

Research commercialization as a link between innovation and inequality

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Outline

1. What distributional effects?
2. University tech transfer implicated
3. Policy implications

Trickle down innovation?

- R&D investments \neq productivity gains (1970-2008 = 1.7%)
- Cumulative Income Growth

Percentile	1947-1974	1974-2005
20th	97.5	10.3
40th	100.0	18.6
60th	102.9	30.8
80th	97.6	42.9
95th	89.1	62.9

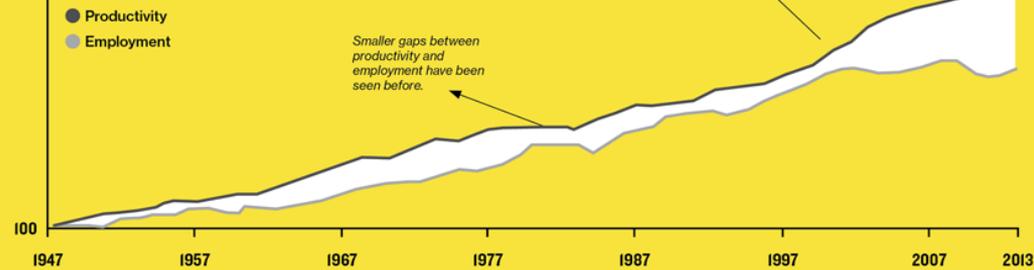
Source: Based on US Census Bureau data tabulated by Bartels (2008)

Decoupling Productivity and Employment

Digital technologies have boosted productivity in the United States without also spurring the expected job growth, argue Erik Brynjolfsson and Andrew McAfee. A result of this decoupling is that while gross domestic product (GDP) has risen, median income has not, and inequality has grown.

U.S. productivity and employment

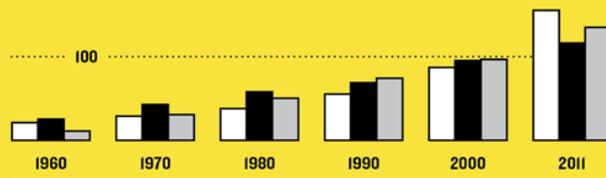
Beginning in 2000, a widening gap between productivity and private employment showed up in federal labor statistics (indexed: 1947 = 100).



Output per employed person in manufacturing

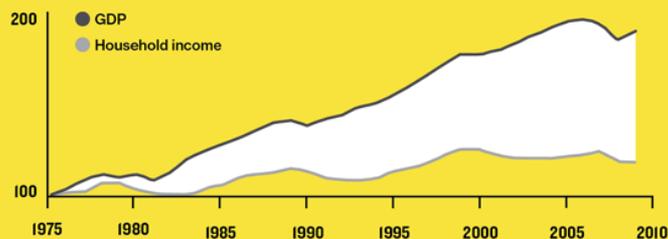
In leading advanced manufacturing countries, output per worker has grown impressively as factories have become more automated (indexed: 2002 = 100).

○ US ● Germany ○ Japan



U.S. GDP per capita and household income

While the nation's total output has generally grown over the last 25 years, the median household income has been nearly stagnant (indexed: 1975 = 100).



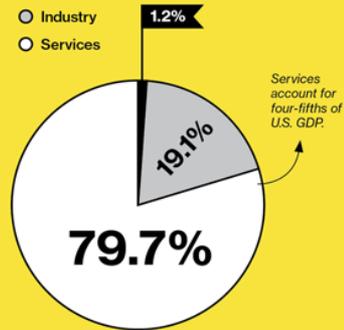
320k Industrial robots sold in the last two years



Automation in services has a dramatic effect

Making service work more efficient has an outsize impact on productivity figures because the sector is so large.

- Agriculture
- Industry
- Services



Source: David Rotman (June 12, 2013), How technology is destroying jobs. *MIT Technology Review*.

Outline

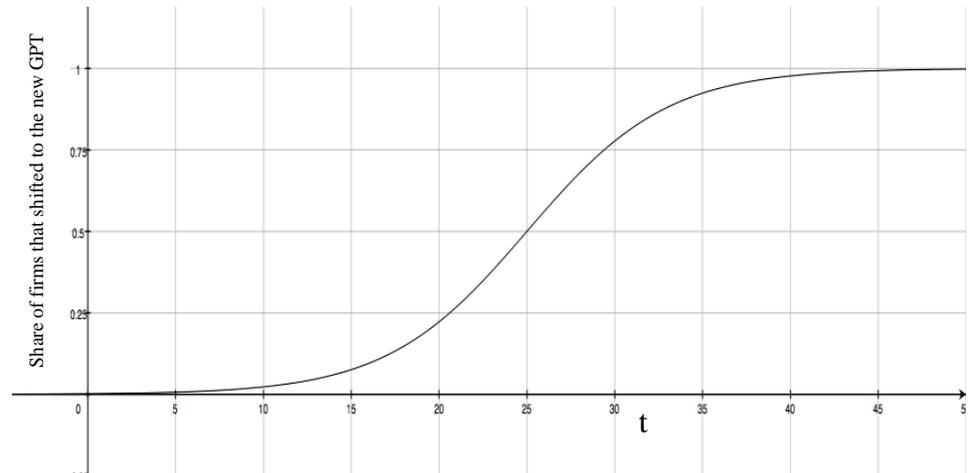
- 1. What distributional outcomes?**
2. University tech transfer implicated
3. Policy implications

What distributional effects?

- Wage disparities
- Consumer surplus

Old stories

1. Deunionization
 2. Excess supply of unskilled labor
 3. Free trade
 4. Skill biased technological change
- Adjusted for GPT

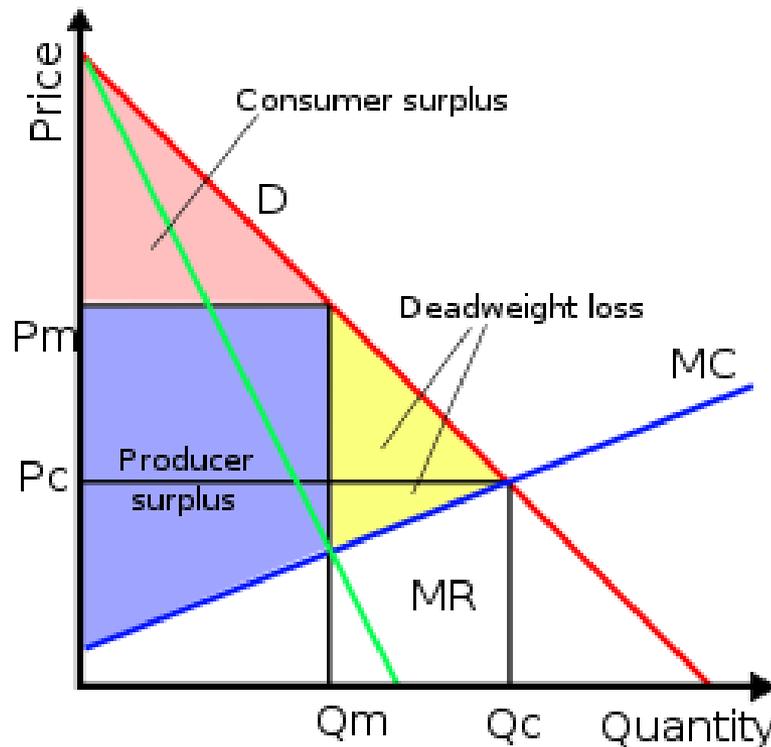


New story: Employer size

5. Non-competitive industries

- Larger employer bargaining power
- Trends in executive compensation
- Creators of sustainable jobs: mid-size companies
 - Cost pressure = large employer layoffs
- More efficiently absorb high-tech into supply chain
 - Nano will not be source of massive job gains

Consumer surplus



Welfare costs of
non-competitive
industries

Estimated deadweight loss of pharmaceutical cartel \$3bn to 30bn (Guell and Fischbaum).

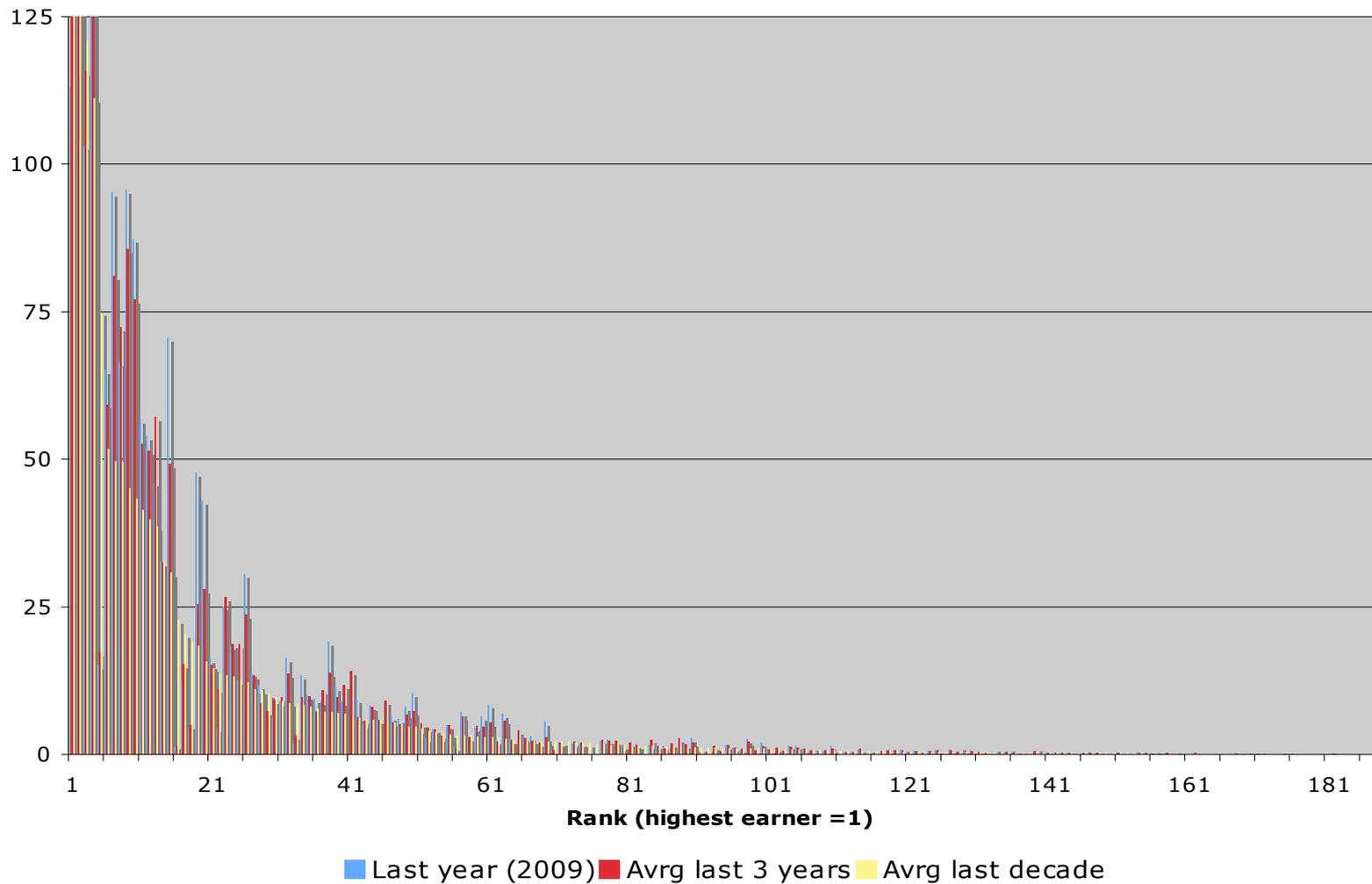
Outline

1. How to measure distributional effects?
- 2. University tech transfer implicated**
3. Policy implications

University's role

- Key nexus: **Industrial Organization**
- University Tech Transfer
 - Is fostering competition in new sectors?
 - Or reinforcing incumbents positions?

Distribution of Licensing Income



Blockbusters for only a few

Distribution of licensing income

- Of 149 TTOs, 91 at a loss
- Stable top 37 earners

A new TTO model

- Nurturing start-ups
 - Legal: IP portfolio
 - Incubator services
 - Experience in negotiation
 - Networking (investors, suppliers)

A new TTO model

Pros

- Easier than selling licenses
- Higher deferred income
- Prestige: fostering entrepreneurship

Cons

- Hard to sell
lackluster start-ups
- Greater early
negative cash-flow
- Univ. going out of
traditional roles

New model: Promise or peril?

- TTO business model can spur competition or concentration
 - Evidence from survey data (Gans, Hsu, Stern, 2000)
 - Biotechnology
 - Nanotechnology

Biotechnology

- 1990s 100+ promising biotech start-ups
- 2013s M&A by big pharma
 - Genentech -- Roche (fully 2009)
 - Chiron -- Ciba-Geigy (1995)
 - Genetics Inst and Immunex -- Amgen (2002)
 - Recent development Repligen
 - Centocor -- Johnson and Johnson (1999)
 - Biogen's PDL Biopharma -- Abbott (2005)

Nanotechnology

- Nanosphere (North Western U).
 - nano-enabled diagnostic devices
 - IPO \$100m 2007, market cap at \$34m 2013, only 25% institutional ownership.
- A123 System (MIT)
 - Lithium-ion batteries
 - IPO \$380m 2009, filed bankruptcy Oct 2012
- Arrowhead Research founded NanoPolaris later Unydim acquired NanoConduction (Nano Inc CNI--Rice U.)
 - Arrowhead Research injects funds in exchange of IP rights.

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3. **Policy implications**

Three levels

- University
- Federal Agency
- Congress: changes to the statute

Policy: Universities

- Emphasis on best practices (9 points to consider)
- Socially responsible licensing programs
- Preference for non-exclusive licenses
- Nurturing start-ups: Longer horizon for investments
- Multi-site research and commercialization

Policy: Federal Agencies

- Declare preference for non-exclusive licenses from their research grants
- Invite grantees to voluntarily opt-out from aggressive licensing practices
 - E.g. Reach-through fees
- More multi-site research grants
- Sponsor patent-pools

Policy: Congress

- Reaffirm the role of the university as broker-agent
- Create incentives for university cooperation
- Relax “exceptional circumstances” (35 U.S.C. § 202-a-ii)
 - For agencies to limit or cancel rights to inventions
- Expand powers for “marching-rights” (35 U.S.C. § 203)
 - To control of monopolistic prices

Policy: Congress

- Liquidity injections to start-ups--march through the valley of death--
 - Via the university
 - Directly

Acknowledgements

- David Guston, CSPO and CNS at ASU
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Old story: wage disparities

1. Deunionization

- May work for FR and DE, not US
- 25% lower variance than non-unionized firms
- However, deunionization started in 1950s, and growth of inequality in the 1970s

2. Excess supply of unskilled labor

- Women entering labor force since the 1960s and immigration
- However, education more than compensated expanding skilled labor.

Old story: wage disparities

3. Free trade

	Developed Countries	Developing Countries
Relative demand for skilled labor	Expand = widens wage gap	
Relative demand for unskilled labor		Expand = close wage gap

However:

- US trade with OECD is only 2% of GDP
- Relative prices of skill-intensive goods have not fallen
- Only 20% of shift from blue-collar to white-collar jobs is across industries (the remaining is within)

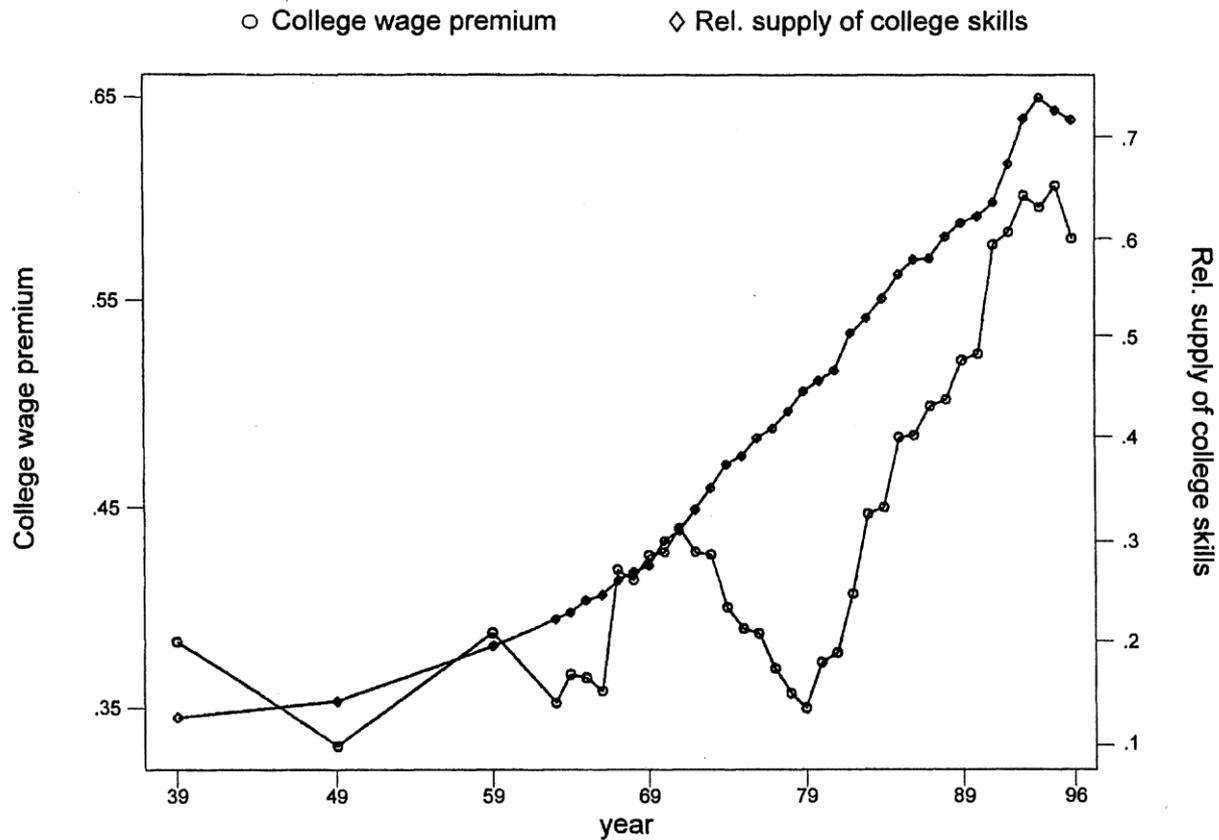
Old story: wage disparities

4. Skill biased technological change

– Formation of wage premium

- Technological change increase productivity of skilled $L >$ unskilled L
- When wage reflect productivity, results in an increase of the wage premium
- Hinges on complementarity of skill and technology
- Relative supply of skilled L should remain constant!

Relative supply of college skills and college premium



Source: Acemoglu, 2002

SBTC adjusted for GPT

- Market size effect: development firms try to preempt expansion of skilled L
- Nonlinear adoption cycle
- Adjustment created the wage gap

