Labor from a Managerial Point of View

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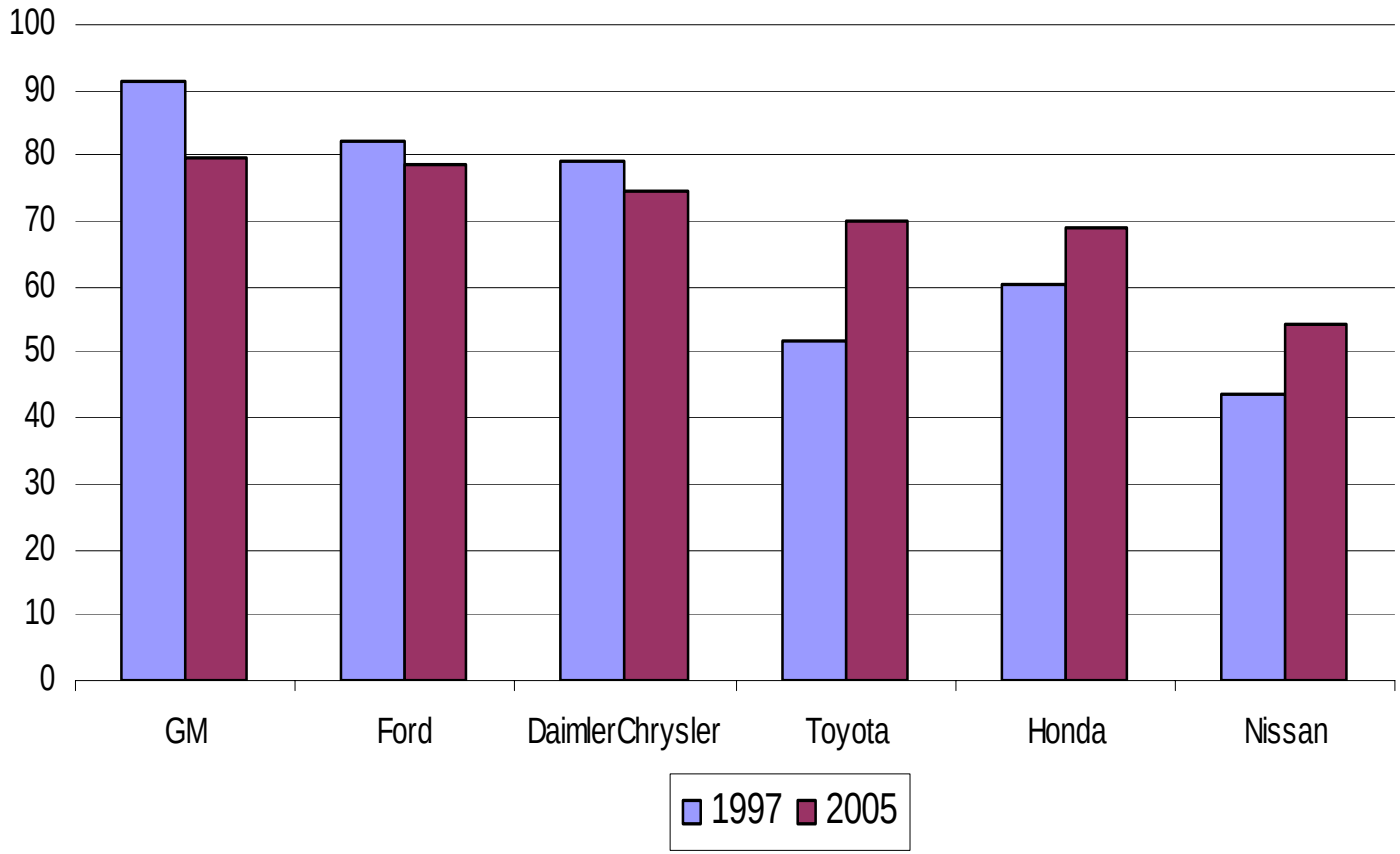
Outline

- US automotive manufacturing is not dead yet
- But, underinvestment in human and organizational capital hurts firms' ability to meet future challenges
  - Offshoring
  - Energy

US automotive manufacturing remains important

- 873,000 direct jobs in motor vehicle and supplier industries
- 4.5 million jobs in indirect and expenditure-generated employment
  - Source: cargroup.org, 2007

Average percentage of auto parts made in the U.S. and Canada for cars sold in North America



Source: wsj, 4/2006

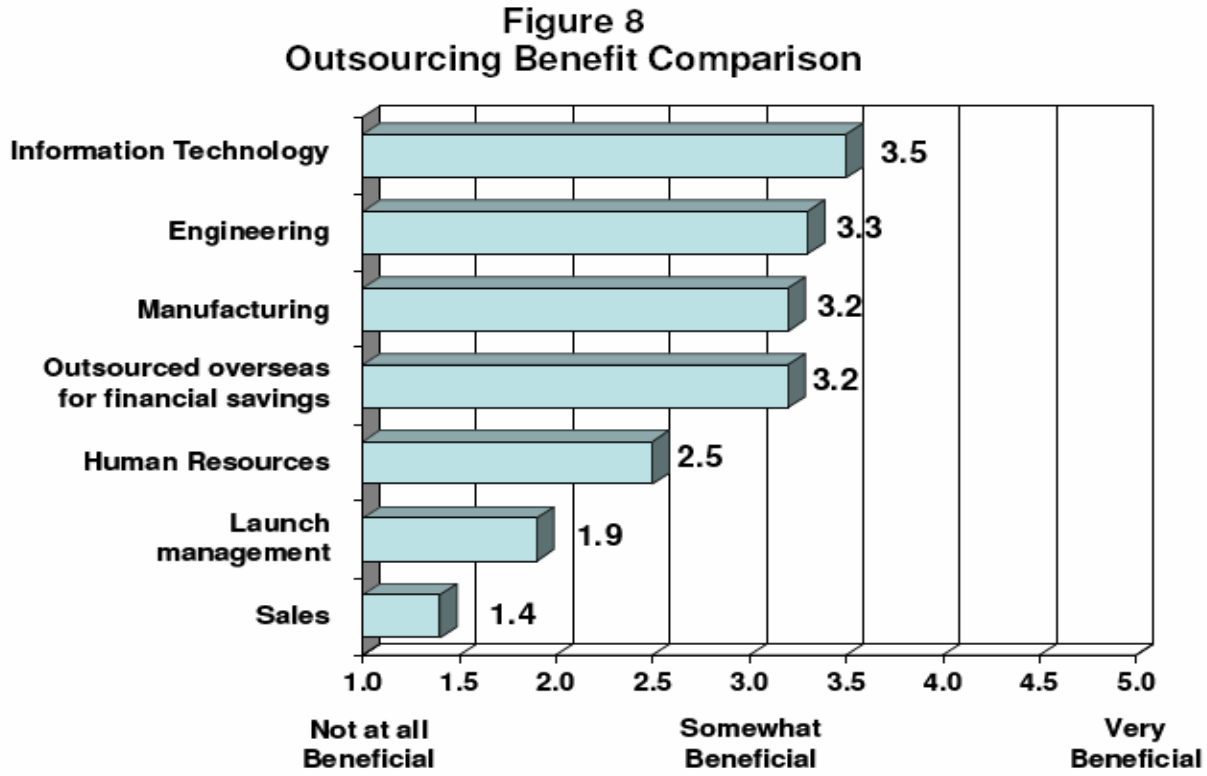
Why are there still so many auto jobs here?

- A big return to skill, integrated problem-solving, and proximity
  - These returns could be increased
- What does an auto worker do?
  - Boron operator
  - Operators who don’t operate
  - Gear carrier assembly
- Manufacturing processes can be designed to take advantage of broad-based skills
  - Toyota production system
  - Fast ramp-up of breakthrough innovations

Offshoring to low-wage countries

- Doesn’t necessarily mean low costs, particularly on a life-cycle basis
- Evidence from
  - 40 First-tier suppliers (CAR report)
  - Second-tier suppliers (2006 survey I conducted with Michigan Manufacturing Technology Center)

Large suppliers: Offshoring has mixed results



Cargroup.org, 2007

The U.S. Component Manufacturing Industry

- Manufactures metal, plaster, and rubber components for final consumer products.
- Approximately one quarter are solely suppliers to auto industry.
- Many small firms, often squeezed between larger suppliers of raw materials and larger producers of consumer products.
- More tied to region than its customers, but increasingly dispersing out of cities.
- Facing a sudden surge in international competition.
- Represents 10.6% of U.S. manufacturing jobs, up from 8.8% in 1980.

Data

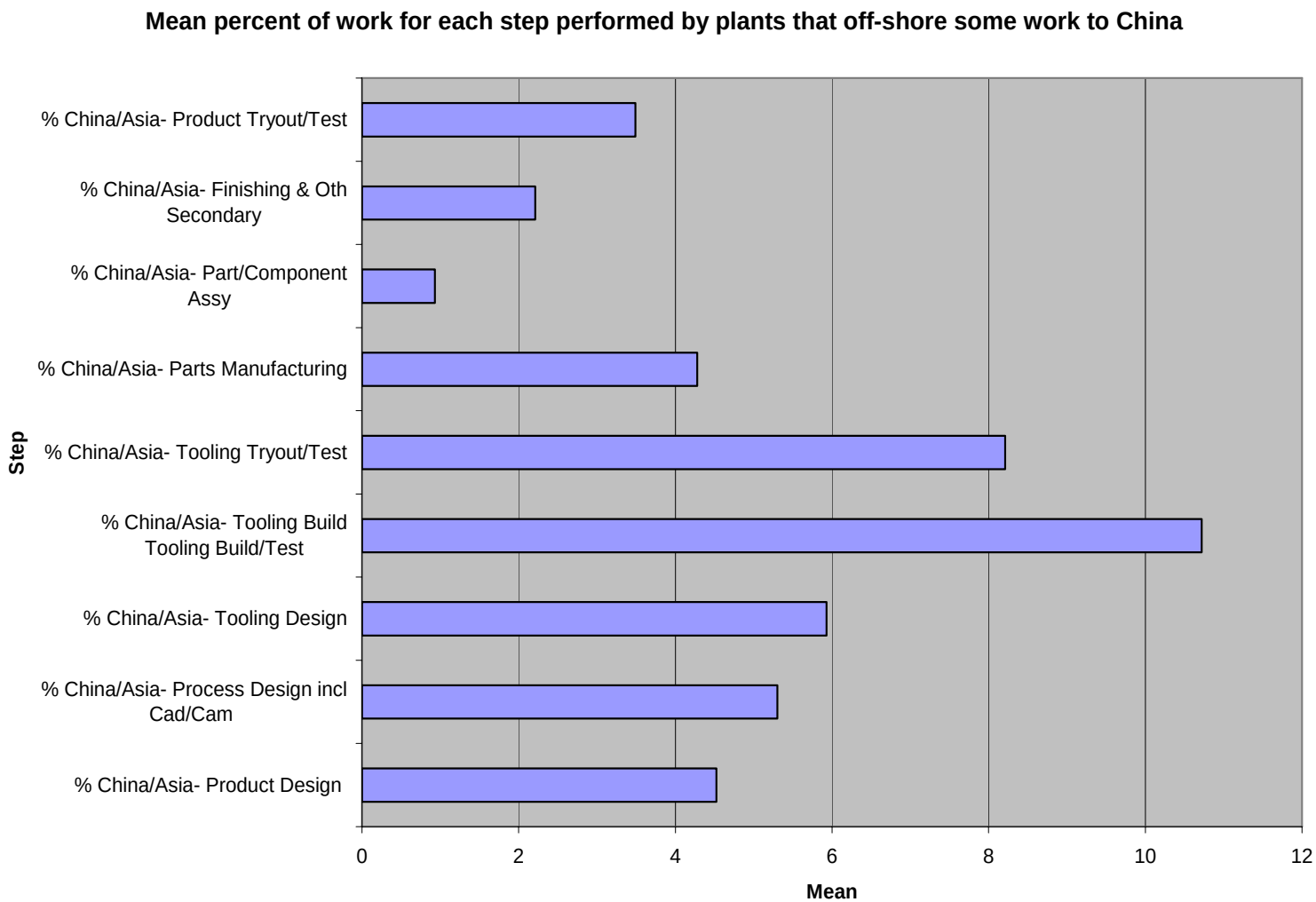
- *Benchmarking Questionnaire*
  - 615 plants responded to survey conducted by Michigan Manufacturing Technology Center in spring 2003
    - Highly detailed survey asks about revenues, costs, operations
    - Respondents are presidents, CFOs, plant managers
    - Low response rate (~10%), but no bias in size, productivity
    - Michigan is overrepresented; South is underrepresented
- *Relationship Questionnaire*
  - Survey sent to plants who answered benchmarking questionnaire
  - Asked about sources of ideas; relationships with customers, suppliers, rivals
  - 65% response rate

- Survey data linked to US Census Zip Code Business Patterns for 2000.

Customers are offshoring

They are relocating more of their manufacturing to regions where wages are lower:	**Applies to our largest single KCL--2006**	**Applies to our largest single KCL--2003**
In the US and/or Canada	22.3	25.5%
In Mexico or in Central or South America	36.4	41.2%
In Eastern Europe	24.9	15.6%
In Asia	42.9	27.4%

Small suppliers are experimenting



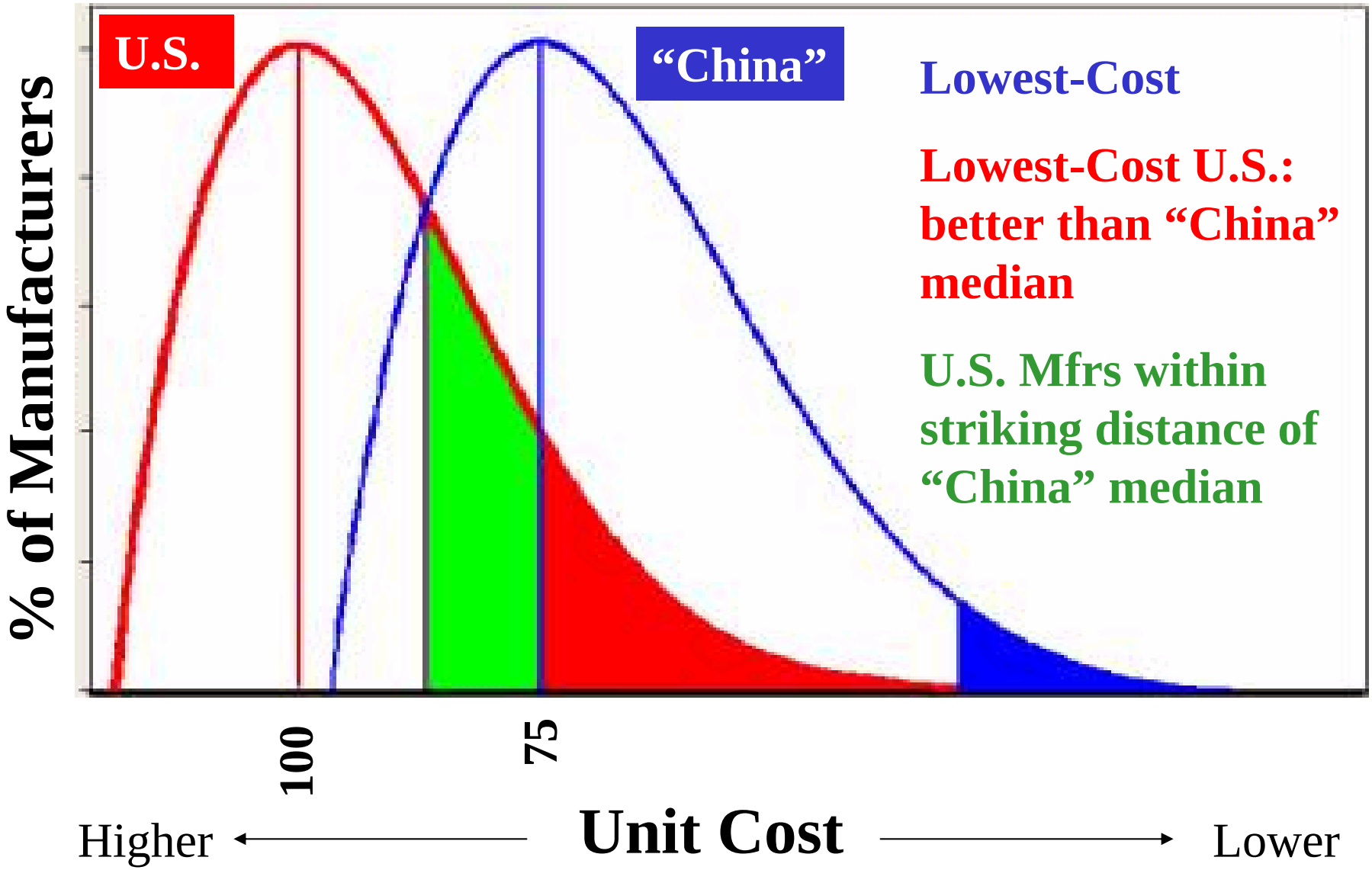
Results are mixed

How well have your expectations been met by your offshore sources, in terms of:	**Frequency of Positive Responses**	**Frequency of Negative Responses**
Quality	39.1%	21.7%
Completeness	47.8%	13.0%
Timeliness	28.3%	37.0%
Cost	67.4%	19.6%

Worrisome impacts on capability

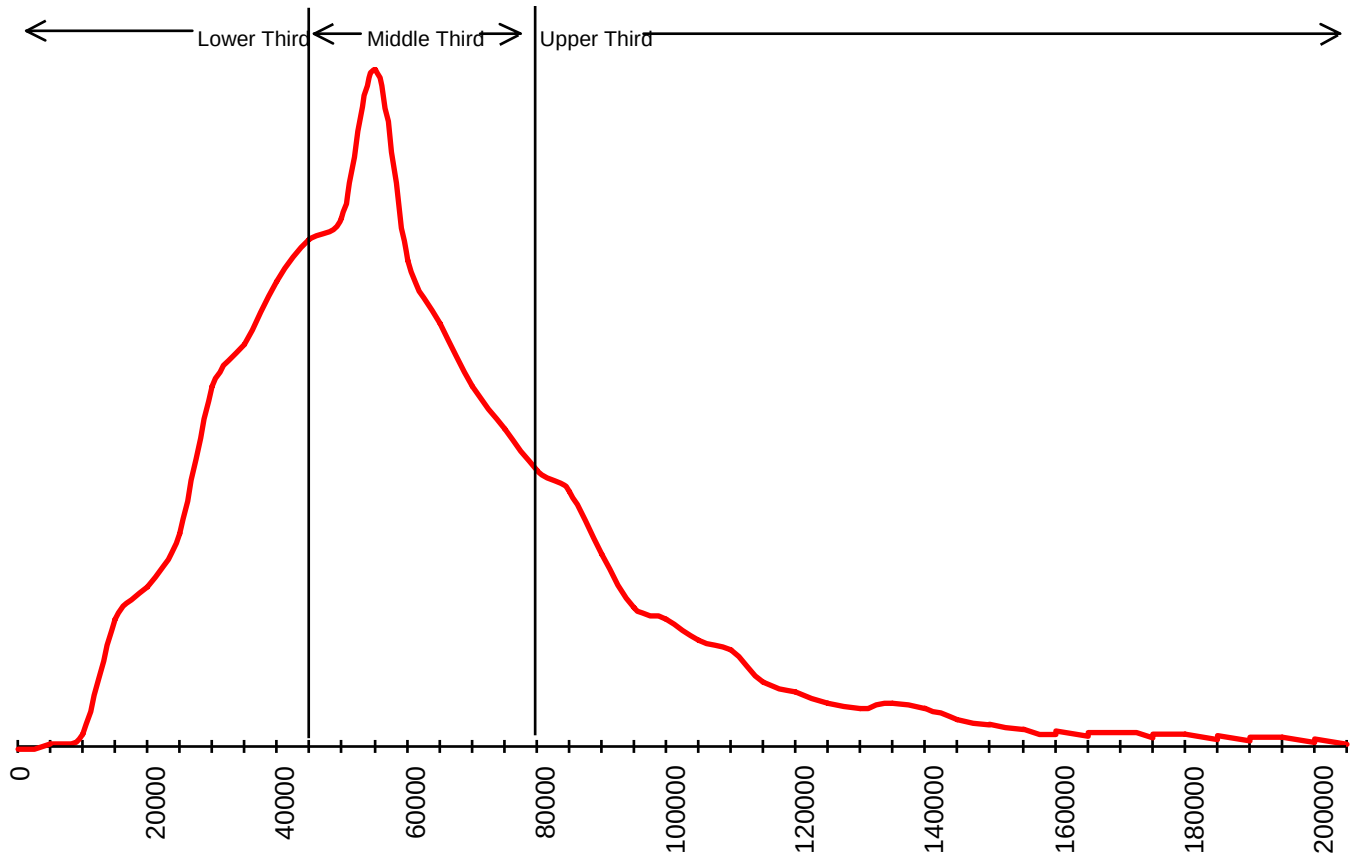
Across all of sales - not just one important contract or product line - how (if at all) has company's use of offshore resources affected ability to:	**Frequency of Positive Responses**	**Frequency of Negative Responses**
Introduce new products quickly?	23.4%	25.5%
Address quality issues as they arise?	23.4%	38.3%
Implement any required engineering changes?	27.7%	31.9%
Make changes to business processes?	32.6%	23.9%

Not all US Manufacturers Doomed by Low-Wage-Country Firms' Lower Landed Cost



Value-added / FTE is highly skewed:

The top 10% are more than twice as productive as the median shop.



Source: Performance Benchmarking Service: metalworking respondents

Look at the variance among tool & die shops serving automotive!

Measures	Low Volume Machining		
	Top 10%	Median	Bottom 10%
Average Hourly Wage, Shop Employees	$ 21.75	$ 18.00	$ 15.24
Employee Turnover Rate	100.0%	21.6%	0.0%
Design Employees as a Percent of Total Employees	17.6%	9.8%	2.3%
Dollar Value of Machinery per FTE	$164,759	$ 52,768	$ 28,743
Percent of Machines More than 20 Years Old & Not Upgraded	75.7%	40.5%	0.0%
Percent of Employees Using a Computer at Least Once a Week	100.0%	64.1%	26.3%
Customers Who Received Advise on Products/Materials as a Percentage of Total Sales	100.0%	40.0%	0.0%
Average Hours per Machine Setup	0.2	0.9	3.1
Running Hours as a Percentage of Available Hours	91.1%	69.2%	35.7%
Percent of Units Scrapped Due to Errors	0.1%	0.5%	1.9%
Percent of Deliveries Made by Original Ship Date	100.0%	90.0%	70.0%
Inventory Turns (Cost-of-Goods-Sold / Total Inventory)	55.1	11.0	5.5
Hours Shop is Open as a Percent of Total Hours in a Year	71.9%	46.6%	25.7%

Note machine age and turnover data reversed

Thinking About Offshore Competition …

Comparing a US gray iron foundry to a low-wage offshore competitor

Cost of Goods Sold (COGS)			
	US	Assumption About Offshore	Offshore
FTE Employees	70.0	1/4 as productive	324.3
Annual Payroll per FTE	$ 32,422	1/10 as expensive	$ 3,242
Annual Fringes per FTE	$ 5,721	1/20 as expensive	$ 286
COGS Labor	$2,670,000		$1,144,083
Purchased Material & Svcs	$3,910,000	10% cheaper per unit	$3,831,800
Utilities	$ 400,000	10% cheaper per MMBTU	$ 416,910
Plant & Eqpt Expense	$ 520,000	25% lower	$ 390,000
Total COGS	**$7,500,000**		**$5,782,793**

Thinking About Offshore Competition …

Payoff to US Initiatives			
		Landed Cost Index	
Initiative	Impact of Initiative	Value	Change
Memo: Baseline		116.95	
Reduce Waste 10%	Cuts labor, capital, & material cost	116.70	-0.25
Reduce Material Cost 10%	Cuts material cost (and maybe weight)	112.63	-4.32
Reduce Pay 10%	Cuts labor costs (but may increase turnover)	113.12	-3.83
Reduce Fringes 10%		116.27	-0.67
Increase Productivity 10%	Cuts FTE heads from 70 to 73	112.44	-4.50
Devalue US Dollar 10%	Raises offshore costs	106.54	-10.41

Costs & benefits often forecast incorrectly

- Accounting is wrong
  - Over-emphasis on direct labor.
  - OEMs misunderstand costs and require unproductive moves overseas.
  - Many important costs are not in the standard spreadsheet:
    - distraction of top management (lost focus on innovation at home)
    - Increased risk from long supply chain, esp. with JIT
  - Increased “handoff costs” between US and foreign operations
    - Products must be more clearly specified
    - Quality problems may be harder to solve due to geographic and cultural distance
    - More difficult communication among product design, engineering, and production hinders serendipitous discovery of new products and processes
    - Reduced quality, increased time-to-market

    $\Rightarrow$ Long term less innovation

How can this be?

- Debate over impacts of offshoring is stalled because carried out at high level of abstraction—even inside firms
- Managers don’t always understand the process that employees actually use
  - If they underestimate interface complexity, may underinvest in proximity or governance
  - Cost projections explicitly assume that overseas plants will equal US productivity

“Learning Lean” vs. “Lean Standardization” model

- ***Lean standardization model*** Achieves significant performance improvements by focusing solely on the technical elements of lean production without modifying HR practices & culture change to encourage worker involvement

- ***Learning lean model*** Combines low-waste manufacturing practices (lean) with an involved, empowered, & prepared workforce focused on innovation, quality & organizational flexibility (learning)

“Learning Lean" model generates better performance because

- Continuous innovation is needed because plants must handle more variety & falling average order sizes as highest-volume orders are most likely to be lost
- Routine self-management is needed to reduce costly supervisory overhead
- Continuous improvement requires knowledge that only direct workers have

Example: Delphi Kokomo Printed Circuit Boards

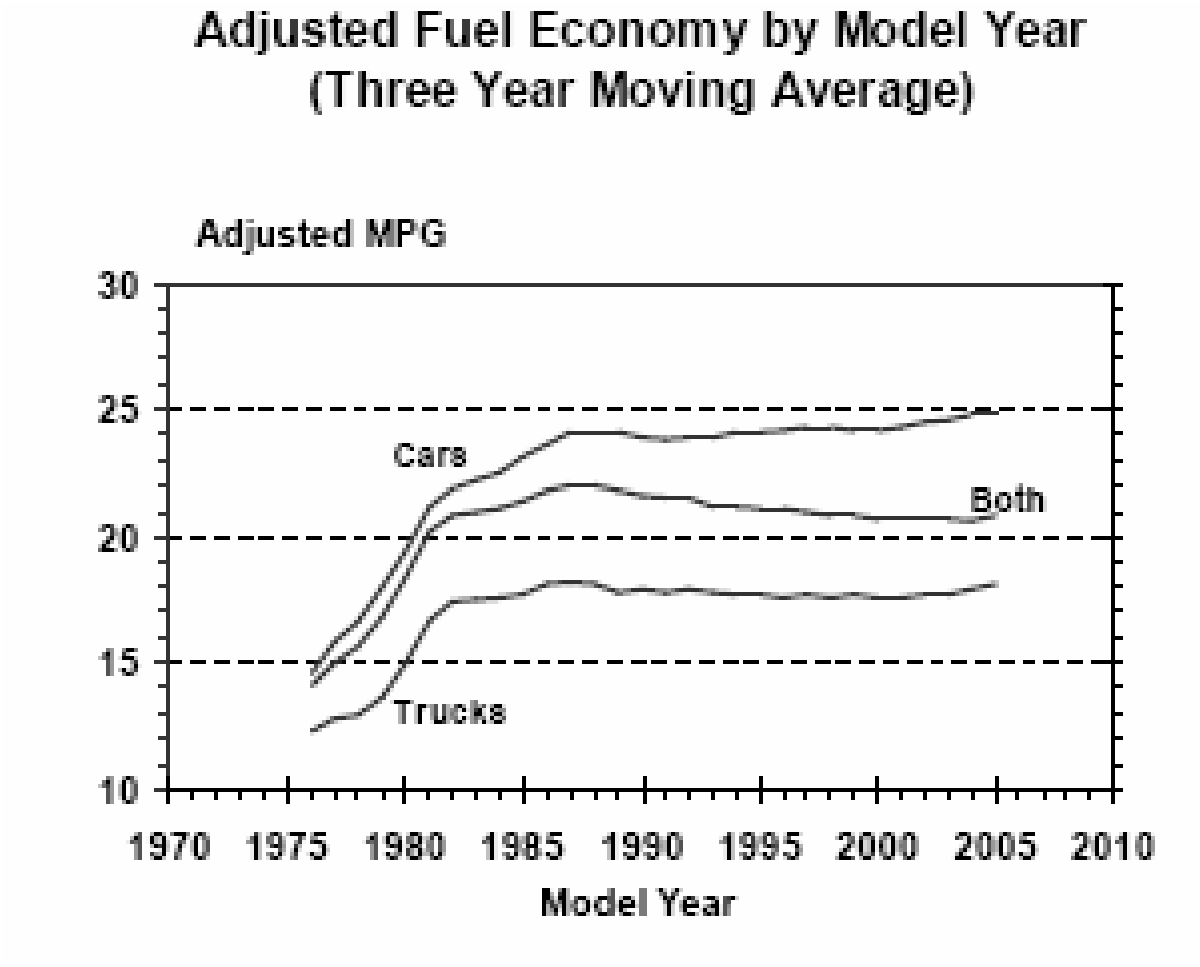
- Delphi Kokomo brought back work from Singapore
  - Increased capacity utilization on existing machines
    - Quality improvement
    - Earlier inspection
  - More broadly trained skilled workers
- Highly paid workers stay a long time—develop deep knowledge
- Knowledge-sharing requires trust between labor and management
  - Union can be a vehicle for negotiating and enforcing agreements about who benefits from productivity improvements

Off-shoring: local or global optimum?

- Off-shoring has benefits given current US automotive product development system (saves money)
- But, distance can drive interfaces (as well as vice versa)!
  - US vs Japan product design strategy
    - US OEM tolerates lower, slower interaction to achieve lower measured cost of off-shored design
    - Japanese emphasize understanding of context: employees need to understand not just their own job, but the context within which they do their job
      - Indian designer makes mistake because not continually reminded of the function of his design
  - Choice of organization will affect evolution of interfaces
  - Is off-shoring hindering evolution of US industry to a more efficient product development process?

Developing Capabilities for Clean Cars

Not much progress recently…



Source: http://www.epa.gov/otaq/cert/mpg/fetrends/420s06003.pdf

Big increases in auto energy efficiency will require major effort

- Invention and innovation
  - Fuel cells, hydrogen
- Ramping up to mass production
  - Regenerative braking
- Incremental improvement using existing technology
  - Can be the source of significant gains
    - Tenneco diesel—cut NOx emissions by 90%
    - Debug production process for recyclable seats
  - Second-tier suppliers a weak link
    - Tooling sector is in trouble
    - Other second tier suppliers
      - Weak product development capabilities
      - Much room for reducing energy use in production

But capabilities for this effort are lacking

- Shortage of skilled workers
  - Auto industry buyouts
    - ¾ of Delphi employees
    - 38,000 GM, 35,000 Ford, 11,000 Chrysler employees
  - National Association of Mfrs study
    - 90% of manufacturers report moderate to severe shortage of skilled production employees
    - 65% report moderate-to-severe shortage of scientists and engineers
  - Yet firms are proposing wage cuts
- Employee involvement programs are atrophying

Conclusions

- US automotive manufacturing is not dead yet
- But, underinvestment in human and organizational capital hurts firms' ability to meet future challenges
  - Offshoring
  - Energy