

Which manufacturing?

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The Case for Manufacturing

- Manufacturing offers **high wage jobs**
- Manufacturing contributes disproportionately to **innovation**
- Manufacturing is key to reducing the **trade deficit**
- Manufacturing contributes to **environmental sustainability**
 - **Goods or services with an environmental benefit is 3x mfg intensive as rest of economy**

Agenda

- *Which* manufacturing matters most for meeting national goals?
 - good industries vs. good firms
 - what market failures, other problems hinder progress?
- Do we need to reconceptualize how manufacturing should be done?
 - Frameworks and methods

The manufacturing sector is heterogeneous.

So which manufacturing matters?

- ***Industries and Firms*** with greatest potential to contribute to national goals (aka create positive spillovers)
 - E.g., adopt an **innovation-based strategy** that promotes high wages

Firms matter, not just industries

Firms within the same industry compete using different “production recipes,” with different implications for innovation and standard of living

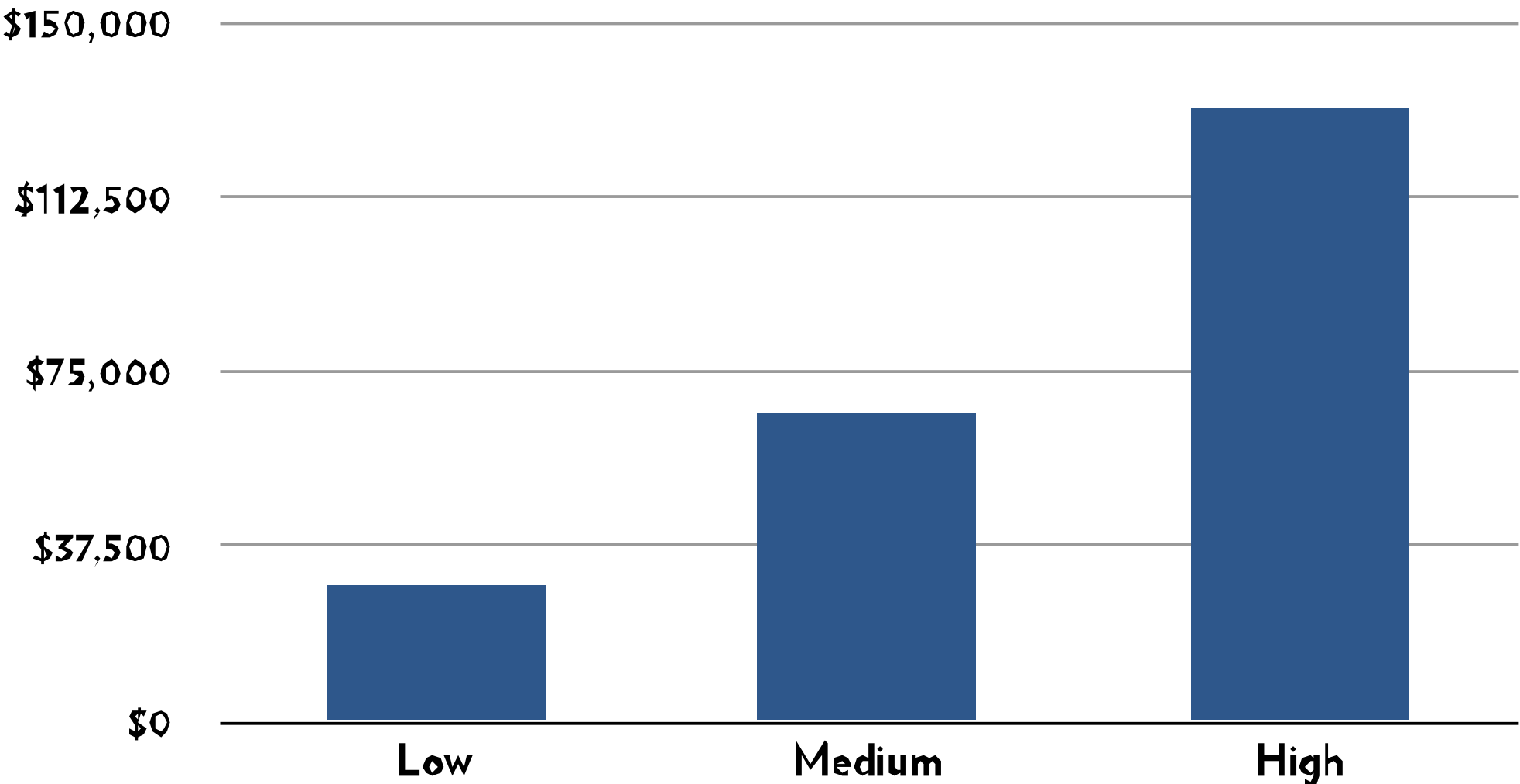
For concreteness, will focus on different strategies in one narrow industry (auto stamping); will refer to literature making the same points for other industries

Case Western Auto Supply Chain Study

- Interviews with 30 firms (summer/fall 2010)
 - Tier: First and second
 - Employment: 50 to 50,000
 - Customers: Detroit 3, Honda, Nissan, Toyota, BMW
- Confidential survey of suppliers in US
 - Includes all tiers, foreign-owned
 - Endorsed by PMA, OESA; Funded by Dept. of Labor
 - 1400 responses (about 25%; 30% for firms < 500 emp)

Wide range of performance even within narrowly-defined industries

Productivity Per Employee at Automotive Stampers

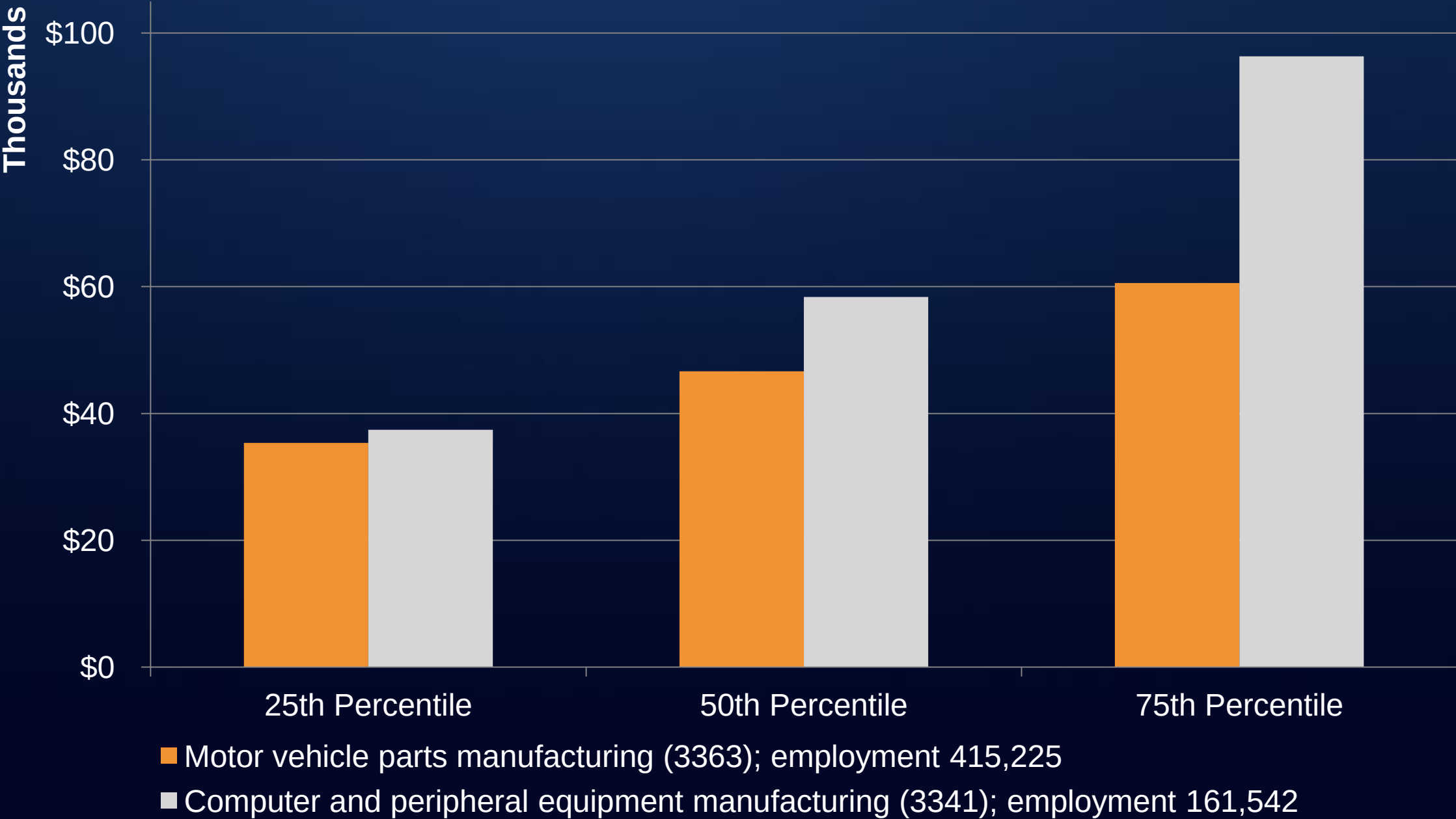


Similar range of within-industry variation found by Syverson 2011, using total-factor productivity

Source: Case Western Reserve University Plant Manager Survey

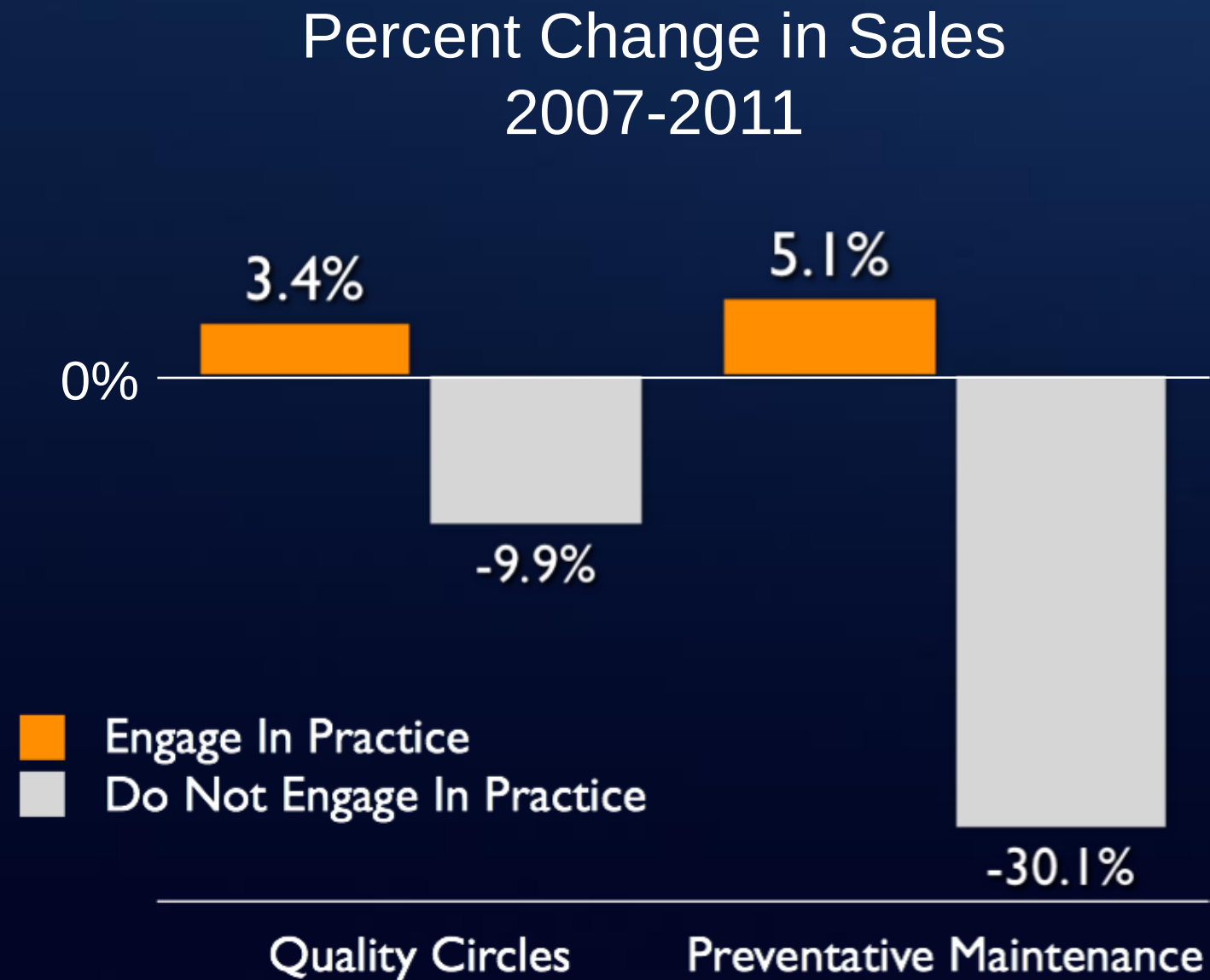
Best performers in “old” industries rival many in “high tech”

Payroll
per employee
by metro



Source: QCEW data from Moody's Economy.com, excluding metropolitan areas with employment below 30 individuals or average annual wage of less than \$14,000

Automotive stamping firms: High road practices



High road practices are associated with markedly improved sales results

Many studies (eg Kathryn Shaw, et al) find similar results:
high road improves performance,
but not widely adopted

Apparently anomalous behavior

- Persistence of bad firms (low productivity)
- Skill shortage *and* unemployment
- Purchasing policies: Persistence in local rather than global optimization
 - Re-shoring: GE's switch
 - GE (and other re-shorers) are huge multinationals. Shouldn't they have thought of these things earlier?

Persistent variation

“High-road” vs “Low-road” production strategies

- **High road**

- **Wages:** Well-paid workers make cost effective, sustainable products for consumers and profits for owners
- **Productivity:** Techniques harness all workers' knowledge to achieve continuous improvement in products, processes

firms make profit by expanding the pie

Low-road

- Each company in the supply chain tries to profit by squeezing those below them

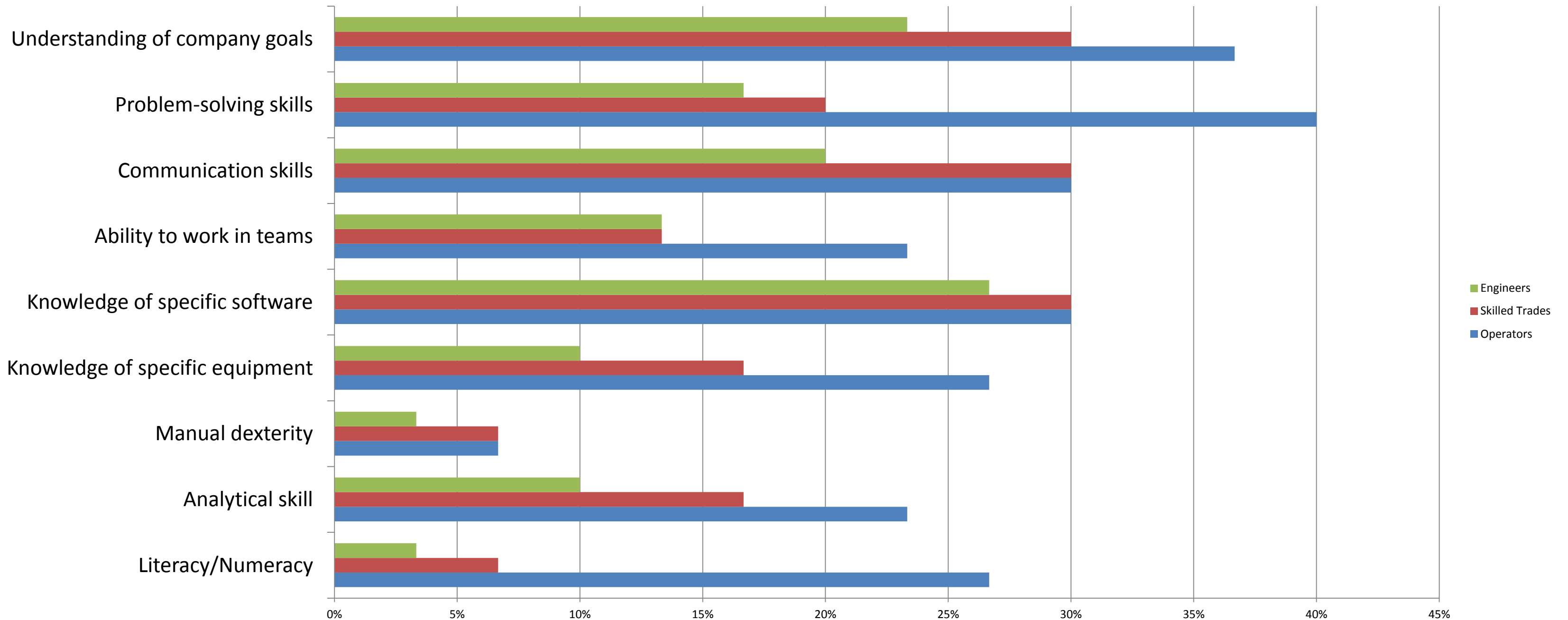
Firms compete mainly by shifting costs to others, rather than by maximizing total value produced

Barriers to adoption of 'high road'

- Complementarities
 - One investment doesn't pay off without other investments—hard for a small firm to pull off
 - Agile production requires near-simultaneous investment in equipment, marketing, IT, HR
- Externalities
 - Firms don't capture benefit to customers, workers and communities of investment in high-quality products, high-wage jobs

Reported skill shortages

Current Skill Deficiencies in Employees (Stampers Only)



Note: firms that pay higher wages report fewer problems

Which firms report shortages?

- Firms paying below-market wage
- Firms seeking upskilled production workers
 - Eg, firms where production workers also do inspection report shortages of literacy
- Firms with weak HR departments

HR policy not internally consistent

(stampers only)



Suboptimization in purchasing

"GE has come to reexamine some of the financial assumptions that led it to outsource"

”

Old: focus on component and labor costs

“Simplistic thinking led to some of these decisions,” Earl Jones, Senior Legal Counsel

Now GE is taking a total system cost view

Includes costs of transportation, longer cycle time, currency exchange, quality, supply chain complexity costs, higher inventory

Even more important: protecting intellectual property, maintaining ability to design for manufacturing, and to optimize production given advance knowledge of product designs.

“We were losing the connection between design, engineering, and manufacturing... We were ending up with managers and spec writers rather than people with great design competence.”

http://www.manufacturing-executive.com/community/leadership_dialogues/next_generation_leadership_and_culture/blog/2011/07/05/can-ge-bring-manufacturing-back-to-life

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Conclusion (1)

- Questions that might guide us to a re-conceptualization of how manufacturing works
 - Which layers and functions can economize on communication?
 - Impact of separating innovation from “routine” production
 - Who has—or can be trained to have—valuable knowledge?
 - Is training sufficient to restore competitiveness, incomes?
 - What assets are productively shared across firms?
 - How important are “shared supply chains,” “industrial commons”, “open innovation”?
 - How should we govern these relationships?

Conclusion (2)

- Implications of conception of manufacturing for views of government's role
 - Neo-classical view:
 - Fixing appropriability problems in individual factor markets
 - Subsidies/tax credits for education, R&D, investment
 - Largely assumes firms know what they need
 - Broker/cocktail party hostess (Lester/Piore, Block)
 - Helping firms find partners, ask the right questions, simultaneously create supply and demand
 - Examples: agile production, DOC model of offshoring's hidden costs
 - These roles can be complementary
 - automotive light-weighting

backup

- Tradeoffs in goals
 - Does having more mfg jobs require lower wages per job?
 - Does more IT innovation necessarily widen income gaps?

questions

1) how important is the "industrial commons" in promoting various dimensions of manufacturing performance?

what kinds of assets are shared in these common spaces, and how do they vary by industry and geography?

What do we know from theory and practice about how to govern the commons better?

2) Are new "manufacturing paradigms" (eg additive manufacturing, nano, etc.) necessary/sufficient/useful to get the US "back in the game" ?

3) Is there a skill shortage in manufacturing currently, or will there be one in the future? What mechanisms can

promote the upskilling of manufacturing

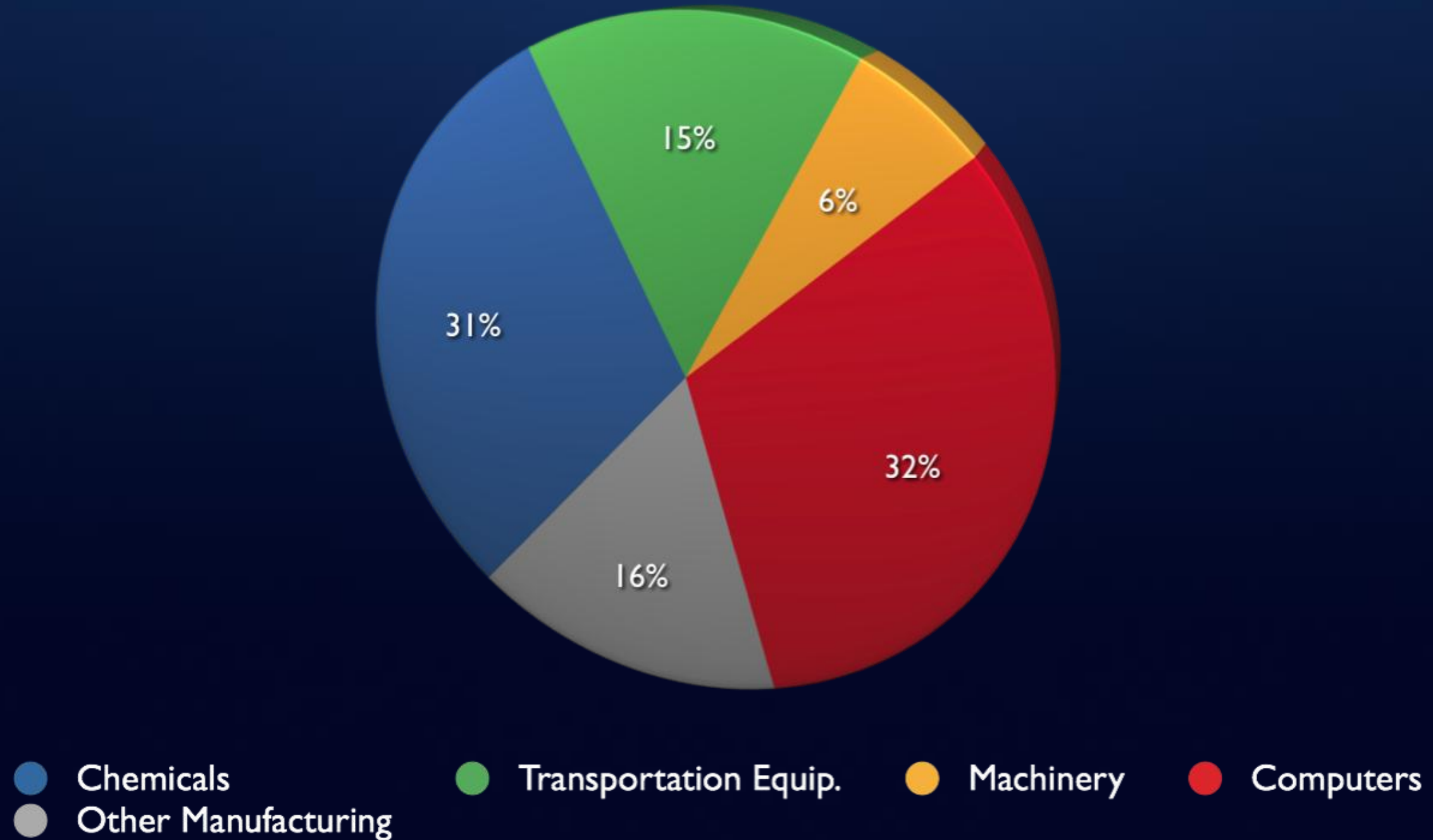
help firms use skilled workers better and b) help workers better capture some of the benefits of their improved productivity? Is the current manufacturing wage premium sustainable, or will it continue to shrink?

Conclusions

- Skills can be productively added to every job
 - Workers, firms, and society benefit
- But adoption of high-road strategy is not inevitable
 - Managers often lack incentives or vision
- Programs that train both workers and management can address this problem.
 - Manufacturing Extension Partnership (MEP)
 - Program pays for itself in increased tax revenue
- Coordinated efforts by governments and firms in supply chain would result in more firms adopting strategies geared toward long-term success

Innovation

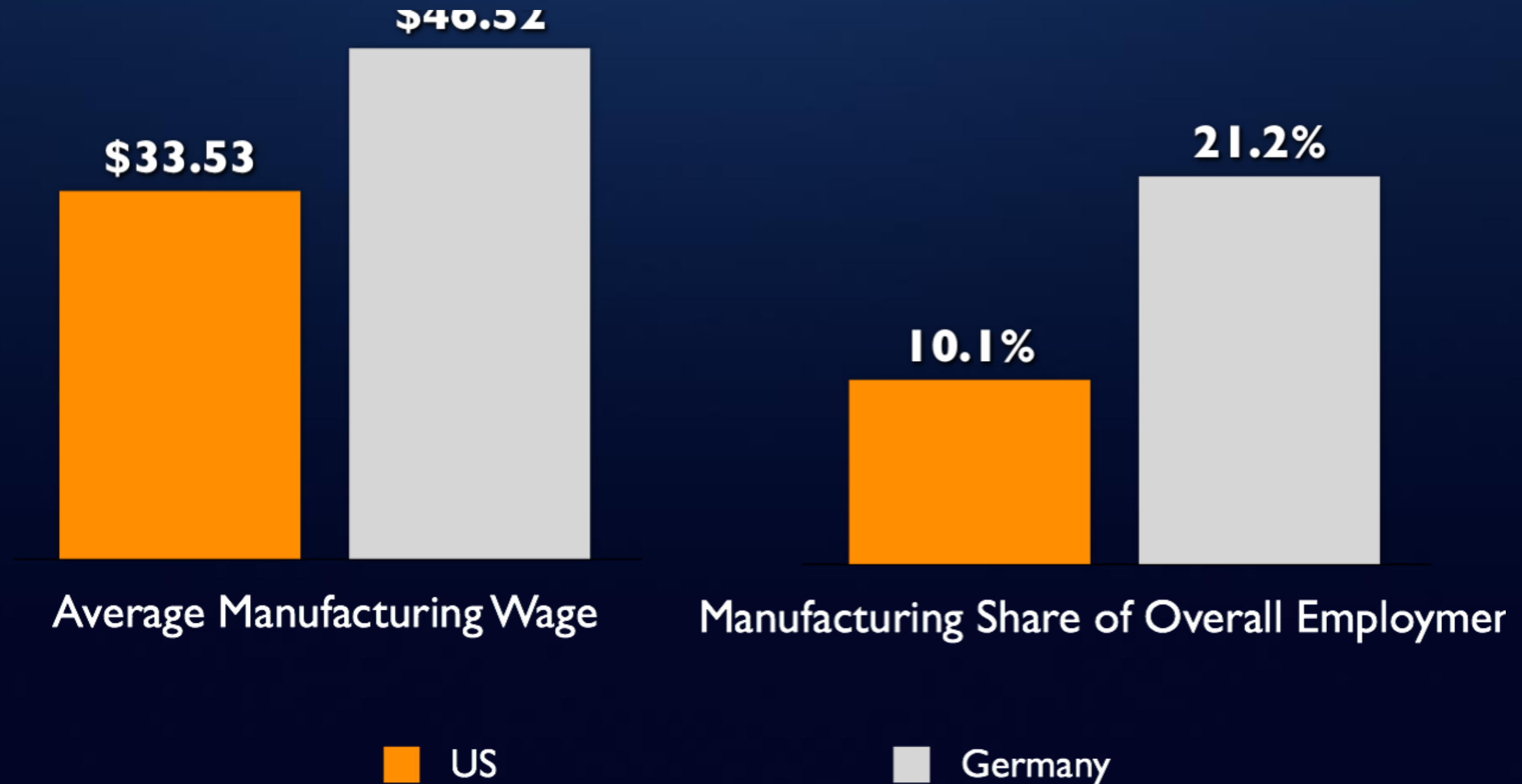
Industry Distribution of Manufacturing R&D Company Spending (2008)



bad firms

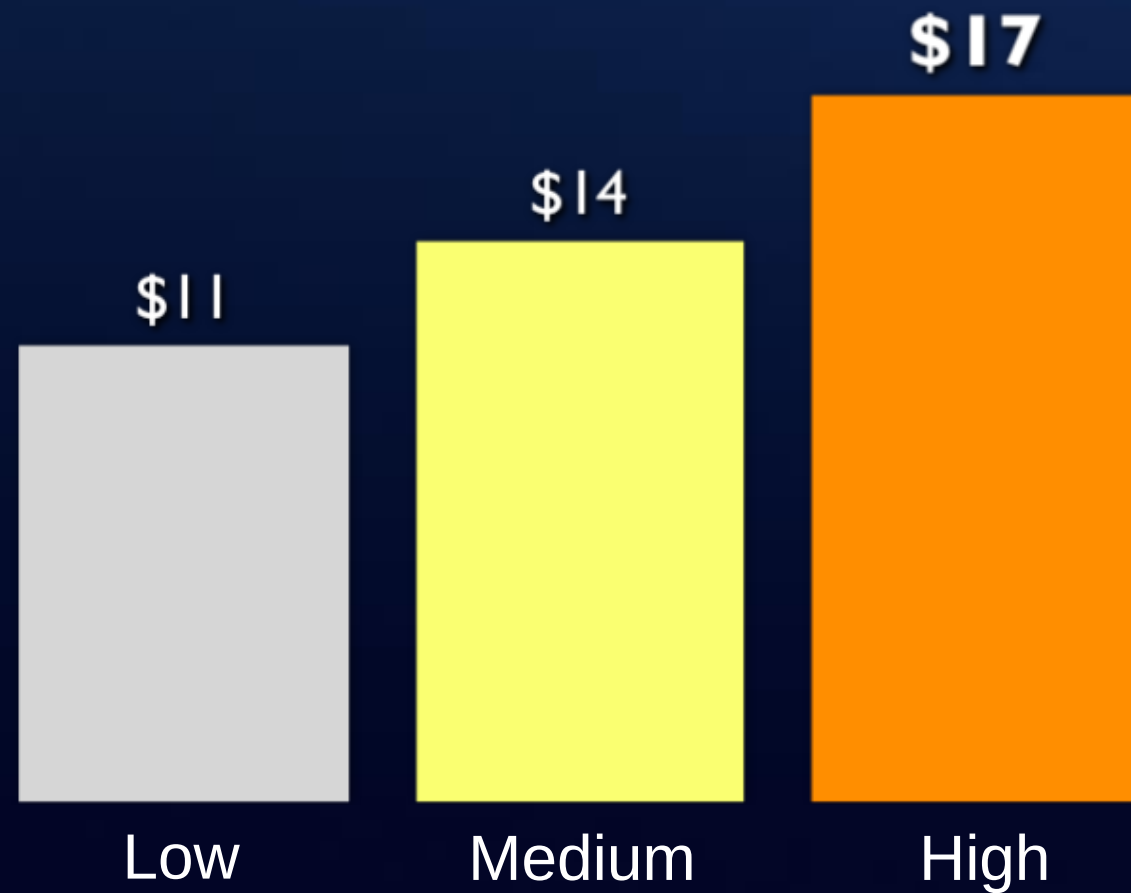
- Why do they persist?
- What are their impacts?
 - Undercut bargaining power of good firms
 - Reduce market for new technology

German manufacturers pay higher wages and employ a greater share of the nation's workforce



Automotive stamping firms: Wages

Hourly wages of
production workers

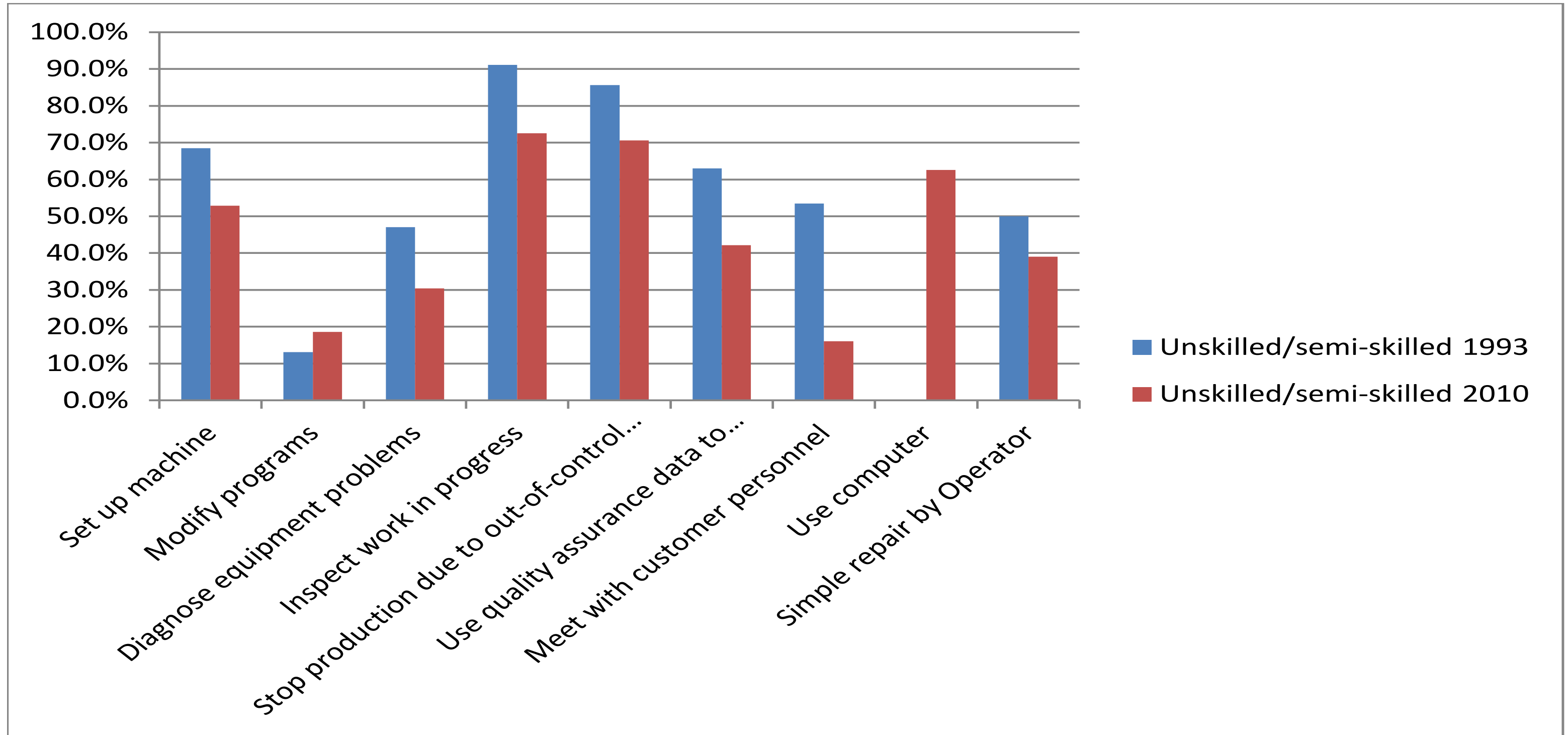


- Is there a collective action problem in innovation, as automakers each wait for competitors to invest in the supply chain?

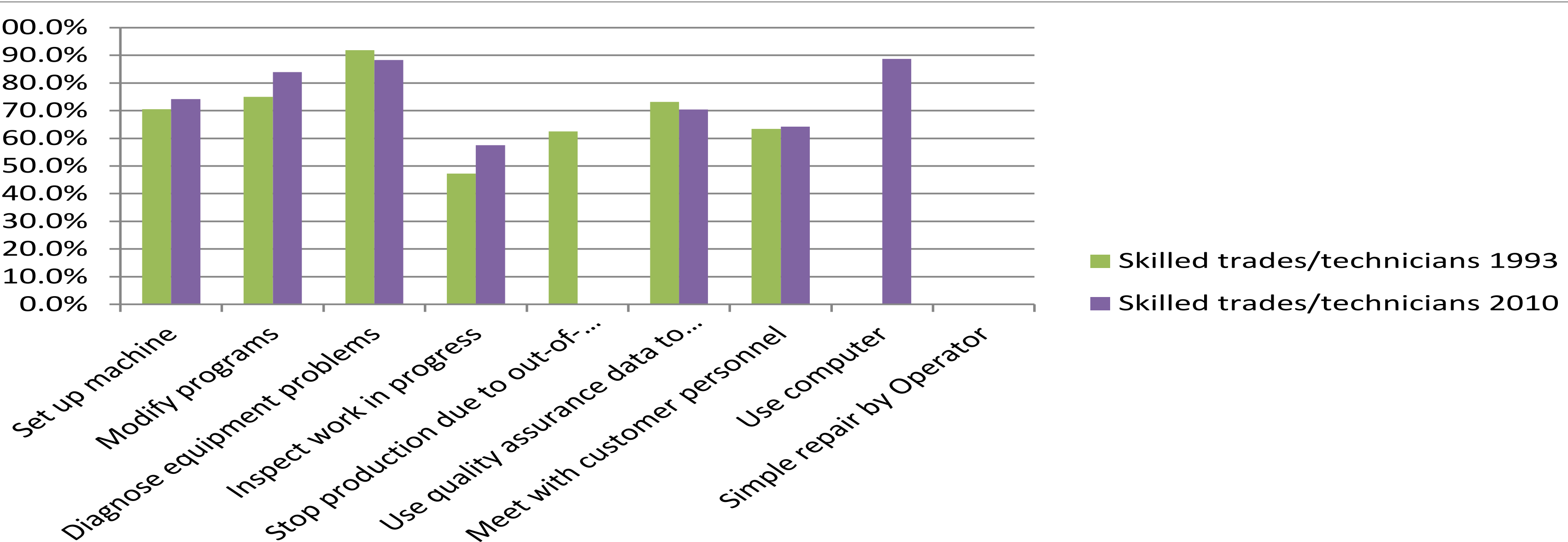
Conclusions

- Crisis creates opportunity
 - Some suppliers have seized opportunities from the crisis
 - Strengthen skills at independent, low cost innovation
 - Fewer competitors
 - Automakers and first-tiers realize (for the moment) interdependence of supply chain
- On-going debate: How should **shared supply chains** be transformed?
 - Who will pay for investments in **capacity**?
 - What **capabilities** are needed?
 - » Skills, coordination
 - » Hollowing out

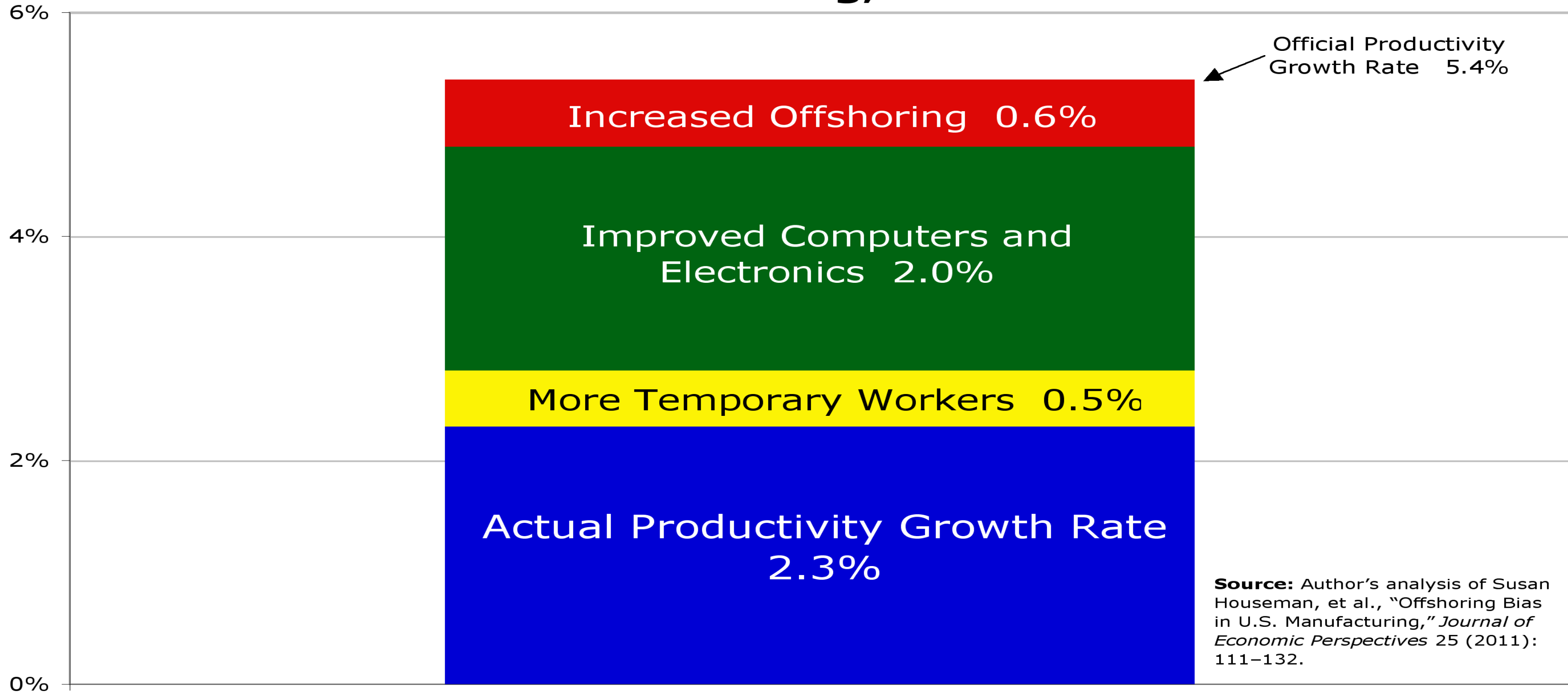
Knowledge overlap (prod'n)



Knowledge Overlap (Skilled)

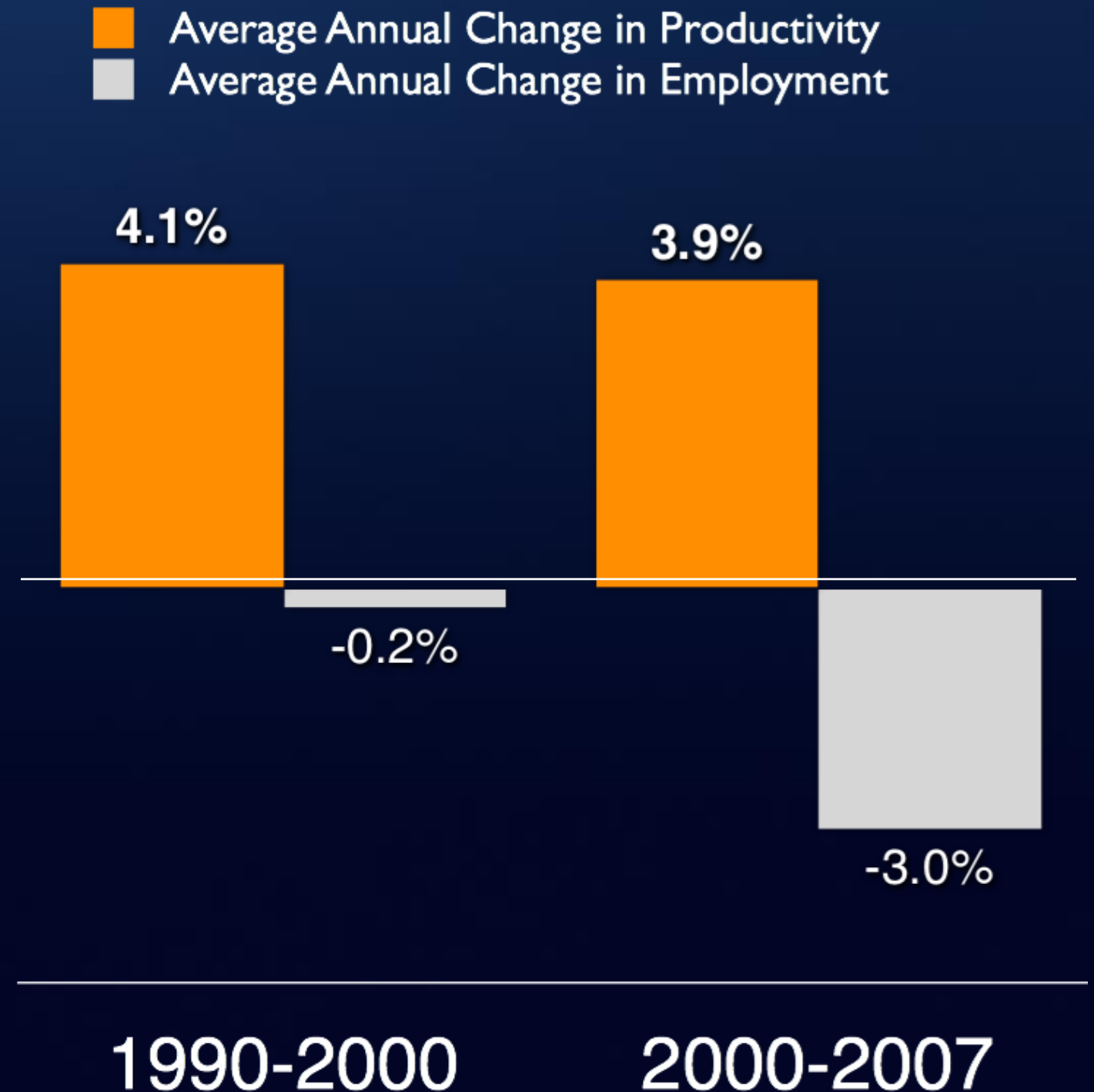


Adjusted Productivity Growth Rate for Manufacturing, 1997–2007

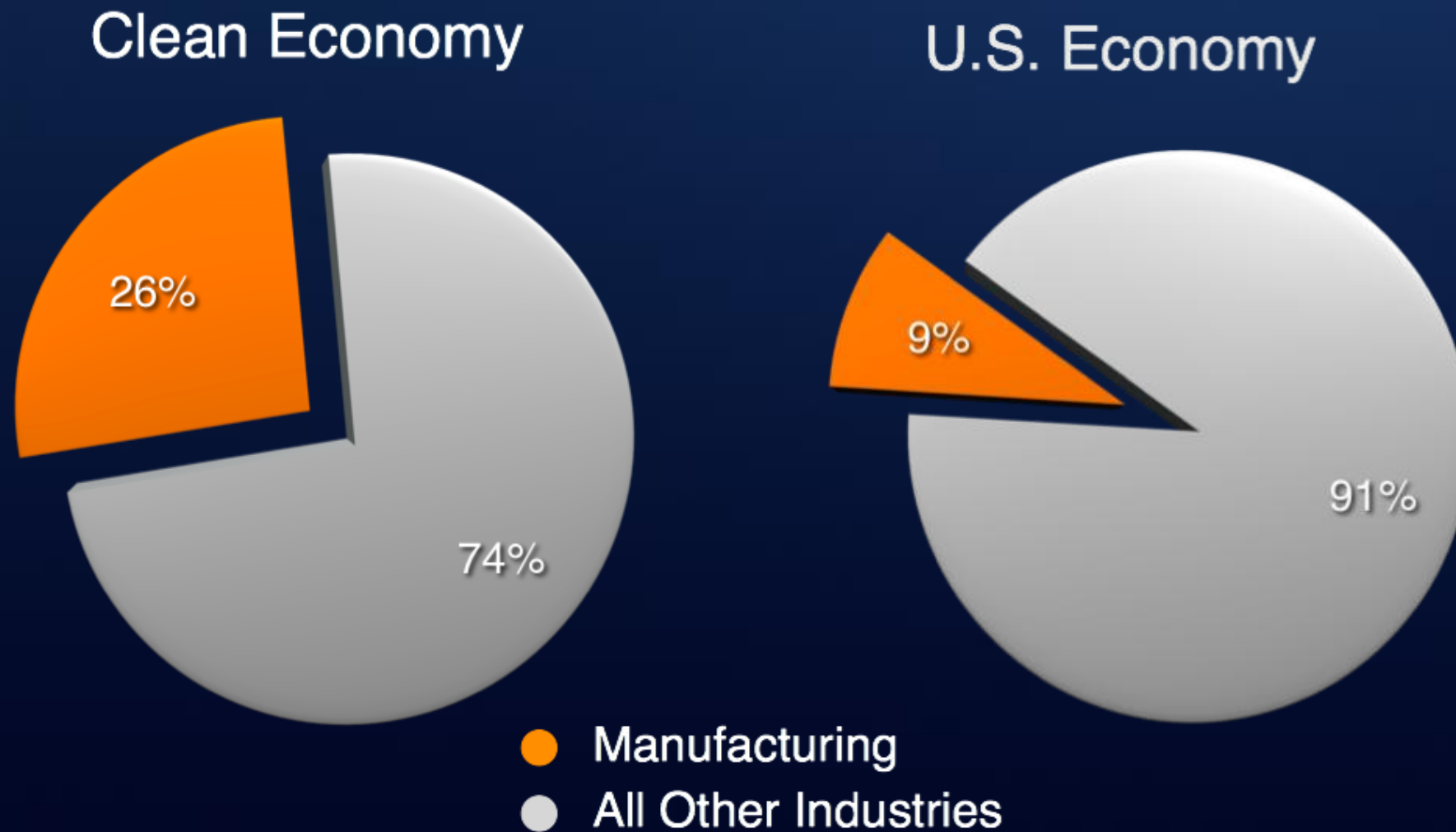


And it is a myth that innovation in manufacturing industries leads to job losses

Job losses and productivity gains move independently of one another



Manufacturing contributes disproportionately to environmental sustainability

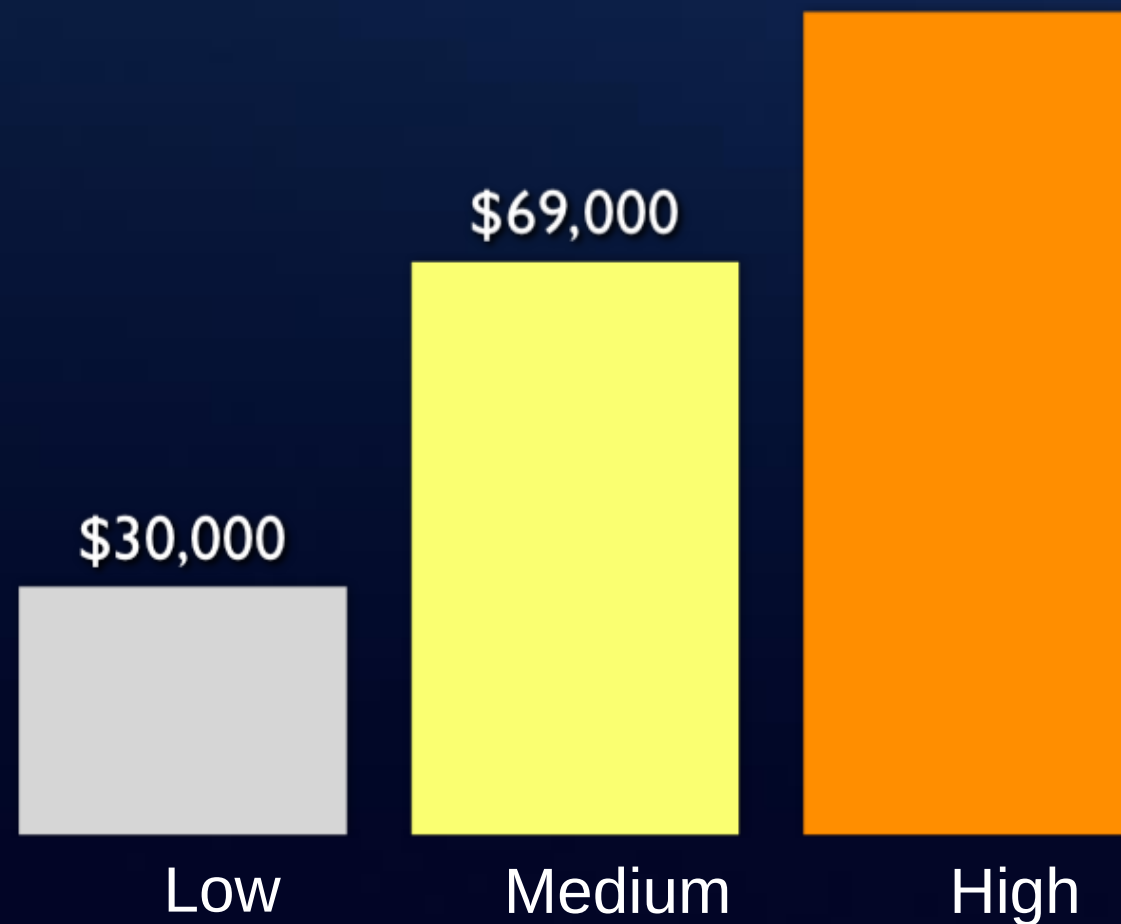


The clean economy is nearly 3x as manufacturing intensive as the broader U.S. economy

Jobs that produce goods and services with an environmental benefit or that add value to such products

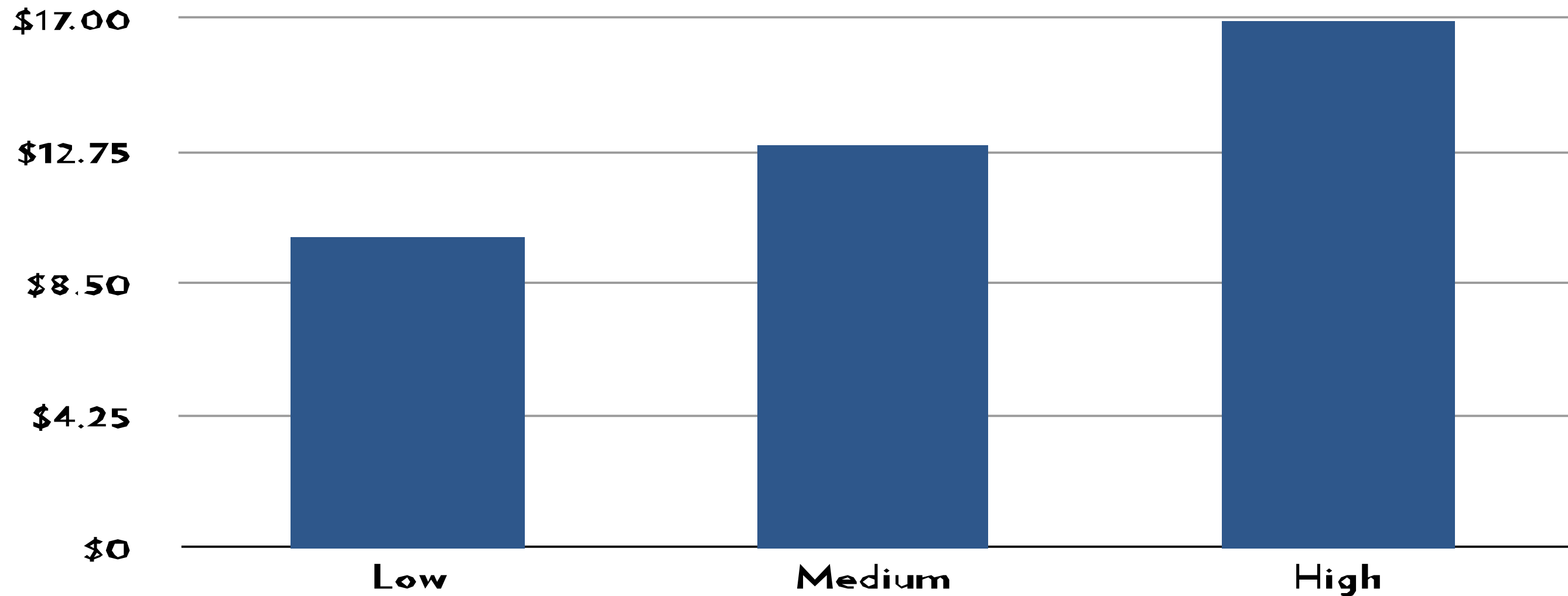
Automotive stamping firms: Productivity

Productivity per employee at automotive stampers



Productivity of high road firms is significantly higher

Hourly Wages of Production Workers at Automotive Stampers



Source: Case Western Reserve University Human Resources Manager Survey

methods

- Researchers should use a variety of tools
- Randomization, discontinuities, matched cases, pilots
- Take advantage of data already being collected