Helping manufacturing can help the rest of the economy

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Manufacturing can help meet national goals

• Good-paying jobs with career ladder
  - 14 million jobs, with weekly wage 20% above economy average

• Energy sustainability
  » Creating renewable capability to meet 25% of US electricity demand would employ 925,000
Energy Sustainability is a critical need

• Combating global warming requires capability for innovations large and small
  – Reduce cost of renewable energy
  – Increase efficiency in producing, using cars, appliances, etc.

• These capabilities are lacking
  – 90% of manufacturers report moderate-to-severe shortage of skilled production employees
  – 65% report moderate-to-severe shortage of scientists and engineers
  – Tooling industry lost 1/3 of employees 2000-2005
“High-road” mfg is necessary to achieve these national goals

• In “high-road” production, well-paid workers make cost-effective, sustainable products for consumers, profits for owners

  » How?
  » High road techniques harness everyone’s knowledge—not just top executives’ -- to achieve innovation, quality, and variety
  » Just one suggestion by workers at Mittal Steel in Cleveland saves $1 million per year
  » Colonial Machine in Kent OH makes tools just in time, with innovative reusable tool bases and computerized equipment equ
Many US Plants are Cost Competitive

Source: Michigan Manufacturing Technology Center. FY2006 data. Does not include hidden costs of off-shoring.
High wages don’t have to mean high costs

- Direct labor is usually only 5-15% of cost
- Offset high wages with better performance
  - Individual high skills
  - Collaborative supply chain, clusters of nearby firms provide fertile ground for new ideas
- Avoid hidden costs of off-shoring
  - Management loses focus on innovation at home
  - Increased risk from long supply chain
  - More difficult communication among design, engineering, and production means quality problems may fester
  - Eventually, design as well as production may move
Firms could close the gap with “high-road” production

• US manufacturers can compete with China.
  – But by *increasing* skill – not by imitating China

• But, many firms don’t use, due to market failures
  – Spillovers to workers and suppliers
    • Firms don’t capture all the gains from high-road production, so they invest too little in it
  – Complementarities
    – Colonial tool needed to invest in information technology, training, process redesign, and marketing
    – No one of these investments would pay off without the other
Public policies can help

- Example: Mfg Extension Partnership
  - Teaches firms high-road skills
    - Problem-solving for all workers
    - New product development
    - Collaboration with suppliers
  - We should triple this program, to million per year
    - Would cost < 18 hours of current Iraq war spending
    - And pay for itself with increased tax revenue
      » Cheap to retain capability, expensive to create it
Complementary policies

• Pave the high road
  – reduce costs of socially-beneficial actions thru
    • Education
    • R&D subsidies
    • Universal health care

– See also Economic Policy Institute Agenda for Shared Prosperity: www.sharedprosperity.org
Complementary policies (2)

• **Block the low road**
  – stop undercutting socially-responsible
    • Protect labor and environmental rights
      – Internationally
        » Treaties should promote competition based on innovation, not exploitation of workers, environment
      – Domestically
        » Strengthen safety, health, and labor regulation
  • Subsidize only firms that commit to high wage, high productivity, sustainable strategies
    – Patriot Corporations Bill
Conclusion: Why Promote High Road Production?

• Helps other stakeholders in the economy
  – Helps meet national goals such as energy sustainability
  – Doesn’t throw money at firms without quid pro quo

• Makes workers integral to production—not disposable
  • Education, R&D are important—but by themselves do not provide good jobs for most Americans

• High road principles apply to all sectors
  – Not just manufacturing
backup
Market design

• Role of externalities
  – Pie-expanding vs. Tapping into workers’ local knowledge may increase their

• Role of complementarities
  – Sector-specific policies needed
    • Need to operate on both supply and demand side
      – Training
      – Equipment design
      – Performance capabilities and expectations of shared supply chains (“industrial commons”)
    • appropriate interventions (in any sector—not just mfg) require industry-specific knowledge and with the participation of firms and other institutions that support the industry.
Other views

• Is manufacturing really in trouble?
  – Output is rising

• Why is mfg employment declining?
  – Reich, CBO views

• Is it a problem that manufacturing employment is declining?
  – Agriculture analogy

• Is manufacturing special in some way?

• Can government improve the situation?
  – Do market failures outweigh gov’t failures?
Dis-integration of Production and the Role of Institutions in the US Auto Industry

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Agenda

• Dis-integration of production in the US Automotive Industry has occurred
  • Key contributor to crisis at GM and Chrysler

• Can the US create institutions to govern shared supply chains?
Suppliers and the US auto crisis

• Cause of US auto crisis often held to be union labor costs
  – But these costs, including “legacy costs” of health care and pensions, made up < 10% of total costs
Detroit 3 Transaction Prices for Like-Like Vehicles Lag Behind Japanese OEMs by $2,500-$3,500

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Low price didn’t stop market share loss

U.S. Light Vehicle Market Share: GM

Source: S&P from Ward’s; 2007 is January 2007
The “Detroit Three” have a *price* problem more than a cost problem

- Suppliers play a key role in this problem—and in its solution
  - Capability problem
    - Massive outsourcing of the last 20 years created a shared supply chain, upon which automakers depend for design, production—
      - But each automaker wants to free-ride on others’ investment
    - Result: Underinvestment in design, quality, delivery capabilities
      - many supplier bankruptcies (even before general crisis)
  - Collaboration problem
    - US automakers incentivize purchasing agents to minimize piece prices
      - but this often results in increased system costs, reduced performance (eg, poor ride quality)
        » due to poor management of interactions across parts, frequent engineering changes
Industries with small suppliers can be productive

• Examples:
  – Germany: Baden-Wurttemburg
  – Italy: Emilia-Romagna
  – US agriculture

• These industries all have structures to overcome free-rider problems
Case study: automotive dies
Die-making

• Forms that bend metal into the shape of parts such as doors, roofs
• Lots of interaction among car design, engineering, auto manufacturing, die design
  – Flanges, attachment points, springback
US die-making: outsourcing

• Outsourced to small shops, who underbid each other on initial price
  – Make money on engineering changes, when OEM bargaining power is low→
    • Supplier may not want to find problems early
  – Shop cannot predict how many bids it will win→
    • Bid on diverse projects—don’t develop expertise on any one type of die
    • Will be late in boom times
  – Die-makers shared across OEMs→ no customer wants to pay for upgrading
US die-making: offshoring

• Chinese subsidies for die-making in last 10yrs
  – entrepreneurs get free factory and equipment if they meet employment goals
  – Piece prices 15-30% lower than US
  – Have developed standard ways of working to overcome distance
    • Webcams, detailed time sheets to show progress

• US die-making lost 1/3 of employees, 2000-5
  • Skilled as well as unskilled mfg being lost

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Die-making: Japanese approach

• Honda, Toyota in US:
  – Establish target cost based on deviations from previous design
  – Ask shop that made previous design if they can meet the target price
    • Discuss changes to design
  – System cost is less, quality is higher
    • No dies imported from low-wage countries

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Collaborative Tooling Example
Door Inners – 30% Savings

Source: Forthcoming CAR research
Implications of supply chain design for training

• Old US way
  – Each die is approached as a one-off project
    • Requires craft skill
    • Little repeatability
    • Expensive; workers retiring

• New US way
  – Rely on equipment, plant subsidies in China
    • Enables low capacity, labor utilization, narrowly-trained workers
    • Chinese have systematic ways of overcoming distance
      – Webcams, product life-cycle management software

• Japanese way
  – Suppliers become specialized, allows repeatability
    • Rewards skill at continuous improvement, systematization
Changes needed

• Adopt collaborative purchasing practices
  – Measure system cost
  – Adopt ‘value analysis’
    • Rigorous joint analysis of each process step improves systemic properties

• Remedy market failures of shared supply chains
  • Externalities
    – Recruit and train workers
  • Complementarities
    – To engage in continuous improvement and/or rapidly introduce new products, firms need to make near-simultaneous investments in marketing, information technology, training, and equipment
    – Hard for small firms to plan, implement, and finance this without help
      • Lean production

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How could industry councils help?

• Elicit the detailed information necessary to design good policies (overcome bounded rationality)
  – identify blockages that retard innovation.
    • Lack of collaboration
  – identify training needs
    • Codification of processes, handling lightweight ("green") materials
  – manage the design of training for field agents of the Manufacturing Extension Program (MEP) who assist firms in their sector.

• Bring together different interests (overcome opportunism)
  – create social networks that allow firms to learn from each other.
  – make coordinated investments, both subsidized and not.
  – compete for competitive grant programs
    • Government sets terms to incentivize competing on innovation, not low wages

• Thus, avoiding government failure (Rodrik), creating "learning by monitoring" (Sabel)
PART

- Program for Automotive Renaissance in Tooling
- Tried to agree on specialization across firms, develop lean capabilities
- Grant funding ran out
- No interest, pressure from OEMs

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Conclusions

• Massive outsourcing in US manufacturing has created shared supply chains.
• These supply chains need explicit governance if we are to overcome free-rider problems that block investments in supplier upgrading.
  — If not, US mfg will remain stuck in middle between high skills of Europe, low wages of China, Mexico.
• Industry councils could play an important role in this new governance structure.
  — But other institutions also needed (your help, please)

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Back-up slides
An industry council for die-making?

- US mfg stuck in middle between high skills of Europe, low wages of China, Mexico
- Rationale: Shared supply chains can be highly productive, *if* they are governed collectively
- Industry council:
  - Industry participants agree on training, standards for investments in computer-aided design, roadmap for tooling new, green powertrains, etc.
  - Government provides grants on competitive basis (to overcome free-rider problems), but does not “pick winners”
Criteria for good supply-chain governance

• Ability to choose investments well
  – Identify blockages that retard innovation
Possible experiment with Detroit-3 automaker

• Automaker would like to try collaboration
  – Higher payoff to proximity, but is it too late?
  – Remaining US shops divide labor (door inner, door outer, roof panel, etc) so can specialize
  – Automaker sources similar die from on-shore and off-shore, and examines system cost
Trust, but verify

- A cautionary tale from Chrysler in the 1990s
  - Chrysler trusted suppliers
    - Sole source across all of Chrysler
  - Little ability to verify that they got best performance
    - Could not benchmark suppliers of similar part for different car models
    - Could not check, improve designs because Chrysler had laid off engineers
  - Result
    - Chrysler was able to speed up product development, but could not obtain competitive supply prices
Why not let Honda and Toyota restructure US auto industry?

• They won’t invest as much in US suppliers as would be efficient
  – Although they spend more on supplier development than do the Detroit 3, Honda and Toyota do worry about others free-riding

• The most advanced processes remain in Japan
  – R&D, advanced product development
  – Close to headquarters and most-skilled supplier production facilities