



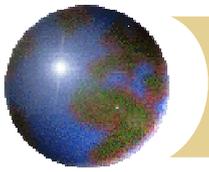
U.S. Manufacturing: The Engine for Growth in a Global Economy*

by

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Manufacturers Alliance/MAPI

Federal Reserve Bank of Chicago
Is Midwest Manufacturing at a Crossroads?
Chicago, Illinois
September 30, 2003

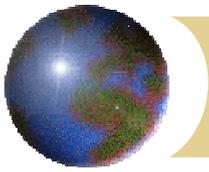
* This presentation is based on the Alliance's just-released book from Praeger Publishers, *U.S. Manufacturing: The Engine for Growth in a Global Economy*, October 2003
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Overview

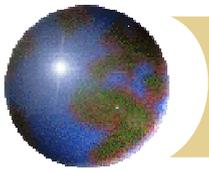
- Principal Themes

- 1. Manufacturing Is Evolving into a “Solutions-Based,” High Innovation Model
- 2. Commitment to Technology and Innovation Key to Sustaining Competitiveness and Productivity Growth
- 3. Manufacturing Sector Leading in Innovation and Productivity; Benefits Spread to Other Sectors; Manufacturing Is Engine for Growth
- 4. United States Is Ideal Platform for the Model Due to Economic, Political, Social, Cultural Structure
- 5. U.S. Manufacturers Face Growing Challenges from International Competitors and from Domestic Policy-Related Problems



Manufacturing is Broadening Value Added Beyond Products to “Solutions”

- The market for products that improve living standards will continue to grow. To meet this demand companies will have to adopt more flexible production techniques.
- Value added will move from manufacturing to activities associated with the design, engineering, marketing, and organization of products.
- The rapid development of information technology is creating a new class of products for both consumer and industrial markets.
- Better use of information radically transforms supply chains. Rather than producing products and then trying to sell them, companies are providing solutions to specific customer problems.
- The organizational change needed to take advantage of these trends is usually difficult to implement. Change needs support from cultural, social, and legal institutions—as well as strong leadership at corporate level.

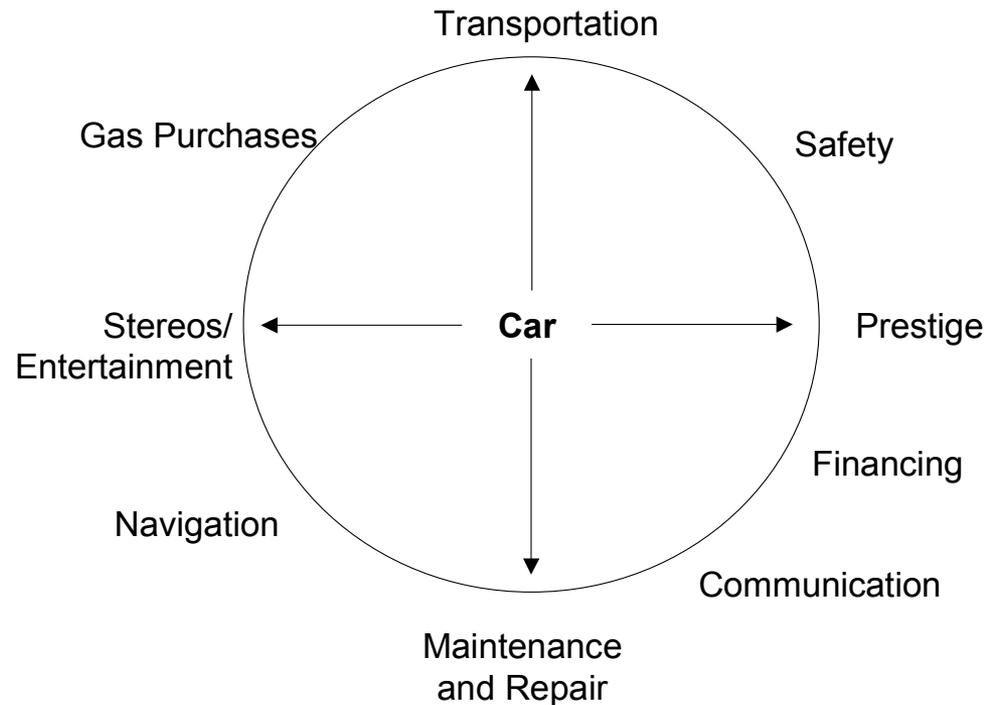


Manufacturers are becoming “solution providers”

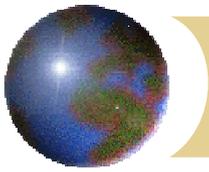
- Distinction between manufacturing & services is eroding. Much of the value added by products is in embedded or accompanying services.
- Firms add services to capture a higher proportion of the total value added and build a closer relationship with their customer. Also, service activities often provide a more stable source of revenue.
- As companies concentrate on core competencies, customers increasingly demand total solutions from their suppliers.
- For example, many capital equipment makers are providing capital asset management services:
 - Design, leasing, installation, operations;
 - Preventative maintenance, diagnostics, repair;
 - Cross-platform capabilities.



Complementary Goods and Services Associated With an Automobile

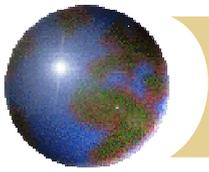


Source: Manufacturers Alliance/MAPI



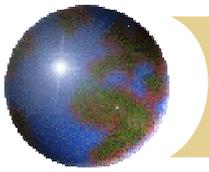
Automation Leaders Have New Opportunities To Thrive in Global Economy

- Firms maximize customer value by delivering optimized combination of: low cost, high quality, fast delivery, rapid innovation, increased flexibility, and product feasibility.
- Capital goods suppliers and automation providers will need new, advanced capabilities to design and deliver solutions tailored to their customers' strategy and tactics.
- Automating data and information flows is the main challenge for the next decade. Manufacturing firms need to get the right information, to the right person (or machine) at the right time.
- Software systems that better connect manufacturing operations with total supply chain will remain the central battleground.
- Global manufacturers will be increasingly looking for standardized solutions for operations located around the globe. Automation providers will need to be ready to respond around the globe.



Increasingly competitive environment forces firms to focus on providing customer value. Companies will use automation as part of a strategy to optimize over the following objectives:

- **Cost** – minimize the “total cost” of a good or service.
- **Quality** – enhance adherence to customer expectations.
- **Speed** – build to order, reduce delivery lead times.
- **Innovation** – shorten product cycles, increase new features for each product.
- **Flexibility** – customization, change production quickly.
- **Feasibility** – create new product concepts not possible without use of automated, connected equipment.



Manufacturing is evolving to a new species.

Lean Manufacturing

- Flow Production
- Flexible Tools
- Short Product Life
- Produce to customer demand

Mass Production

- Volume Manufacturing
- Large Buffers
- Long Throughput
- Build to forecast

Henry Ford

- Flow Production
- Dedicated Tools
- Long Product Life
- Unlimited demand, zero variety

Craft

- One-off Products
- Flexible, simple tools
- Quality through tinkering
- Build to order

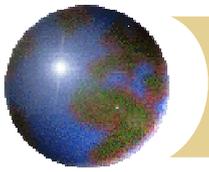
Historical
Time

1900

1945

1995





Survival Ratios for New U.S. Manufacturing Plants, 1967-1997

(Percent that survive in 5-year increments)

Number of new plants	1967	1972	1977	1982	1987	1992	1997
97,285	100	52	36	25	19	14	11
119,250		100	54	36	26	19	15
145,562			100	49	32	23	17
130,106				100	56	36	27
132,106					100	50	34
143,238						100	53



Technology Increasingly Drives Growth and U.S. Has Global Technology Lead

- Innovation has become the central pillar of long-run economic growth
- Technology improvement accounts for approximately one-third of growth in 1995-1999
- U.S. investment and R&D concentrated in manufacturing
- U.S. investment higher than foreign competitors; and more efficient
- Rate of technology change embedded in products and processes has dramatically accelerated



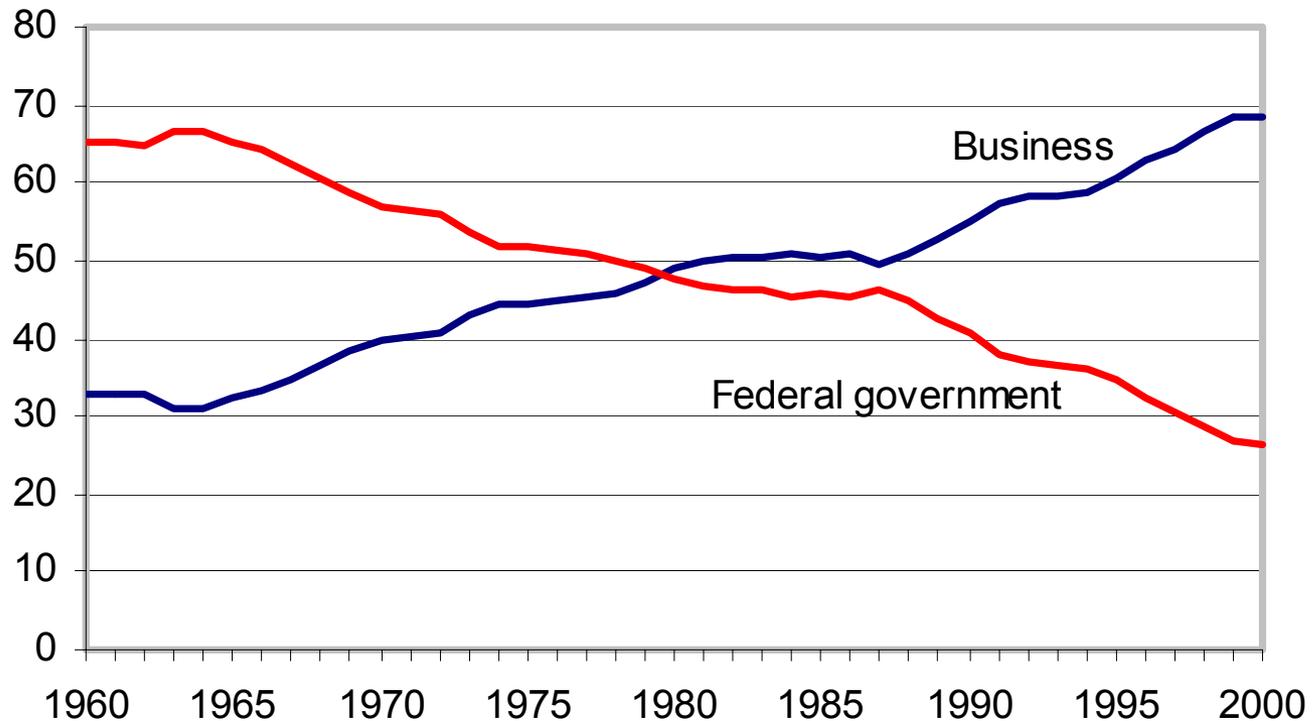
U.S. Manufacturing Is the Engine of Innovation-Led Growth

- Accounts for over 70 percent of business-sector R&D (concentrated in computer and electronic products, transportation equipment, chemicals, and industrial machinery).
- Accounts for 50 percent of technology-related royalties and license fees received from foreign companies.
- Accounts for at least 90 percent of all U.S. patent approvals.
- Accounts for 80 percent of all domestic capital goods sales (not including \$300+ billion annual sales abroad).



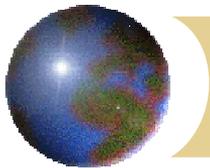
U.S. R&D Funding by Business and the Federal Government, 1960-2000

percent of total



Note: Chart excludes R&D funded by universities, state governments, and nonprofit organizations, which together accounted for 5.3 percent of total R&D funding in 2000.

Source: National Science Foundation



Distribution of U.S. Patent Approvals by Major Industrial Sectors, 1963-1995 and 1996-2000

(percent of total)

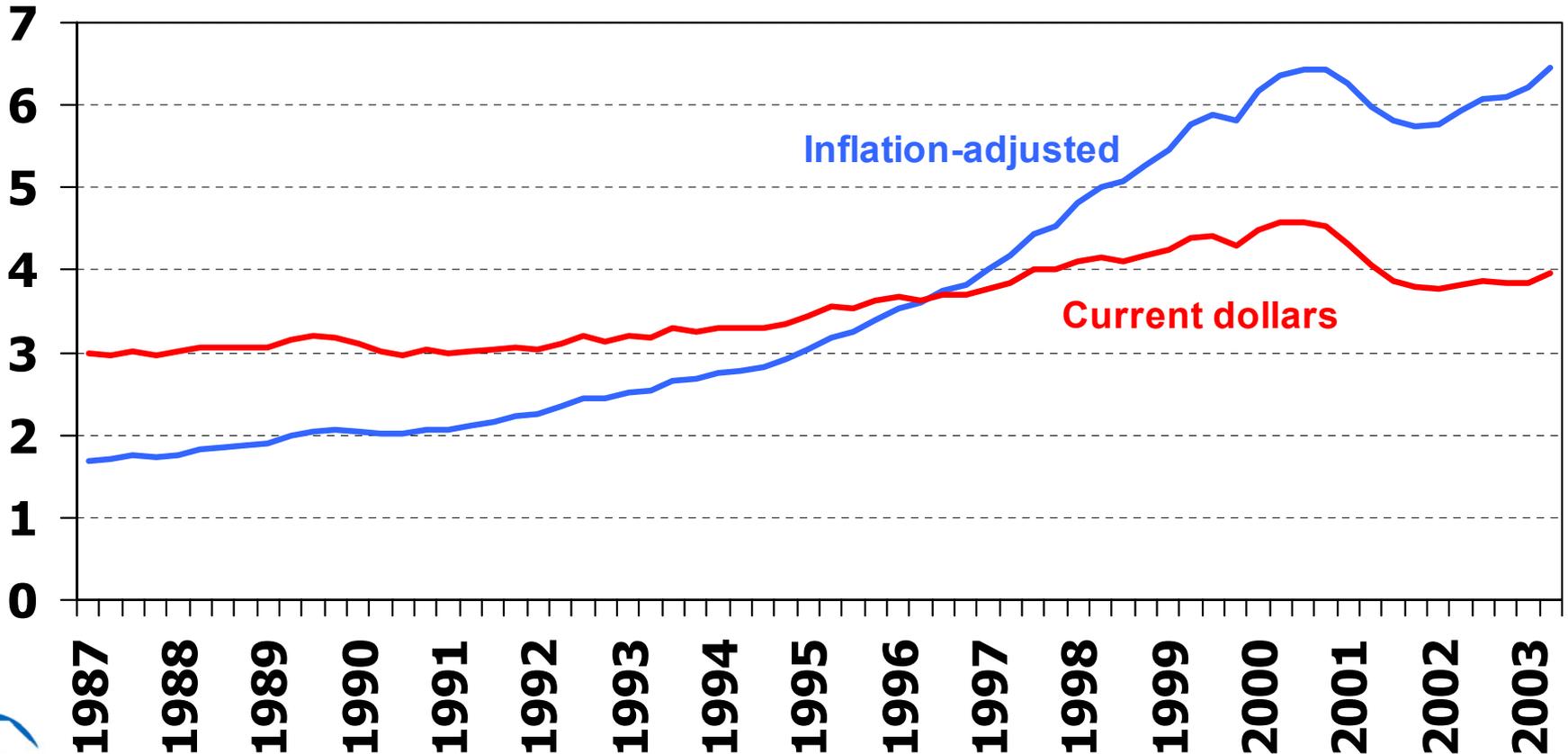
	SIC Code	1963-1995	1996-2000
All manufacturing industries	N/A	91.8	92.1
Electrical and electronic machinery	36	19.6	26.1
Machinery, except electrical	35	23.5	22.1
Professional and scientific instruments	38	11.9	13.7
Chemical and allied products	28	14.4	13.6
Other manufacturing industries	N/A	22.4	16.6
All nonmanufacturing industries	N/A	8.2	7.9



High Tech Investment is a Growing Share of the Economy

Information Processing Equipment and Software

Percent of GDP





Growth in Selected Productivity Indexes, 1950-1999

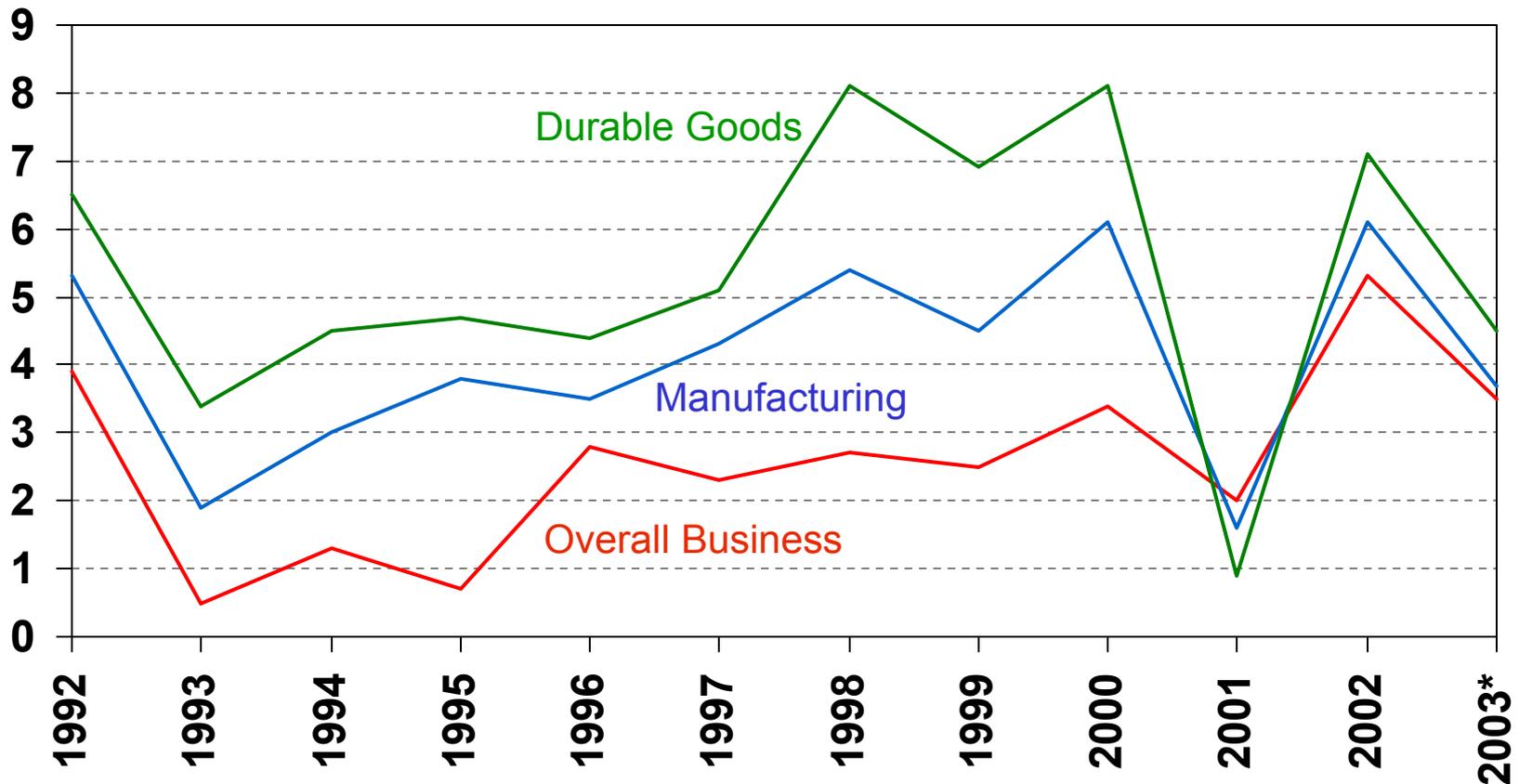
(average annual rates of growth)

	1950-1973	1973-1990	1990-1995	1995-1999
Multifactor productivity				
Manufacturing	1.4	0.5	1.2	2.4
Nonmanufacturing	2.3	0.5	0.5	1.0
Labor productivity				
Manufacturing	2.6	2.4	3.2	4.3
Nonmanufacturing	3.1	1.1	1.1	2.2
Capital productivity				
Manufacturing	-0.3	-1.2	0.7	0.1
Nonmanufacturing	0.5	-0.8	-0.1	-0.5



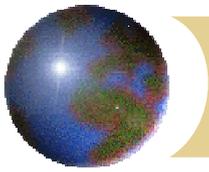
U.S. Productivity Growth, 1992-2002

(percent growth per year)



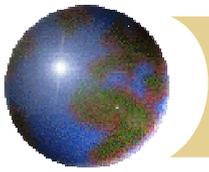
* First half 2003

Source: U.S. Department of Labor

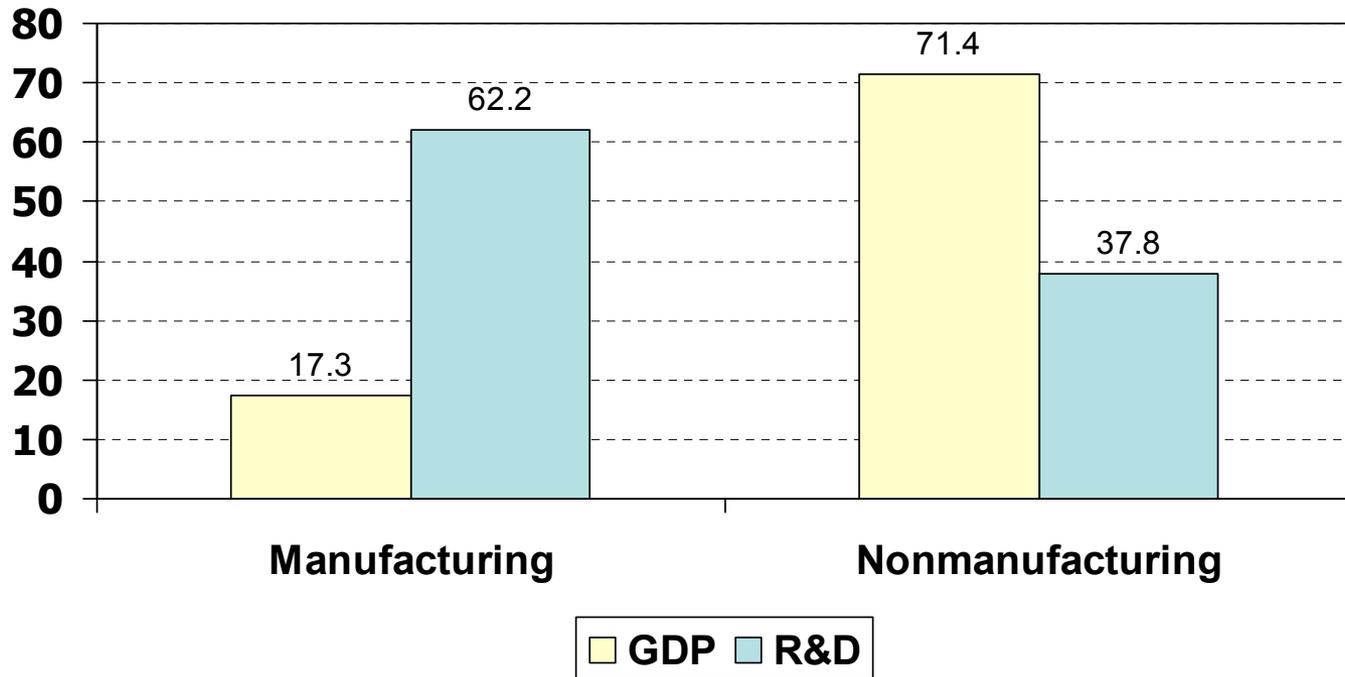


Reasons for Higher Productivity Growth in Manufacturing

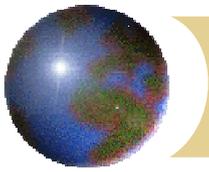
- Emphasis on research and innovation
- New technology development
- Flexible, efficient management practices such as Lean, Six Sigma
- Greater exposure to global markets
 - Bigger markets
 - More competition
 - More cross-border joint ventures



Major Industry Sector Shares of GDP and R&D Performance, 2000



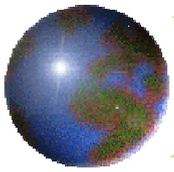
“Especially important is the fact that the service sector acquires most of its technology from manufacturing firms. . . This fact emphasizes the substantial dependency of services on manufacturing firms for technology and thus the critical role of the myriad communications and market transactions between the two sectors.”



Productivity Growth by Industry, 1990-2000

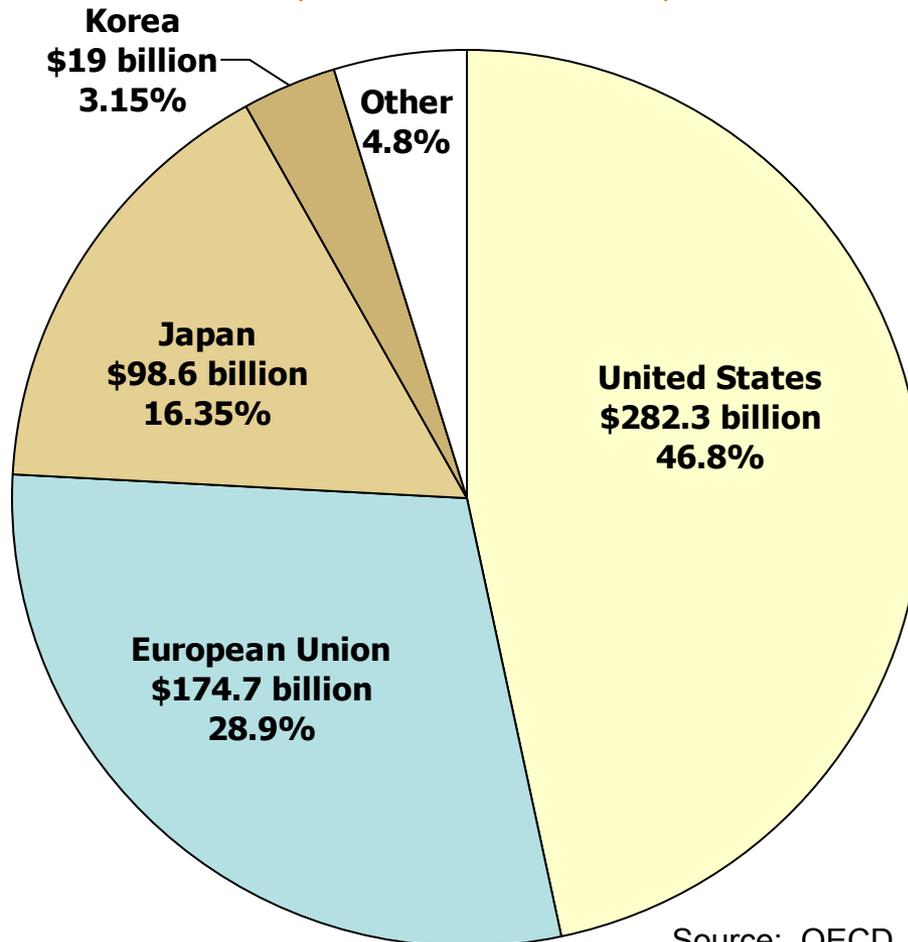
(average annual rate of change)

Related Service Industries	1990-1995	1995-2000	1990-2000
Wholesale trade	2.7	4.0	3.3
Durable goods	4.8	6.1	5.4
Nondurable goods	0.2	1.2	0.7
Warehousing	4.4	-2.0	1.2
Long-distance trucking	2.4	0.9	1.7
Rail transportation	5.5	4.5	5.0
Retail trade	1.6	3.2	2.4



Shares of Domestic Expenditures on R&D in OECD Countries, 2000

(in \$ billions at PPP)

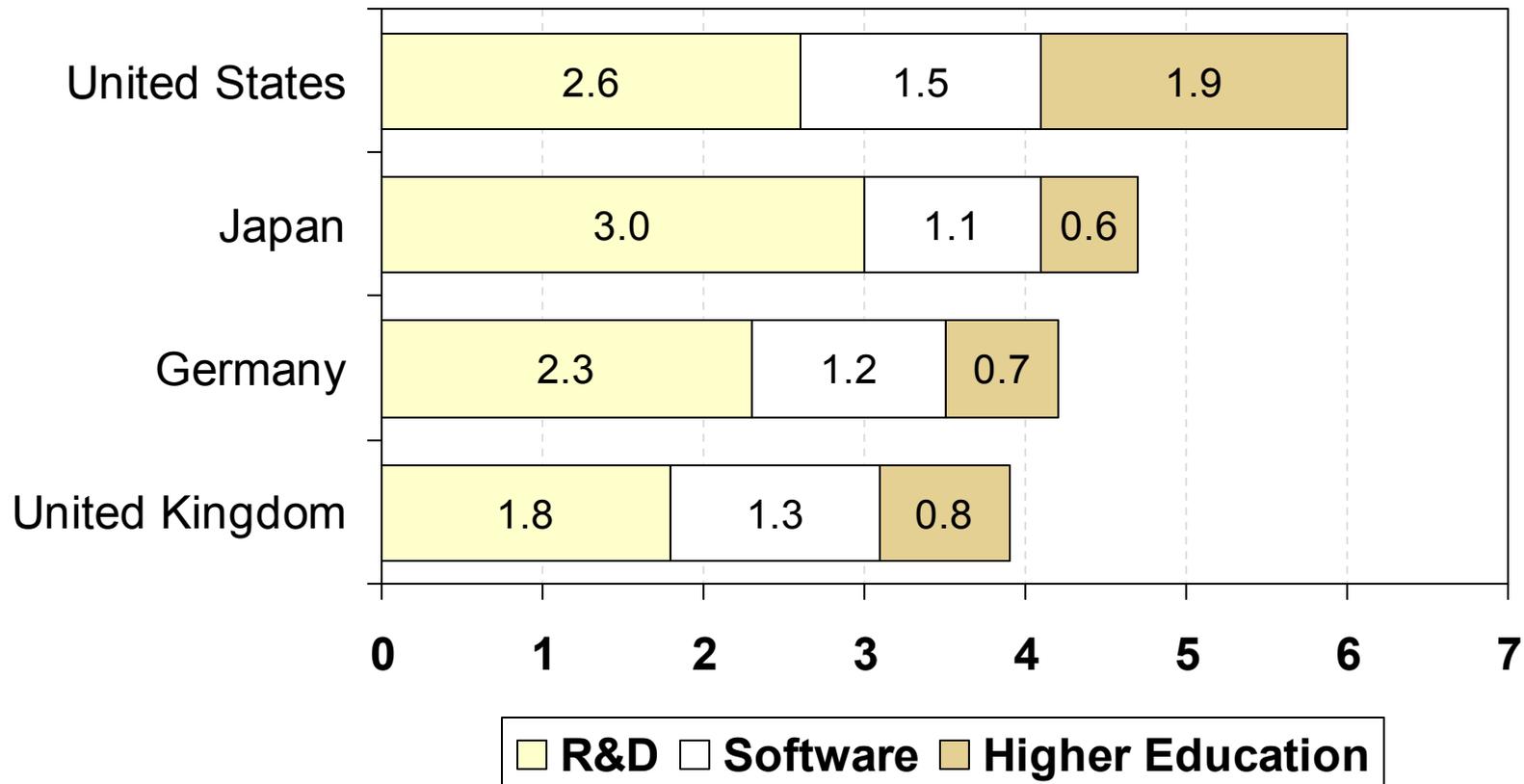


Source: OECD



Investment in Knowledge in Selected Countries, 1998

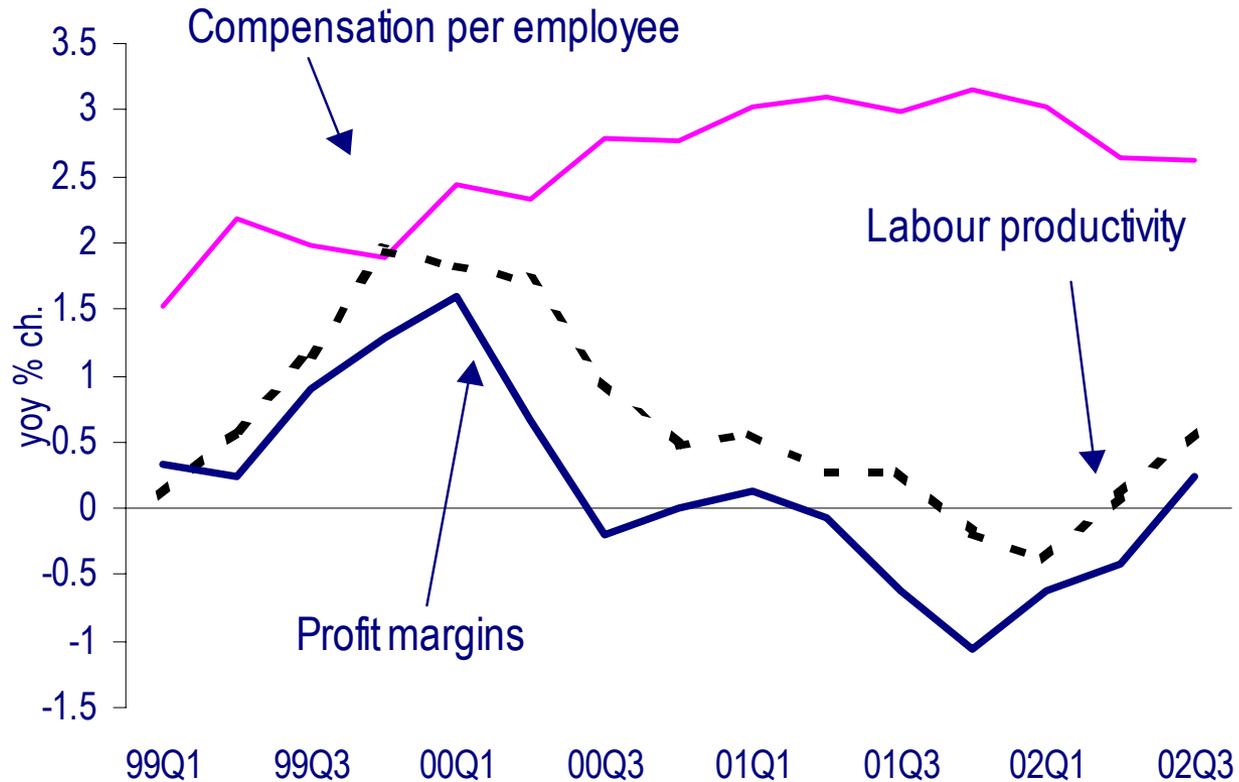
(as a percent of GDP)



Source: *OECD Science, Technology and Industry Scorecard: Towards a Knowledge-Based Economy*, Organization for Economic Cooperation and Development, Paris, 2001



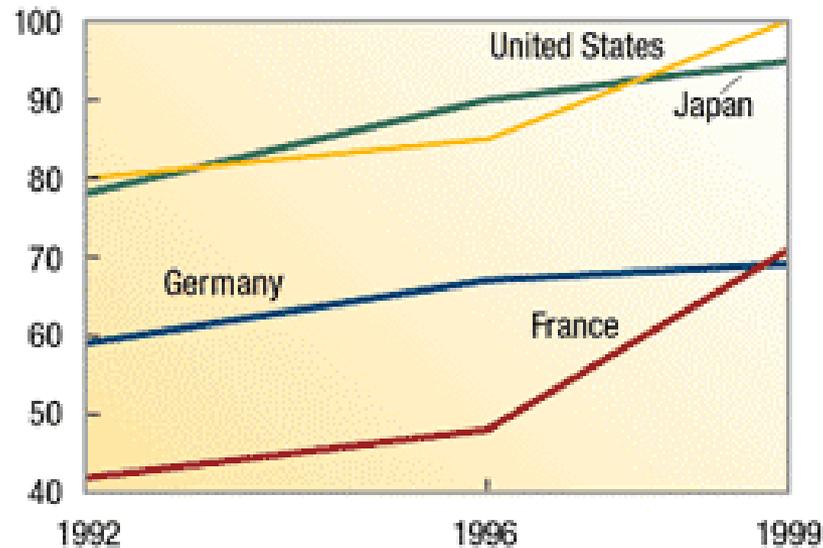
European Productivity Lags . . .



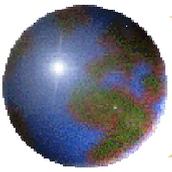


Comparative Productivity in the Auto Sector

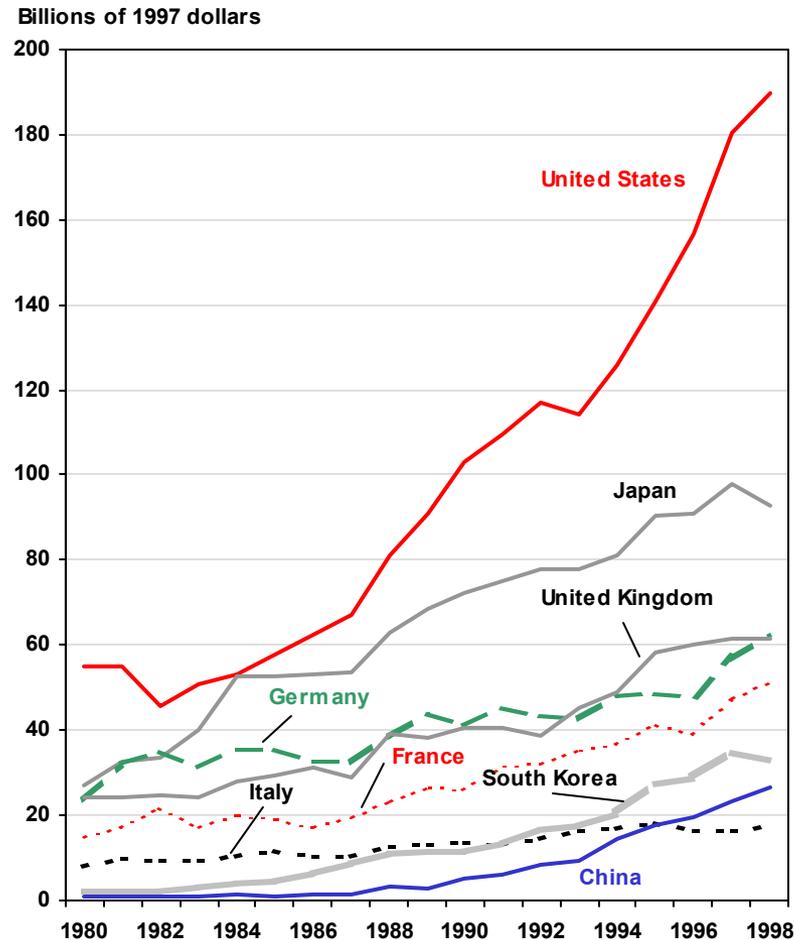
Real labor productivity for automotive sector;
index: United States = 100 in 1999

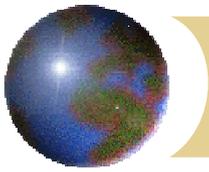


Source: Institut National de la Statistique et des Études Économiques (INSEE);
Japan Statistics Bureau & Statistics Center; Statistisches Bundesamt Deutschland;
US Census Bureau



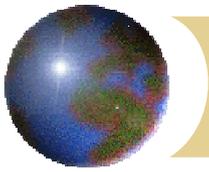
High-Tech Exports, 1980-1998





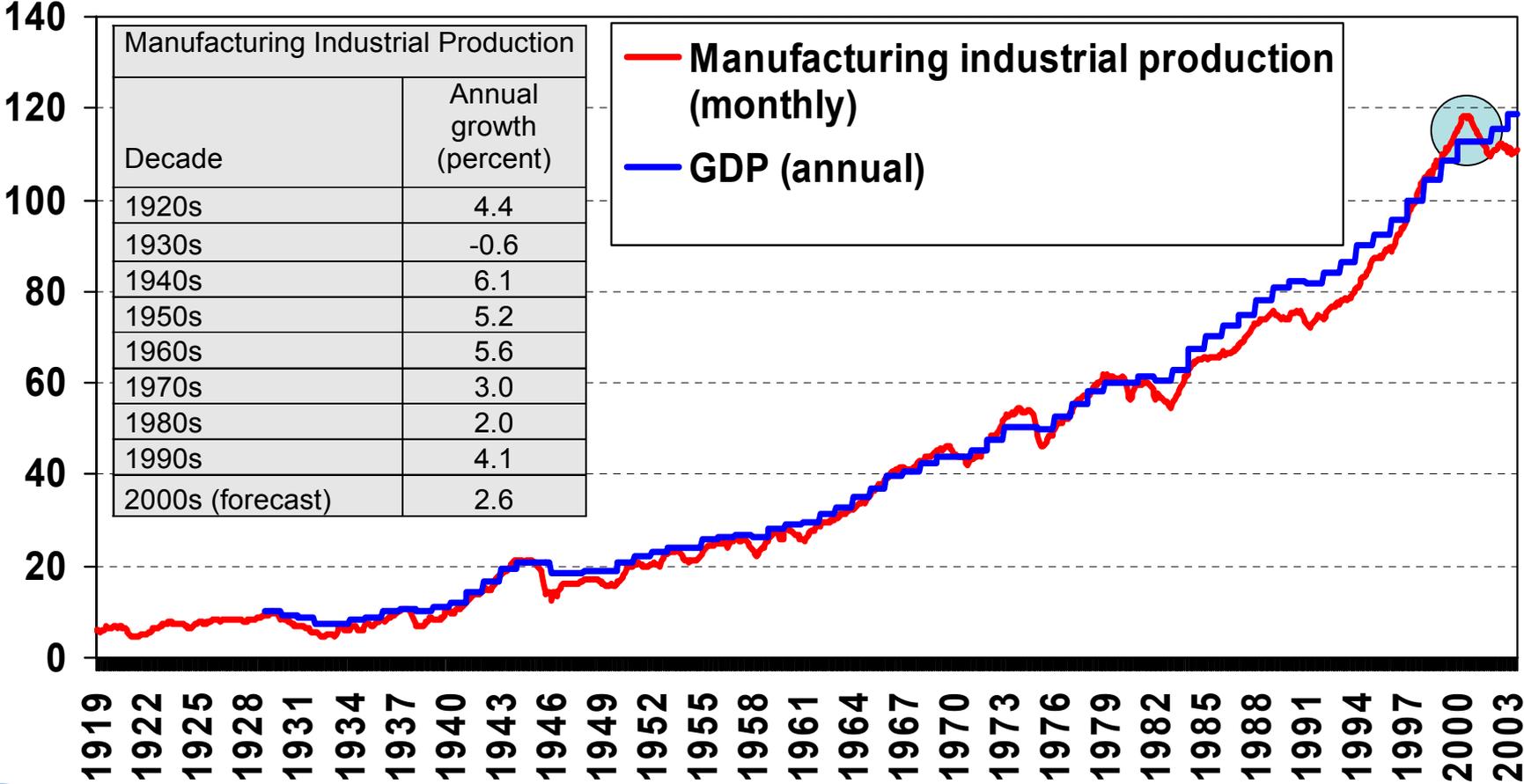
U.S. Manufacturing is the Principal Engine of Growth

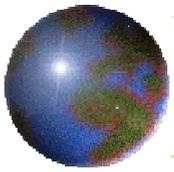
- Despite secular decline as proportion of GDP, growth remains strong
- Manufacturing provided 22 percent of overall U.S. growth in 1992-2000 and averaged 4.8 percent versus 3.4 percent for nonmanufacturing; if the 1990-1991 recession is included, growth in 1989-2000 averaged 3.3 percent in manufacturing and 3.0 percent in nonmanufacturing
- Productivity boom centered in manufacturing
- Products with embedded new technologies come almost exclusively from manufacturing sector
- Manufacturing sector also leads in management innovation; Lean, Six Sigma, JIT, Supply Chain Integration, etc.



Manufacturing Closely Linked to the Economy: Report of its Demise Is Premature

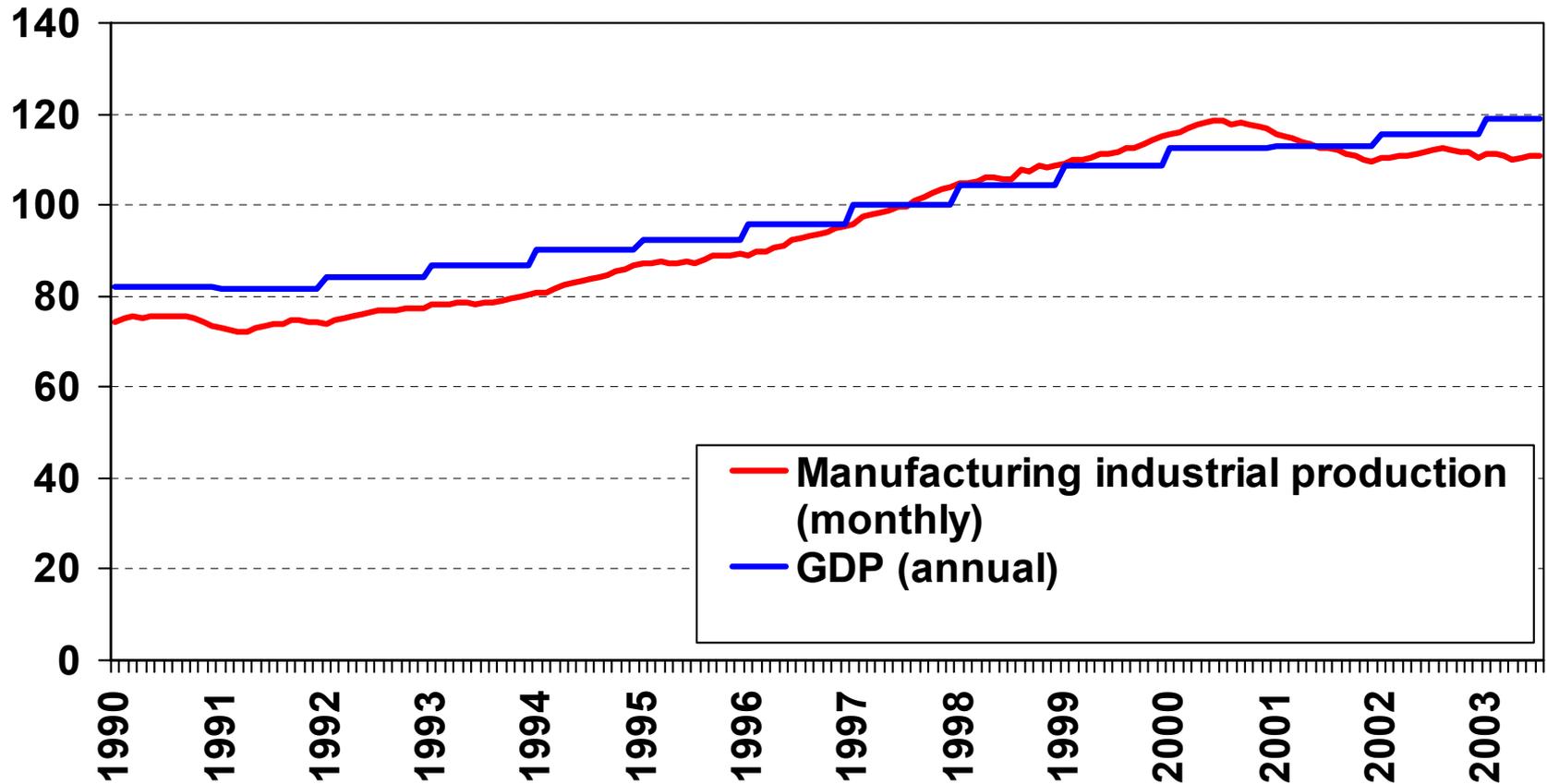
Index 1997=100

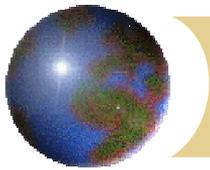




Manufacturing Closely Linked to the Economy

Index 1997=100

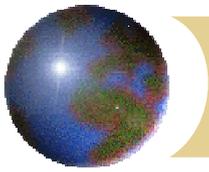




U.S. Manufacturing Cash Flow (Undistributed Profits Plus Depreciation Allowances), 1990-2001

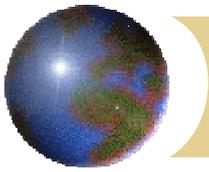
	Millions of dollars	Percent of total corporate cash flow
1990	169,469	37.2
1991	152,544	32.2
1992	156,937	30.7
1993	166,462	30.9
1994	205,249	33.8
1995	234,362	34.7
1996	241,834	33.9
1997	257,725	33.3
1998	225,528	30.9
1999	245,950	30.4
2000	231,573	30.0
2001	198,239	25.3

Source: U.S. Bureau of Economic Analysis



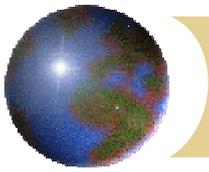
Favorable U.S. Macroeconomic and Political Framework for Stimulating Innovation and Growth in Manufacturing

- Well-established rule of law
 - IPR protection
 - Dispute resolution
 - Transparency
 - Favorable commercial code
- Superior financial system
 - Equity culture
 - Venture capital
 - High-yield bonds
 - Attractive market for foreign investors



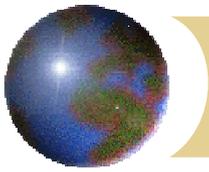
Favorable U.S. Macroeconomic and Political Framework for Stimulating Innovation and Growth in Manufacturing (continued)

- Educated, flexible workforce (open to immigration)
- Management dedicated to constant improvement and open to change
- Good economic infrastructure
- Size, wealth, and sophistication of market
- Open trade and investment
- Leader in science and technology



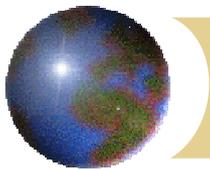
Some Problems in Developed Countries

- Rigid labor markets
- Lack of worker mobility
- Sanctioned or indirect protectionism
- Lack of flexible financial systems
- Risk-taking cultures are rare
- Aging labor markets, little immigration
- Heavy hand of regulation
- Poorly developed bankruptcy codes
- Resistance to exit by established firms



Risks in Doing Business in Developing Countries

- Sovereign risk: Russia, Africa
- Transfer risk: Capital controls common
- Currency risk: East Asia
- Economic risk: Argentina
- Political/Institutional risk: India
- IPR risks: China
- Health/Environmental risks: Pacific Rim (SARS)

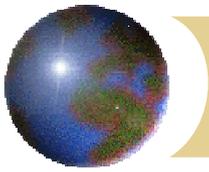


Geographic Distribution of U.S. Exports and Imports, 1990 and 2002

	Exports		Imports	
	1990	2002	1990	2002
Canada	21.1	24.6	18.1	19.1
European Union	26.3	22.0	20.0	20.6
Japan	12.3	7.9	18.2	11.1
Other industrialized economies	3.4	3.2	2.4	2.0
TOTAL ADVANCED	63.1	57.6	58.7	52.7
Mexico	7.2	14.9	6.0	12.3
China	1.2	3.4	3.1	11.4
Southeast Asia	9.4	11.1	15.8	13.8
Other developing economies	12.0	7.6	11.3	4.3
TOTAL DEVELOPING	29.9	37.0	36.1	41.7
Unclassified	7	5.4	5.2	5.6

Note: Southeast Asia includes Taiwan, South Korea, Hong Kong, Singapore, Malaysia, Philippines, Thailand, and Indonesia.

Source: World Trade Organization (1990) and U.S. Bureau of the Census (2002)



U.S. Has Policy Challenges To Sustaining Manufacturing Engine of Growth

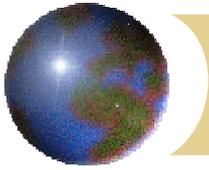
Broad Policy Support for the Manufacturing Engine of Growth

- Wider freedom for creativity and innovation
- Sustained high level of investment
- Increased level of domestic savings
- More open international trade and investment
- More educated and flexible work force
- Reduced and more market-oriented government regulatory role



Specific Policy Proposals to Address Impediments to the Manufacturing Engine of Growth

- Fiscal reform
 - Corporate tax reduction
 - Encourage savings/investment
- Tort reform
- Better financial market standards and transparency
- Higher educational achievement, especially in physical sciences, engineering
- More cost-effective health care services
- Improved environmental policies
- Continued deregulation (especially energy and telecommunications)
- Free trade in manufactures
- Return to market-based currency exchange rates



Questions and Comments:

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