

# MASSACHUSETTS BENCHMARKS

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The quarterly  
review of  
economic  
news &  
insight

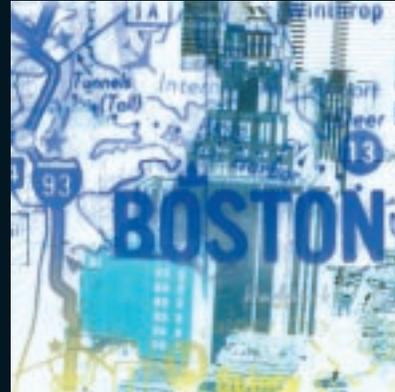
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- Economic Currents
- Massachusetts Current and Leading Indices
- Jet Engine Manufacturing in Massachusetts: Roots and Restructuring
- From the Field: The Greater Boston Region
- Street Signs

A PUBLICATION OF  
THE UNIVERSITY  
OF MASSACHUSETTS

IN COOPERATION WITH  
THE FEDERAL RESERVE  
BANK OF BOSTON





## Massachusetts Benchmarks Editorial Policy

*Massachusetts Benchmarks* is a quarterly journal published by the University of Massachusetts in cooperation with the Federal Reserve Bank of Boston. It presents timely information concerning the performance of the Massachusetts economy, including periodic economic analysis of major geographic regions within the Commonwealth and an array of key industries that make up the economic base of the state. The journal provides commentary and interpretation of economic data aimed at business leaders, public policymakers, educational organizations, and the general public.

The editors of *Massachusetts Benchmarks* invite articles on topics of current interest from researchers on various aspects of the state economy, regional economic development, and key growth industries. The editors also welcome queries from academic or professional economists for future issues of the journal. Please send queries to Carolyn Dash Mailler at [cmailler@donahue.umassp.edu](mailto:cmailler@donahue.umassp.edu) with a brief biography and topical outline. Authors considered for *Massachusetts Benchmarks* will be furnished with writers' guidelines.

All submissions are subject to rigorous review by the Editorial Board or other referees. Manuscripts of accepted articles are expected to adhere to the guidelines. Final publication decision rests exclusively with the editors.

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This and past issues of *Massachusetts Benchmarks*, along with information about the Benchmarks Project, can be found on the Web at [www.massbenchmarks.org](http://www.massbenchmarks.org).

# PRESIDENT'S LETTER

To anyone concerned about the future of Massachusetts, the performances of high-tech manufacturing and of the new economy's service industries have been of great interest.



In this issue of *Massachusetts Benchmarks*, Beth Almeida profiles the jet engine industry, arguably the Commonwealth's first high-tech manufacturing industry. With roots in the precision tooling industries established in Springfield nearly 150 years ago, jet engine production is our link between the machining economy of the 19th century and the technology economy of the 21st.

Economic transformation is also seen in the results of this quarter's UMass Poll, which indicates that far fewer people have worked on a factory floor in this generation than in the previous generation.

There are words of caution as well. It has been well established that the new economy has not benefited everyone or every community. Professor David Terkla of the University of Massachusetts Boston writes about the uneven growth in and around Boston, ground zero of the recent economic boom in Massachusetts. It is the contention of Professor Alan Clayton-Matthews, also of the University of Massachusetts Boston, that though the Massachusetts economy is growing and labor markets remain tight, the economy is expected to slow down.

A broadening of our economic vitality to include more of our citizens, as well as the effort to maintain that vitality, continue to be the goals of those who seek to advance the interests of the Commonwealth.

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

**A**fter what has been a truly remarkable decade of prosperity, the economy is finally experiencing a slowdown. At their December meeting, editorial board members were in general agreement that a “soft landing” is likely; the future rate of growth will be more in line with long-term averages. Board members expressed some concern, however, that there is now a risk of what might be characterized as a “hard landing,” with more severe economic consequences. The potential for a colder-than-normal winter with rising energy prices, a continued sell-off in the stock market, and weakening consumer demand could trigger a recession.

A disquieting long-term trend during this expansion has been the absence of income growth in some segments of the population. Many households, especially those who depend on hourly-wage jobs, have failed to benefit from the expansion, and some have even lost ground.

Indications that other groups may also be feeling pinched are suggested by a weakening of consumer confidence across the nation. One tangible sign of this is the drop in state sales tax collections, especially those generated by automobile sales. A slowing in consumer spending, a driving force throughout the expansion, would be widely felt. Sharply higher oil and natural gas prices are partly to blame, as they have reduced households’ disposable income and increased business costs.

Equity prices, broadly measured, have stagnated in recent months. This has already affected business liquidity among new high-tech firms; many dotcoms have been forced to scale back—and even cease—operations. Other negative effects of a bear market would include a reverse wealth effect, further retarding consumer spending. And the state’s important mutual fund industry ultimately would suffer if the downturn is long and/or sharp. With regards to business investment spending, waning demand for electrical and electronic equipment could have a significant impact on this component of the Commonwealth’s manufacturing sector.

No major player in the global economy seems poised to take the place of the United States as the engine of growth. In fact, there are increasing signs of moderating economic growth worldwide. Many countries depend on the American economy as a major market for their production. Japan’s inability to show a strong recovery is disconcerting, and Europe is putting its hopes on a tax cut in the coming year to get its economy moving.

Despite these troubling signs, there is still optimism among board members that the coming landing will be soft. It has been clear for some time that extraordinary rates of growth were not sustainable, especially in Massachusetts, where labor-force constraints are severe. The new year may provide an opportunity for the economy to return to a more balanced growth path that can better support long-term prosperity.

# Economic Currents

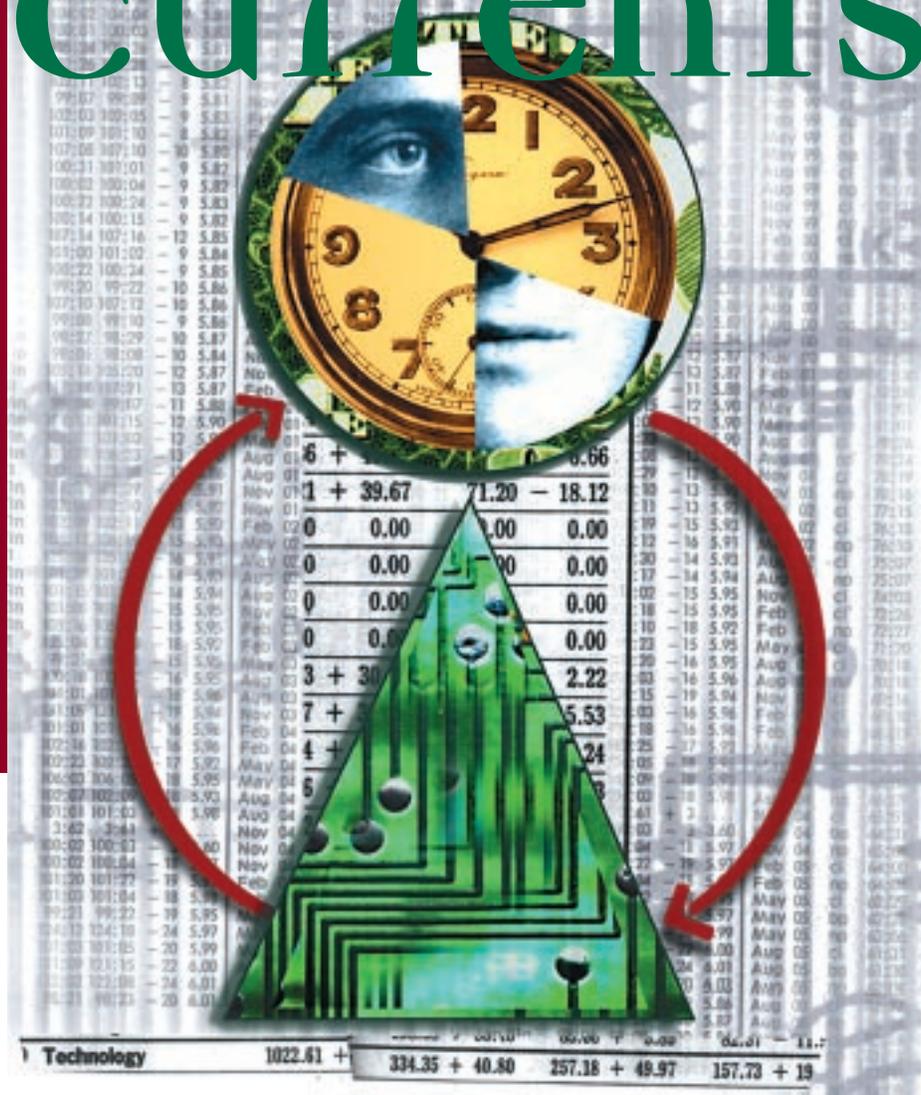


ILLUSTRATION: NAOMI SHEA

*While the state's economy is still growing, albeit at a much slower rate than in the 1990s, there is a risk of a serious deceleration of economic activity. The evidence we have still favors a "soft landing" for the economy, but the risks of recession appear to have risen substantially.*

**F**or the first three quarters of the year 2000, businesses—particularly those supplying investment equipment—drove the Massachusetts economy. Strong but slower-growing consumer and housing sectors also contributed to overall growth. The Massachusetts Current Economic Index indicated a 3.4 percent annualized rate of real growth for the state economy in the third quarter of the year. This is roughly comparable to real U.S. GDP growth, which was 2.7 percent for the same period.

The Massachusetts Leading Economic Index has raised a warning signal that the state economy is decelerating quite rapidly. The index for November registered a 1.1 percent decline, while the three-month average for September through November was 0.2 percent. Eight of the ten index components contributed to below-trend rates of change, giving a clear indication of a pronounced slowdown in the economy.

The Bloomberg stock index was the most important contributor to the decline in the leading index. This indicator

# The Current and Leading Economic Indices for Massachusetts

The Massachusetts Current Economic Index for November was 129.2, up 1.5 percent from October (at annual rates), and up 3.4 percent from November of last year. The current index is normalized to 100 in July 1987 and calibrated to grow at the same rate as the Massachusetts real gross state product over the 1978–1997 period.

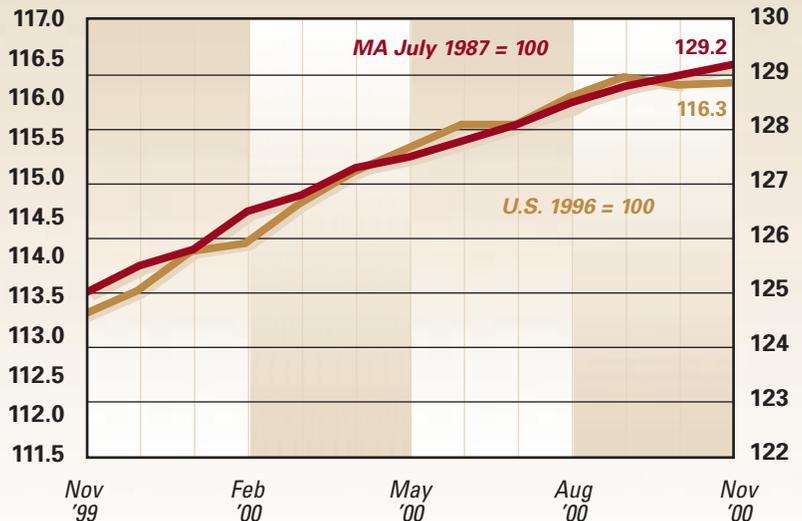
The Massachusetts Leading Economic Index for November showed a 1.1 percent drop, and the three-month average for September through November was 0.2 percent. The leading index is a forecast of the growth in the current index over the next six months, expressed at an annual rate. Thus, it indicates that the economy is expected to contract at an annual rate of 1.1 percent over the next six months. Because of monthly fluctuations on which the index is based, the three-month average of 0.2 percent, which indicates weak growth, may be a more reliable indicator of near-term growth.

The Massachusetts economy is decelerating. Withholding and sales taxes slowed substantially in recent months, and consumer confidence and stock markets were down sharply. Eight of the ten indicators registered below-trend rates of growth, clearly indicating that a pronounced slowdown is under way. The negative reading of the leading index does not indicate that a recession is imminent, however, as it is the result of a negative 1.8 percent contribution of the Bloomberg Massachusetts Index, a magnitude surpassed only during the stock market crash of October 1987. The effect of this outlier on the index should be appropriately discounted. Nevertheless, the risks of recession appear to have risen substantially.

*Submitted Dec. 28, 2000; Revised Jan. 5, 2001*

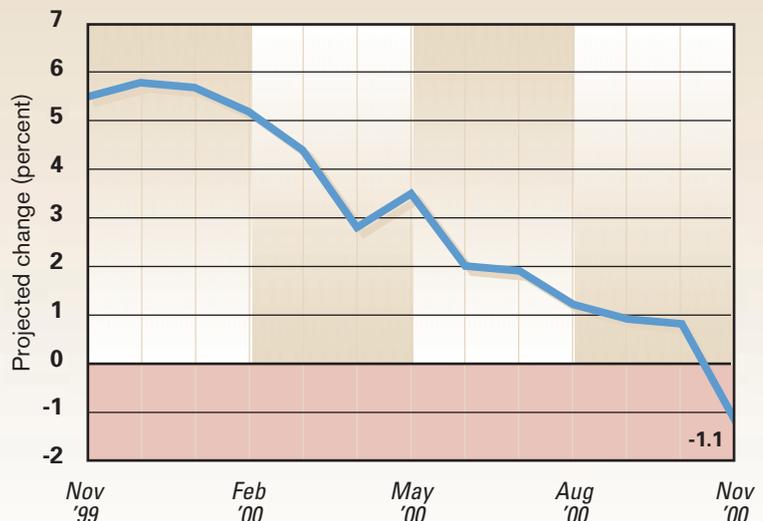
## Current Economic Index United States and Massachusetts

*The U.S. Current Economic Index is measured on the left vertical axis; the Massachusetts Current Economic Index is measured on the right.*



## Massachusetts Leading Economic Index

*The leading index is the annualized, six-month projected change in the Massachusetts Current Economic Index.*



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

recorded a 1.8 percent decline in November, a precipitous drop surpassed only by the stock market crash of October 1987. The effect of this outlier, while it should not be ignored, should be qualified as an outlier. Therefore, it may be appropriate to give more weight to the three-month average leading index, indicating that, six months hence, growth in the state economy may be weak. In November, the Massachusetts Current Economic Index was up 1.5 percent from October and up 3.4 percent from November of last year.

### Some Businesses Boom

Despite the state's current labor shortage and slow-growing labor force, several sectors have grown robustly. Showing strength were export-based manufacturing and services, sectors related to heavy construction, childcare services, and education. Manufacturing employment showed increases in stone, clay, and glass; primary metals; industrial machinery and equipment; and electronic components. Transportation employment growth was also strong. While slowing somewhat from decade-long, break-neck growth, money market and mutual fund employment continued to expand rapidly. Service sector employment growth was particularly strong in business services, education, childcare, and engineering and consulting.

Growth in merchandise exports from Massachusetts is another indicator of strong business activity. Exports in the second quarter of 2000 were up at an annualized and seasonally adjusted<sup>1</sup> rate of 32.2 percent over the first quarter and 22.6 percent over the second quarter of 1999. These rates eclipsed the corresponding national growth rates of 15.5 and 14.1 percent, respectively.

Nationally, the electronic components and accessories industry, which includes computer chip makers, has been bursting at the seams. (State-level data are not available at this level of detail.) Manufacturing employment grew by 7.8 percent over the year ending in October. Shipments in the third quarter of 2000 grew at an annual rate of 24.7 percent, and were 30.8 percent above shipments in the prior year. Unfilled orders amount to three months of current production levels.

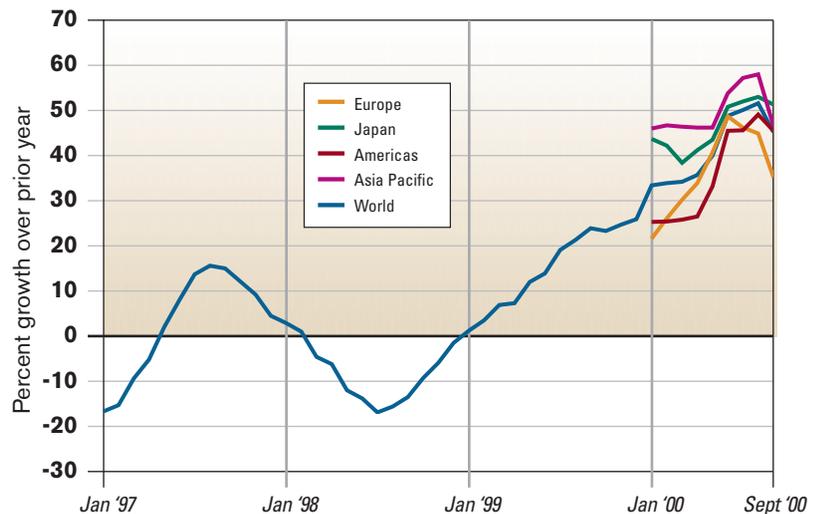
National and worldwide demand for chips and other electronic equipment and machinery has been fueling the industry. Worldwide semiconductor billings were up 45.2 percent in the third quarter of 2000 from the prior year, with growth over 35 percent in all major regional markets—the Americas, Europe, Japan, and Asia Pacific. The book-to-bill ratio for semiconductor equipment was 1.16 in the third quarter, indicating that new orders are outpacing shipments.

Massachusetts is sharing in this boom. Manufacturing employment in electronic components was up 1.6 percent

in September over the prior year, according to the monthly establishment survey (ES-790). Due to sampling problems, however, this survey seriously understates recent employment growth and will be revised sharply upward when the

## Semiconductor Billings

*Although growth in worldwide semiconductor billings is strong, it is falling.*



Source: Semiconductor Industry Association; Regional data are not available before January 2000.

annual benchmark revisions become available. The most reliable employment data are from the Massachusetts Division of Employment and Training's ES-202 unemployment insurance series, which includes all employers. Data show 8.8 percent employment growth in electronic components manufacturing between the first quarter of 1999 and the first quarter of 2000, a figure comparable to national growth rates. Exports from the state's electrical equipment manufacturers in the second quarter were up 47.6 percent over the prior year.

Furthermore, compensation per employee has been rising rapidly. As compared to a year earlier, average wages rose 22.3 percent in the third quarter of 1999, 18.4 percent in the fourth quarter of 1999, and an astounding 60.3 percent in the first quarter of 2000. This figure almost certainly reflects an unusually high level of bonuses and stock options derived from the run-up in technology stock prices during the period.

### Some Forecasts Revised Downward

There are several signs that the growth of business activity is slowing both nationally and worldwide. Most important for Massachusetts, capital expenditures for state-manufactured products are slowing. Growth in real U.S. investment spending for equipment and software in the third quarter of 2000 declined to an annual rate of 8.5 percent, sharply down from recent typical growth of 15 percent.<sup>2</sup>

Technology stock prices fell steadily throughout the fourth quarter, as companies revised their sales-growth forecasts downward. New orders for U.S. electronics components manufacturers were down 31.7 percent in the third quarter and up “only” 24.2 percent from the third quarter of 1999. Though growth in worldwide semiconductor billings is strong, it is falling, as are book-to-bill ratios for semiconductor equipment. Industry analysts expect these trends to continue and for capacity to exceed production sometime in 2001. We may be at the peak of the chip cycle.

### Consumer Sector Strong, but for How Long?

Because of the volatility of sales tax receipts, it is difficult to get a clear reading on current consumer spending in Massachusetts. Available data are consistent, though, with national trends that reflect strong but slower-growing consumer demand. Nationally, nominal retail sales grew at a 6.0 percent annual rate in the third quarter of 2000 and were up 7.6 percent over the third quarter of 1999. The closest concept in Massachusetts is an estimate of the sales tax base derived from sales tax receipts.<sup>3</sup> The nominal sales tax base grew at an annual rate of only 0.4 percent in the third quarter but by 9.9 percent over the third quarter of 1999.

Massachusetts motor vehicle sales taxes are less noisy and therefore more reliable for discerning short-run trends. Third-quarter spending declined at an annualized rate of 1.7 percent, and was off at an annualized rate of 0.5 percent in the six months ending in September, versus the prior six months. This slowdown may indicate that most households, after eight years of double-digit growth in motor vehicle purchases, simply don't need any more new cars.

The same stock adjustment process may be occurring with other consumer durable purchases. Other factors slowing demand include rising interest and credit rates, high oil and gas prices, and poorly performing stock markets.

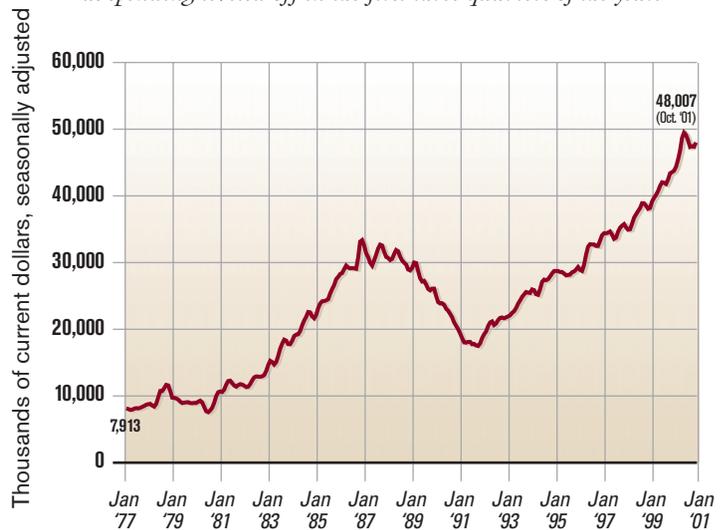
Though still at high levels, consumer confidence measures for both New England and Massachusetts have leveled off. Retail employment in September was no higher than a year earlier. Most likely, this reflects the difficulty retailers have in hiring, given the availability of better jobs for their target workforce. However, holiday-season sales growth was expected to drop relative to a year earlier, given the performance of stock markets and the likelihood of smaller bonuses and other lump-sum earnings supplements.

### Bonuses and Stock Options Mirror Equity Markets

Bonuses and stock options have become significant components of labor compensation for a growing minority

## Massachusetts Motor Vehicle Sales Taxes

*Motor vehicle sales taxes indicate a softening in consumer demand as spending leveled off in the first three quarters of the year.*



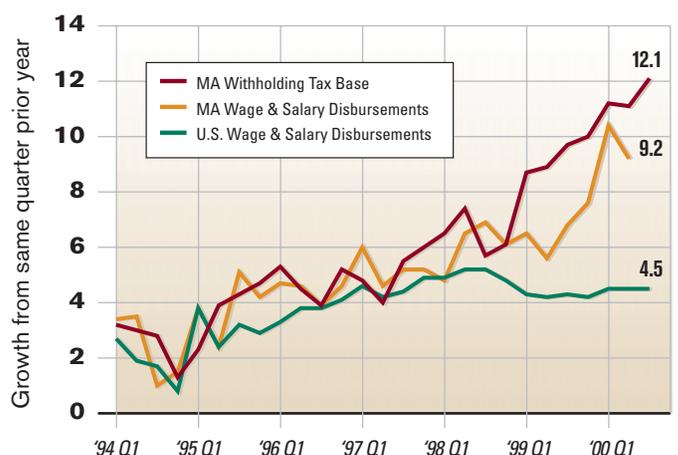
Sources: Massachusetts Department of Revenue; author's calculations

of Massachusetts workers. The explosive wage growth in the first quarter of 2000 can only be explained by gains in the equity markets in 1999 and early 2000, especially in technology stocks. In the last two months of 1999, the NASDAQ rose 37 percent and the Bloomberg Massachusetts Index rose 32 percent. Through the peak in early March 2000, they rose an additional 21 and 30 percent, respectively.

Anecdotal evidence of remuneration related to equity markets has been circulating for some time; now official aggregate economic statistics support the notion. The key evidence is from the quarterly state income data released by the U.S. BEA in late October, along with the Massachusetts Division of Employment and Training's ES-202 unemployment insurance quarterly employment and wage reports.<sup>4</sup> The BEA reported a dramatic 4.1 percent upward revision in

## Growth in Wages by Source of Data

*Wage growth in the first quarter of 2000 can be explained by gains in equity markets in 1999 and early 2000.*



Sources: U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; MA Department of Revenue; author's calculations

first-quarter wage and salary disbursements, amounting to \$1.45 billion (\$5.8 billion at annual rates). This revision raised the year-over-year growth in average wages per payroll worker to 10.4 percent from the first quarter of 1999 to the first quarter of 2000. This is in line with the estimate of 11.2 percent derived from state withholding taxes. The most recent data in these series suggest a continuing trend of faster wage rate increases in the state than in the nation.

Quarterly ES-202 data reveal that the strong BEA and tax-based wage growth estimates are due to a surge in bonuses and realized stock options. According to this source, in the first quarter of 2000, average private-sector wages per worker rose 19.2 percent over the prior year. The figure reflects the huge lump-sum additions to pay. When the fourth quarter of 1999 and first quarter of 2000 are combined, taking account of the full bonus season, average wages were 13.6 percent higher than in the prior year.

Because the ES-202 data are not seasonally adjusted, it is possible to estimate lump-sum payments as the excess wages paid in the fourth and first quarters relative to trend.<sup>5</sup> These were estimated to be \$3.9 billion in the fourth quarter of 1999 and \$3.9 billion in the first quarter of 2000, versus \$3.2 billion and \$1.4 billion a year earlier. The more recent numbers represent 6.1 percent of all wages and salaries paid in 1999, up from 4.0 percent in the prior year.

A \$2.5 billion piece of the pie was paid to workers in the finance industry. Service industry employees got \$2.0 billion,

*While future sales growth in the technology sector is expected to decline, even the lower levels would be the envy of “old-economy” businesses.*

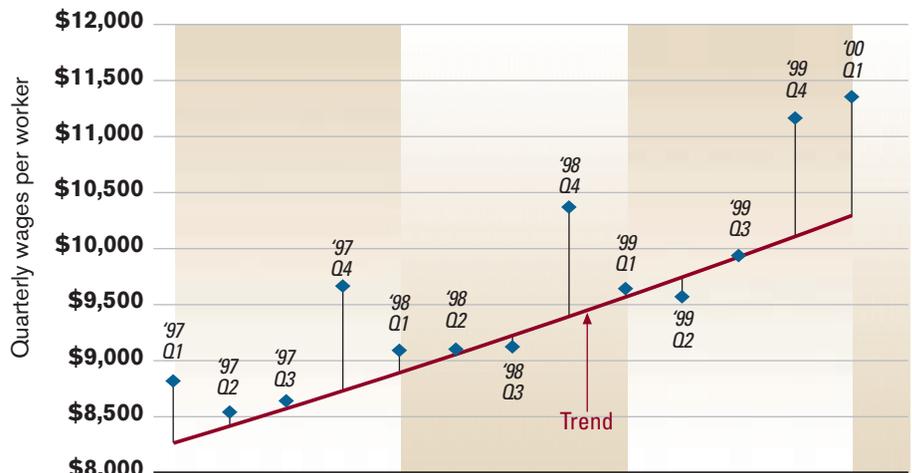
concentrated in computer and data processing services, doctors’ and lawyers’ offices, engineering and architectural services, research and testing services, and management and public relations services. Manufacturing accounted for \$1.2 billion, concentrated in computers, instruments, electronic components, and pharmaceuticals. Nonfinancial sectors

generally received larger proportional gains in lump sum payments in the first quarter, suggesting a more widespread reliance on compensation tied to the stock market.

It is important to recognize that these large increases in earnings are received by a minority of high-paid workers. At

### Private Sector Wages: Average Wage per Worker vs. Trend

*The line represents the time trend of average wages per worker, net of average fourth and first quarter deviations from that trend. Deviations reflect bonuses and stock options.*



Sources: DET ES-202; author's calculations

the other end of the spectrum are the 56 percent of Massachusetts workers who are paid on an hourly basis.<sup>6</sup> In the 12 months ending in September 2000, the average wage rate for hourly workers was \$12.69, versus an hourly rate of \$17.64 for all workers. Furthermore, the wage rate of hourly workers has been growing at a much slower rate than for salaried workers, at 2.6 percent in the year ending in September versus the prior year. For all workers, the annual hourly rate of wage growth was 6.2 percent. These figures from the Current Population Survey for Massachusetts exclude lump-sum payments, such as bonuses and stock options.

### Soft Landing Still Likely, but not Certain

Though a soft landing still looks like the most probable outcome, the risk of recession has increased substantially. While 8 of the 10 components of the leading index are pointing toward slower-than-trend rate of growth, the negative reading for November was the result of a precipitous drop in the Bloomberg stock index. The rapid deceleration in growth implied by the indices suggests that the economy is slowing more sharply than anticipated. Assuming that stock markets do not continue to fall at this rate, the outlook is for a much slower rate of growth—significantly below those we have experienced in this long expansion—but not a recession.

Other indicators are consistent with a successful soft landing. While future sales growth in the technology sector is expected to decline, even the lower levels would be the envy of “old-economy” businesses. Prices of technology stocks seem to be adjusting accordingly. The consensus of forecasts for national and world economies is for moderate growth. World oil price futures project a price decline as increased supplies make their way through the transportation and refining pipelines. On the state level, housing starts have slowed, but moderately; and recent declines in mortgage rates should encourage a healthy level of activity in the housing market.

One cannot be too sanguine, however, especially about the long-term outlook for Massachusetts. Core consumer inflation is running about a full percentage point above the national rate, due largely to our faster-increasing shelter and health costs. The cost of living, particularly in housing, is still very much higher here than nationally, and the gap continues to widen.

Though new evidence suggests that a substantial portion of recent wage-rate growth may be tied to stock markets and is therefore flexible downward, we know too little to conclude whether or not labor costs in Massachusetts are getting out of line with those in other areas of the country. There is still the danger that traditional inflation in hourly wage rates will accelerate in response to tight labor markets and consumer price inflation. The state may also be facing a new fiscal challenge, as recent stock market declines will lower individual income tax receipts from capital gains. At the same time, withholding rates will decline in the wake of the passage of ballot question number four. ▮

Submitted November 27, 2000; amended January 5, 2001

1. Seasonally adjusted by the author.
2. Nominal growth shows a similar decline, so a drop in spending is not the result of an increase in the rate of change in the price deflator.
3. Sales taxes are converted into a sales tax base by adjusting for tax-law changes in the tax base, dividing by the tax rate, and smoothing. The resulting indicator is weighted toward durable goods, since food and most clothing is tax-exempt. The indicator also includes taxes paid by businesses, which may account for up to one-fourth of sales tax revenue.
4. The ES-202 series consists of quarterly reports to the Massachusetts Division of Employment and Training from virtually every employer in the Commonwealth, required by the unemployment insurance system. Employers report monthly employment and total wages for the quarter. The wage figure is supposed to include bonuses and the value of realized stock options. State ES-202 reports form the basis of the BEA’s quarterly state wage and salary disbursement estimates, except for the most recent quarter, which use the less reliable state monthly payroll estimates to extrapolate wages. These estimates subsequently get revised in the following release, based on the ES-202 data. Occasionally these revisions are substantial.

5. The estimates referred to here were calculated as follows: Quarterly average wages per worker from 1997Q1 to 2000Q1 were logged and regressed on a trend and dummies for the fourth and first quarters. The difference, when positive, between actual quarterly wages per worker in the first and fourth quarters and the trend values calculated from the regression (ignoring the quarterly dummies) served as estimates of average lump sum payments per worker. These figures times the corresponding quarterly employment gave an estimate of total quarterly lump sum payments. The analysis was done separately for each 3-digit industry.

6. These figures for Massachusetts are from the monthly Current Population Surveys (CPS). Each month, the CPS asks one-quarter of interviewees about hourly and weekly pay received in the survey week. Workers are asked to include usual forms of pay received on a regular basis, and so exclude lump sum payments like bonuses and stock options. In a single month, about 300 persons in Massachusetts are asked these questions. In order to get a large enough sample size for reliable estimates, the figures reported are 12-month moving averages.

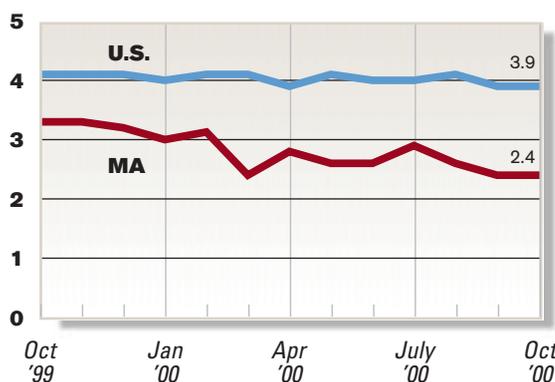
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*ALAN CLAYTON-MATTHEWS is an assistant professor and the director of quantitative methods in the Public Policy Program at the University of Massachusetts Boston. He is also president of the New England Economic Project.*



# The Measure of Massachusetts

## Unemployment Rates



## State Labor Force, Employment, & Income

	Period	Value	Change from Year Earlier (%)
Labor Force ( <i>Household-based</i> )	10/00	3,281,000	-0.3
Employment ( <i>Establishment-based</i> )	10/00	3,311,500	1.7
<i>Manufacturing</i>		431,100	-0.3
<i>Services</i>		1,203,300	2.7
Monthly Initial Unemployment Claims	10/00	20,637	-1.0
Income	'00 Q2		
<i>Personal Income (\$M)</i>		236,822	9.4
<i>Real Personal Income (\$M 1982-84)</i>		137,901	5.9
Help Wanted Advertising Index, Boston (1987 = 100)	9/00	54	-8.5

## Regional Employment

	Employment		Unemployment Rate	
	10/00	Change from Year Earlier (%)	10/00	10/99
<b>Central</b>				
Fitchburg-Leominster PMSA	64,524	-1.8	2.9	3.9
Worcester, MA-CT PMSA (MA only)	240,375	0.3	2.2	3.0
<b>Cape and Islands</b>				
Barnstable-Yarmouth MSA	74,594	1.7	1.9	2.6
<b>Boston Metro</b>				
Boston, MA-NH PMSA (MA only)	1,785,494	0.7	1.8	2.6
<b>Northeast</b>				
Lowell, MA-NH PMSA (MA only)	158,152	-0.2	2.0	3.2
Lawrence, MA-NH PMSA (MA only)	124,196	1.0	3.0	4.5
<b>Southeast</b>				
Brockton PMSA	131,010	0.6	2.3	3.2
New Bedford PMSA	77,622	0.9	4.0	4.9
Providence-Fall River-Warwick, RI-MA MSA (MA only)	113,000	0.0	2.6	3.6
<b>Pioneer Valley</b>				
Greenfield LMA	32,517	0.7	1.9	2.3
Springfield MSA	278,210	0.4	2.4	3.1
<b>Berkshire</b>				
North Adams LMA	12,395	1.3	2.3	2.6
Pittsfield MSA	38,042	0.0	2.6	3.7

# The University of Massachusetts Economic Benchmarks

	Nov. '00	Nov. '99
Current Economic Index	129.2	125.0
Leading Economic Index	-1.1%	5.5%

The Massachusetts Current Economic Index for November was 129.2, barely up from October and up 3.4 percent from November of last year. The current index is normalized to 100 in July 1987, and calibrated to grow at the same rate as the real gross state product over the 1978–1997 period.

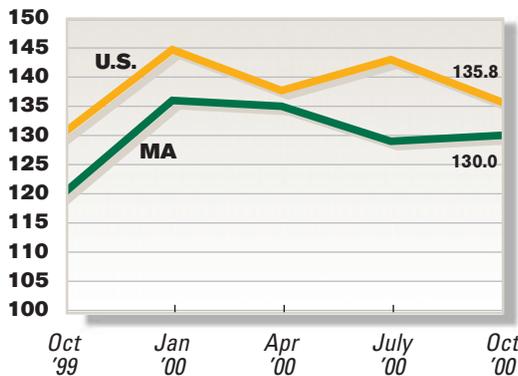
The Massachusetts Leading Economic Index for November was -1.1 percent, and the three-month average for September through November was 0.2 percent. The leading index is a forecast of the growth in the current index over the next six months, expressed at an annual rate.

The November leading index should alert us to the possibility of a more serious economic slowdown than previously envisioned.

## Consumer Confidence U.S. and Massachusetts

QUARTERLY DATA

*The trends rather than the levels of these indices should be compared, due to different base points.*



## Business Confidence in Massachusetts

MONTHLY DATA

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



## Boston Consumer Price Index

(1982–84 = 100)

9/00	Change from Year Earlier (%)
184.3	4.2

## MA Home Price Index

(1987 Q1=100)

'00 Q2	Change from Year Earlier (%)
147.46	14.1

## MA New Housing Permits

(monthly average, 11/99–10/00)

Through 7/00	Change from Year Earlier (%)
1,486	-5.0

## Estimated Massachusetts Bonuses, Stock Options, and Other Lump-Sum Earnings, Selected Industries

Source: DET ES-202 and Alan Clayton-Matthews's calculations

Note: For methodology see note 5 in *Economic Currents*

	Millions of Dollars	
	Q4 1998 and Q1 1999	Q4 1999 and Q1 2000
<b>Manufacturing</b>	751	1,202
<b>Wholesale Trade</b>	349	638
<b>Retail Trade</b>	238	268
<b>Finance</b>	1,204	2,456
Depository Institutions	269	450
Nondepository Institutions	77	53
Securities & Commodity Brokers	858	1,953
<b>Insurance</b>	226	273
<b>Real Estate</b>	91	108
<b>Holding &amp; Other Investment Offices</b>	106	314
<b>Services</b>	1,313	1,977
Business Services	283	657
Health Services	260	214
Legal Services	124	150
Engineering & Management Services	464	773
<b>All Other Industry Sectors</b>	375	487
<b>Total Bonuses &amp; Stock Options</b>	<b>4,652</b>	<b>7,723</b>

SOURCES: Associated Industries of Massachusetts; The Conference Board; Mass Insight/New England Economic Project; Fannie Mae and Freddie Mac; Massachusetts Division of Employment and Training; U.S. Department of Commerce; U.S. Bureau of Economic Analysis; U.S. Bureau of Labor Statistics; University of Massachusetts; The Alliance for the Commonwealth



Where the Saugus River empties into the Atlantic on the Commonwealth's North Shore stands General Electric's oldest plant, the Lynn "River Works." In 1942, thanks to an unusual confluence of technological and historical factors, the Type I centrifugal-compressor jet engine was built at this site to power America's first jet aircraft, the legendary Bell XP. Since that time, the jet engine industry has been a successful—though overlooked—example of the Commonwealth's strengths in high-tech manufacturing.

Jobs in aircraft engine manufacturing are good ones. According to national manufacturing data, workers in this industry are substantially more productive than other manufacturing workers, and this productivity premium translates into significantly higher average hourly earnings.<sup>1</sup> Today 11,000 people in 20 Massachusetts firms build the complex parts, components, subassemblies, and control systems that make up gas turbine engines for aircraft. Massachusetts industry employment accounts for about 9 percent of total U.S. jet engine and engine parts employment. This is second only to Connecticut, which in 1999 had close to 16,000 jobs in 95 establishments.<sup>2</sup>

### Industry Grows, but Employment Declines

In the dark days of the early 1990s, a downturn in military and commercial segments of the aircraft market led to devastating job losses both locally and nationally. But the market for aircraft engines and spare parts has made a strong recovery. Unfortunately, the industry's employment picture here has not kept pace. Employment declined by 7.5 percent between the fourth quarter of 1993 and the fourth quarter of 1997, a period when the state's overall manufacturing employment increased by about 1 percent.<sup>3</sup>

Why have there been employment declines as the market for aircraft engines and spare parts has expanded? An

## Aircraft Engine & Engine Parts Manufacturing: Top Ten States

	Establishments	Employees	Percent of U.S. Employment in This Industry
Connecticut	78	21,783	20.8
California	92	12,624	12.1
Massachusetts	20	10,917	10.4
Florida	49	9,473	9.1
Indiana	17	5,768	5.5
New Jersey	13	4,311	4.1
Ohio	23	2,782	2.7
New York	27	2,402	2.3
Georgia	15	2,454	2.3
Pennsylvania	17	1,685	1.6
<b>Total</b>	<b>351</b>	<b>74,199</b>	<b>71.0</b>

Source: iMarket Inc., 1st quarter 2000

examination of the history of the industry in the state, the skill base and key technologies that underlie competitive advantage, and what has been behind recent market changes may help us resolve this paradox.

### An Industry Launched in Massachusetts

Gas turbine activities carried out in General Electric's industrial laboratories helped launch the company into the jet engine business. Research on power generation equipment formed the foundation of a successful aircraft supercharger business at the Lynn plant during the 1920s and 1930s. That work gave the company experience in building two essential parts of a gas turbine engine, the compressor and the turbine, which resulted in their selection by the Air Force in 1941 to build America's first jet engine.<sup>4</sup>

Chances are about one in three that the aircraft carrying you through the skies the next time you fly is powered by an engine of General Electric design. At GE, building and selling aircraft engines is a \$10 billion-a-year business. The company's Lynn plant continues to make small gas turbine engines for helicopters and small planes, while its large engine assembly work is divided between plants in Ohio and North Carolina.

Today's other industry leader in the field of turbine engine manufacturing is New England-based Pratt &

Whitney, a builder of aircraft engines since the 1920s. While the company's home is still in Hartford, Connecticut, it too maintains production, maintenance, and repair facilities around the globe. Today, Pratt's base of installed engines represents an amazing 48 percent of all engines powering "free world" civil aircraft. Together, GE and Pratt & Whitney dominate the global market for aircraft gas turbines. In recent years, the two firms received 80 percent of all new orders for large commercial jet engines.<sup>5</sup>

### The Supply Chain Disperses

GE and Pratt & Whitney rely on a complex supply chain of sophisticated parts and components manufacturers, companies that fabricate precision parts from specialty materials to extremely precise tolerances. This supply chain was heavily represented by New England firms for many years, but it has recently become global in nature.<sup>6</sup> While Massachusetts remains home to many of these world-class suppliers, recent industry developments may give us cause for concern over the viability of the region's jet engine manufacturing skill base.

The region seems well positioned in the area of engine control systems technologies. Most aircraft engines currently being produced employ FADEC, or full-authority digital engine control systems. The strengths of many Massachusetts firms in designing and manufacturing electronics and instrumentation may bode well for regional competitive advantage in this segment of the industry. One firm involved in these activities is Ametek Aerospace in Wilmington. This GE spin-off manufactures monitoring systems for all types of jet engines, including sensors for fuel flow, temperature, and speed.

Where fabricated engine components are concerned, the picture for Massachusetts may not be as bright. Historically, many of the thousands of rotating parts that make up an engine have been forged, then machined to precise tolerances and incorporated into a final assembly. The work is carried out by highly skilled machinists. Locally, there is much capacity in these operations, especially in the area of large forgings. More and more frequently, however, precision casting methods are replacing forging processes for some engine parts, since this requires less final machining and thus can be more economical. Investment casting is

the process used most frequently. Neither of the leading firms in this process, Howmet and Precision Castparts, maintains operations in Massachusetts.

At the same time, even with respect to forging and machining activities, we may be witnessing a dilution of the regional skill base that is occurring as a result of industry consolidation. For example, Coltec Industries subsidiary Walbar Metals, with a plant in Peabody, specializes in the precision machining of complex turbine parts (blades, vanes, and disks) as well as in protective, high-temperature coatings of these kinds of components. In early 1994, Walbar moved most of its fabrication operations from Peabody to plants in Arizona and Ontario, though refurbishment operations and some coating operations remain.<sup>7</sup> The plant currently employs more than 200 workers and continues to be an important local GE supplier. Still, when the company recently expanded its coatings capacity, that investment was made in Greenwood, South Carolina, not in Peabody.<sup>8</sup>

Another example of the local employment effects of industry consolidation can be found at forging giant Wyman-Gordon in North Grafton. Wyman-Gordon is a maker of precision forgings, investment castings, and composite structures for aircraft engines. The company employs about 4,000 people worldwide. Plants in North Grafton and Worcester produce titanium forgings for aircraft turbines, a business in which it has become a leader. In 1994, in the wave of consolidation that swept the aerospace industry, the company

acquired its main rival, Cameron Forged Products in Houston. Many forging operations were moved from North Grafton to Texas.<sup>9</sup> In 1996 and 1997, the company's bulging order book allowed for close to 600 new hires to be made companywide. Just 90 of these jobs were added in Massachusetts, with plants in Connecticut, New Hampshire, Nevada, and California benefiting from most of the growth.<sup>10</sup>

### Recent Changes Help Global, but not Local, Market

The market leadership of GE and Pratt & Whitney symbolize, in many respects, the success of the nation's "accidental industrial policy" during the Cold War years in



fostering the growth of high-tech manufacturing. Like the computer and electronics industries, aerospace manufacturers were the beneficiaries of generous research and development funds as well as equipment contracts flowing from the Department of Defense. There was significant financial backing to spin off technologies for other products aimed at commercial markets. As that era drew to a close, original equipment manufacturers (OEMs) in the aerospace industry experienced the loss of high-margin defense work and increasingly sought to invest in other market segments, especially lucrative O&M (overhaul and maintenance) operations. Over the past few years Pratt and GE have aggressively increased their presence in O&M activities, growing existing operations and acquiring others.<sup>11</sup> Such a strategy does little to improve the employment picture locally, since these O&M facilities tend to be spread across the globe.

A second trend that appears to be accelerating in the industry is the OEMs' drive to spread the risks involved in developing new products. Without DOD contracts to break the industry's fall during downturns in commercial demand, leading firms have established "risk- and revenue-sharing partnerships" (RRSPs). Basically, these partnerships involve a foreign supplier firm committing to finance a portion of the development costs of a new engine program at the time of its launch (taking on risk) in exchange for a fixed work share (revenue) when the engine enters production. The OEMs see such partnerships as a means of enhancing market access in making sales to foreign airlines or governments. Trading work for market access has long been standard practice on the military side of the business, where such deals are referred to as "offsets"; a portion of each sale is offset by the purchase of locally produced parts. In this way, RRSPs could be viewed as a kind of "commercial offset."

## Offsets May Boost Business

For the original equipment manufacturers, the logic behind offering an offset goes as follows: If a foreign airline (which may be government-owned or subsidized) or government knows that a portion of the work in building engine A is being done locally, that might sway the choice to purchase engine A over engine B.

No exact figures show the significance of risk- and revenue-sharing partnerships (RRSPs), but one way to gauge their impact is by taking the dollar value of orders and then adjusting them for the stake of the program the systems integrator (OEM) actually retains. Doing this for Pratt & Whitney, we see the impact is substantial. Taking a \$6.1 billion sample of Pratt orders from mid-1998 through early 1999, we can see that RRSPs resulted in \$3.4 billion of this work being committed, up front, to foreign supplier firms. Of course, these foreign partners may, in turn, subcontract some of this work to U.S. suppliers, and by symmetry, a fair share of the work retained by Pratt will go out to other suppliers, both foreign and domestic.

Assessing the economic impact of RRSPs and offset agreements is far from straightforward. But the increasing reliance of the OEMs on international sources of supply (whether due to RRSPs, military offsets, or more traditional sourcing activity) is difficult to refute, reflected as it is in the growth of imports of aircraft engine parts, which has followed a steady upward trend over the past two decades.

### Recent Orders for Commercial Engines at Pratt & Whitney

Date	Customer	(\$ mil.)	Engine Model	RRSP-Adjusted P&W Share (\$ mil.)
Feb. '99	UPS	1,500	PW4184	945
Dec. '98	TWA	400	PW6000	400
Nov. '98	International Lease Finance Corp.	250	PW6000	250
Oct. '98	U.S. Airways	800	PW4168	504
April '98	United Airlines	550	PW4000	346
April '98	LanChile, Tam, TACA, etc.	2,300	V2500	759
April '98	FedEx	112	PW4000	71
April '98	TWA	200	JT8D-200	152
	<b>Total</b>	<b>\$ 6,112</b>		<b>\$3,427</b>

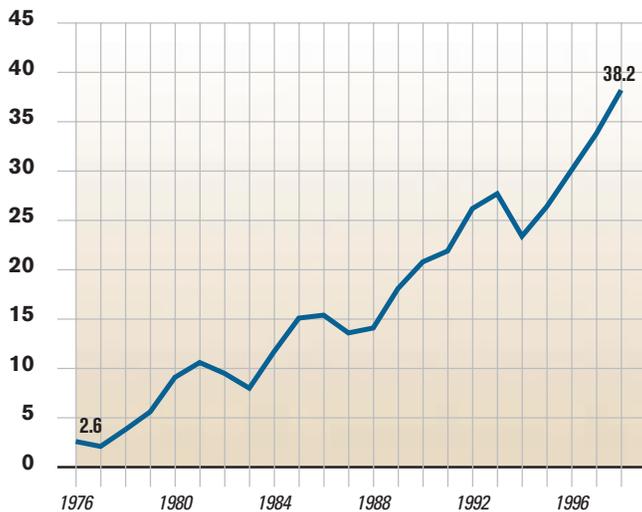
Source: Author's calculations based on data from United Technologies Corporation and Jane's Aero-Engines

## International Competition Heats Up

The top five producers of turbine engine parts—France, the U.K., Germany, Canada, and Japan—account for close to 80 percent of U.S. imports for these components. Thus, it is difficult to make the case that, up to this point, the globalization of aircraft engine manufacturing has been based on low-wage foreign competition. Due to the skill requirements in the industry and the need for suppliers to have a certain degree of technological sophistication, such a result should not be surprising. Moreover, each of these five countries has a long history of engagement with turbine technology.

### Ratio of Import Value to Value of U.S. Industry Shipments

*Trends reflect the rise in cooperative production agreements with foreign supplier firms.*



Source: Author's calculations based on data from International Trade and U.S. Department of Commerce

Still, a contingent of newcomers is making rapid inroads in the supplier tier. Imports of turbine engine parts from Israel, for example, increased from \$41 million in 1989 to \$217 million in 1998. Last year's imports from South Korea, valued at \$55 million, are close to triple their 1989 level. Imports from Turkey saw a similar growth pattern, from \$12 million in 1989 to \$47 million in 1998. But the fastest-rising star is Singapore, whose exports of engine parts to the U.S. have increased tenfold since 1989 (from \$20 million to \$206 million).<sup>12</sup>

For most of these emerging sources of engine parts, military offset programs appear to have been an important source of learning opportunities. Thus, it seems that government-sponsored offset programs may have the unintended effect of fostering international competitors that may supplant domestic suppliers. This is probably worthy of further investigation. While the issue is one for those focused on national security policy, it overlaps with important economic development aspects that are of interest to those in the state as well.

## A Look Ahead

In high-tech manufacturing, we tend to highlight the importance of a scientific skill base to regional competitive advantage. Certainly the list of science-based disciplines an organization needs to master in this industry is an impressive one: thermodynamics, aerodynamics, heat transfer, combustion, structures, materials, and instrumentation and controls.<sup>13</sup> Universities and industrial research laboratories form an important part of this scientific infrastructure supporting the industry locally.

Such a perspective can lead to an "if you build it, they will come" approach to economic development policy with respect to high-technology manufacturing. That is, we may be lulled into thinking that it is sufficient to beef up univer-



### Top Sources of Turbine Engine Parts Imports

Country	1998 U.S. Imports (in millions)
France	\$1,902
United Kingdom	\$1,141
Germany	\$755
Canada	\$517
Japan	\$277
Israel	\$217
Singapore	\$206
Italy	\$158
Sweden	\$108
Mexico	\$79
Switzerland	\$68
Belgium	\$56
South Korea	\$54
Norway	\$51
Turkey	\$46
Ireland	\$32
Netherlands	\$28
Brazil	\$16
China (PRC)	\$13
Taiwan	\$12

Source: U.S. Census Bureau, Foreign Trade Division

sity engineering programs that will retain the employment and skill base that is so crucial to economic vitality in the state. But, as the Commonwealth's aircraft engine manufacturing industry has shown, equally critical to competitive advantage is the ability to develop and continually improve upon manufacturing processes. These competencies are often taken for granted by economists, but their existence requires significant technological and organizational investments. If enterprises are unwilling or unable to make these investments, then such a situation is especially problematic from a policy perspective. The high-tech policy cure-all—"invest in education and R&D"—may not hurt, but it is not the ultimate solution.

The decline of aircraft engine manufacturing jobs from Massachusetts appears to be due to a number of factors, including industry consolidation, risk aversion on the part of OEMs, and the eagerness of firms in other countries to break into the ranks of the world-class supplier tier. Such factors seem to be far from the reach of state-level policymakers' traditional economic development tool kit. That may be discouraging on some level, but perhaps we should view it as a challenge to think more creatively about how to address industrial retention and renewal issues, broadly speaking, in the Commonwealth. At the same time, policymakers need to give sufficient attention to the maintenance and upgrading of the state's precision manufacturing skill base. For even if industry trends in aircraft engine manufacturing continue on their current course, the state's ability to grow and to attract other high-tech manufacturers will continue to rely heavily on the vitality of such a skill base. Scientific talent, after all, is just one half of the high-tech equation. ▮

1. Source: iMarket, Q1 1999.

2. According to figures from the Census Bureau's *Annual Survey of Manufactures*, value added per production worker in aircraft engine manufacturing measured \$218,278, as compared with value added per worker in overall manufacturing of \$143,794. Likewise, average hourly earnings for production workers in aircraft engine manufacturing were about \$20 per hour in 1996, versus about \$13 per hour for manufacturing as a whole.

3. Source: Massachusetts Division of Employment and Training, ES-202, Q4 1993 and Q4 1997.

4. The General Electric Company. *Eight Decades of Progress: A Heritage of Aircraft Turbine Technology*. Cincinnati: Hennigan Co. 1990.

5. "Flight International Engine Directory 1997—Order Backlog." *Flight International*. September 24, 1997, p. 31.

6. Bluestone, B., Jordan, P. and Sullivan, M. *Aircraft Industry Dynamics: An Analysis of Competition, Capital and Labor*. Boston: Auburn House. 1981.

7. "Coltec to Close Plant." *New York Times*. September 3, 1993.

8. "Walbar Metals Expands South Carolina Plant." Coltec Industries Press Release. December 19, 1996.

9. "W-G Cuts 24 Manager Positions." *Worcester Telegram and Gazette*. June 23, 1998.

10. "Demand for Aircraft Parts Creates Need for New Jobs at Wyman-Gordon Plants." *Worcester Telegram and Gazette*. October 16, 1997.

11. "OEMs: Partners or Competitors?" *Interavia Business and Technology*. November 1998.

12. Source: U.S. Census Bureau, Foreign Trade Division.

13. Principe, A. "Technological Competencies and Product's Evolutionary Dynamics: A Case Study from the Aero-engine Industry." *Research Policy*, 25. 1997, pp. 1261-76.

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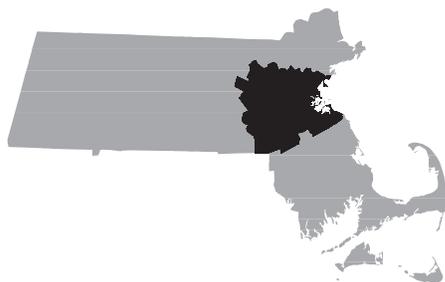
ILLUSTRATION: NAOMI SHEA

# The Greater Boston Region

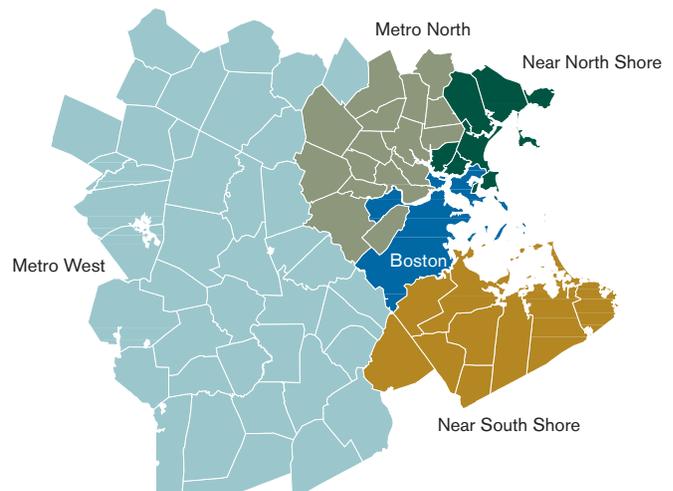
## *Industry Mix Affects Growth*

*The economic explosion of the past several years has been felt everywhere. Or has it? While it may be fair to say that the Greater Boston region has experienced remarkable gains, a closer look at its subregions tells a different story.*

DAVID TERKLA



*A more detailed map of the region can be found inside the back cover of this journal.*

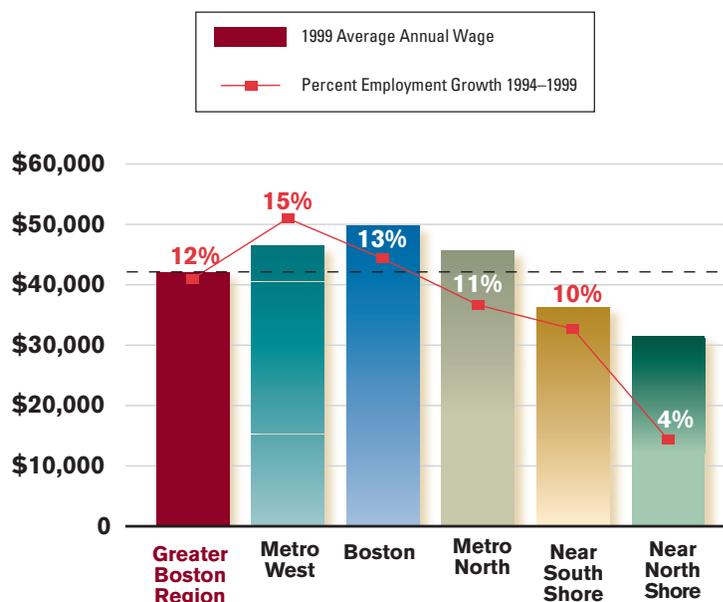


Overall prosperity in the Greater Boston region masks the extreme diversity among its cities and towns. Some areas have experienced robust growth in relatively high paying industries. Others have faced growth only in low-paying jobs, accompanied in many cases by a substantial decline in high-paying sectors. By examining the area's five subregions in terms of industry types, wage levels, and employment growth, we begin to see reasons for these differences.<sup>1</sup>

The Commonwealth's strong economy is reflected in the employment numbers for the Greater Boston region, which accounts for more than half of the state's jobs. At less than 3 percent, the region's unemployment rate is modest, a reflection of a 12 percent employment increase since 1994.<sup>2</sup>

The Near North Shore subregion—consisting of the older industrial cities of Lynn, Saugus, Revere, Everett, and

## Average Wage and Employment Growth



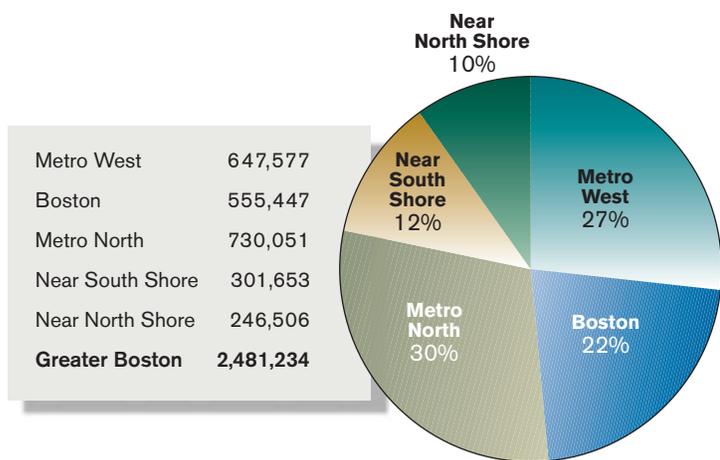
Source: Massachusetts Division of Employment and Training

Chelsea—is the smallest subregion, representing only 5 percent of Greater Boston employment and 10 percent of its 1998 population. Employment growth here during the 1994-1999 period was 4 percent, the slowest in the region. Moreover, average annual wages were only a little more than 60 percent as high as those in the city of Boston.

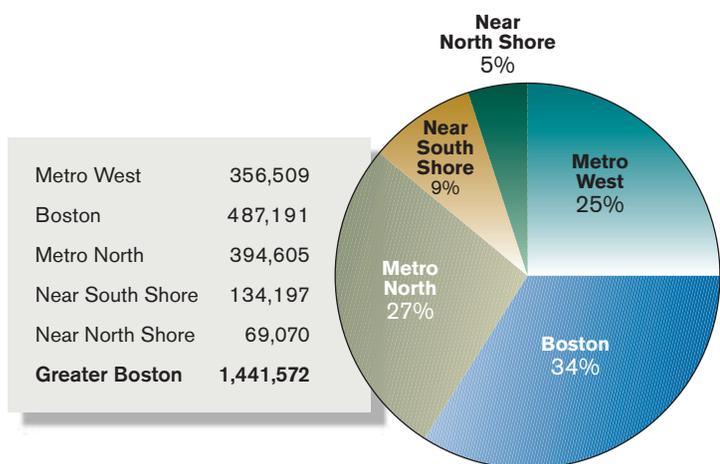
The Near South Shore—with the older industrial cities of Quincy and Braintree, as well as several wealthy bedroom communities—accounts for a little over 9 percent of Greater Boston employment and 12 percent of its population. It has also underperformed the region in terms of employment growth. Average wages here are below the region's and less than three-fourths those in Boston.

The remaining three subregions appear to be experiencing the greatest benefits from the economic expansion. Among these high-performing areas, Metro West stands out. Consisting of the newer industrial parks and bedroom communities between Route 128 and I-495, as well as older, wealthier communities, this subregion represents one quarter of the region's employment and 27 percent of its population. It is by far the fastest growing in terms of employment (15 percent) and has average wages second only to Boston.

The Metro North subregion—including Cambridge, Newton, Somerville, and Medford; bedroom communities north of Boston; and many of the industrial parks on Route 128—accounts for 27 percent of the region's employment and 30 percent of its population. While showing an employment growth rate (11 percent) slightly below that of Greater Boston and 30 percent below Metro West, it has average wages that exceed the Greater Boston average by almost 9 percent and that are less than 10 percent below those in the city itself.



### Population



### Employment

Source: U.S. Census Bureau

The City of Boston accounts for 34 percent of Greater Boston employment and 22 percent of the region's population. Its average annual wage of almost \$50,000 is the highest in the region, exceeding the regional average by nearly 19 percent. Employment growth here is second highest among the subregions.

Key among the underlying factors influencing these variations is the industry mix in each subregion. A closer look at these industries clarifies the picture.

### Near North Shore Is Still Struggling in the New Service Economy

The relatively low paying eating and drinking industry accounts for the largest share of employment in this subregion. This is followed by health services, in which employment is concentrated in the low-paying nursing home and hospital services sectors. Wholesale trade, transportation equipment, construction, retail food stores, transportation, miscellaneous retail, and social services each account for 4 percent to 7 percent of employment. The transportation equipment sector pays well (\$74,000 average annual wage), but this sector is declining. Wages in wholesale trade and construction are near the average for all industries in the region, while transportation-sector jobs pay roughly 75 percent of the average. The remaining jobs pay below 50 percent of the average wage.

Average wages in all of these industries, with the exception of transportation equipment, lag behind the region's overall average. With the exception of transportation equipment and eating and drinking, all annual wages fall below 80 percent of the highest wages for its industry in the area. The transportation equipment, food manufacturing, food stores, and eating and drinking industries all represent a more important portion of the Near North Shore employment base than they do for Greater Boston as a whole.

Fastest growing between 1994 and 1999 was the low-paying educational services jobs sector (257 percent growth), followed by higher-paying food manufacturing (94 percent), commodity brokers (74 percent), engineering and management services (66 percent), and air transportation (69 percent). The "high" growth in all of these areas, with the exception of food manufacturing, reflects increases in a very low employment base and thus a small number of new jobs. There was also significant growth in the larger industries of transportation, construction, and social services.

Employment declines were concentrated in manufacturing (nonelectric machinery down 45 percent and electrical equipment down 22 percent) and construction (up 20 percent) that pay average to above-average wages for the region and wages that are 8 percent to 40 percent above the subregion's average. Health services, wholesale trade, transportation equipment, and food stores also experienced declines. Overall, the majority of declines were in industries with better-paying jobs, while much of the increases were in lower-paying sectors.

## Largest Industry Sectors

Near North Shore	Percent of Near North Shore Employment	Percent Change 1994-99	Average Annual Wage in Greater Boston Region	
			Average Annual Wage	Average Annual Wage in Greater Boston Region
Eating & Drinking	11.3	2.6	\$15,861	\$16,322
Health Services	10.1	(10.2)	\$30,891	\$39,178
Wholesale Trade	6.8	(9.7)	\$42,269	\$61,996
Transportation Equipment	6.5	(6.9)	\$74,070	\$70,297
Construction	5.7	19.6	\$43,207	\$49,089
Food Stores	5.5	(5.2)	\$16,140	\$20,781
Transportation	4.8	51.0	\$32,146	\$36,434
Miscellaneous Retail	4.6	4.4	\$21,080	\$24,232
Social Services	4.2	19.0	\$19,545	\$22,073

Near South Shore	Percent of Near South Shore Employment	Percent Change 1994-99	Average Annual Wage in Greater Boston Region	
			Average Annual Wage	Average Annual Wage in Greater Boston Region
Health Services	11.4	12.7	\$32,723	\$39,178
Banking	8.4	8.4	\$49,599	\$52,939
Eating & Drinking	7.1	11.0	\$16,235	\$16,322
Business Services	6.8	17.4	\$32,480	\$47,715
Wholesale Trade	6.6	1.5	\$49,827	\$61,996
Construction	5.8	25.1	\$48,264	\$49,089
Food Stores	4.4	(12.1)	\$29,107	\$20,781
Insurance	3.8	(1.5)	\$49,005	\$54,772
Engineering & Management	3.1	34.5	\$51,493	\$66,807

Metro West	Percent of Metro West Employment	Percent Change 1994-99	Average Annual Wage in Greater Boston Region	
			Average Annual Wage	Average Annual Wage in Greater Boston Region
Business Services	12.0	66.3	\$56,493	\$47,715
Health Services	9.0	11.0	\$35,086	\$39,178
Wholesale Trade	8.2	1.6	\$61,410	\$61,996
Engineering & Management	6.2	25.5	\$65,112	\$66,807
Eating & Drinking	5.6	13.9	\$14,888	\$16,322
Instruments	4.6	(10.7)	\$78,718	\$75,975
Nonelectric Machinery	4.2	(12.7)	\$88,849	\$82,284
Construction	4.2	35.0	\$43,830	\$49,089
Miscellaneous Retail	3.6	27.7	\$26,890	\$24,232

Metro North	Percent of Metro North Employment	Percent Change 1994-99	Average Annual Wage in Greater Boston Region	
			Average Annual Wage	Average Annual Wage in Greater Boston Region
Business Services	16.3	44.5	\$54,622	\$47,715
Educational Services	9.8	5.0	\$42,864	\$41,139
Health Services	9.3	(4.8)	\$36,877	\$39,178
Engineering & Management	8.7	20.5	\$69,792	\$66,807
Wholesale Trade	6.3	7.5	\$66,905	\$61,996
Eating & Drinking	5.6	14.8	\$16,267	\$16,322
Construction	3.9	47.3	\$49,534	\$49,089

Boston	Percent of Boston Employment	Percent Change 1994-99	Average Annual Wage in Greater Boston Region	
			Average Annual Wage	Average Annual Wage in Greater Boston Region
Health Services	15.2	386.6	\$44,201	\$39,178
Business Services	9.7	44.5	\$34,769	\$47,715
Securities Brokers	7.9	61.4	\$96,505	\$91,978
Engineering & Management	7.1	25.9	\$67,254	\$66,807
Eating & Drinking	6.5	11.5	\$17,406	\$16,322
Educational Services	5.0	6.3	\$42,347	\$41,139
Transportation	4.3	6.6	\$40,738	\$36,434
Banking	3.9	2.5	\$64,373	\$52,939
Legal Services	3.5	11.5	\$67,358	\$61,236

Source: Massachusetts Division of Employment and Training

## **Near South Shore Moving Toward Faster-Growing Service Industries**

The two largest sectors in the Near South Shore subregion are health services (11.4 percent) and banking (8.4 percent) followed by eating and drinking, business services (temporary employment agencies, computer and data processing, and building services), wholesale trade, construction, food stores, insurance, and engineering and management services, each accounting for 3 percent to 7 percent of employment.

While the health sector, business services, food stores, and eating and drinking places pay low to medium wages, the other sectors have average annual wages around \$50,000, 19 percent above the Greater Boston average for all industries. However, as with Near North Shore, all industries but food stores have average annual wages below the regional average for their industries and as much as 40 percent below the highest annual average wage for their industries in the area. The banking, specialty trade contractors, apparel stores, food stores, and insurance industries are more concentrated in the Near South Shore than in the entire Greater Boston area.

The fastest-growing sectors in the last five years were securities and commodity brokers (98 percent), educational services (47 percent), construction (25 percent), engineering and management services (34 percent), air transportation (33 percent), and apparel stores (31 percent). Because each of these industries (except air transportation) had a considerable enough presence in 1994, these percentage increases represent significant growth in numbers of jobs.

The job expansion in the brokerage and educational service industries is on the low end of the pay spectrum, with average wages at half the level of those for similar jobs in the Boston, Metro North, and Metro West regions. Likewise, Near South Shore engineering and management services wages average about 80 percent of those in these other regions but are 40 percent above the average subregional wage for all industries. Conversely, apparel store jobs, while still relatively low paying (\$31,400), pay much higher than apparel jobs in the other four subregions.

Job declines have been concentrated in manufacturing, with nonelectric machinery falling 38 percent, and electrical equipment and instruments down 15 percent each. These industries have average annual wages more than 20 percent above the average Near South Shore wage. There was also a significant decline in food store jobs (12 percent) where average wages are 20 percent below the Near South Shore average. Thus, job declines in some high-wage sectors have been offset in part by job increases in higher-wage sectors, such as engineering and management services, banking, and construction.

Thus, while lagging behind other subregions in employment growth and wage levels, it appears that the economic base here continues to shift away from manufacturing and toward banking and the business and engineering

service industries. Much of the job growth so far, however, has been in the lower-paying jobs within these industries.

## **Metro West Dominated by Rapidly Growing, High-Paying Information Technology**

This is the largest geographic region, with excellent transportation connections (the Route 128 and I-495 corridors as well as Route 2, I-90, I-95, and the commuter rail). This, combined with its substantial open space, helps to explain why the area continues to grow so rapidly.

The largest sector (12 percent of employment) is business services, particularly the very high wage computer and data processing firms and higher-wage temporary professional personnel supply services. Health services is the next largest sector, followed by wholesale trade, engineering and management services, eating and drinking, and instrument and nonelectric machinery manufacturing. Where wholesale trade in the North Shore and South Shore subregions is concentrated in the lower-paying warehousing and product distribution jobs, it is dominated in Metro West by very high paying computer software and programming services.

Wages in Metro West are above or close to the Greater Boston industry average in six of the nine largest sectors, and three of these have the highest average annual wage in the area for their industries. The high-technology manufacturing sector—nonelectric machinery, electric equipment, and instruments—along with wholesale trade, apparel stores, and miscellaneous retail are more concentrated in this region than in Greater Boston. Though this is not the case for business services as a whole, the data processing sector is somewhat more highly concentrated in this area.

The fastest-growing sectors in the last five years have been air transportation (382 percent), business services (66 percent), commodity brokers (39 percent), construction (35 percent), apparel stores (32 percent), and social services (28 percent), printing and publishing (26 percent), and engineering and management services (26 percent). While the growth in brokers and air transportation began with very low employment numbers in 1994, the growth in the other sectors represents substantial numbers of additional jobs. With the exception of the apparel and social service industries, these jobs have very high average annual wages. Job declines have been concentrated in the high-wage manufacturing industries of instruments and nonelectric machinery, which are largely computer related.

The economic base of the Metro West area is very strong and continues to have a solid mix of information and high-technology industries with high wages and excellent growth prospects.<sup>3</sup>

## **Metro North Benefiting from the Expansion of High-Paying Service Industries**

Major industries in Metro North are similar to those in Metro West, though business services accounts for a larger component (over 16 percent) and includes greater employment in

the lower-paying building services sector. With its concentration of higher-education institutions, educational services is the second largest industry (9 percent), followed by health services, engineering and management services, wholesale trade (as with Metro West, concentrated in software), eating and drinking establishments, and construction.

Average annual wages in the business services sector (\$54,622) are second only to Metro West. Pay in educational services and engineering and management services is higher than in any of the other subregions. Average pay in the remaining sectors is second only to that in Boston. This region has an unusually high employment concentration in education services, business services, engineering and management services, instruments, and wholesale trade.

### *The economic base for Metro North revolves mostly around the fastest-growing industries in the region, and many of the higher-paying ones.*

The fastest-growing industries in the last five years were air transportation, securities brokers, food manufacturing, construction, business services, and engineering and management services. The first three are a function of very low employment levels in 1994, but the others involve substantial job growth. Manufacturing industries here have experienced the greatest declines, including fabricated metals (down 11 percent), nonelectric machinery (down 8 percent), transportation equipment (down 61 percent), and instruments (down 37 percent). Only in the case of instruments was employment large enough in 1994 for this to represent significant job loss.

The economic base for Metro North revolves mostly around the fastest-growing industries in the region, and many of the higher-paying ones.

### **Boston Has Highest Wages Plus Rapid Employment Growth**

Health services is the largest employer in Boston, followed by business services, securities brokers, engineering and management services, eating and drinking establishments, educational services, transportation, banking, insurance, and legal services. Average wages in all of these industries are the highest or second highest in the region, with the exception of business services (\$34,769), whose lower wages reflect the heavier concentration of building service and temporary personnel supply jobs in Boston. The sectors with the highest relative employment concentrations are legal services, securities brokers, air transportation, lodging, and insurance.

The fastest-growing sector was transportation equipment (305 percent), followed by commodity and securities brokers (61 percent), construction (46 percent), food

stores (36 percent), business services (35 percent), and engineering and management services (26 percent). Growth in transportation equipment and food stores was a function of the small number of jobs in these sectors in 1994.

Significant declines were experienced in two manufacturing sectors, nonelectric machinery (down 63 percent) and electrical equipment (down 9 percent), both of which accounted for less than 1 percent of 1994 employment. There were also declines in the insurance industry, a more significant employer.

Again, the lack of higher-paying niche manufacturing industries and the expansion of lower-paying business service jobs hurts the city's population with lower levels of formal education and limited mobility.<sup>4</sup>

### **The Future Looks Bright, but Not Across the Board**

While experiencing robust growth in recent years, the Greater Boston region's overall expansion has not been felt in all of its cities and towns. In fact, stark contrasts in economic performance remain, with the Near North Shore subregion experiencing less than one-third of the employment growth of the fastest-growing Metro West subregion.

Amplifying these differences in employment growth are differences in average wages, which tend to be considerably lower in the slower-growing subregions, both because these regions have higher concentrations of low-wage industries and because they have a higher concentration of the lower-wage jobs within industries.

All signs point to continued economic expansion in the Metro West, Metro North, and Boston areas, where the economic base is dominated by industries projected to grow in the next decade. The Near South Shore also appears to be making progress in reorienting its industrial base to the new economy, but the Near North Shore still lags behind. Unless greater efforts are made to attract high-growth industries to this subregion, it is likely to continue to underperform relative to the rest of the Greater Boston region. ▮

1. While subregional divisions are somewhat arbitrary, those used here correspond roughly to previously published divisions, existing transportation corridors, and commuting patterns (see Commonwealth of Massachusetts, *Choosing to Compete*, 1993).

2. The five-year period is measured from the third quarter of 1994 to the third quarter of 1999 using the Division of Employment and Training's ES-202 data. All wage data are also calculated from ES-202 data.

3. Division of Employment and Training, *The Massachusetts Job Outlook Through 2006*. Boston, 1998.

4. David Terkla, "The Importance of Manufacturing in Boston," Greater Boston Manufacturing Partnership, 1999.

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# S T R E E T

## Signs

*Numbers reveal that manufacturing labor has given way to service jobs in recent decades. But who among us has this trend affected directly?*

A recent UMass Poll asked 400 registered voters to comment on the changing nature of work in their lives and in the lives of their parents. Twenty-six percent reported having worked in factories at some point, a number that was constant for all age groups. When asked if their parents had worked in factories, however, 44 percent of those over 45 responded affirmatively, compared to only 29 percent of those younger.

Educational differences arose as an indicator of tendencies toward manufacturing employment. When looking at respondents without college degrees, 38 percent have worked in factories, and 40 percent reported that at least one of their parents had done manufacturing work. When considering college-educated respondents, only 14 percent worked in factories, while 35 percent reported that at least one parent had done manufacturing work.



Gender, as well, conforms to popular images: 34 percent of men and 18 percent of women respondents have worked in factories. Among those who are not college graduates, 50 percent of the men and 28 percent of the women have had factory jobs. For college graduates, these numbers drop to 21 percent and 6 percent, respectively.

This poll does *not* address the new economy's so-called white collar factory jobs, such as telemarketing. These jobs, with their repetition and movement restrictions, compare to assembly-line jobs of yesteryear. They are considered service jobs, rather than manufacturing, however, for the purposes of analysis.

Through the prism of this poll, education—though not a sole factor—is a telling sign of class structure in the Massachusetts economy.

## *New England Economic Project Consults Its Crystal Ball*

*For more than 25 years, the nonprofit New England Economic Project (NEEP) has sponsored the development of economic analyses and forecasts for the six New England states. The most recent economic forecast for Massachusetts was presented at the organization's Economic Outlook conference on October 31.*

**A**ccording to NEEP's most recent forecast, the overall outlook for the Massachusetts economy is for continued growth—but not at the rates to which we've become accustomed. Real gross state product (GSP), the most comprehensive measure of the state's economic performance, is forecast to grow at an annual rate of around 3.0 percent annually over the next few years. This is in contrast to growth above 4.0 percent in recent years.

As GSP growth moderates, so will other measures of state economic performance. Employment is expected to continue growing at annual rates below 1 percent, compared to more than 2 percent annually in recent years. The unemployment rate is expected to rise modestly while remaining well below the national rate. Real personal income in the state will continue to grow, but at annual rates just below 3 percent. This is in contrast to growth rates over 5 percent in recent years.

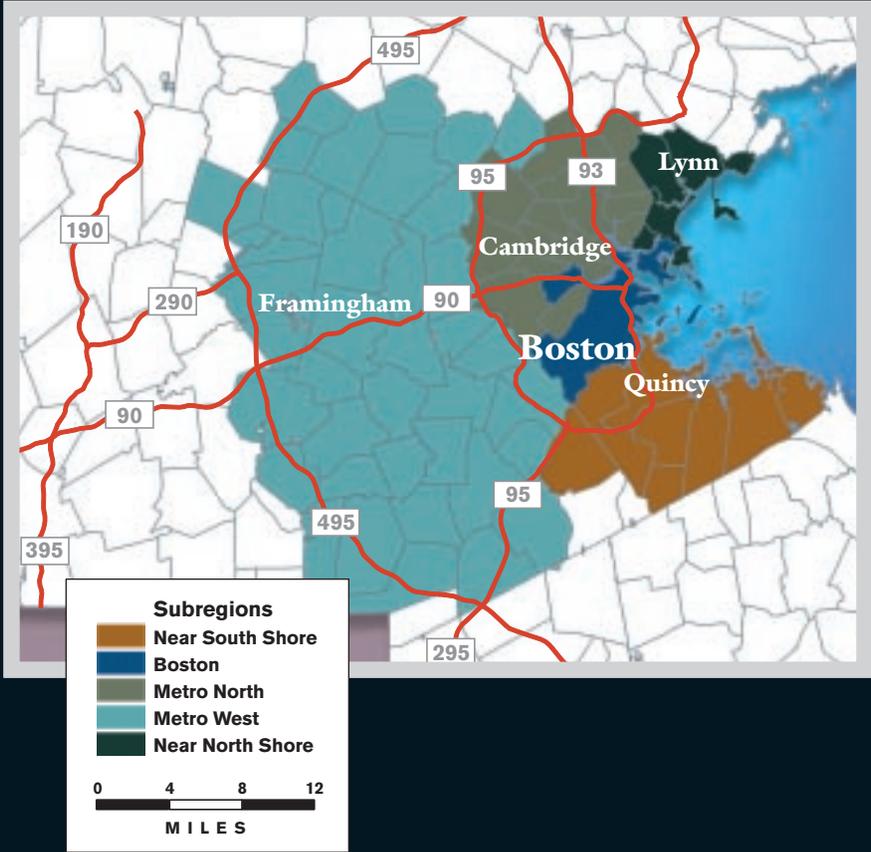
Driven by faster-than-national personal income growth, as well as a very hot housing market, the rate of inflation in consumer prices is expected to remain around one percent-

age point above the national rate. While the nation is expected to experience consumer inflation in the range of 2 percent to 2.5 percent per year, the Boston CPI is expected to come in at around 3.5 percent annually.

A recurring theme during the latter stages of this expansion has been the tightness of the state's labor markets. Growth in employment has outstripped growth in labor force for 10 of the last 12 months and 51 of the past 66 months. In some recent months, total employment has exceeded the size of the labor force. (The gap between employment and labor force is made up by out-of-state commuting and by multiple job holdings.) The NEEP forecast expects this phenomenon to continue into the future.

The NEEP analysis warned of a number of risks confronting the Massachusetts economy. These include a stagnating or declining stock market, high or rising energy prices, a slowdown in consumer spending, and a deterioration of household balance sheets due to higher interest rates. All of these are consistent with the "soft landing" that has been anticipated—and hoped for—since the overheated late-1990s.

# Greater Boston Region



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