our younger, well-educated individuals and families is critical.

The short-term solution suggested by many in the industry seems to be expanding the availability of foreign immigrants who have the training and skills to fill these jobs. Some existing firms are contracting for programming services in countries such as Russia and India to tap a less expensive, talented labor pool. Industry recruiters are also seeking English speaking immigrants with good technical skills.

**Telecommunications Infrastructure.** Another major factor influencing growth and investment in this sector is the availability of high quality telecommunications services. This means universally available, low-cost services with very high bandwidth. The recent efforts of businesses to acquire good telecommunications services in Berkshire County underscores the importance that this industry places on network access. Every effort must be made to extend top quality services across the commonwealth and ensure reasonable costs. Deregulation has not yet been successfully carried out in this state, and more efforts must be made to continue to ensure full access and effective competition.

## IT AND THE FUTURE ECONOMY

The information technology cluster has been and continues to be a key sector in the Massachusetts economy. While manufacturing in this industry is lagging, software and systems integration are soaring. These two sectors of the industry are critical to the future prosperity of the commonwealth, not just for their direct benefits, but for the extraordinary access they provide to other key clusters in the state. Information is the new foundation of our economy, and mastering the technology used to gather, manage, distribute and communicate with it is the key to our prosperity. ▀

CRAIG MOORE is University Professor of Political Economy at the University of Massachusetts. He has authored numerous journal articles and monographs in regional economics and has been a professor in the School of Management in Amherst for over 25 years.

## ENDNOTES

1. This analysis uses data based on the primary standard industrial classification (SIC) codes reported by firms. The data used are primarily from Dun & Bradstreet, which, though not a research data base, has the advantage of being more current and includes partnerships and small firms that contract out much of their work. Many of these firms are in software, systems integration, and IT services. Given the very high sampling fraction used, percentages and changes in employment over time are very reliable. Absolute values of employment are reasonably accurate, and sales figures, less reliable.

2. The employment figures used in an earlier study, "Connection to the Future, a Study of the Telecommunications Industry in Massachusetts," included all of these categories and parts of others, such as software.



# street Signs

*Massachusetts has a higher  
percentage of college-educated  
individuals than any other state.*

*What does this mean to its citizens?*

Since the early 1980s, it has been common in policy circles to say that the state's brainpower — its concentration of a lot of people with advanced educations — is an important economic resource. Until now, though, it has never been shown that this view is held by those with and without college degrees.

In a recent survey, we asked: "Some people say that having a high percentage of workers with a college education is good for a state's economy. How important do you think it is?"

Overall, a striking 86 percent say it is important. As you might expect, the response varies with the education levels of the respondents. Of those with at least a four-year degree, 90 percent say it is important to have a high percentage of such workers: that is, of people like themselves. Of those without college educations, 75 percent see it as important — lower than 90 percent, but still significant.

While Massachusetts has a higher percentage of college-educated individuals than does any other state, only a minority of the state's voters hold four-year degrees. We wanted to learn more about how populations with and without college degrees assess the economic role of college graduates, so we asked: "Some people say that working in a state with a high percentage of college graduates has economic benefits even for

## BRAINPOWER AS AN ECONOMIC RESOURCE

workers who are not college educated. Would you say you agree or disagree with this statement?" Overall, 75 percent agree. The responses appear to vary by education — 80 percent of college graduates agree, 67 percent of those without college educations agree — but this 13-point gap is one point too small to be significant.

To college graduates, the statement is an open door through which they can view themselves as a source of economic benefit, and it is not surprising that a large share of them accept the invitation. To those with high school educations or less, however, this is an occasion to assess the economic role of those above them on the educational ladder, so their response is more revealing. It suggests that they might accept a version of trickle-down theory: the presence of a high percentage of college educated workers generates benefits that trickle down to the rest of the population. ▀

LOU DiNATALE is a senior fellow at the John W. McCormack Institute of Public Affairs at the University of Massachusetts Boston and one of the most widely quoted political analysts in New England.

RALPH WHITEHEAD, JR., is the Public Service Professor of the University of Massachusetts and the features editor of this journal.



## New Current and Leading Indexes for Massachusetts

Appearing in this issue of *Benchmarks* is a new current index and a new leading index for the state of Massachusetts. The current index is composed of four state-level economic indicators that move concurrently with the commonwealth's economy: establishment employment, the unemployment rate, withholding taxes, and sales taxes. The index is normalized at 100 in July 1987. Its average trend growth over 1978–96 is set to equal the trend growth of real gross state product. The current index indicates whether the economy is expanding or contracting and at what rate it is doing so. It provides a more comprehensive and reliable indication than does any single component, and a more frequent and timely measure than does gross state product or personal income.

The leading index is a forecast of the growth of the current index over the next six months, expressed at an annual rate. Positive growth rates indicate a continuing expansion; negative growth rates, a contraction. The leading index is comprised of several indicators that are statistically significant in predicting the future growth of the current index, including the current index itself, initial unemployment claims, construction employment, motor vehicle sales taxes, consumer confidence in New England, the spread between long- and short-term interest rates, and the Bloomberg Stock Market Index for Massachusetts.

Both indexes may be termed “composite,” since they are composed of several indicators, but their construction differs from the current and leading composite indicators released by the Conference Board and from other existent Massachusetts composite economic indexes. These indexes are simple weighted averages of the component series. The new Massachusetts indexes, on the other hand, use a more sophisticated time series methodology, patterned after the work of James H. Stock and Mark W. Watson and implemented previously by Theodore M. Crone for Pennsylvania and New Jersey. The current index is a dynamic factor model, where the component indexes are

the indicators and the resultant composite index is the (unobserved) factor that is common to each indicator. As a result, the component series are optimally weighted to form the index. Furthermore, the dynamics of the model allow additional weighting over time, which is important because of the noisiness of many state-level series. The leading index is an autoregressive model in which the six-month growth of the current index is explained by the current and lagged values of the current index and the leading indicators. Again, the output is a set of dynamic weights that are econometrically estimated to maximize the predictive power of the model.

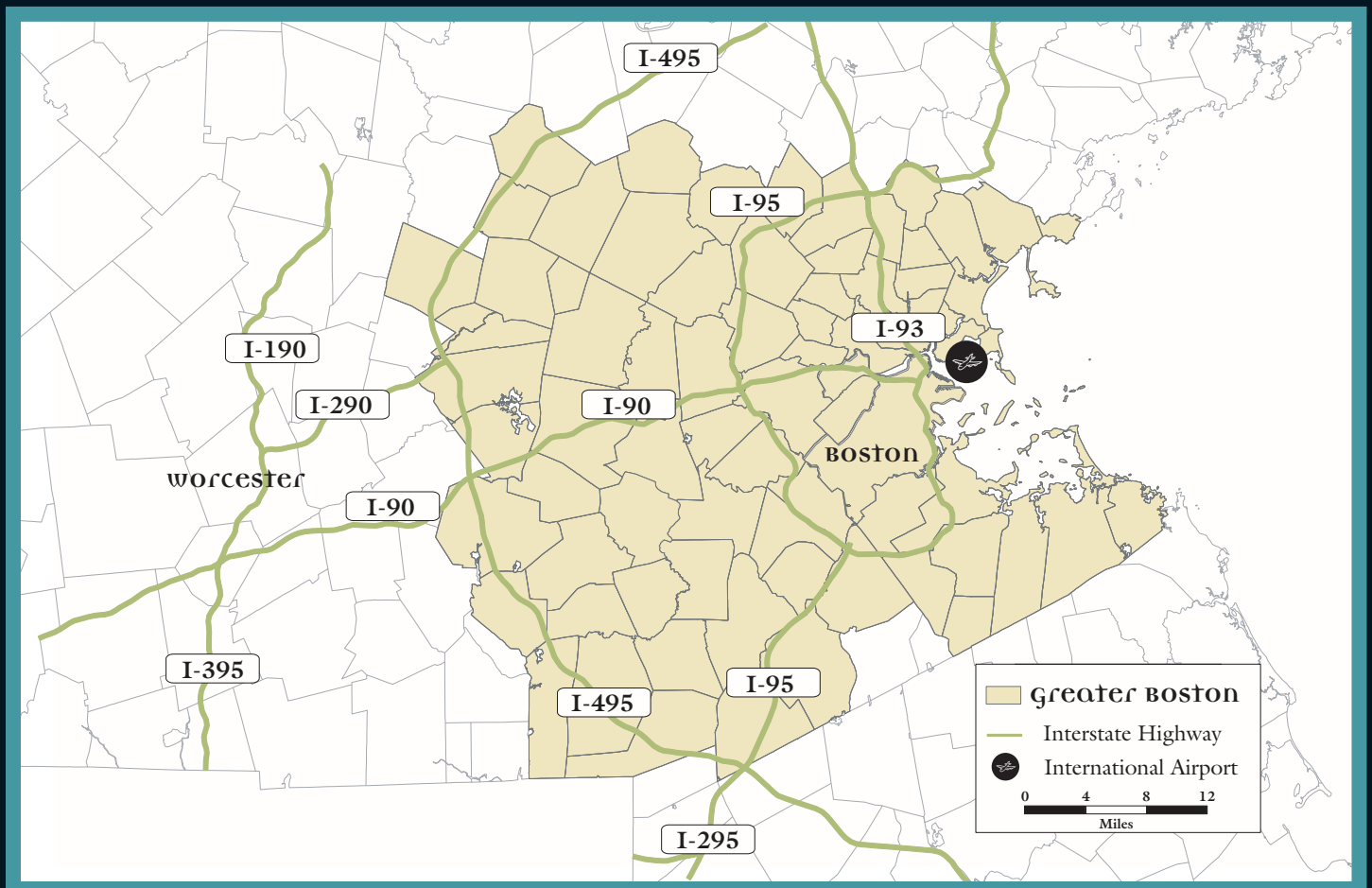
The theoretical enhancements that these new indexes provide should make them a useful addition to the indicators and tools that economy-watchers use to assess the current and future state of the state. ▀

ALAN CLAYTON-MATTHEWS

1. These indexes were developed by the author and James H. Stock, and are fully described and documented in a forthcoming working paper available from them. Note that the term “current index” and the often-used term “coincident index” are interchangeable.
2. One usually looks for several consecutive months of negative forecasts to confirm that a contraction is imminent or has begun.
3. The authors are aware of three broad-based Massachusetts indexes: a leading index developed by Brian O'Conner, which is published regularly in *The Wall Street Journal*, New England edition; a leading index developed by James Howell, that is available from the Howell Group, in Boston; and a leading index developed by Regional Financial Associates.
4. See, for example, Stock, James H., and Mark W. Watson. 1993. “A Procedure for Predicting Recessions with Leading Indicators: Econometric Issues and Recent Experience.” In James H. Stock and Mark W. Watson, eds., *Business Cycles, Indicators, and Forecasting*. Chicago and London: The University of Chicago Press.
5. Crone, Theodore M. 1994. “New Indexes Track the State of the States.” *Federal Reserve Bank of Philadelphia Business Review*, January/February, pp. 19-31; and Crone, Theodore M., and Kevin J. Babyak. 1996. “Looking Ahead: Leading Indexes for Pennsylvania and New Jersey.” *Federal Reserve Bank of Philadelphia Business Review*, May/June, pp. 3-14.



# REGIONAL Map: BOSTON METRO



## the massachusetts benchmarks quarterly

### THE MASSACHUSETTS BENCHMARKS PROJECT

*Project Manager*  
Steven Landau

*Managing Editor*  
Carolyn Dash Mailler

*Research Analysts*  
Robert Alber  
Rebecca Loveland

*Administrative Assistant*  
Jacqueline Adams

is published by the University of Massachusetts

in cooperation with the Federal Reserve Bank of Boston.

Send inquiries to the Massachusetts Benchmarks Project,

University of Massachusetts, 220 Middlesex House,

Amherst, Massachusetts 01003-5520. The views expressed

in this publication are not necessarily those of the

University of Massachusetts, the Federal Reserve Bank

of Boston or the Editorial Board. The contents of this

publication may be reproduced only if all sources are credited.

All rights reserved.

*Creative Services*  
*Art Director*

Radwell Marketing • Advertising  
Leslie Chamberlain

Northampton, MA

### The Massachusetts Benchmarks Project

Office of the President, Donahue Institute

University of Massachusetts

220 Middlesex House

Amherst, MA 01003-5520

Address service requested