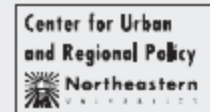


Staying Power: The Future of Manufacturing in Massachusetts

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Don Walsh
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David Streim

November 7, 2008



Manufacturing in Massachusetts: The “Conventional Wisdom”

Deindustrializing



An Industrial Dinosaur ...



“Dead as a Door Nail”



Examining the “Conventional Wisdom”

This new study of manufacturing, undertaken for the Commonwealth, is aimed at understanding:

- ❑ ***What*** Massachusetts firms still produce in the state
 - ❑ ***Where*** it is produced
 - ❑ What its **future** might be
 - ❑ The ***challenges*** it faces to sustain or expand in-state operations
 - ❑ What the state can do to ***support*** this important sector
-

Support for the New Study

- Commonwealth of Massachusetts through 2006 Economic Stimulus Funding
 - Massachusetts Manufacturing Extension Program (Mass MEP)
 - Massachusetts Alliance for Economic Development (MAED)
 - The Boston Foundation
-

Study Partners

- ❑ **Associated Industries of Massachusetts**
 - ❑ **Berkshire Chamber of Commerce**
 - ❑ **Berkshire Economic Development Council**
 - ❑ **Boston Redevelopment Authority**
 - ❑ **Boston Tooling and Machining Association**
 - ❑ **495/Metro West Corridor Partnership**
 - ❑ **Mass BioTech Council**
 - ❑ **Mass Business Roundtable**
 - ❑ **Mass Insight**
 - ❑ **Mass High Tech Council**
 - ❑ **Mass MEDIC**
 - ❑ **Mass Taxpayers Foundation**
 - ❑ **Merrimack Valley Council**
 - ❑ **Metro West Chamber of Commerce**
 - ❑ **Neponset Valley Chamber of Commerce**
 - ❑ **New England Council**
 - ❑ **Quincy 2000**
 - ❑ **Regional Employment Board of Hampden County**
 - ❑ **South Coast Development Partnership**
 - ❑ **Taunton Development Corporation**
 - ❑ **University of Massachusetts**
 - ❑ **Western Massachusetts Economic Development Council**
-

Study Components

- Analysis of **historical data** back to World War II
 - **New survey** of more than 700 manufacturing firms in the state
 - **Interviews** with the CEOs, owners, or managers of more than 100 surveyed firms
-

Massachusetts Manufacturing: An Historical Overview

From World War II to the 21st
Century



Long-Term Manufacturing Employment Trends - WWII

- Mobilization for World War II saw Massachusetts' manufacturing workforce swell from 534,000 in 1939 to **801,000** by 1943
 - Nearly **45%** of the Commonwealth's workforce was employed in manufacturing – compared to 38% of the workforce nationwide
 - Massachusetts became the true "***arsenal of democracy***"
-

Manufacturing Employment Trends: Post-WWII

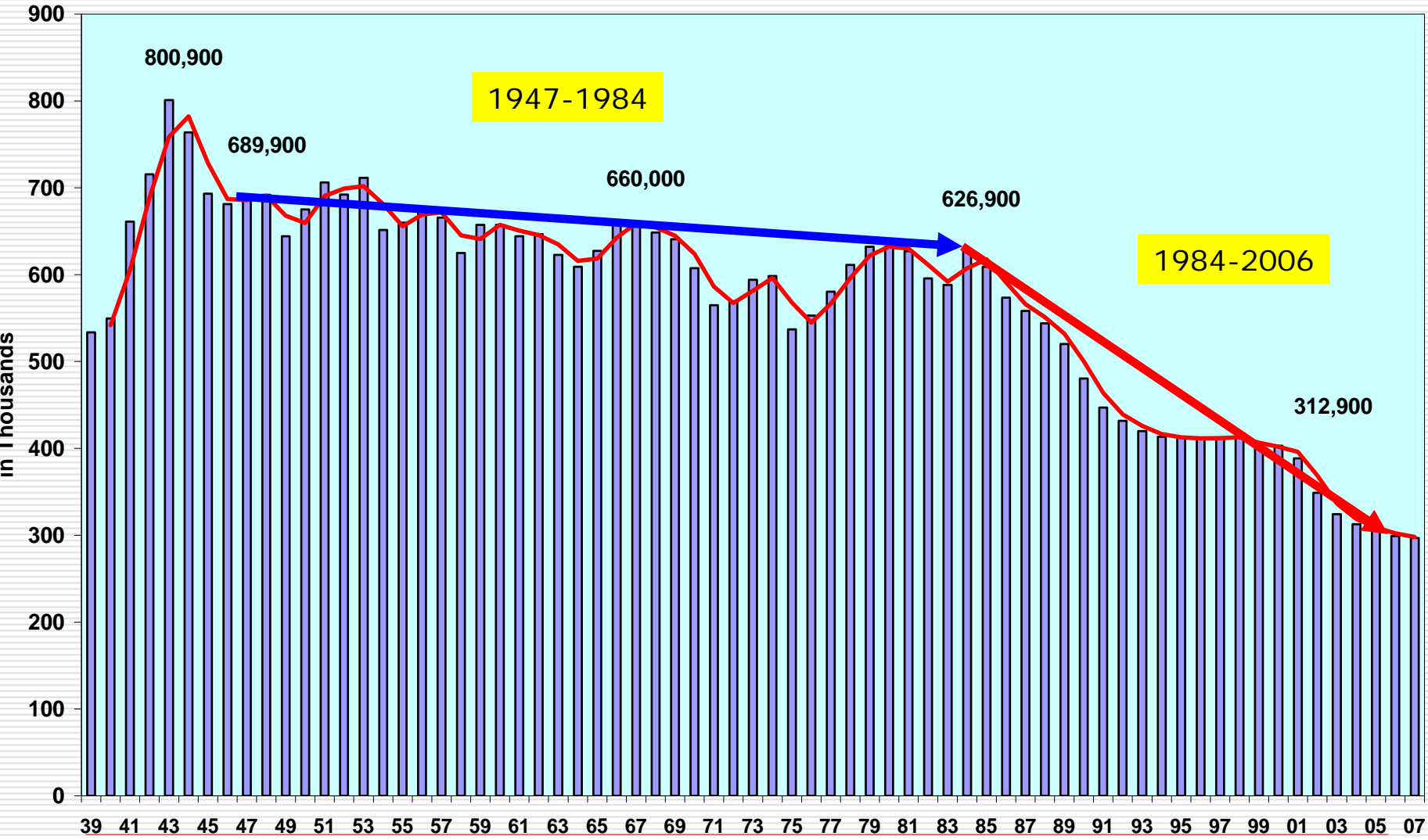
- ❑ With demobilization, the Massachusetts manufacturing workforce **shrank by more than 100,000 between 1945 and 1947.**
 - ❑ By 1967, employment was down to **660,000** – 18% below its WWII peak
 - ❑ But with the rise of the mini-computer industry led by DEC, Data General, Wang, and Prime, manufacturing employment by 1984 was still at 625,000 – the rise of Rte 128
-

Manufacturing Employment Trends: 1984 to 2006

- ❑ With the demise of the mini-computer market and growing competition for Massachusetts manufactured products, employment plummeted
 - ❑ By 2006, manufacturing employment stood at just **299,000**
 - ❑ Between 1984 and 2006, Massachusetts **lost** an average of **15,000** manufacturing jobs *each year ... and the annual **rate of decline** was nearly **twice** as large during 2000-2006 as it was between 1984 and 2000*
-

Figure 1.1

Massachusetts Manufacturing Employment (1939-2007) (with 2-Year Moving Average)



Is Massachusetts Manufacturing Destined to Disappear?

- If the 2000-2006 employment trend were to continue, **Massachusetts would see its last manufacturing job disappear before 2025.**
 - **BUT**, as our analysis will demonstrate, this conclusion is much too pessimistic
 - Indeed, there is reason to believe that the greatest loss in manufacturing employment is behind us and the **future is shaping up to be quite bright**
-

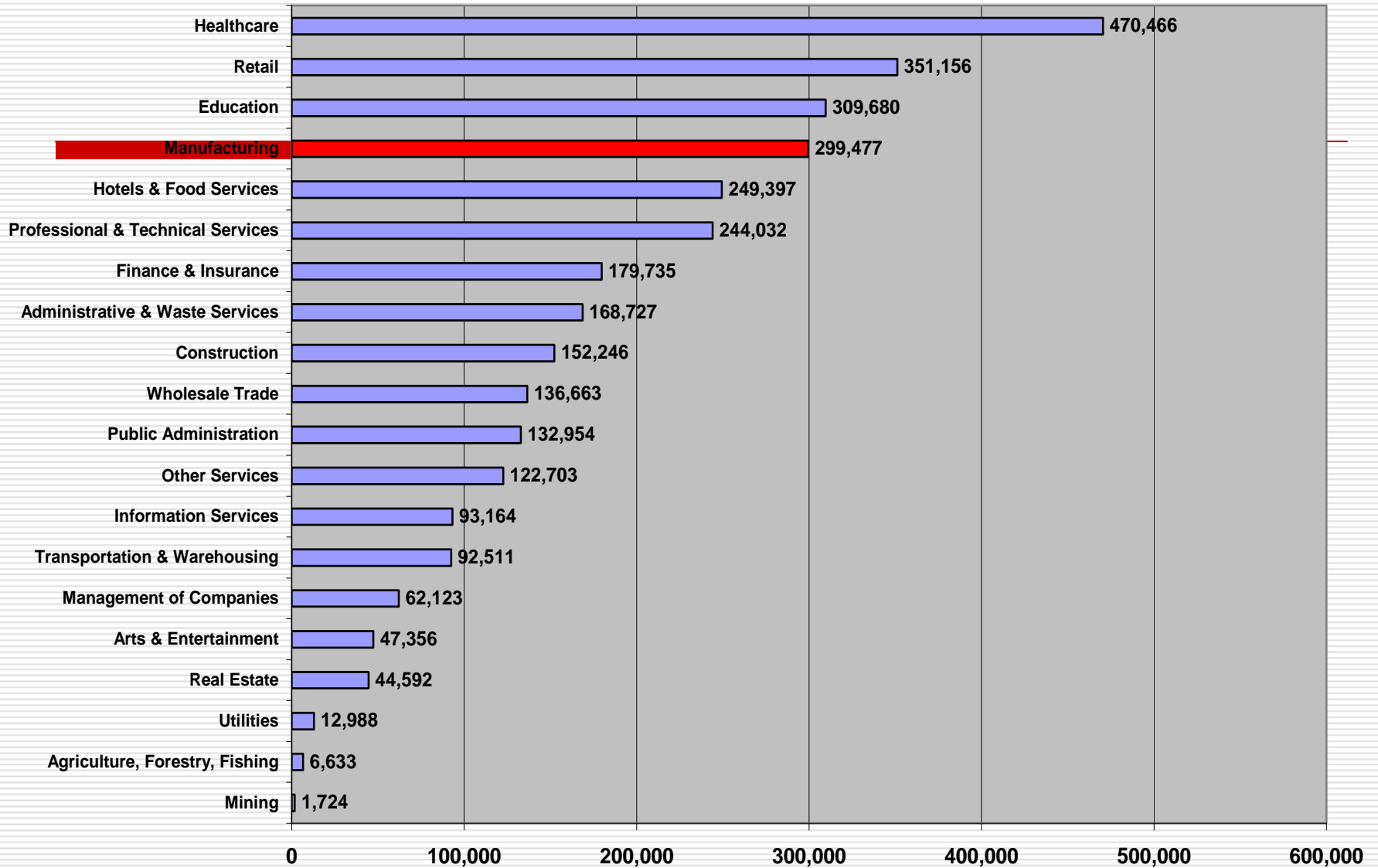
Massachusetts Manufacturing Today



Massachusetts Manufacturing: Still a Powerful Economic Sector

- ❑ **4th largest employer** in the Commonwealth
 - ❑ Only healthcare, retail trade, and education sectors employ more
 - ❑ Manufacturing employs more than all the hotels, restaurants, and bars in the state
 - ❑ It employs **50,000 more** than all professional & technical service industries
 - ❑ It employs nearly **4X** as many as all of the state's biotechnology companies put together
 - ❑ It employs **two-thirds more** workers than all the state's banks, brokerage houses, and insurance companies combined
-

Massachusetts: Employment by Sector 2006



Massachusetts Manufacturing: Firm “Births” and “Deaths”

- While many manufacturing firms go out of business or leave the state each year, many new ones still start up or come to Massachusetts
 - Even during the devastating recession of 2000-2001, over 900 manufacturing firms were established in Massachusetts
-

Manufacturing Births vs. Deaths: 1995-2003

Year	Initial Year Establishments	Births (Adjusted)	Deaths (Adjusted)	Birth : Death Ratio
1995	9,544	584	691	0.85
1996	9,437	722	686	1.05
1997	9,473	419	876	0.48
1998	9,016	481	701	0.69
1999	8,796	523	646	0.81
2000	8,673	546	612	0.89
2001	8,607	454	804	0.56
2002	8,257	486	622	0.78
2003	8,121	N/A	N/A	N/A

Total '95-'03

4,215

5,638

Massachusetts Manufacturing: Top 20 Key Sectors (2006)

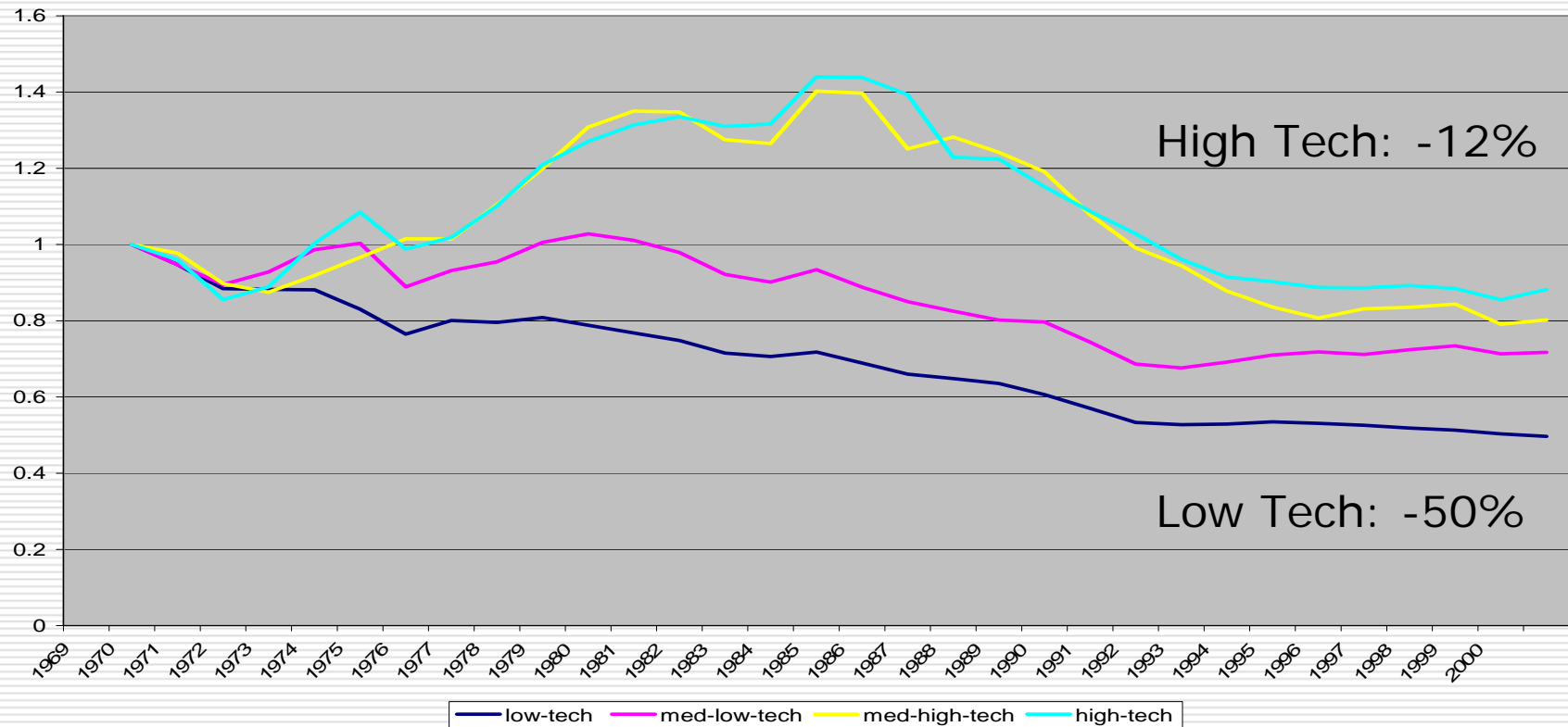
- ❑ Computer and Electronic Products
 - ❑ Navigational, Measuring, Electromedical, and Control Instruments
 - ❑ Semiconductor and Other Electronic Components
 - ❑ Other Miscellaneous Manufacturing (e.g. medical devices, jewelry, sporting goods, and toys)
 - ❑ Plastic Products
 - ❑ Printing
 - ❑ Medical Equipment
 - ❑ Communications Equipment
 - ❑ Converted Paper Products
 - ❑ Industrial Machinery
 - ❑ Machine Shop Products
 - ❑ Pharmaceuticals
 - ❑ Aerospace Parts
 - ❑ Bakery Products
 - ❑ Architectural and Structural Metal Products
 - ❑ Chemical Products and Preparations
 - ❑ Fabrics
 - ❑ Metalworking Machinery
 - ❑ Cutlery and Tools
 - ❑ Apparel
-

Massachusetts Manufacturing: Technology Intensity

- Industries categorized by “technology intensity” based on the ratio of R&D expenditure to value-added in an industry and the technology embodied in an industry’s purchase of intermediate and capital goods
 - Technology intensity taxonomy developed by the Organization for Economic Cooperation and Development (OECD)
-

Massachusetts Manufacturing: Low Tech to High Tech (1969=1.0)

Massachusetts Manufacturing Employment 1969-2000 by Sector (1969=1.00)



The Big Surprise: Massachusetts Manufacturing: Rising Real Output/Larger Share of GSP

- ❑ Falling employment levels in manufacturing hide the fact that manufacturing output in the state has been rising steadily
 - ❑ **Between 1997 and 2006, the real gross state product originating in manufacturing has increased from \$25 to \$40 billion**
 - ❑ Manufacturing actually produces a larger share of total gross state product today than in 1997 ... **rising from 10.9% to 13.3%**
-

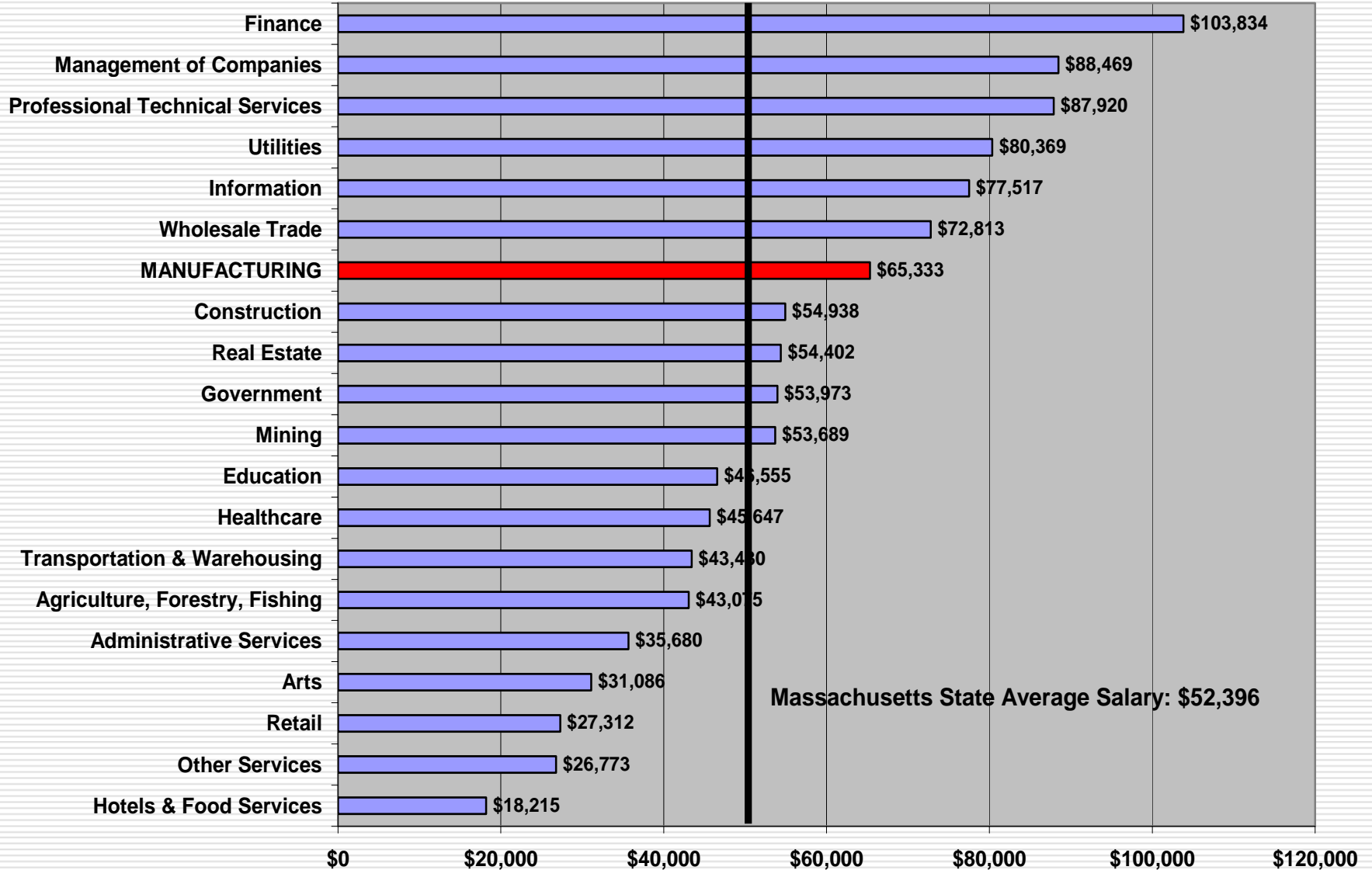
Massachusetts Manufacturing: Sharply Rising Productivity

- ❑ Employment in Massachusetts manufacturing has declined despite increased real output because of extraordinary productivity improvement
 - ❑ **Real output per worker has increased from \$60,000 in 1997 to \$133,600 in 2006**
 - ❑ Massachusetts manufacturers have increased productivity **2X** the U.S. manufacturing rate
 - ❑ This productivity growth averages **4X** productivity growth across all Massachusetts private sector industries
 - ❑ Productivity has risen sharply as the result of the shift from lower productivity industries to higher productivity industries
-

Massachusetts Manufacturing: Workforce

- ❑ On average, less formal education required in manufacturing industries
 - ❑ Despite less formal education, the **\$65,333** average annual wage in Massachusetts manufacturing is higher than the average wage in construction, real estate, government, education, and health care
 - ❑ Average Massachusetts manufacturing annual wage **25% higher** than average annual wage in the Massachusetts economy
-

Average Annual Salaries for Massachusetts Industry Sectors, 2006



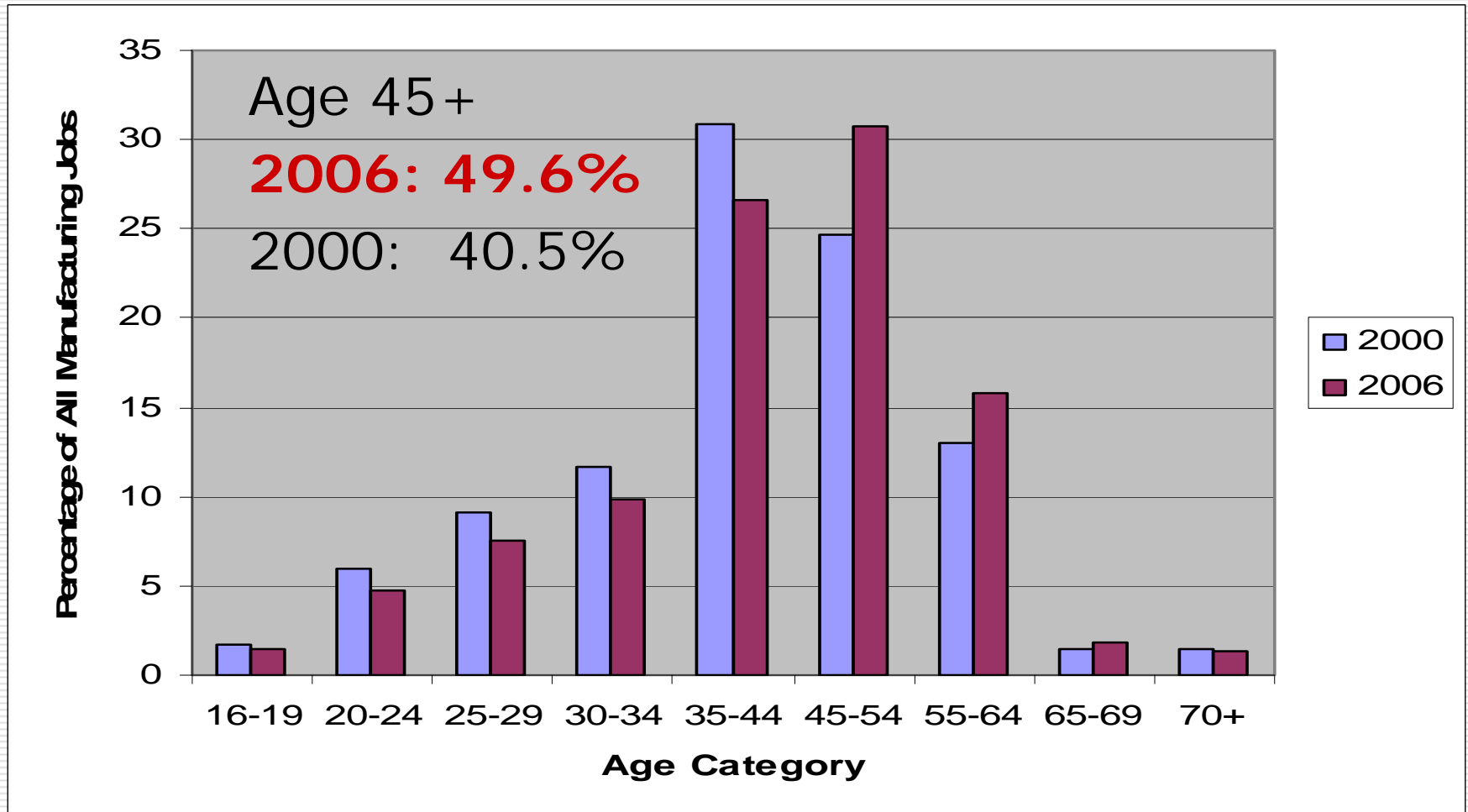
Share of Massachusetts Payroll (2006)

	Total Employment	Percent of Massachusetts Workforce	Percent of Massachusetts Total Payroll
Health Care	470,466	14.3%	13.2%
Retail Trade	351,156	10.7	3.9
Education	309,680	9.4	9.9
Manufacturing	299,477	9.1	11.5

Massachusetts Manufacturing: A Diverse Workforce

	Share of Non-Manufacturing Workforce	Share of Manufacturing Workforce
Foreign Born	15.9%	24.4%
Hispanic	5.8	8.3
Asian	4.1	6.5
African-American	4.9	3.8

Massachusetts Manufacturing: But a Rapidly Aging Workforce



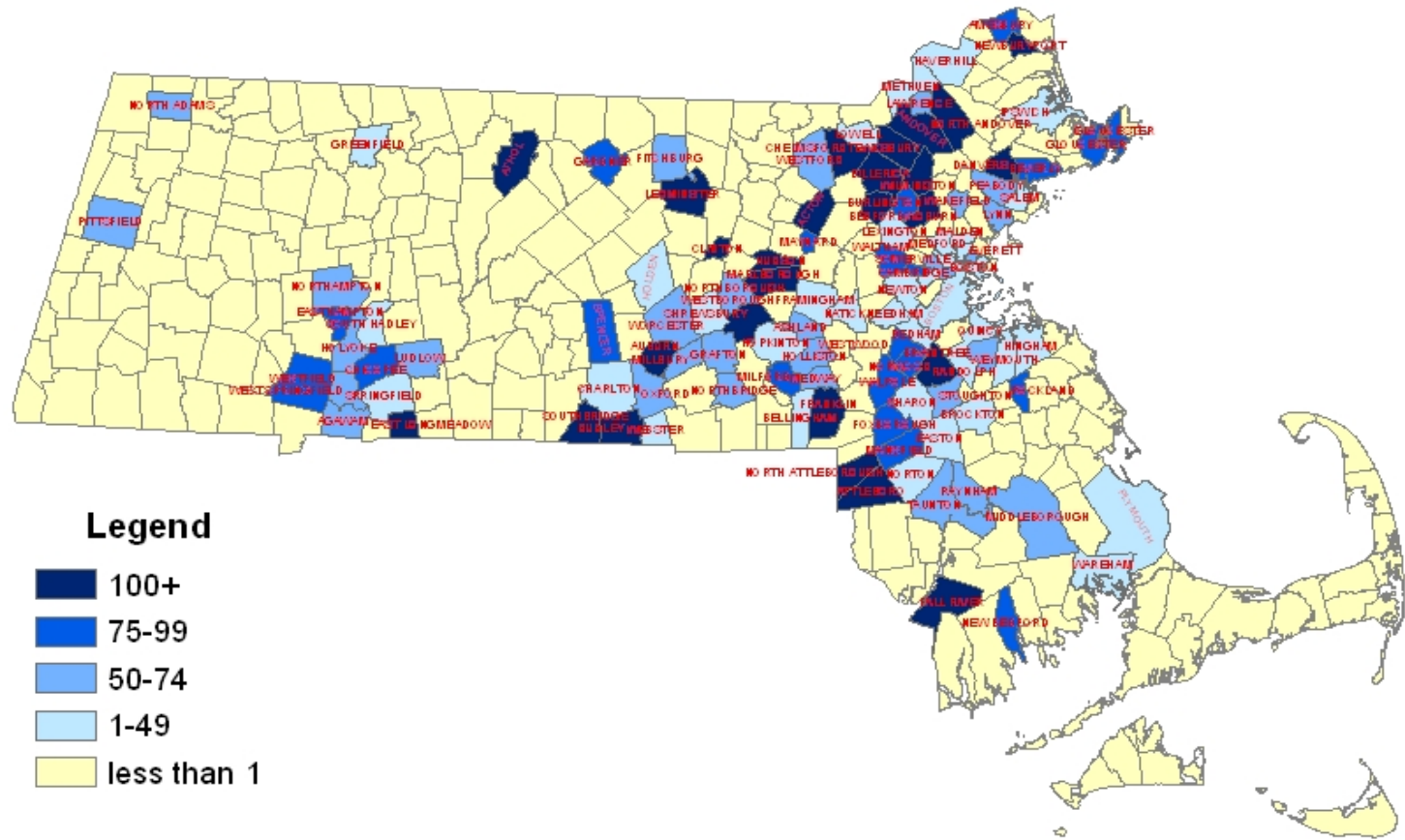
... Leading to Job Openings

- Given the likely retirement of more than 50,000 manufacturing workers over the next decade and given normal turnover of younger and prime age workers in this sector, it is likely that **100,000** or more jobs will need to be filled in this sector. A large number of these will be for production workers.
-

Massachusetts Manufacturing: Location

- ❑ Manufacturing is spread throughout the state
 - ❑ Much of it is outside of Rte 495
 - ❑ Much of it is concentrated in our Older Industrial Cities and Towns
-

Manufacturing Employment per 1,000 Residents



Legend

- 100+
- 75-99
- 50-74
- 1-49
- less than 1

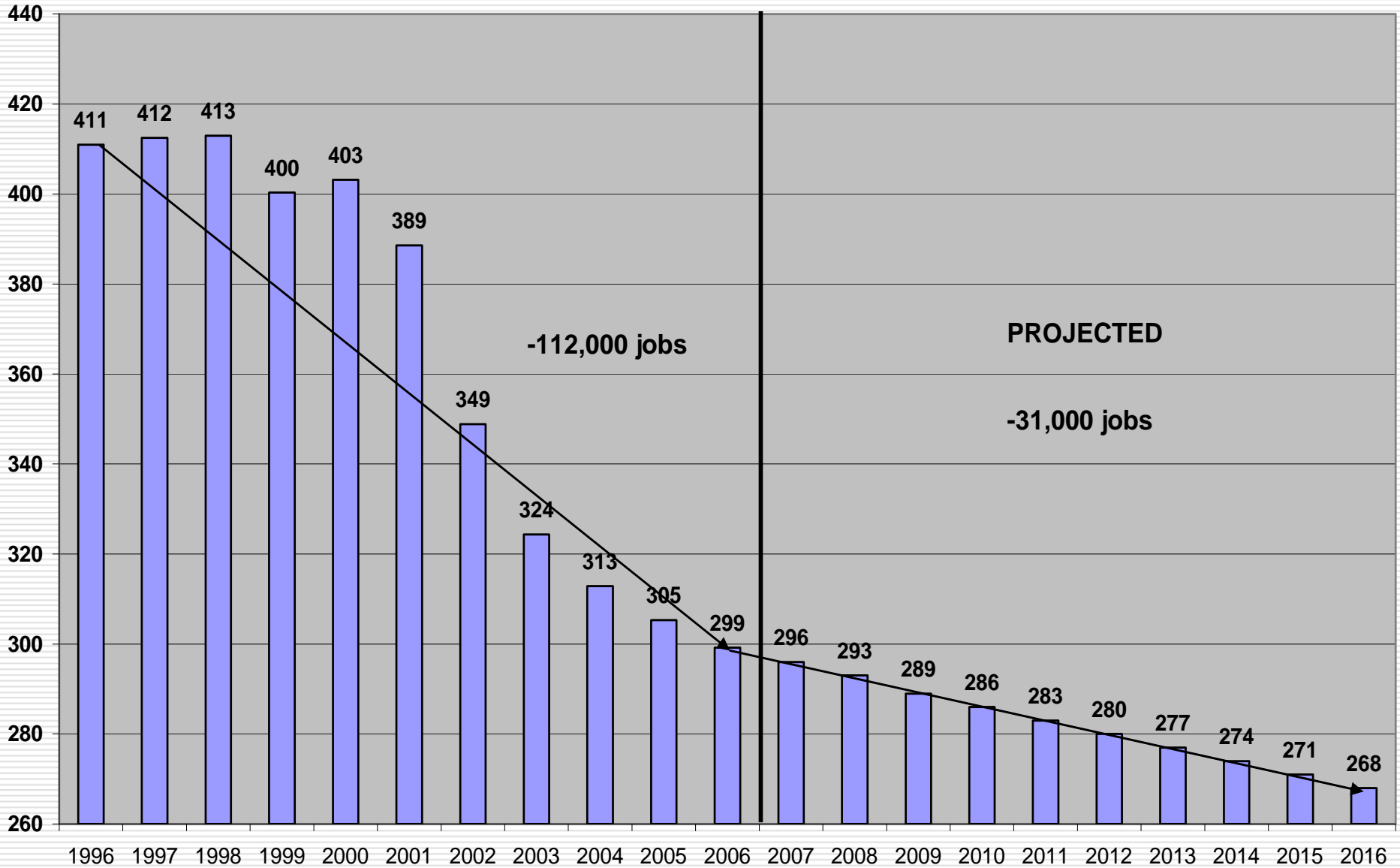
Source: 2002 Economic Census

Massachusetts Manufacturing: Employment Forecast

- ❑ Forecast employment to 2016 based on a “shift share” analysis of Massachusetts using 4-digit NAICS code industries
 - ❑ Use BLS national estimates of employment change for each 4-digit NAICS industry
 - ❑ **2016 Forecast: Employment no less than 268,000 – 90% of current level**
 - ❑ Total 10 year loss forecast: 31,000 jobs (vs. 112,000 over past 10 years)
 - ❑ Loss due primarily to continuing rapid increase in productivity
-

Projected Massachusetts Manufacturing Employment (1996-2016)

(in 000s)



Manufacturing Losses since 2006

- Between January 2006 and May 2008, manufacturing employment in Massachusetts has declined by 9,600 or 3.2%
 - This is almost perfectly in line with the modest losses we projected based on data through 2006, despite the rapidly weakening national economy
 - The Massachusetts loss is smaller than the 4.5% loss in manufacturing jobs nationwide
-

Massachusetts Manufacturing: Projected Employment Losses by Sector based on National Forecasts

□ Cut and sewn apparel	-58%
□ Fabric finishing mills	-40%
□ Leather products	-40%
□ Computers & peripherals	-34%
□ Fabric mills	-32%
□ Pulp & paper mills	-31%
□ Non-ferrous metals	-31%

Massachusetts Manufacturing: Projected Employment Gains by Sector based on National Forecasts

❑ Pharmaceuticals	+ 24%
❑ Cement & concrete products	+ 7%
❑ Aerospace products & parts	+ 5%
❑ Architectural & structural metals	+ 5%
❑ Other food manufacturing	+ 2%
❑ Medical Equipment & Supplies	+ 1%

Massachusetts Manufacturing Employment may be even **Stronger?**

- Even with current near recession national conditions, the May 2008 Massachusetts manufacturing level was in line with this forecasted loss
 - **Declining value of the U.S. dollar** may enhance domestic manufacturing
 - **Productivity growth could slow** from its blistering pace, reducing job displacement
-

The CURP Survey

Is there any corroborating evidence for this optimistic forecast?

New evidence concerning the viability of manufacturing in Massachusetts

CURP Survey Sample

- Use InfoUSA.com commercial database to identify the population of Massachusetts manufacturers
 - **9,630** manufacturing establishments
 - Mailed survey to all 9,630 establishments
 - 870 returned undelivered
 - Received **706** survey responses out of a total of 8,670
 - Sample was roughly representative of all manufacturers by industry, size, sales, and Massachusetts location.
-

CURP Interviews

- ❑ Working with the state's leading economic development organizations, identified 104 firms for follow-up interviews
 - ❑ Interviews conducted with CEOs, owner-operators, vice-presidents for manufacturing operations, human resource personnel, or public relations associates
 - ❑ Questions similar to survey, but face-to-face interviews permitted deeper elaboration
-

What Manufacturers tell us about their Companies

Products, Sales, Geographic Dispersion,
Suppliers, Customers, Competitors,
Ownership, Manufacturing Processes,
Workforce, Wages

Examples of Massachusetts Manufactured Products – **High Technology**

- Aerospace components
 - Printed circuit boards
 - Bio-surgery products
 - Fiber-optic components
 - Infrared sensors
 - Optical safety lens
 - Radar equipment
-

Examples of Massachusetts Manufactured Products – **Medium-High Technology**

- Ceramic components
 - Machine tools
 - Electrical & electronic switches
 - High voltage cable assemblies
 - Specialty chemicals
 - Electrical marine supplies
 - Oil-water separators
 - Robotic systems for welding
-

Examples of Massachusetts Manufactured Products – **Medium-Low Technology**

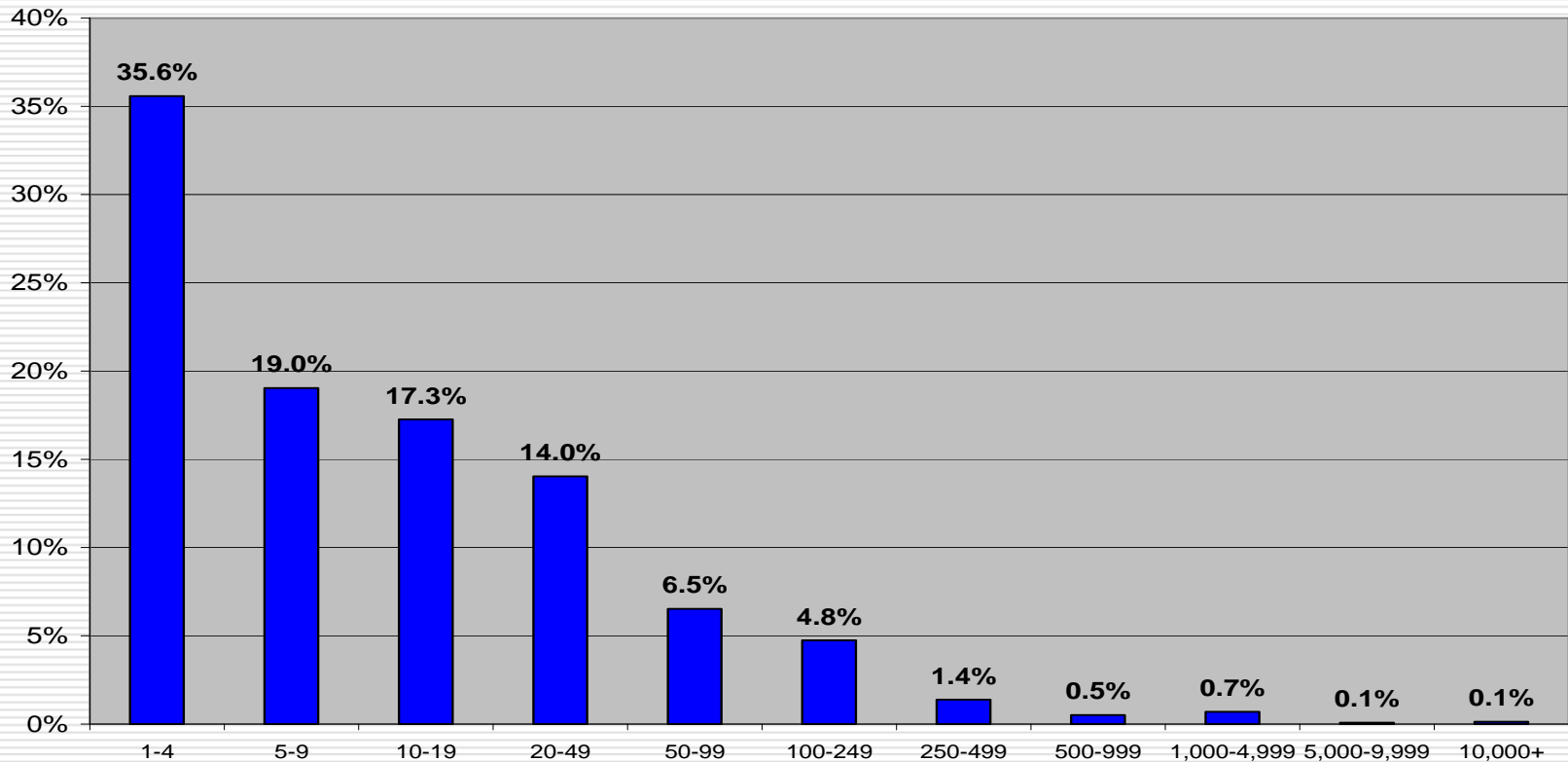
- Bearings
 - Construction castings
 - Fabricated metal parts
 - HVAC duct work
 - Decorative glass
 - Band saw blades
 - Floor tiles
 - Lighting fixture
 - Plastic food wrap
 - Sailboats
 - Snow shovels
-

Examples of Massachusetts Manufactured Products – **Low Technology**

- Stacked heels for shoes & boots
 - Offset printing
 - Gaskets & gears
 - Cannoli shells
 - Beer
 - Frozen seafood
 - Frozen desserts
 - Dried cranberries
-

Size of Massachusetts Manufacturing Firm by Employment

Manufacturing Firm Size by Employment Level (Database)



Share of Massachusetts Manufacturing Employment by Size of Firm

Size of Firm (Employees)	Share of Manufacturing Firms	Share of Total Manufacturing Workforce
1-4	35%	1.9%
5-19	36%	8.7%
20-99	21%	21.1%
100-499	7%	32.9%
500+	1%	35.4%

Location of **Primary Suppliers** to Massachusetts Manufacturers

Region	All Firms	0-19 Employees	20-100 Employees	101+ Employees
Massachusetts	43%	49%	39%	26%
Other U.S. States	49%	45%	51%	57%
Foreign Country	9%	6%	10%	17%
	100%	100%	100%	100%

Location of **Primary Customers** of Massachusetts Manufacturers

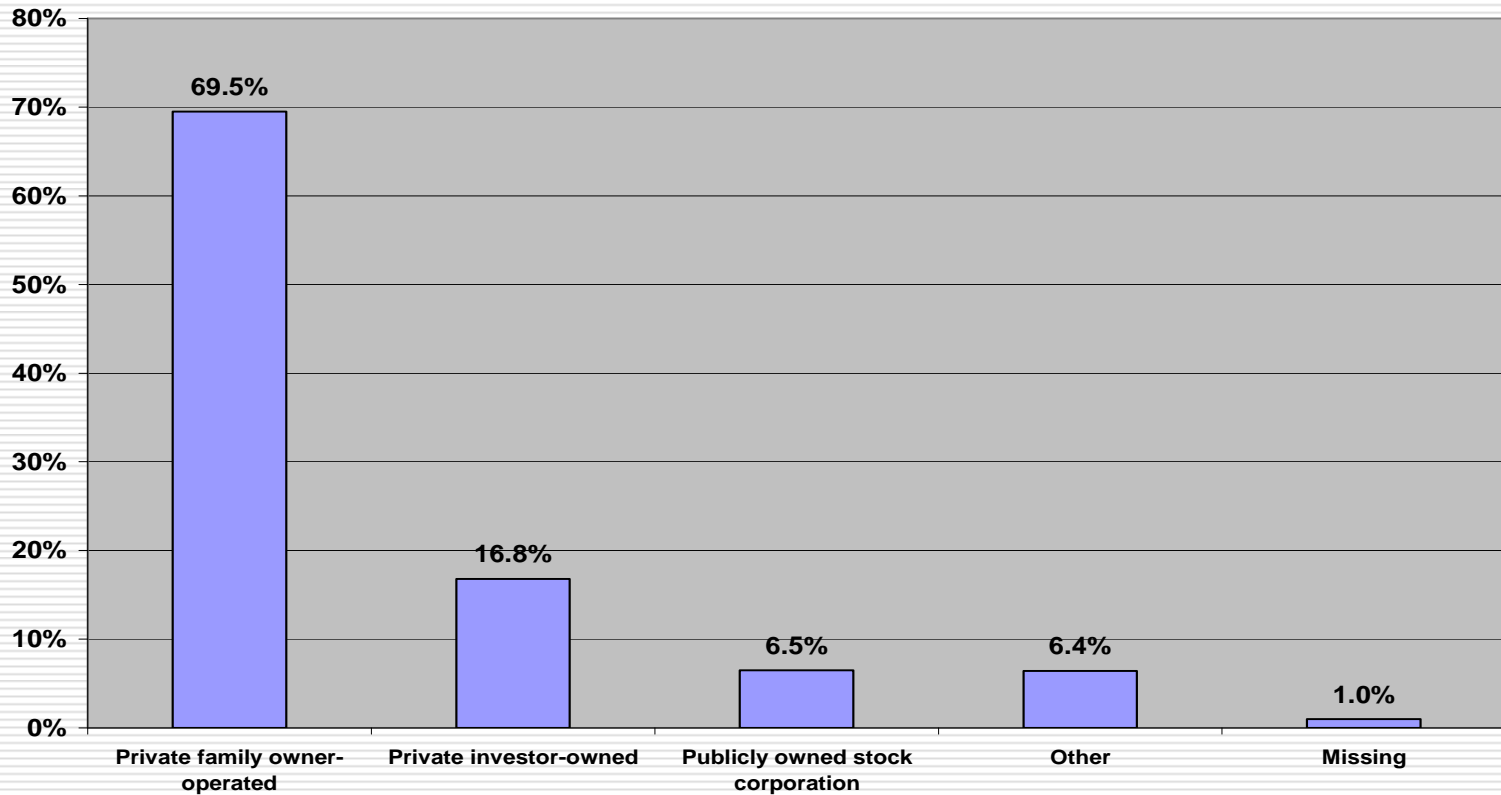
Region	All Firms	0-19 Employees	20-100 Employees	101+ Employees
Same region in Massachusetts	32%	44%	22%	8%
Massachusetts	13%	14%	13%	6%
New England or New York	16%	14%	19%	13%
Other U.S. States	29%	22%	34%	52%
Foreign Country	11%	7%	13%	21%
	100%	100%	100%	

Reasons Customers buy from Massachusetts Manufacturers

	All Firms	0-19 Employees	20-100 Employees	101+ Employees
Quality of Product	41%	40%	40%	44%
Service	32%	33%	32%	24%
Price	28%	29%	25%	25%
Location	8%	10%	5%	4%
Other	8%	7%	8%	11%

Ownership Structure of Massachusetts Manufacturers

Ownership Structure of Massachusetts Manufacturers



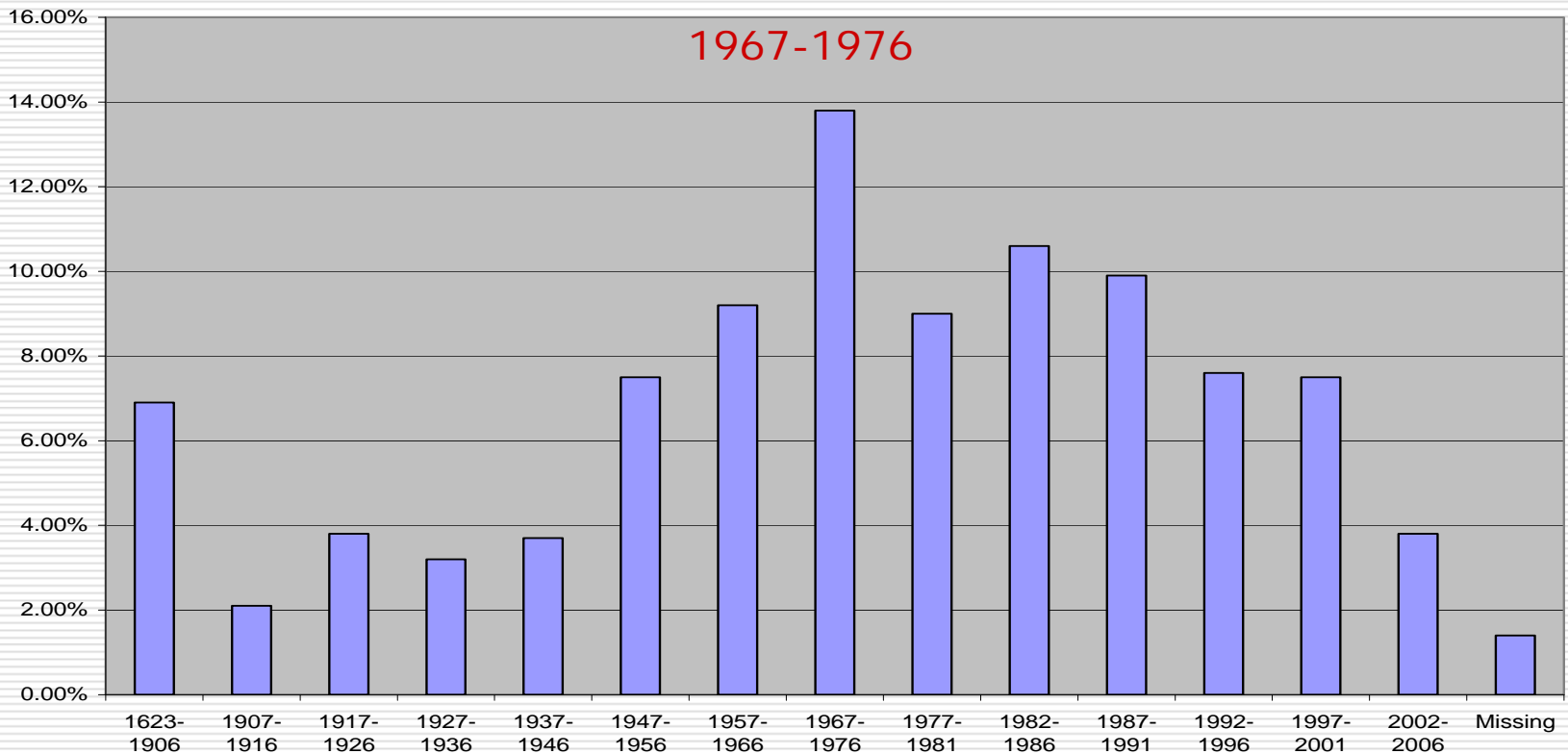
Ownership Structure of Massachusetts Manufacturers by Size of Firm

	All Firms	0-19 Employees	20-100 Employees	101+ Employees
Private family-owned	70%	79%	69%	38%
Private investor-owned	17%	13%	21%	20%
Publicly-owned stock corporation	7%	0.6%	5%	35%
Other	7%	8%	5%	7%

- Even among firms with 100+ employees, nearly 60% are family-owned or private investor-owned
-

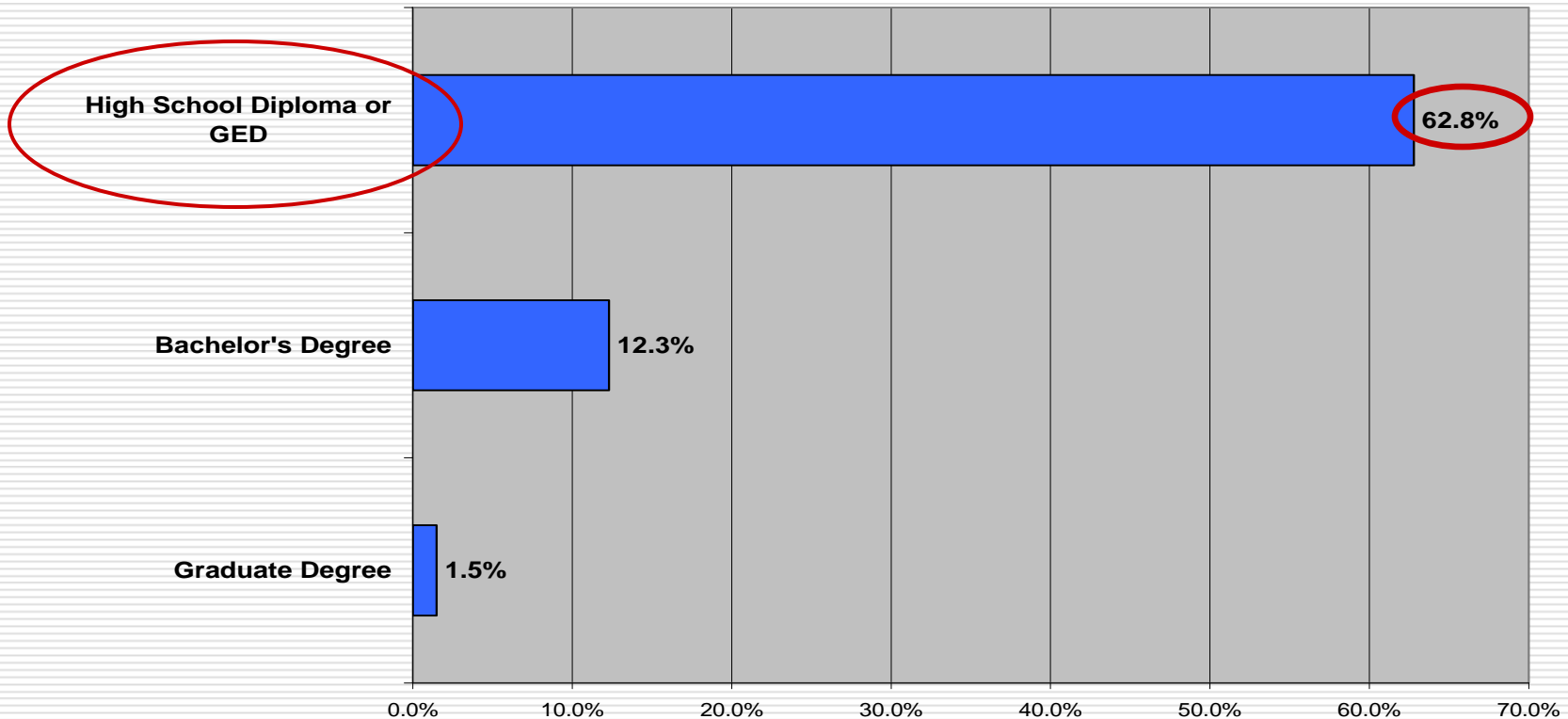
Massachusetts Manufacturers: Year Company Founded

Year Company Founded; Source-CURP Survey



Massachusetts Manufacturers: Workforce Education Requirements

Percentage of Firms Reporting that a Majority or more of their Jobs
Require Stated Amount of Formal Education



Massachusetts Manufacturers: Hourly Wage for **Unskilled** Production Workers

Average Hourly Wage	Percent of Firms
\$8.00-\$10.00	30%
\$10.01-\$12.00	27%
\$12.01-\$14.00	17%
\$14.01-\$16.00	14%
\$16.01+	13%
Mean	\$12.81
Median	\$12.00

Massachusetts Manufacturers: Hourly Wage for **Skilled** Production Workers

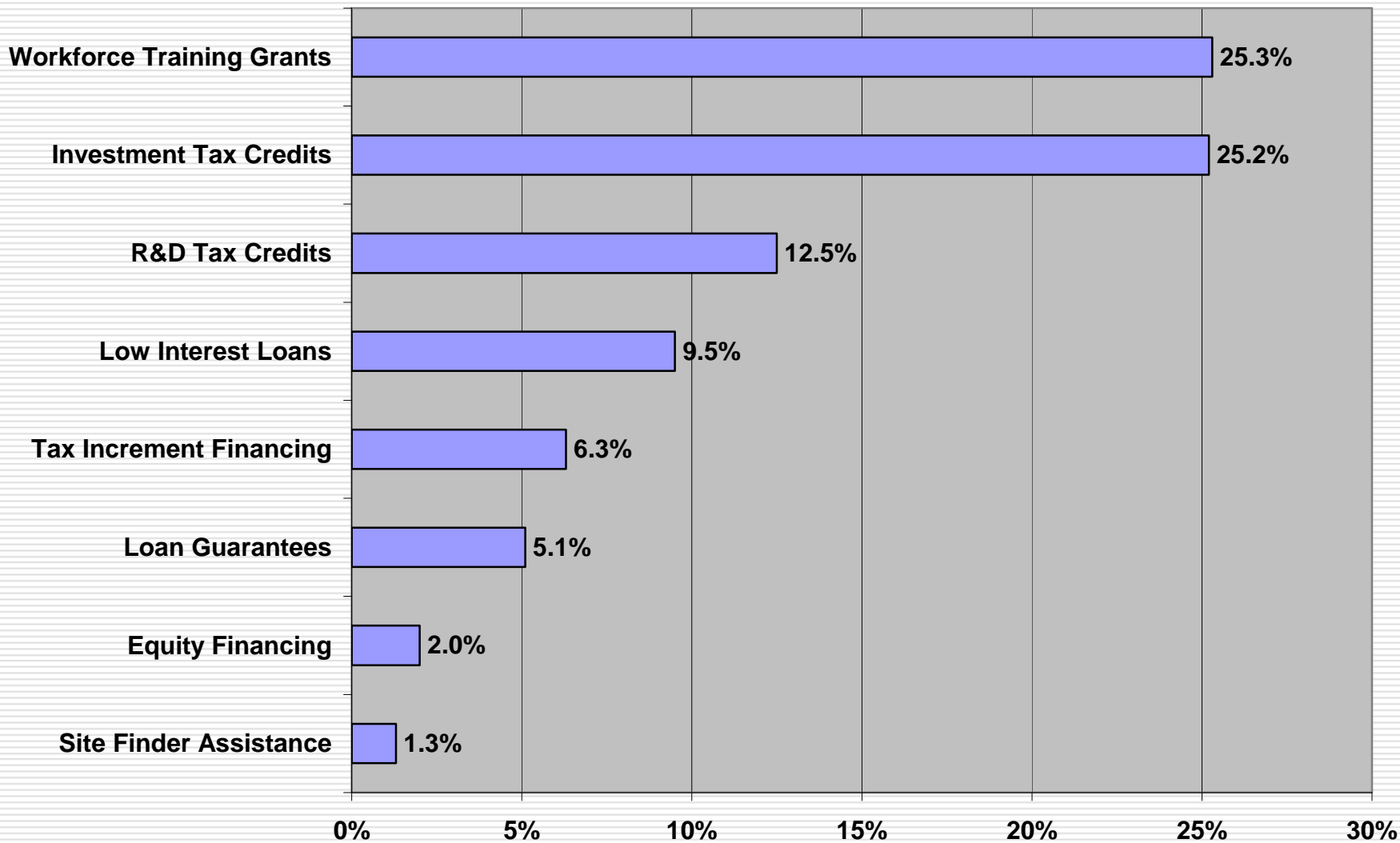
Average Hourly Wage	Percent of Firms
\$8.00-\$14.00	13%
\$14.01-\$18.00	29%
\$18.01-\$22.00	31%
\$22.01-\$30.00	22%
\$30.01+	5%
Mean	\$20.48
Median	\$20.00

Why have Manufacturers Stayed in Massachusetts?

Reasons for Staying in Massachusetts

<i>Reason</i>	<i>Number of Firms</i>	<i>Percent of Firms</i>
Strong work ethic in workforce	347	49.2
Inertia (too hard to relocate)	345	48.9
Proximity to customers	260	36.8
Availability of appropriate skilled labor	258	36.5
Availability of reasonably priced labor	258	36.5
Quality of life (e.g. public schools, recreation, and cultural institutions)	249	35.3
Monetary or in-kind incentives from state, local governments or quasi-publics	221	31.3
Availability of reasonably priced land for expansion	219	31.0
Accessibility to transportation for shipping and commuting (e.g. highways, airports, rail, seaport)	216	30.6
Proximity to key suppliers	148	21.0
Proximity to professional or research support services	74	10.5
Proximity to universities and colleges	71	10.1
Critical mass of similar firms in region	66	9.3
Proximity to European markets	37	5.2

Percent of Firms Using State or Local Incentive Programs

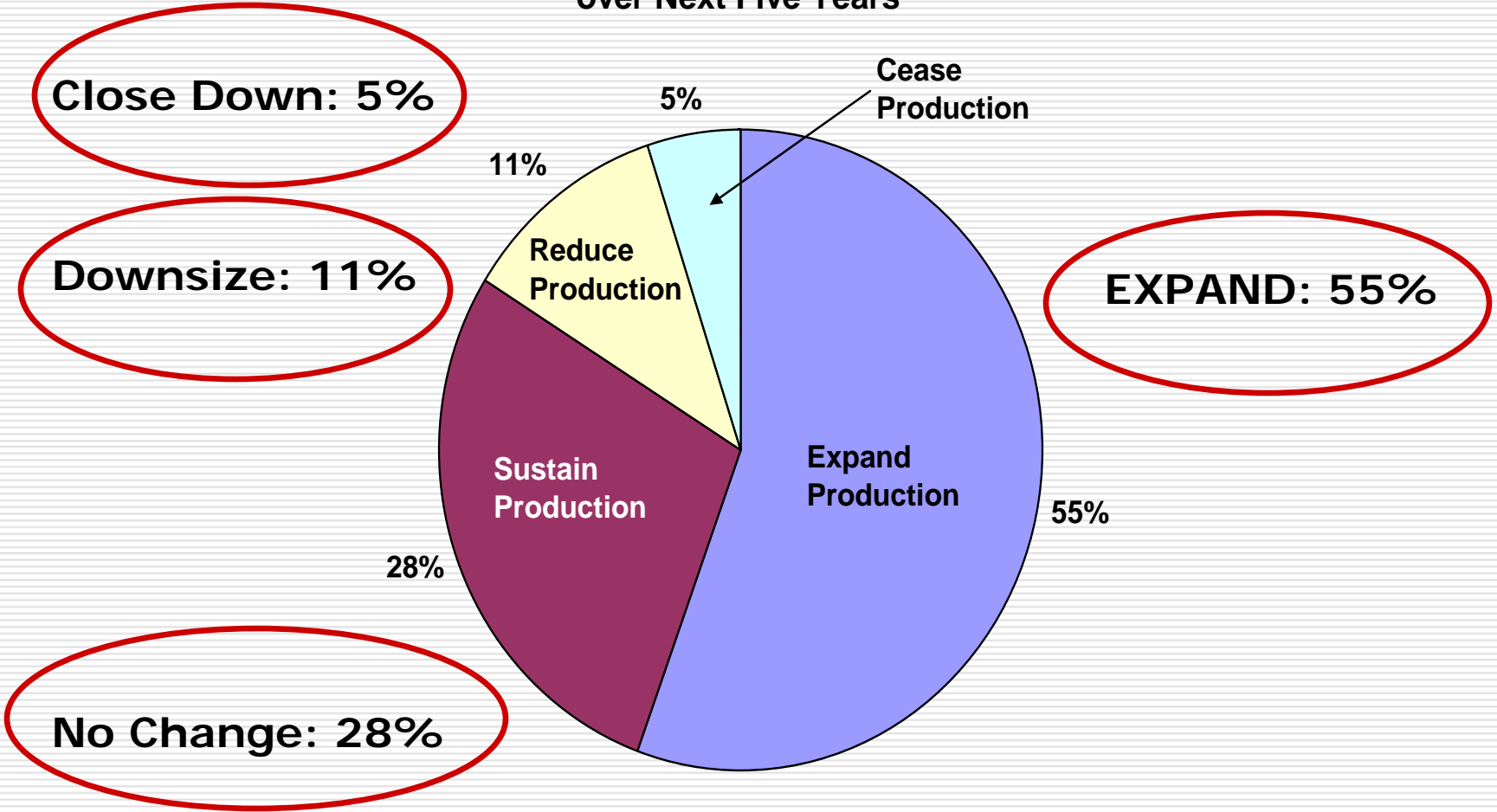


Manufacturers' Expansion Plans

Expanding Production?

Expanding Employment?

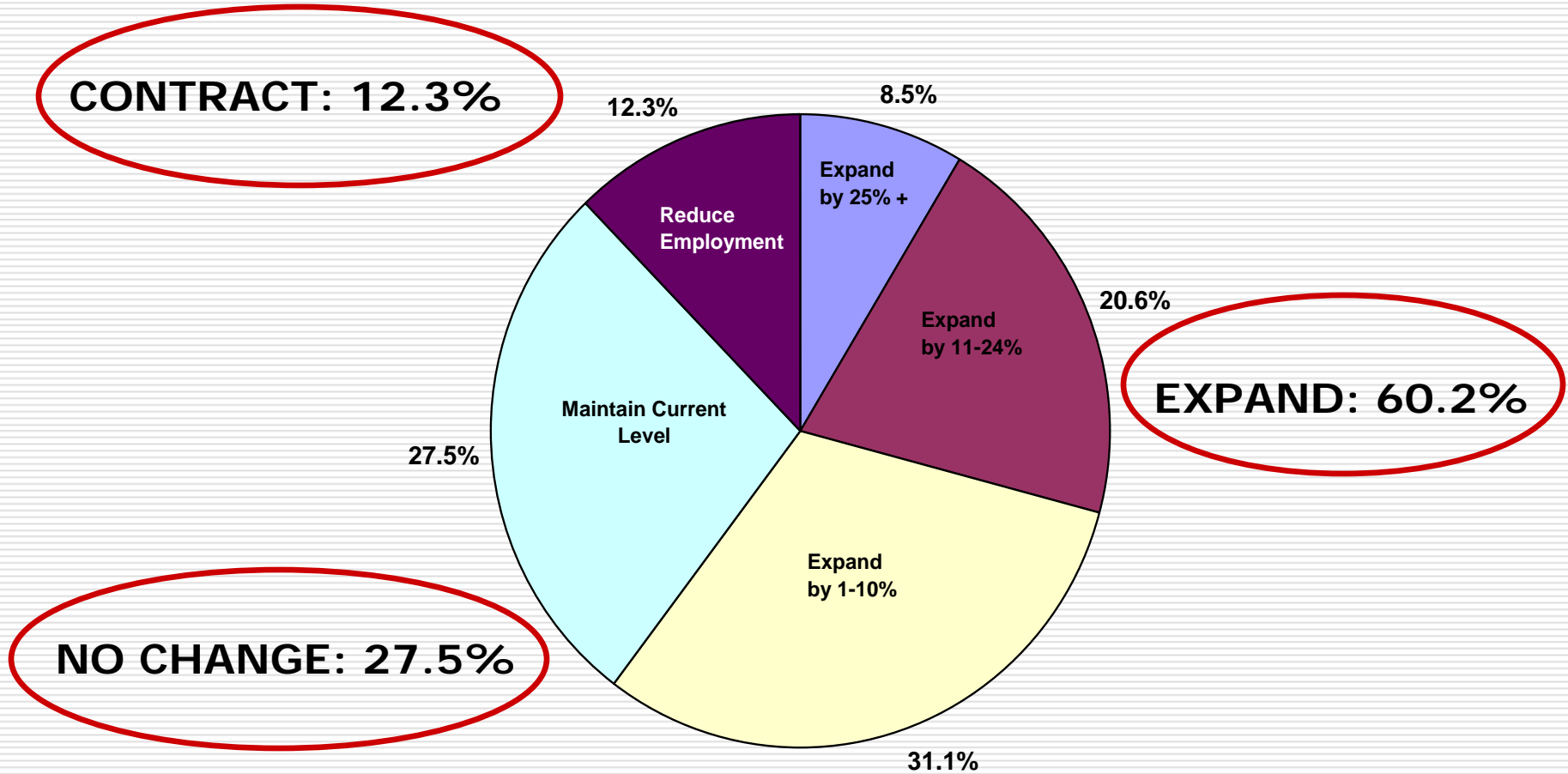
**Expected Production Levels in Massachusetts
over Next Five Years**



Expected Production Levels over the next Five Years

	All Firms	0-19 Employees	20-100 Employees	101+ Employees
Expand Production	55%	47%	67%	65%
Sustain Production	28%	33%	22%	20%
Reduce Production	11%	13%	8%	15%
Cease Production	5%	7%	3%	0%

5 Year Employment Projections



Challenges Facing Massachusetts Manufacturers

Assuring that manufacturing remains a strong economic sector in the Commonwealth depends on taking action to meet a number of key challenges

What our Survey showed

What the Interviews told us

Challenges

- ❑ High Cost of Health Insurance
 - ❑ High Cost of Workers' Compensation
 - ❑ High Taxes
 - ❑ High Energy Costs
 - ❑ High Labor Costs
 - ❑ Environmental Regulations
 - ❑ Zoning and Building Code Regulations
 - ❑ Inadequate Supply of Appropriately Skilled Labor
-

What's Not a Challenge?

- Massachusetts weather and climate
 - Trade unions
 - Transportation and infrastructure
 - Ability to import skilled labor
-

The Recruitment Challenge

- ❑ The manufacturing workforce is aging rapidly
 - ❑ Replacing retirees will be a major challenge for many manufacturers
 - ❑ This is especially true of **skilled craftsmen** ... even more difficult to recruit than scientific R&D workers
 - ❑ Recruiting **entry level workers** as hard as recruiting middle managers
-

The Difficulty in Recruiting Labor for Massachusetts Manufacturers

Type of Employee	Percent of reporting "Extremely Difficult"	Percent of reporting "Difficult"	Percent reporting "Difficult" or "Extremely Difficult"
Executive Management	15%	24%	39%
Middle Management	8%	20%	28%
Scientific/R.&D	25%	28%	53%
Skilled Craftsmen	35%	32%	67%
Entry Level	7%	20%	27%

How Can Government Help?

20 Most Important Actions Government can take to Assist Manufacturing in Massachusetts: **TOP 10**

% of Surveyed Firms

-
- Reduce Cost of **Health Insurance** 92%
 - Reduce Workers' Comp Costs 78%
 - Ensure **Lower Cost Energy** 75%
 - Reduce Unemployment Comp Costs 74%
 - More **Business-Friendly State Gov't** 72%
 - Reduce State Income & Sales Tax 68%
 - Reduce Local Property Tax 63%
 - More Business-Friendly Local Gov't 62%
 - Improve **Vocational Schools** 49%
 - Streamline State & Local Regulations 47%
-

20 Most Important Actions Government can take to Assist Manufacturing in Massachusetts: **NEXT 10**

% of Surveyed Firms

-
- | | |
|---|-----|
| <input type="checkbox"/> Provide Access to Capital | 43% |
| <input type="checkbox"/> Connect Community Colleges to MFG | 42% |
| <input type="checkbox"/> Improve K-12 Education | 42% |
| <input type="checkbox"/> Promote Emerging Technologies | 37% |
| <input type="checkbox"/> Improve Workforce Training Programs | 33% |
| <input type="checkbox"/> Expand & Improve Higher Education | 33% |
| <input type="checkbox"/> Promote Exports | 32% |
| <input type="checkbox"/> Reduce Crime in Local Communities | 32% |
| <input type="checkbox"/> Expand Supply of Worker Housing | 29% |
| <input type="checkbox"/> Weaken Influence of Trade Unions | 28% |
-

Manufacturers Want a Little Respect: The “**Rodney Dangerfield**” Syndrome

- In the interviews with CEOs, owners, and managers, we heard many times that the state seems to pay little respect to the manufacturing sector. **Everyone talks about biotech, nanotech, and financial services ... but this large important sector seems to be thought of as some kind of dinosaur. This must change**
 - **With little respect and little knowledge of manufacturing’s strength, few young people see a reason to train for jobs in this sector**
-

A Healthy Manufacturing Sector helps the Commonwealth deal with key challenges

- **Provides diversity** to state output so that we can better weather economic downturns
 - **Provides jobs** for many workers, particularly those who do not go on to college
 - **Provides economic vitality to older regions in the state**
-

So ...believe it or not

**Mass Manufacturing
has real Staying Power!**

