Skills, Education, and the Rise of Earnings Inequality Among the "Other 99 Percent"

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The Other 99%

1. Is it all about the 'One Percent'?
2. Do skill investments still pay off?
3. Why are skill returns so high?
4. Job 'polarization' and the middle class
5. Are we running out of jobs?
6. Does inequality impede mobility?
7. Conclusions

Concentration of U.S. Incomes has Risen Dramatically Since the Late 1970s

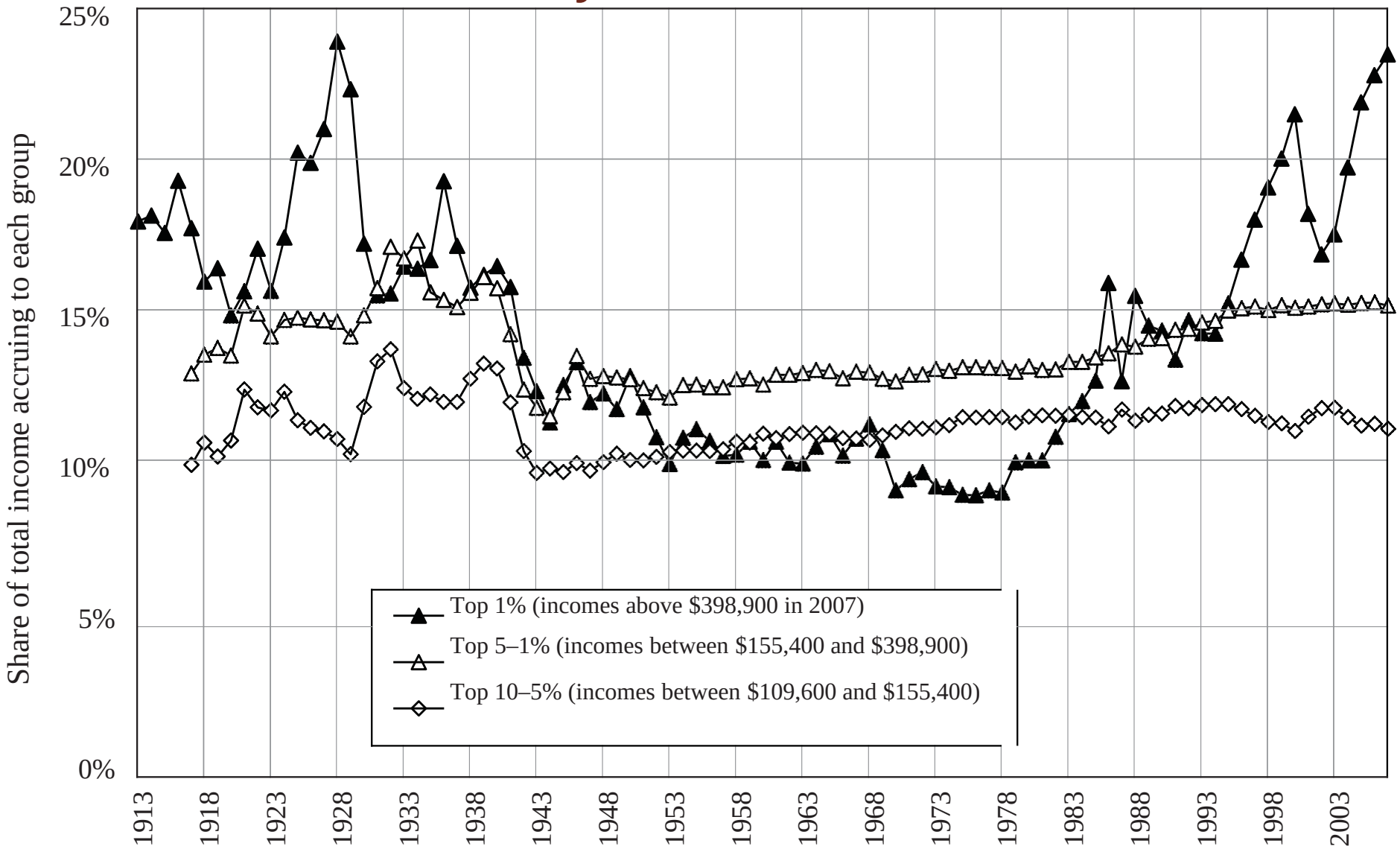


Figure 2. Decomposing the Top Decile US Income Share into three Groups, 1913–2007

Atkinson, Piketty, Saez 2011

Comparison of U.S., Canada, Spain, Sweden and Finland

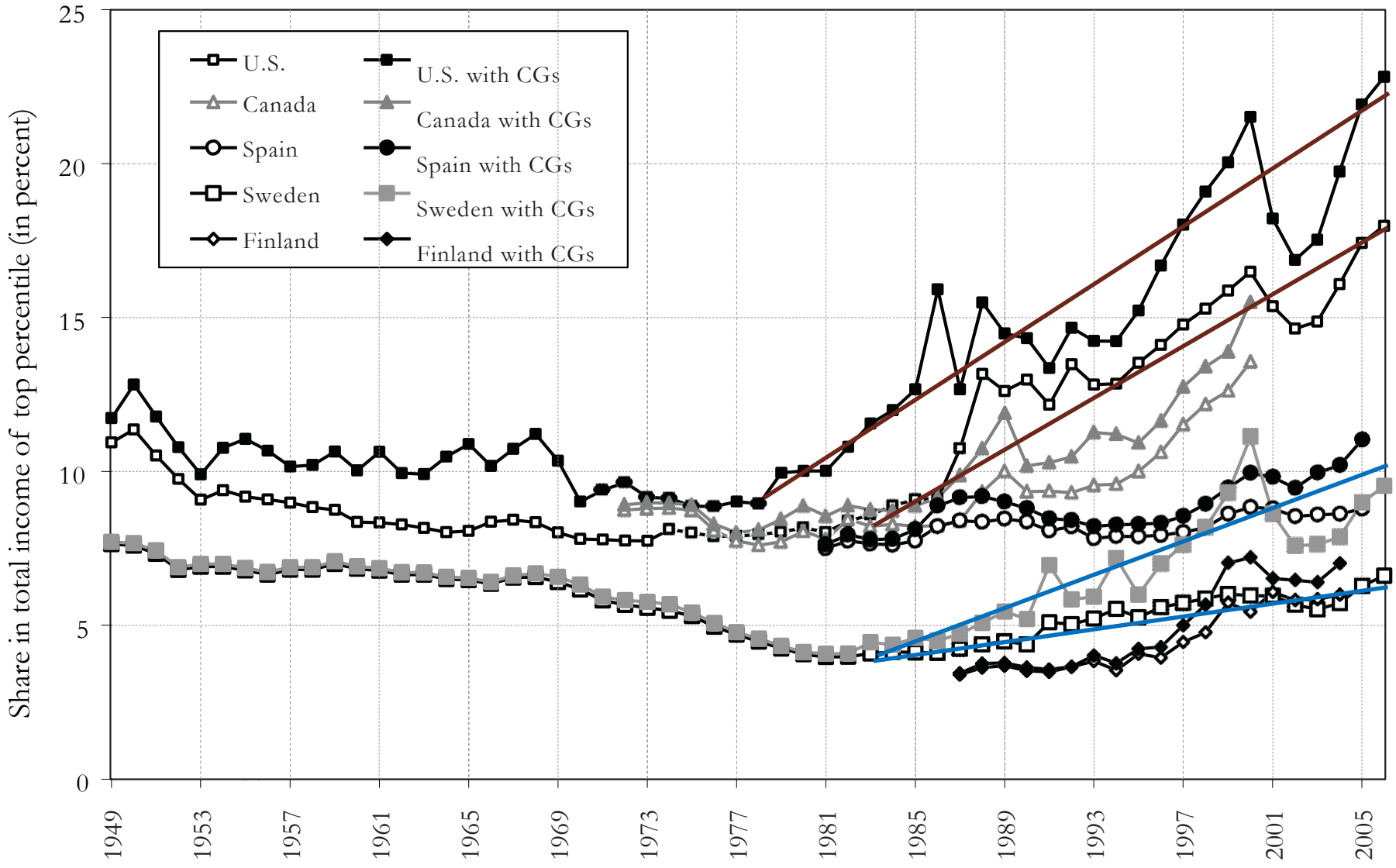
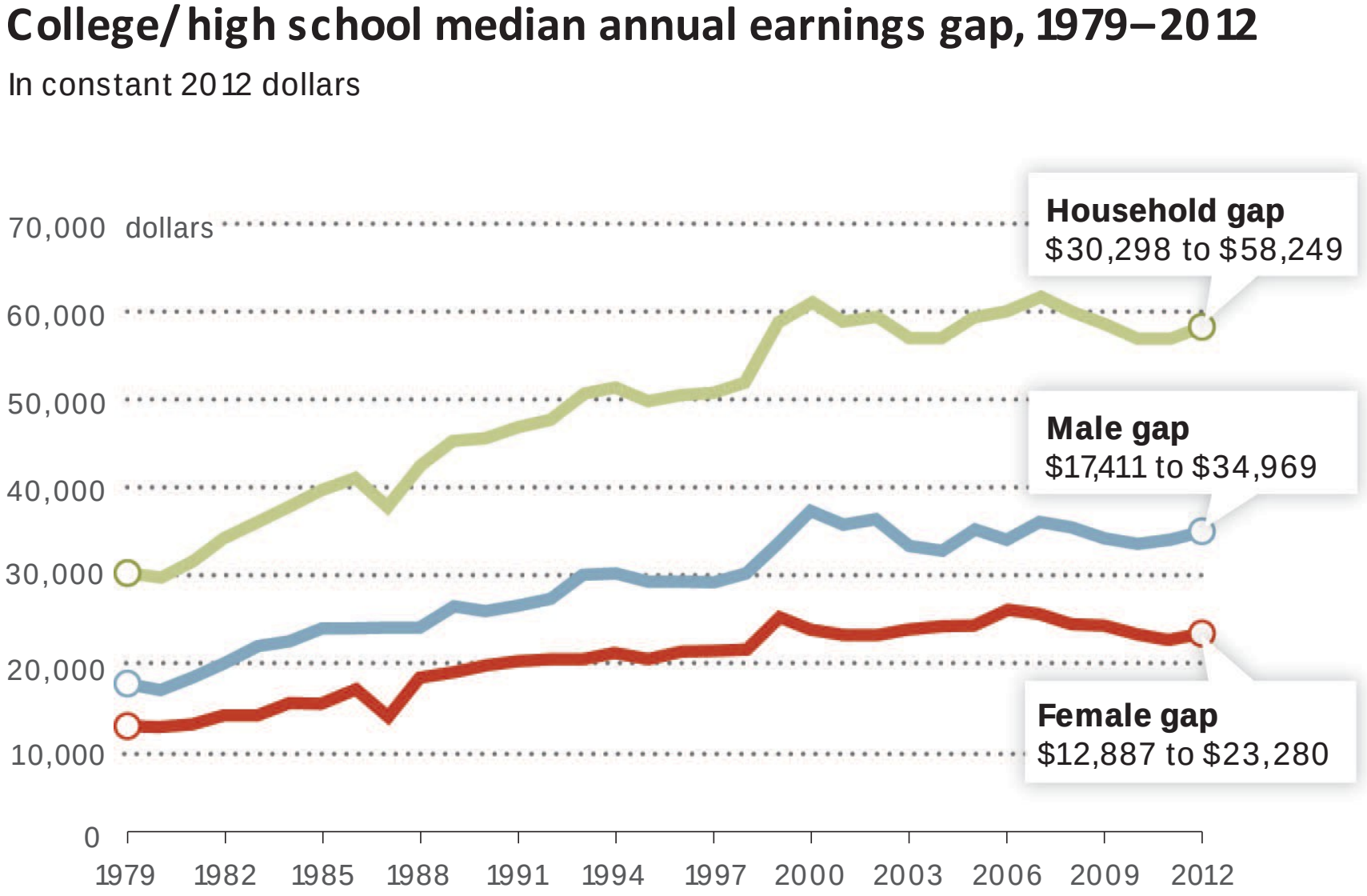


Figure 7. Effect of Capital Gains on Share of Top Percentile, 1949–2006

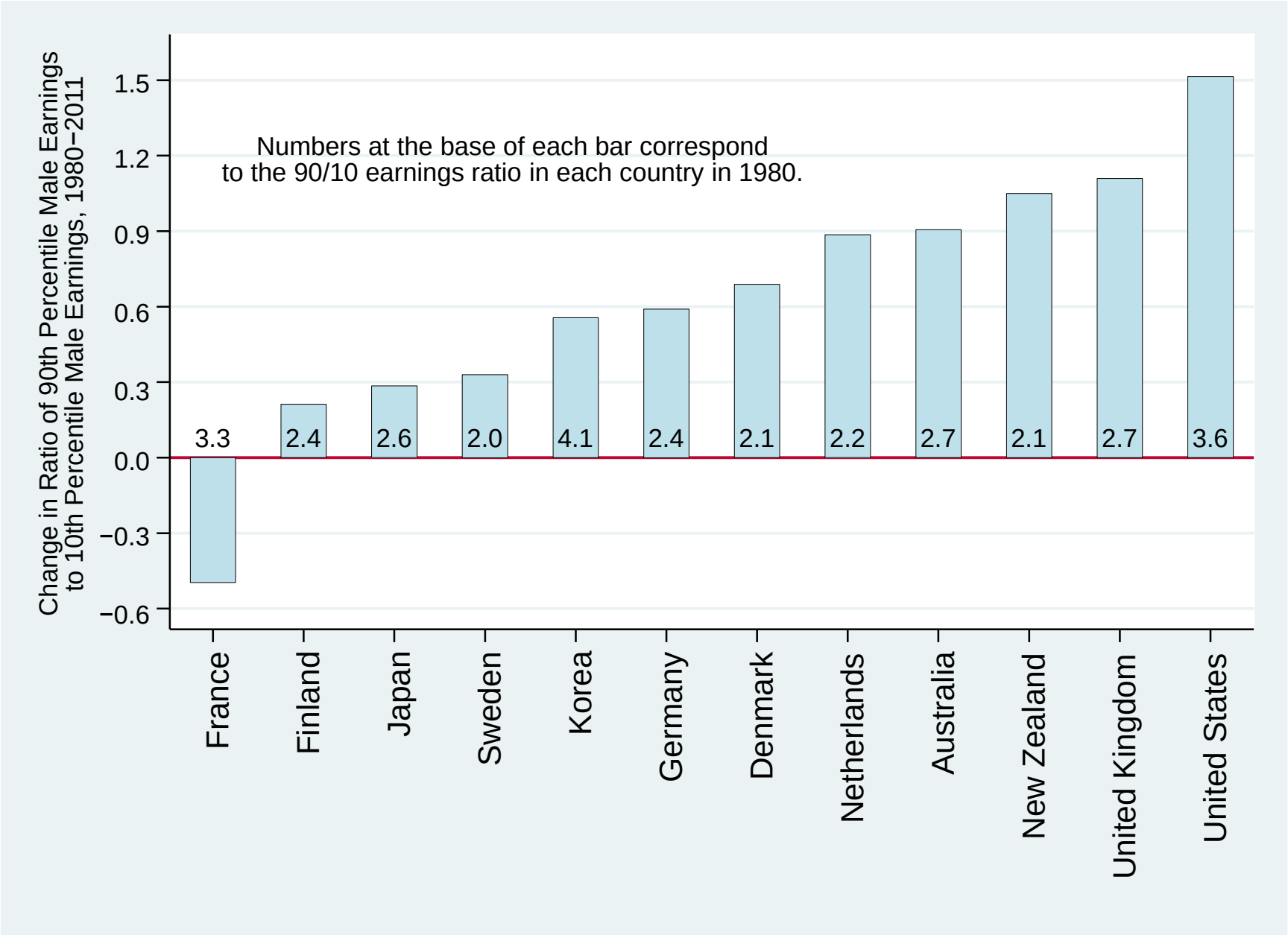
Atkinson, Piketty, Saez 2011

Median Earnings Gap b/w College & High School Roughly Doubles between 1979 and 2012



Autor, 2014

Changes in the 90/10 Ratio of Full-Time Male Earnings Across Twelve OECD Countries, 1980-201



OECD Statistical Abstracts, Machin and Van Reenen 2010

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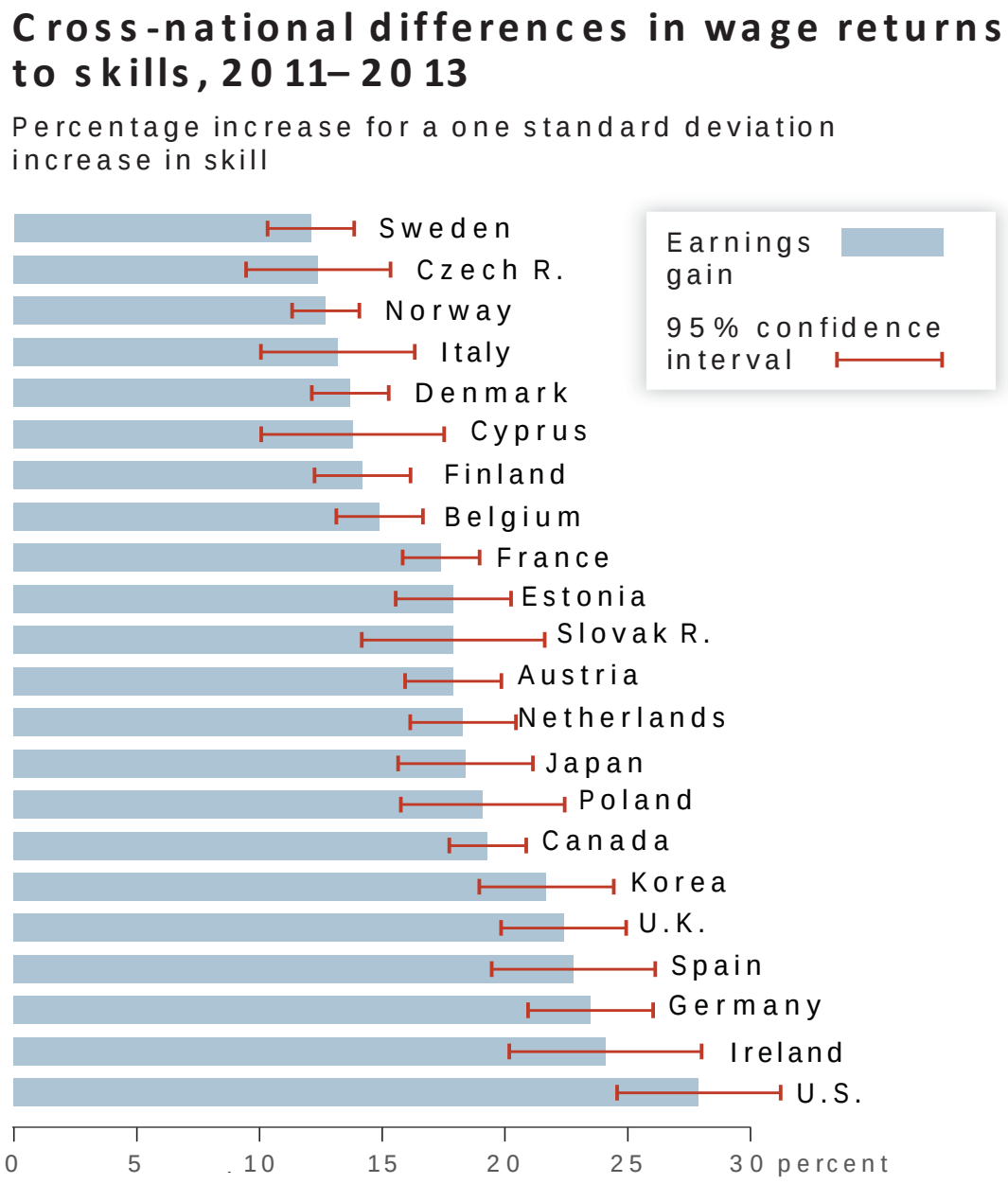
U.S. Has Very High Returns to Skill Relative to Other Industrialized Countries

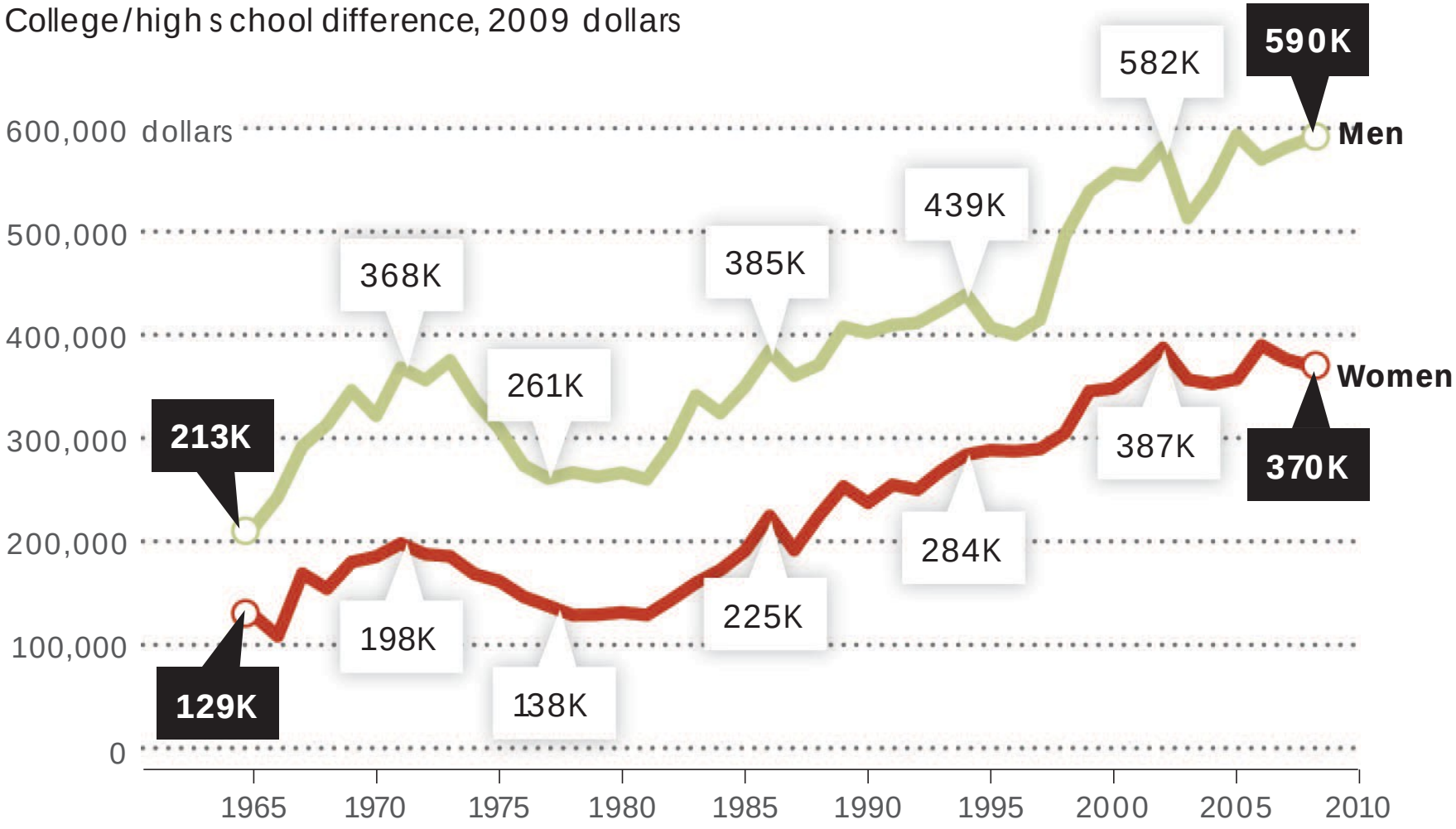


Autor, 2014

Inclusive of Tuition, College in the U.S. is a Better Investment Now Than it Was 50 Years Ago

Present discounted value of college relative to high school degree net of tuition, 1965–2008

College/high school difference, 2009 dollars



Avery and Turner, 2012

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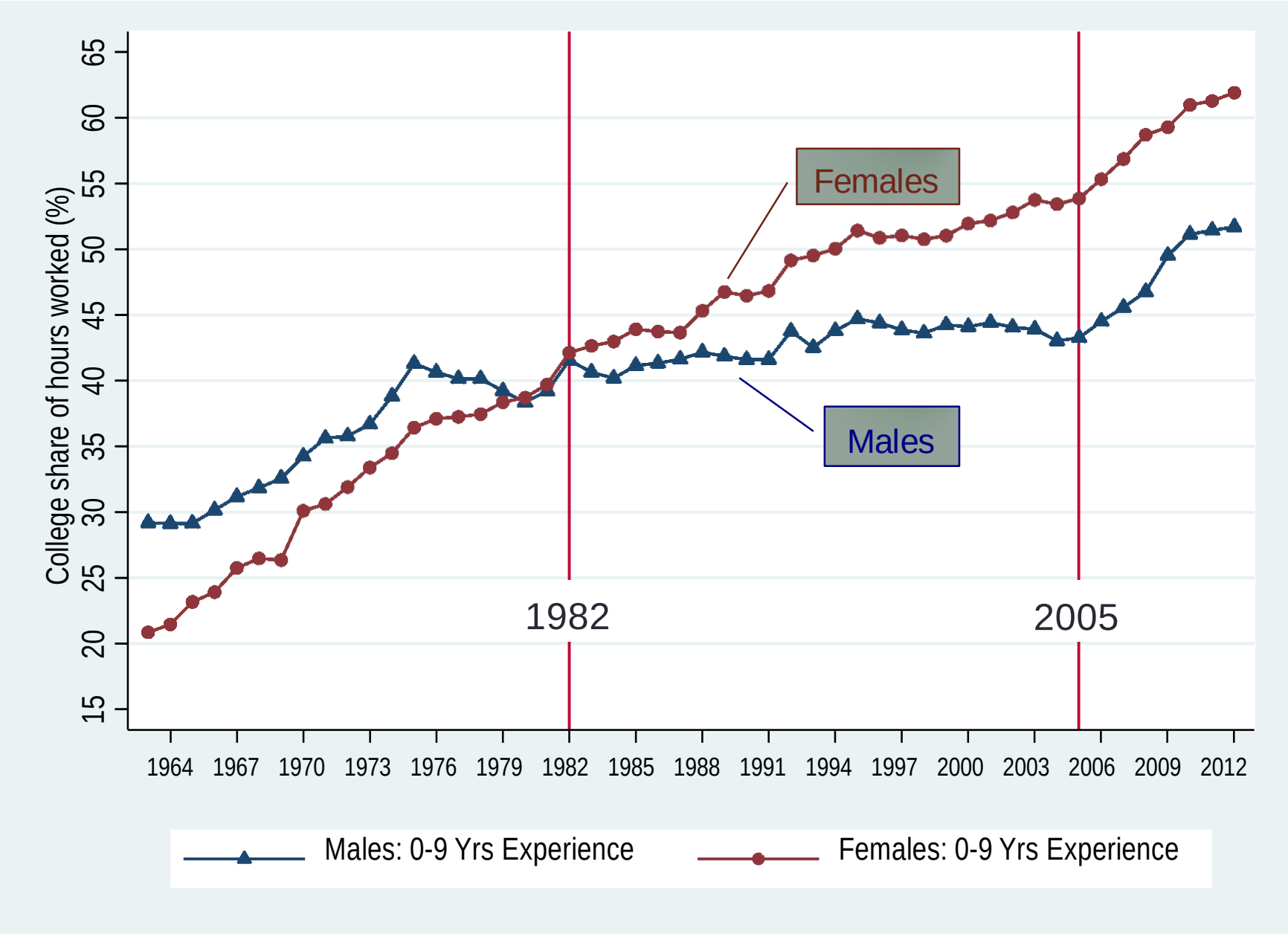
Largest Contributor to Widening Earnings Inequality: Deceleration in Supply of U.S. College Graduates

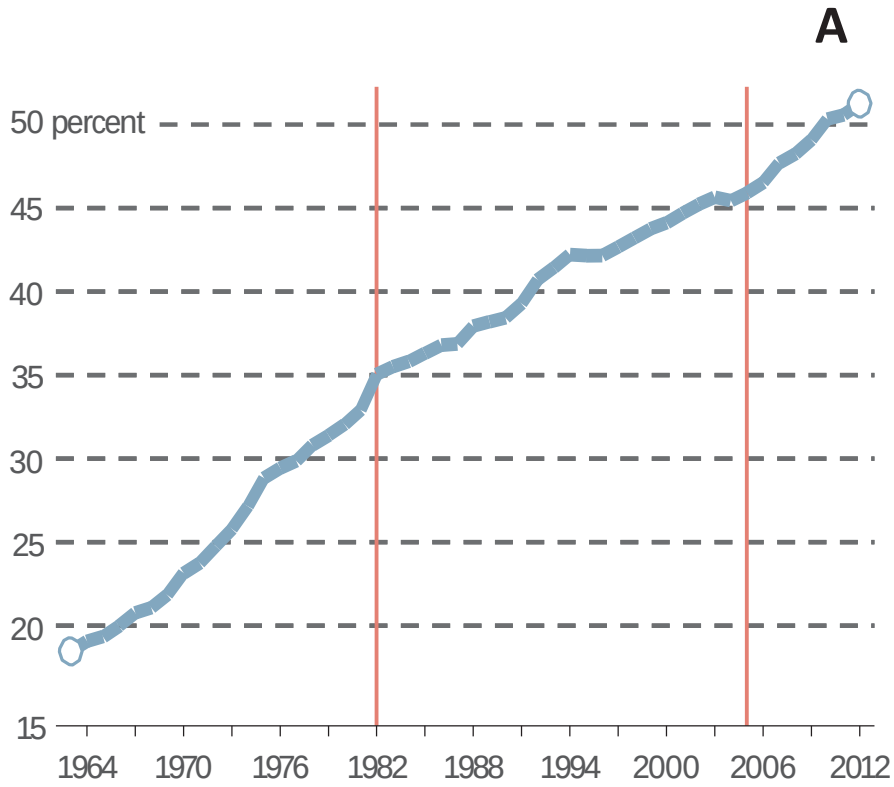


Autor, 2014

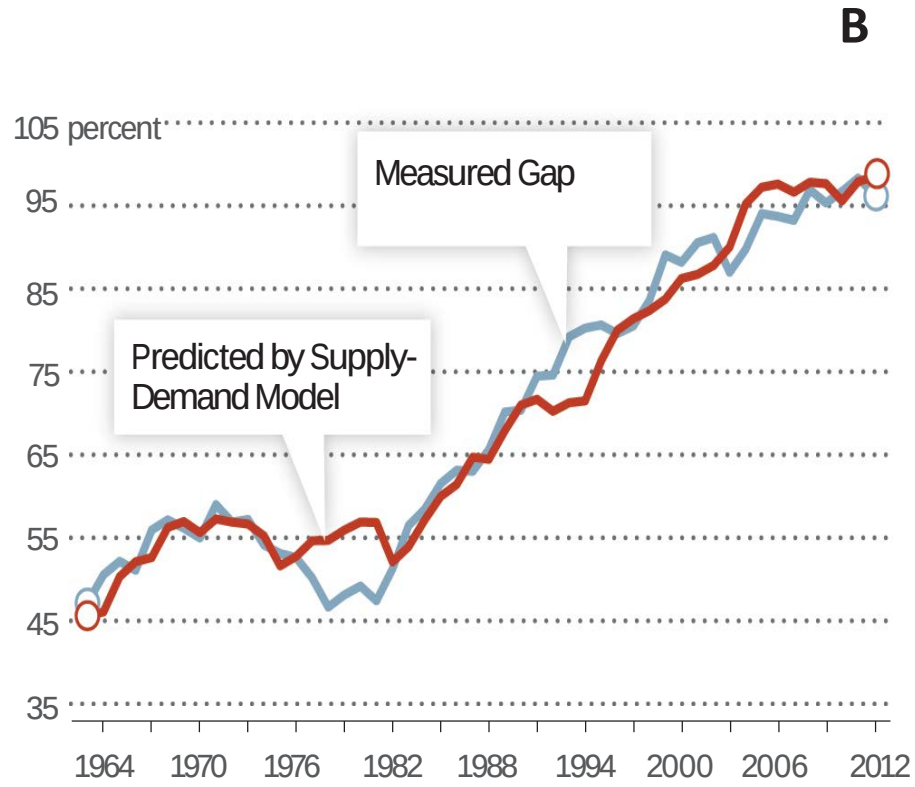
Largest Contributor to Widening Earnings Inequality: Deceleration in Supply of U.S. College Graduates

The supply of college graduates and the U.S. college/high school premium, 1963–2012

College share of hours worked (%), 1963–2012:
All working-age adults



College versus high school
wage gap (%)



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Tacit versus Explicit Knowledge

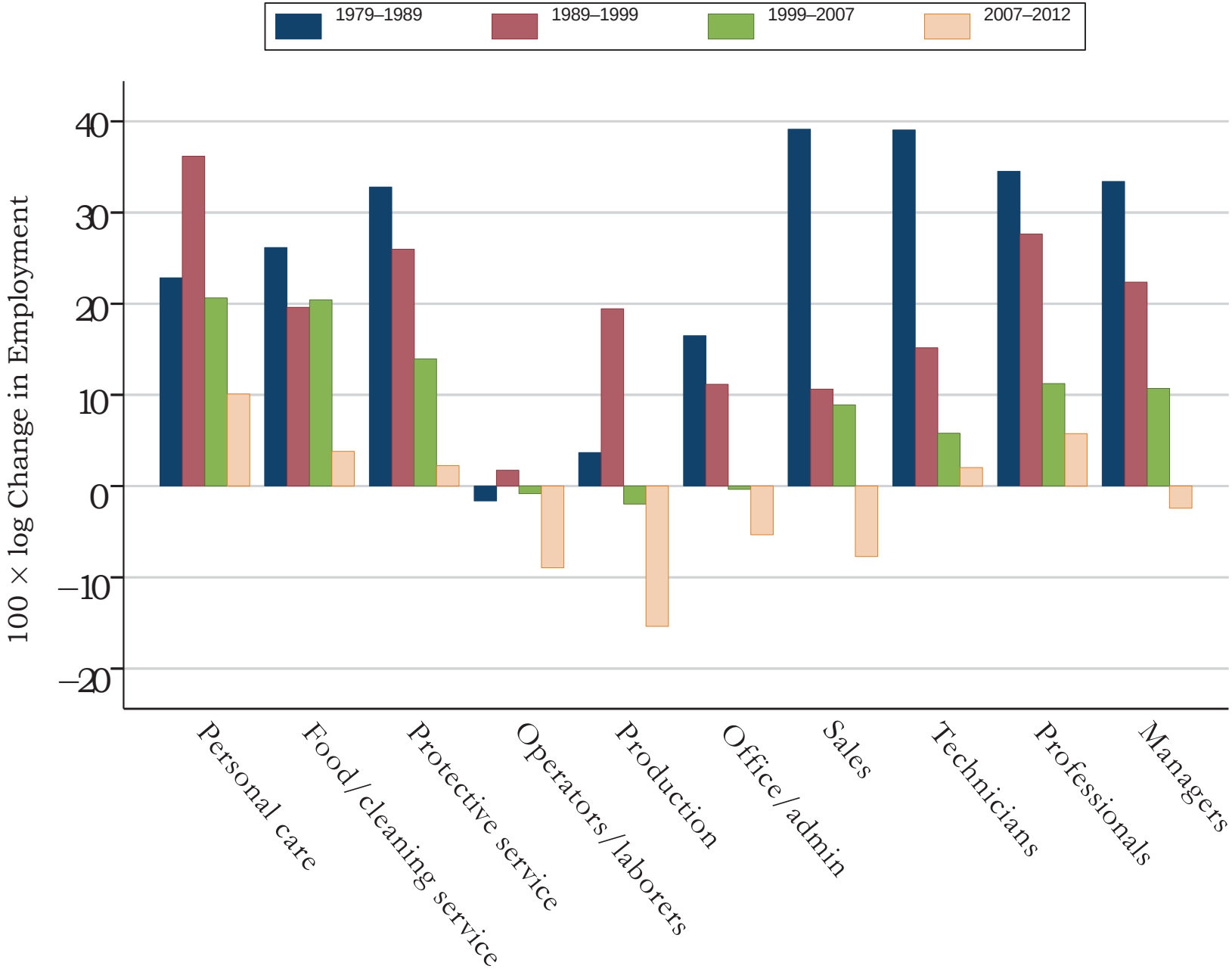
Michael Polanyi, The Tacit Dimension, 1966

> "We can know more than we can tell... The skill of a driver cannot be replaced by a thorough schooling in the theory of the motorcar; the knowledge I have of my own body differs altogether from the knowledge of its physiology."

Two implications of Polanyi's Paradox – One technical, one economic

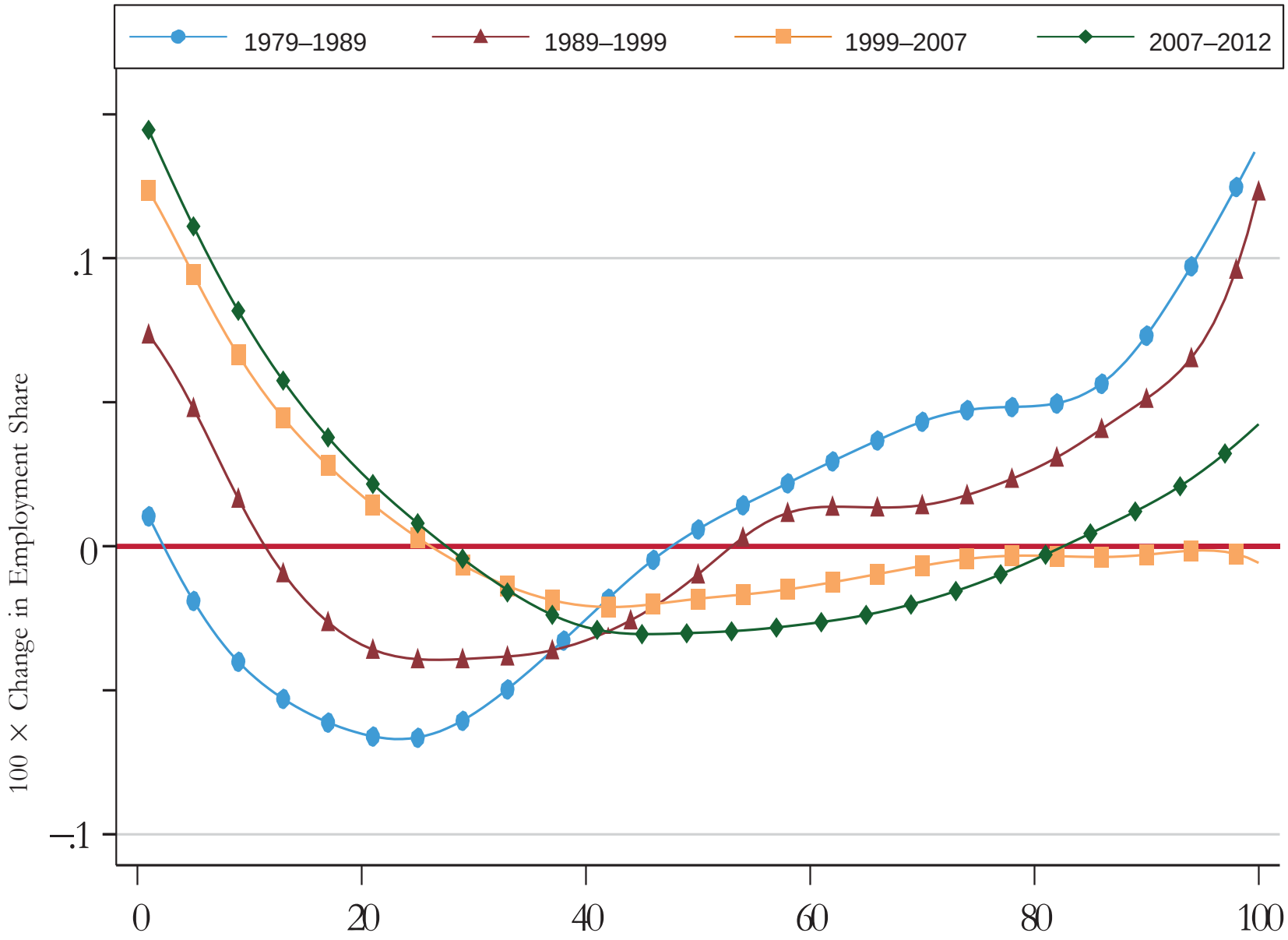
1. (*Technical*) Cannot automate what we don't explicitly understand
2. (*Economic*) Tasks that are not <u>substituted</u> by machines are typically <u>complemented</u> by machines

Employment Polarization in the U.S: Changes in Employment by Major Occupational Category, 1979–2012



Autor, 2015

Smoothed Changes in U.S. Employment by Occupational Skil Percentile, 1979–2012



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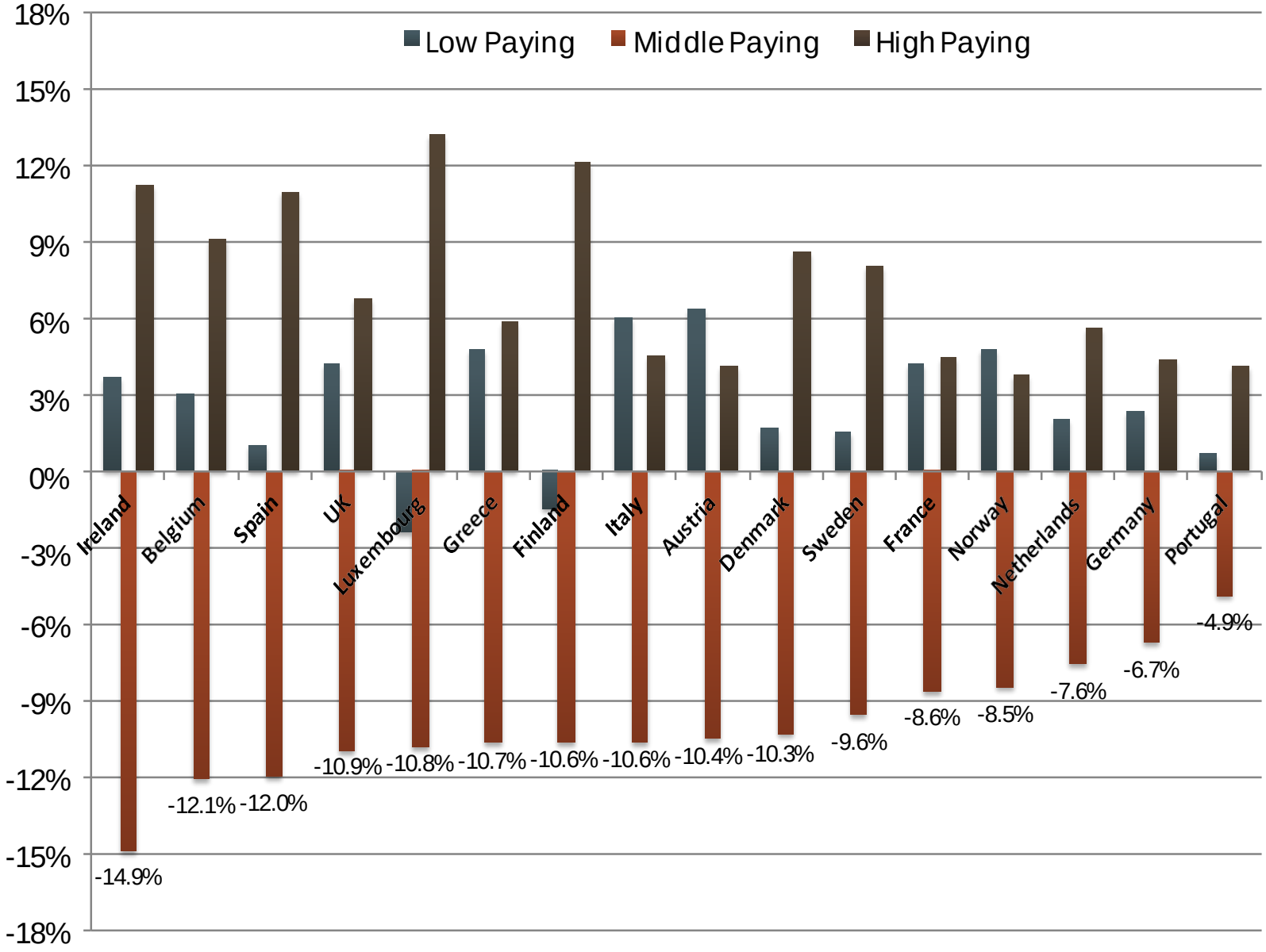
Employment Polarization in Sixteen European Union Countries, 1993 - 2010



Goos, Manning and Salomons, 2014

Factors that Shape Impact of Automation on Workers' Earnings

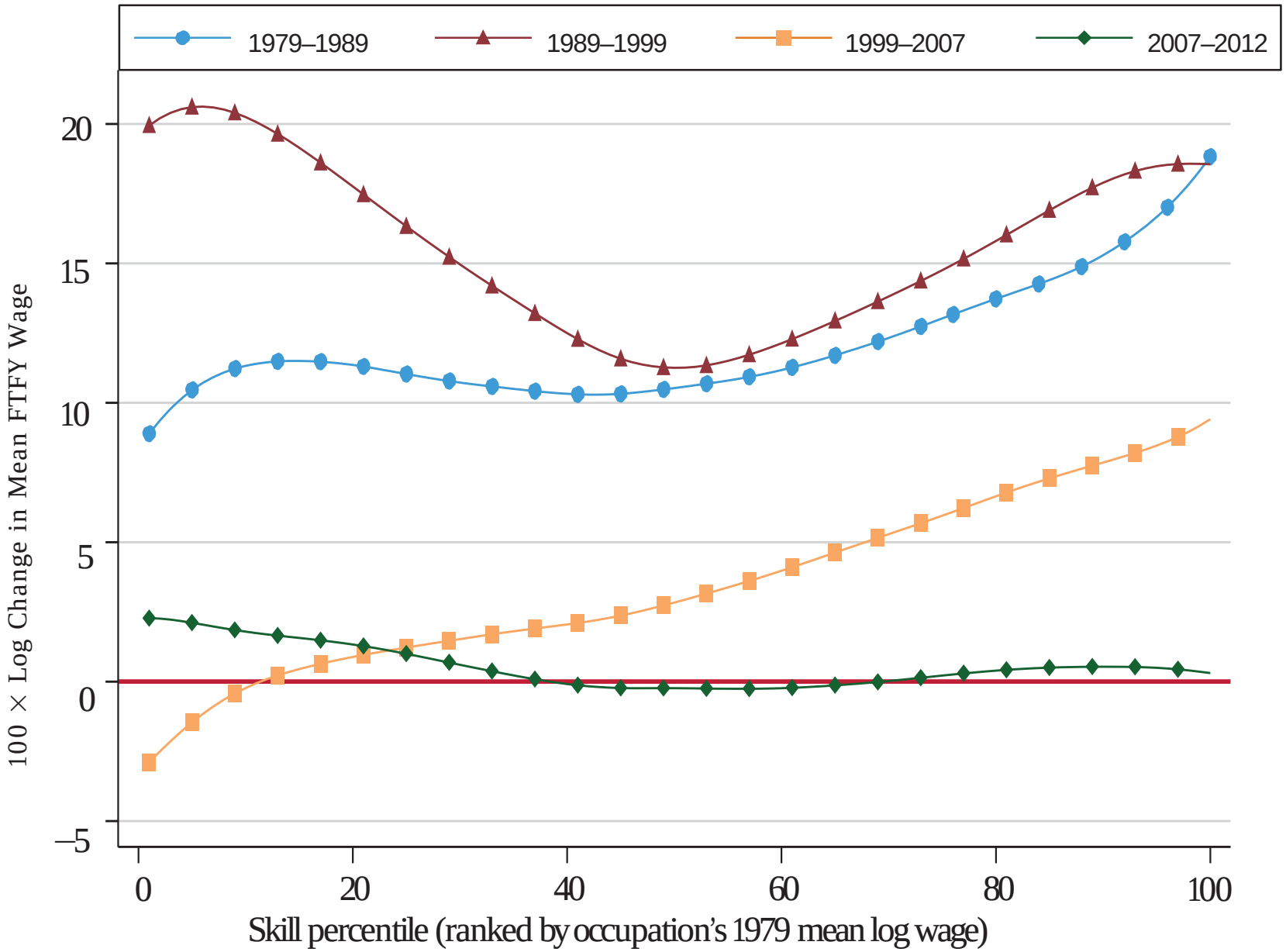
1. **Substitution versus complementarity**
   - Workers benefit if their job tasks are complemented, but not if tasks are substituted. *Great time to be a CADD operator, bad time to be a paper and pencil draftsperson.*

2. **Elasticity of final demand**
   - Can either dampen or amplify the gains from automation. *Think of agriculture versus health care.*

3. **Labor supply elasticity**
   - Can mitigate wage gains. *Why wages don't rise rapidly in food service and hair cutting…*

4. **Relevance:**
   - Abstract task-intensive versus Manual task-intensive jobs

Smoothed Changes in U.S. Mean Wages by Occupational Skil Percentile, 1979–2012

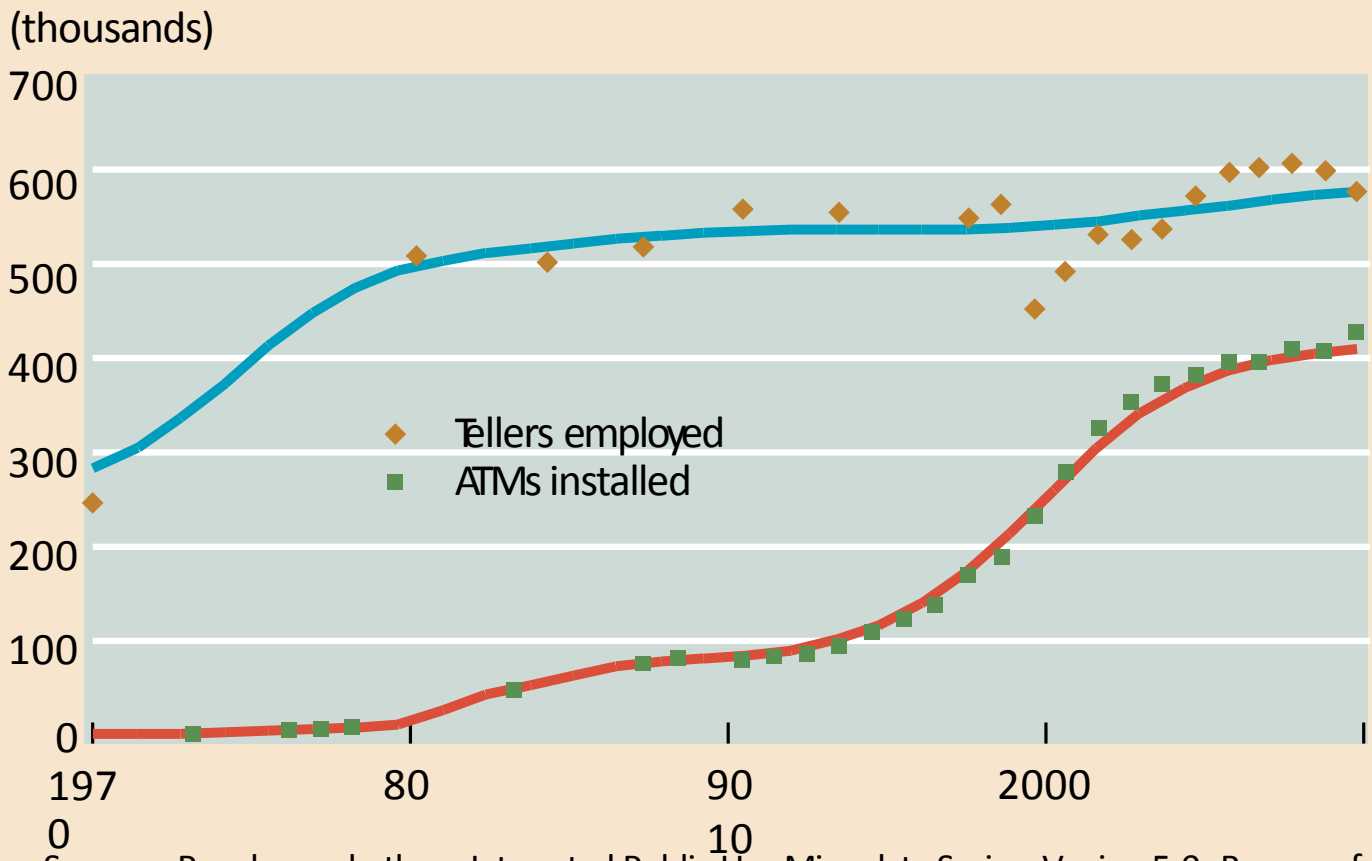


Autor, 2015

ATM Deployment and Bank Teller Employment, 1970 – 2010

Dispensing jobs

As more ATMs were installed in the United States, the number of tellers employed did not drop.



Sources: Ruggles and others, Integrated Public Use Microdata Series: Version 5.0; Bureau of Labor Statistics, Occupational Employment Survey; and Bank for International Settlements, Committee on Payment and Settlement Systems, various publications.

Bessen, 2015

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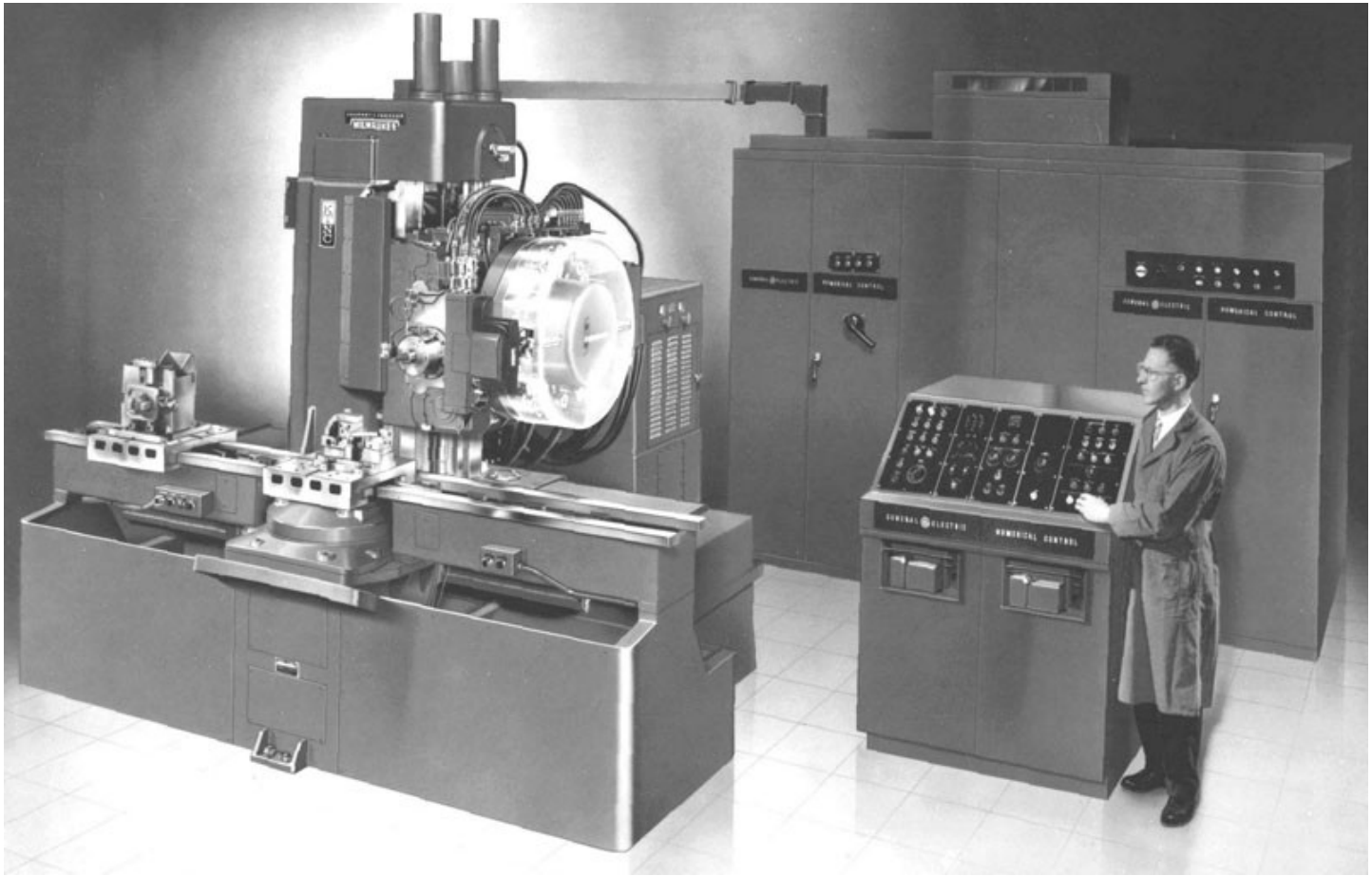
The 'Productivity Problem' of 1964

1964: President Johnson establishes "Blue-Ribbon National Commission on Technology, Automation, and Economic Progress"

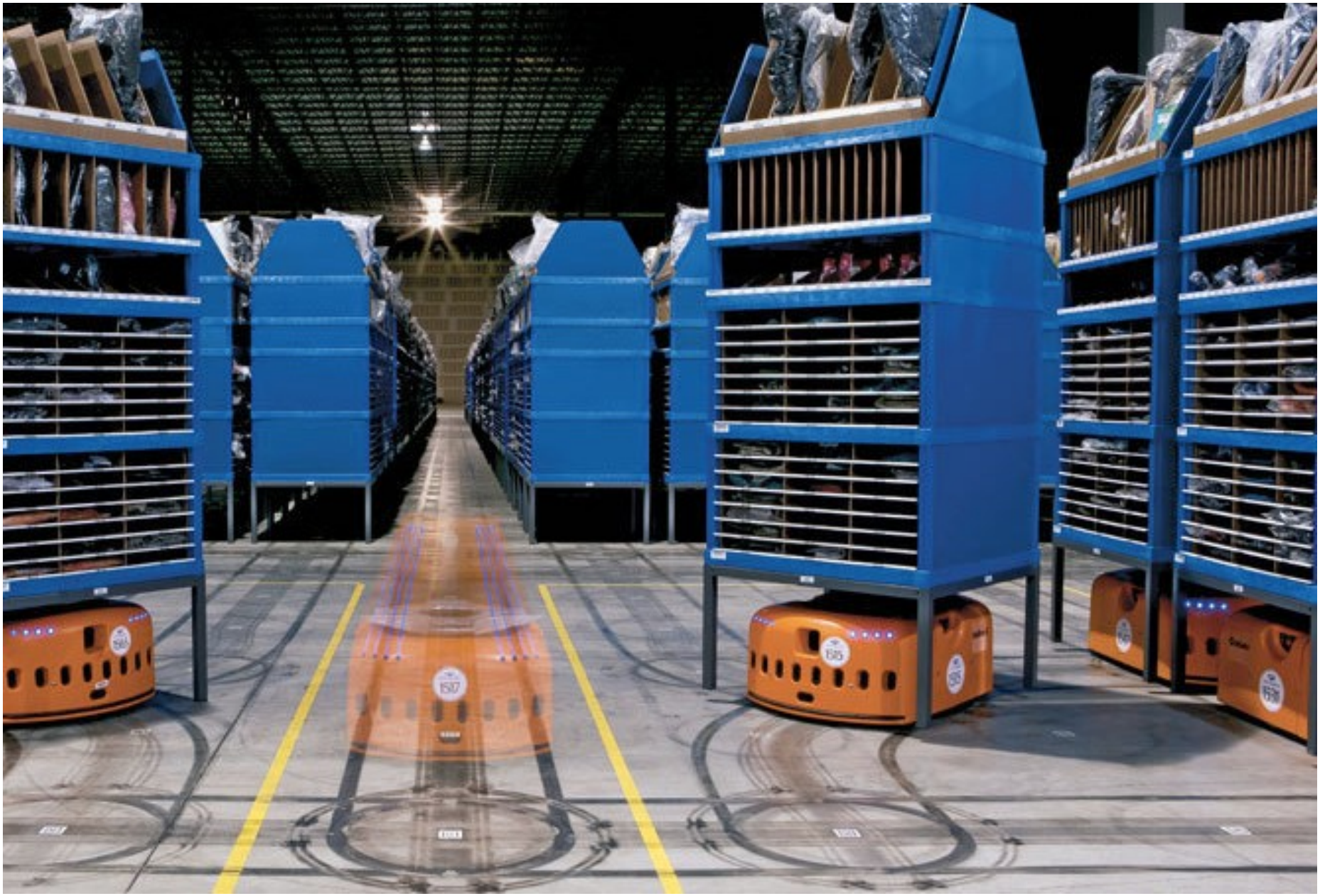


The Milwaukee-Matic industrial machining tool, 1963

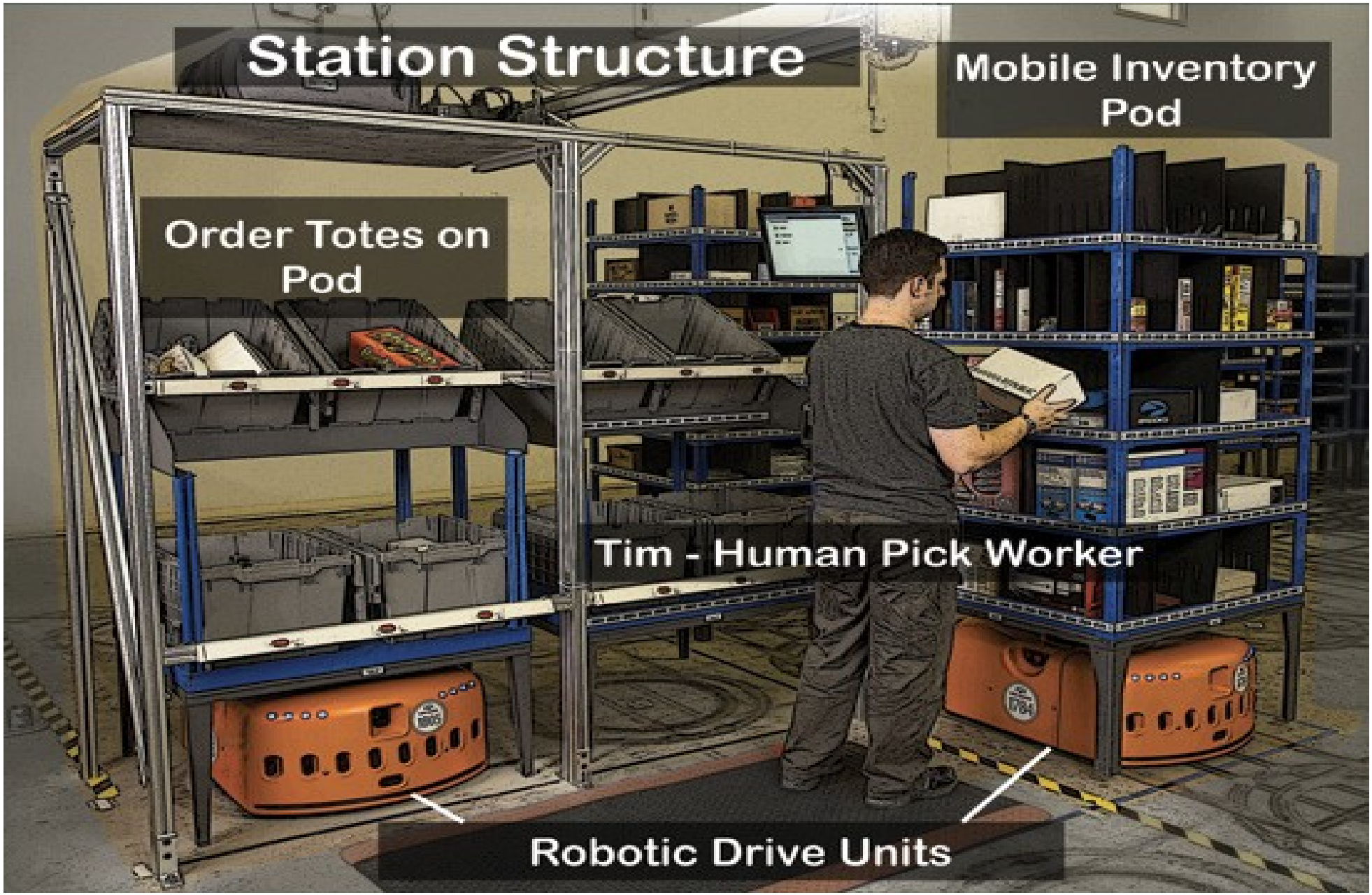
The Future of Polanyi's Paradox

- **Computerization has progressed…**
  - Driving vehicles
  - Parsing legal documents
  - Performing agricultural field labor.
- **Polanyi's paradox remains relevant central…**
  - Explain what has not yet been accomplished
  - Illuminates the contours of the technological frontier
- **Overcoming Polanyi's Paradox**
  1. Environmental Control:
     - *Bows to Polanyi's paradox*
  2. Machine Learning
     - *Attempts an end-run around it*

Environmental Control -- Kiva Systems Order Fulfilment: Robotic Drive Units Move Shelves to Workers for Picking



Kiva-Worker Interaction: Guided by Laser Pointer, Worker Picks Items from Shelves for Shipping



Machine Learning

- **Machine learning**
  - *Inductive reasoning versus procedural programming*
- **Problem**
  - Cannot program a machine to “simulate” a non-routine task by following a scripted procedure
- **Solution**
  - Program a machine to master the task autonomously by studying successful examples of the task being carried out by others

Images of Cats Successfully Recognized by Google X Labs Team, Using a Neural Network of 16,000 Processors

Le, Ranzato, Moga, Devin, Chen, Corrado, Dean and Ng, 2012

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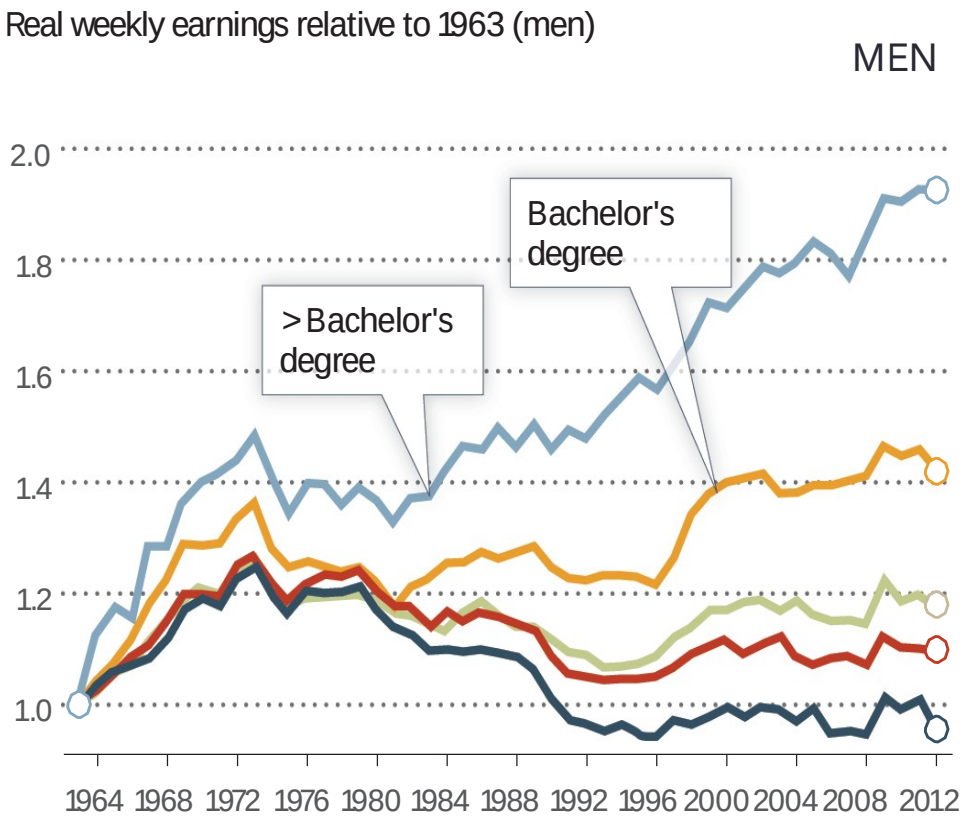
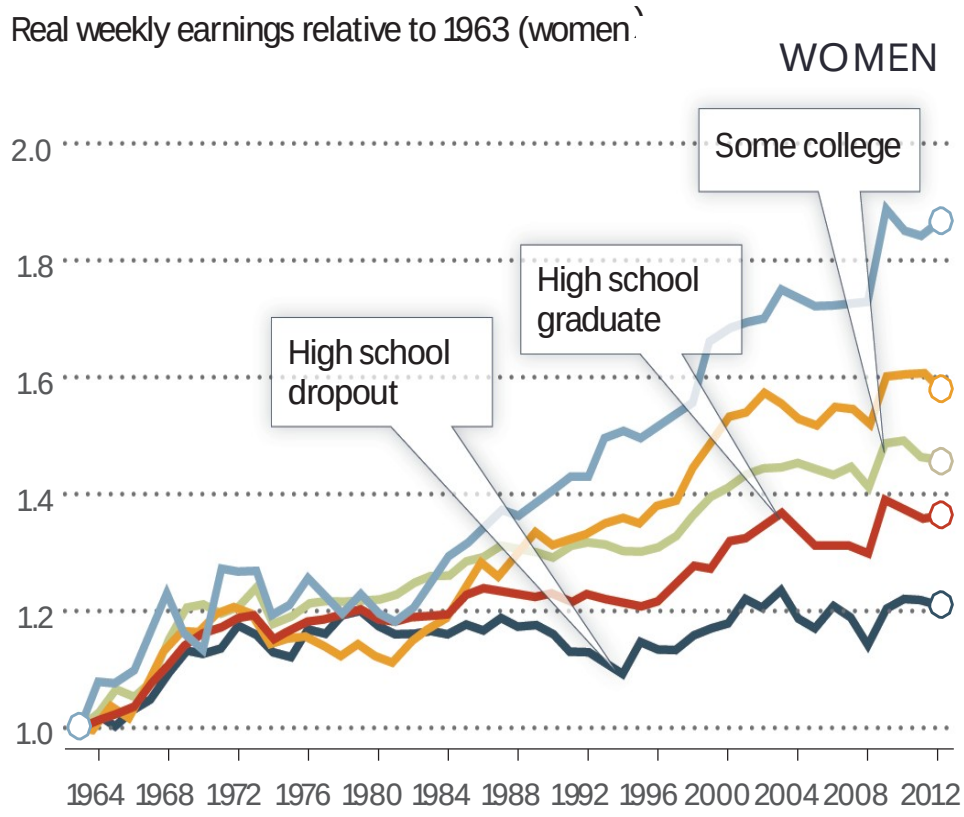
College Grads are Faring Relatively Well b/c Non-College Workers are Faring Absolutely Worse

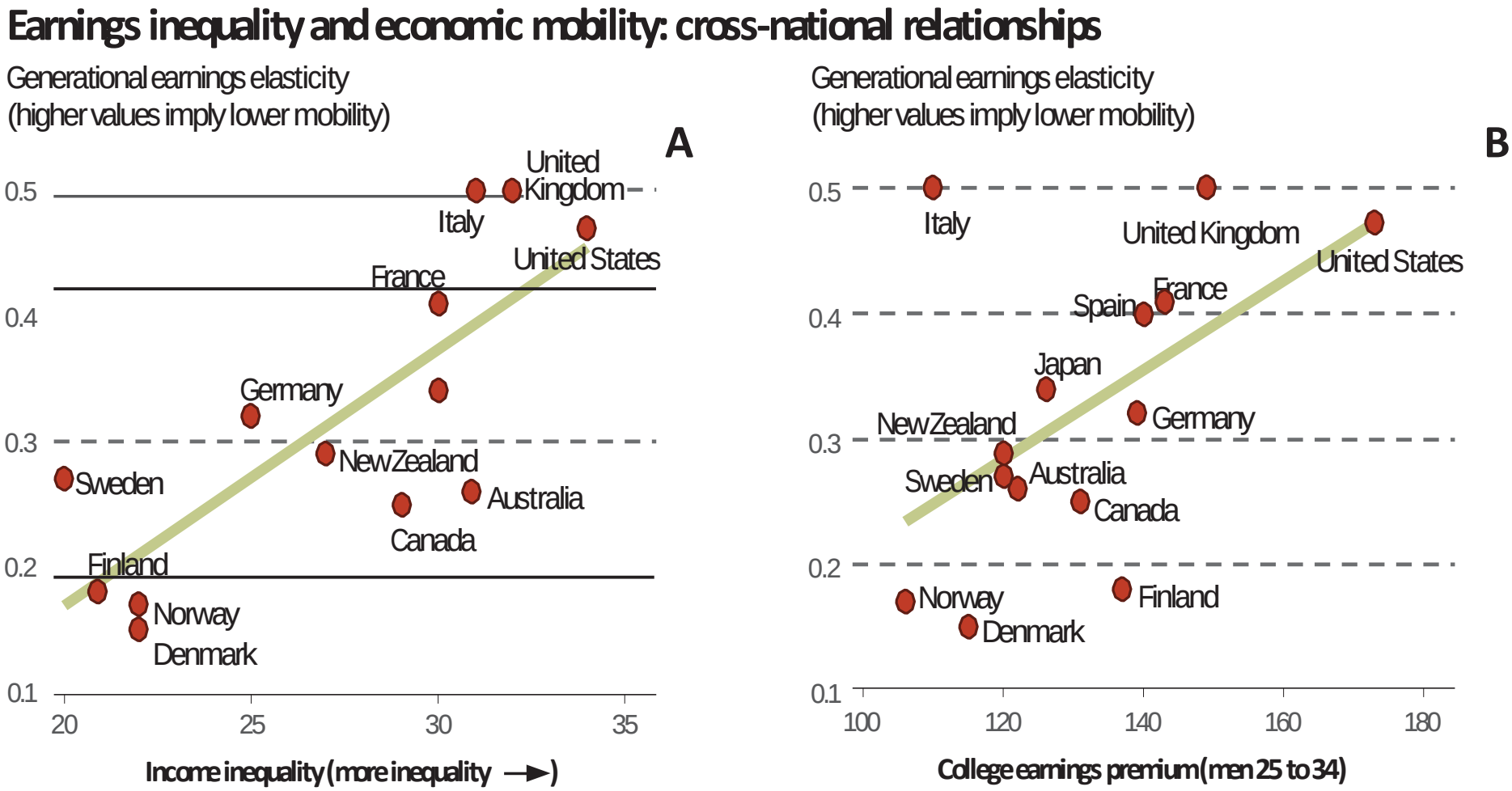
Changes in real wage levels of full-time U.S. workers by sex and education, 1963–2012





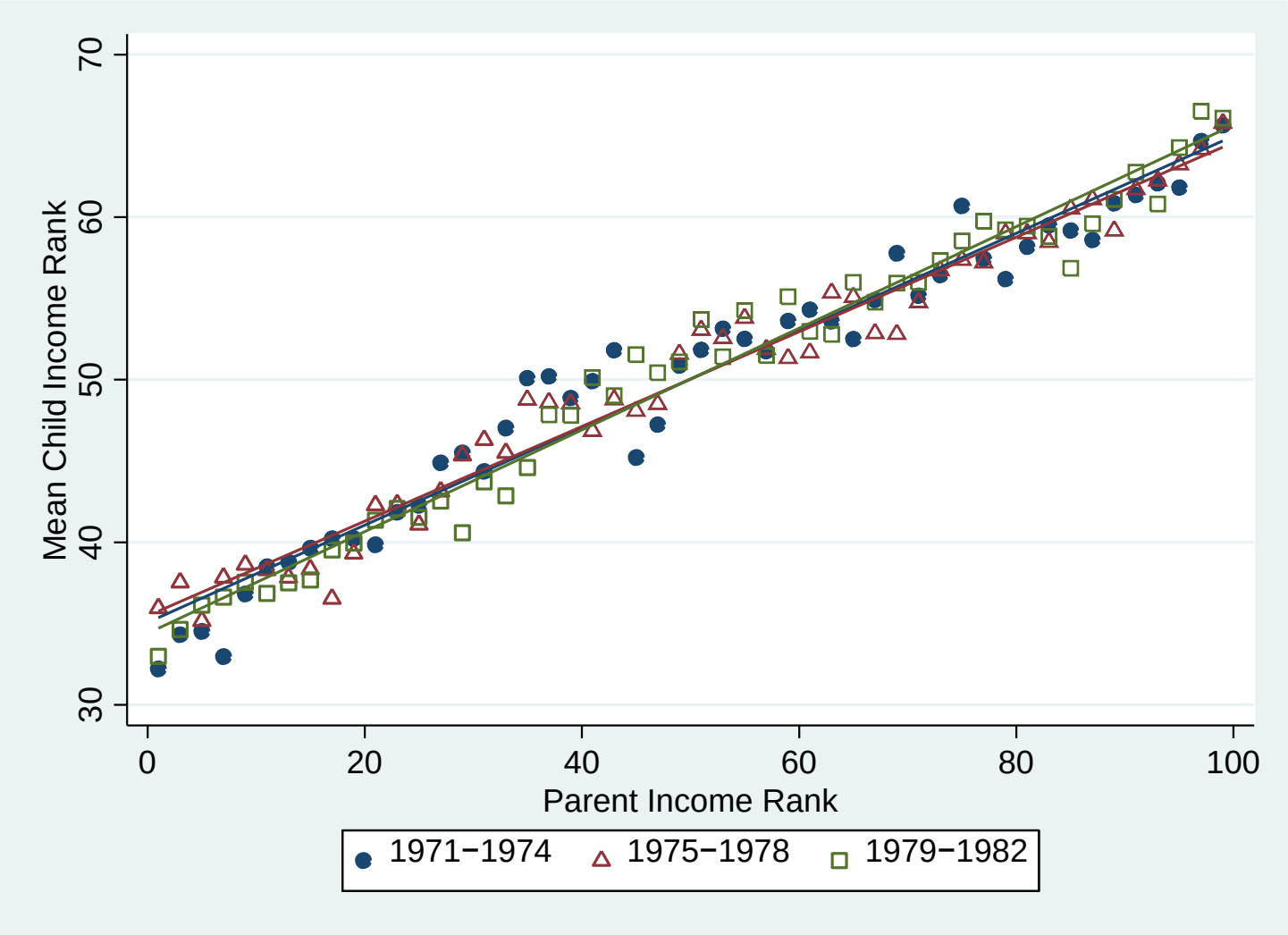
Autor, 2014

Countries with High Inequality and High Skill Returns Have Low Intergenerational Mobility



Source: Miles Corak

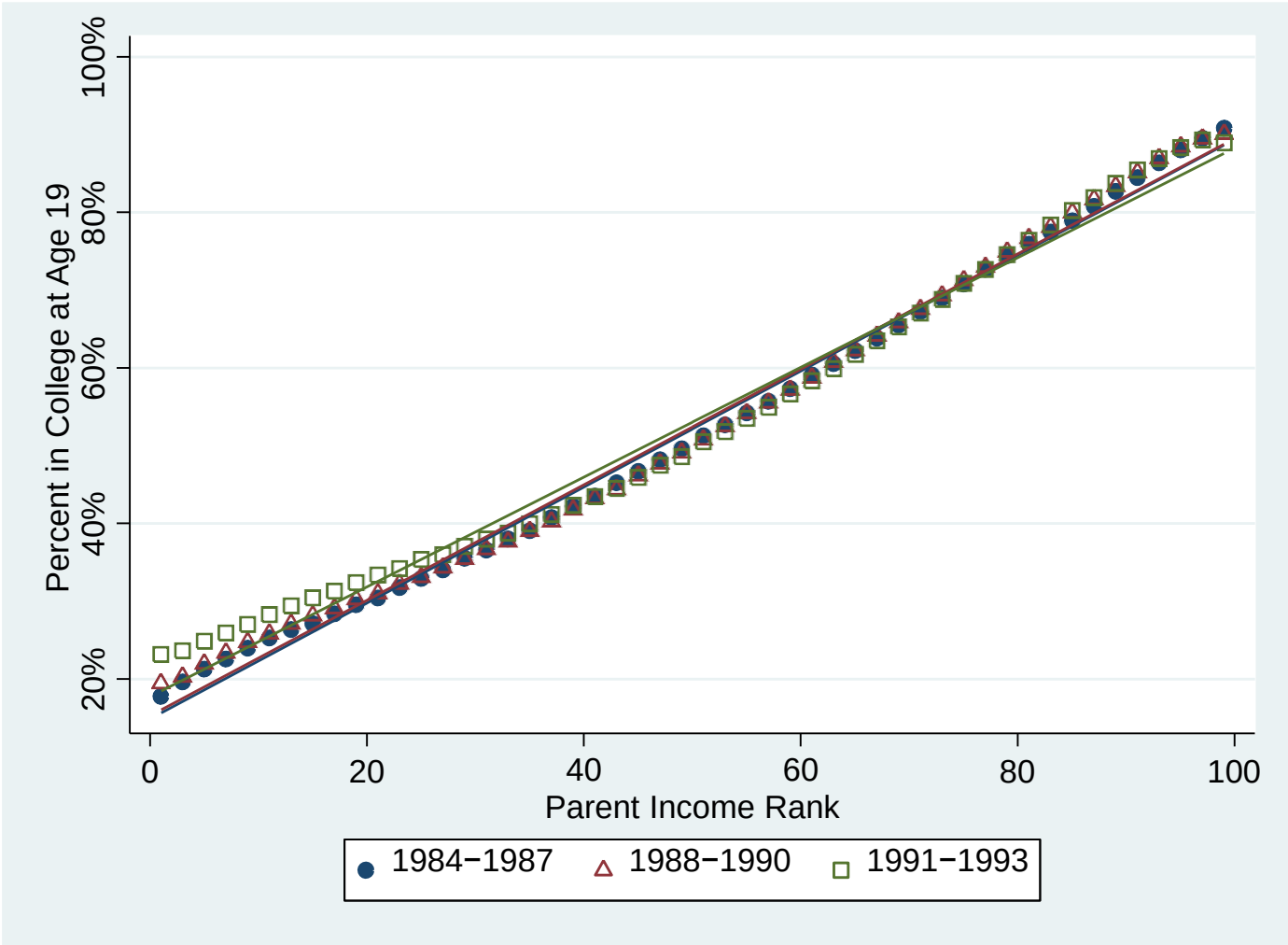
No Decline in Intergenerational Income Mobility for U.S. Children Born 1971 – 1974 vs. 1979 – 1982



Mean percentile income rank of children at ages 29-30 vs. percentile rank of their parents for three groups of birth cohorts: 1971-1974, 1975-1978, and 1979-1982

Chetty, Hendren, Kline, Saez and Turner 2014

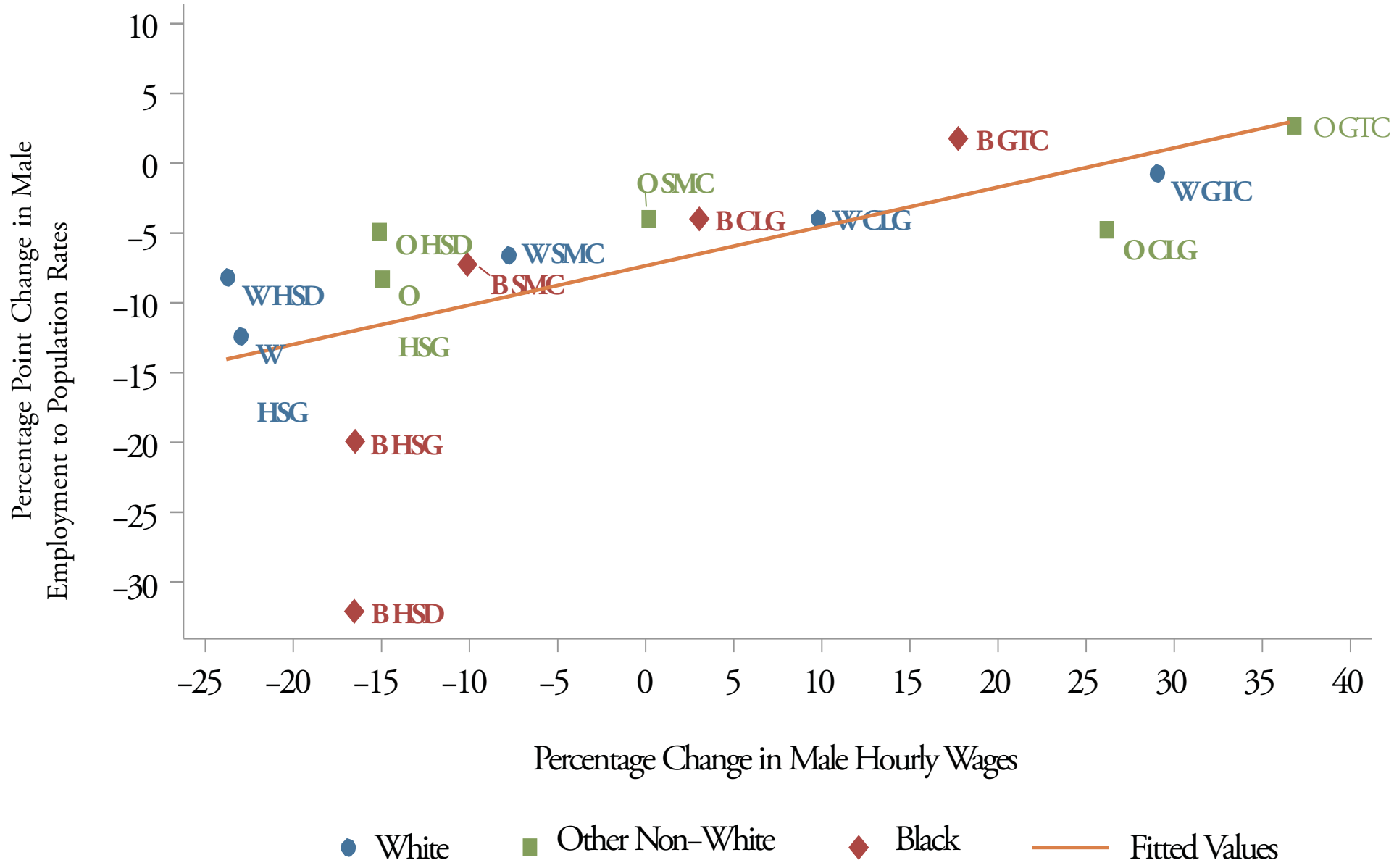
No Decline in Intergenerational 'Educational Mobility' for U.S. Children Born 1984 – 1987 vs. 1991 – 1993



Mean percentile income rank of children at ages 29-30 vs. percentile rank of their parents for three groups of birth cohorts: 1984-1987, 1988-1990, and 1991-1993

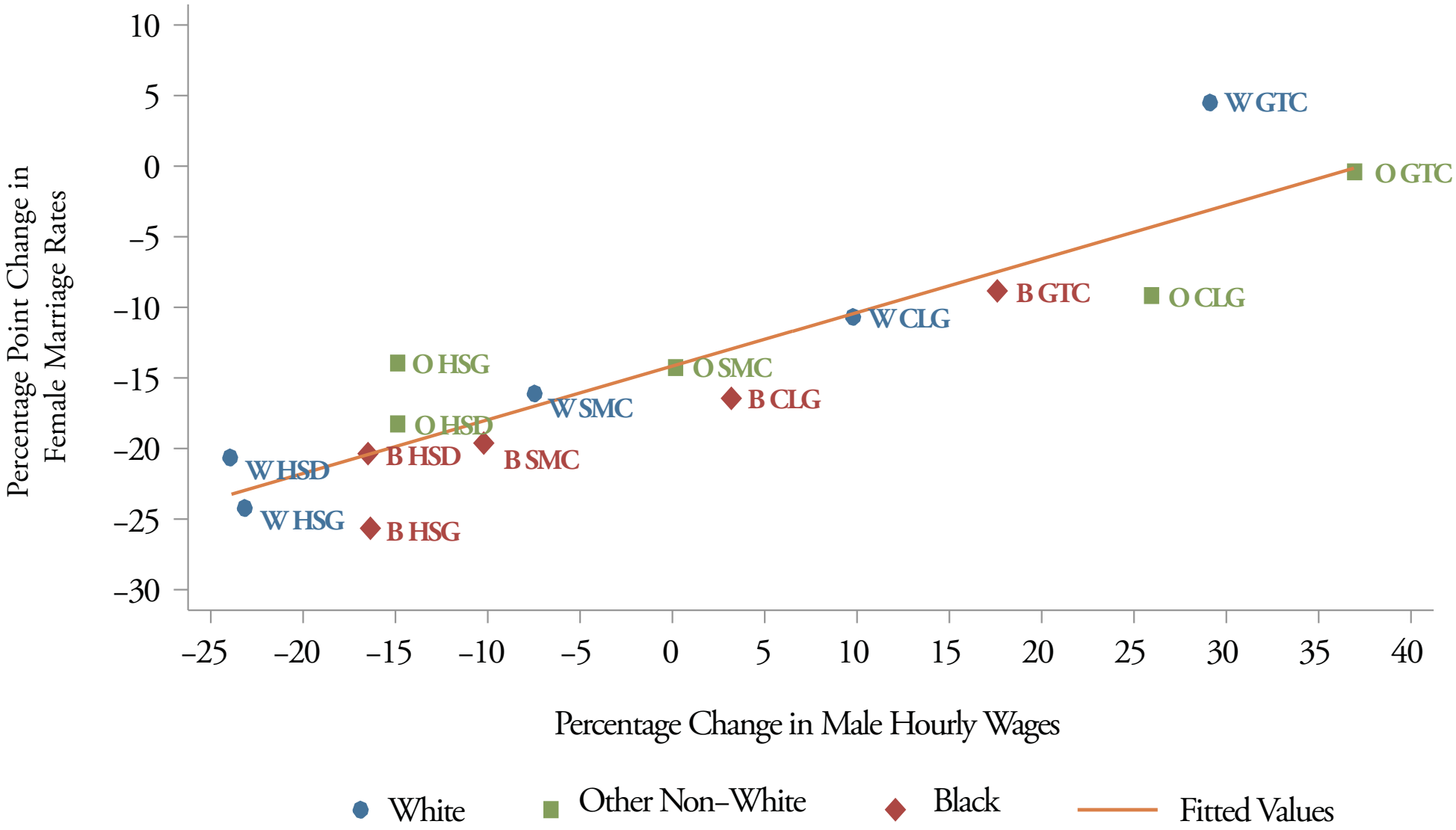
Chetty, Hendren, Kline, Saez and Turner 2014

Changes in U.S. Male Emp/Pop and Real Wage Levels 1979 – 2008 (Ages 25-39)



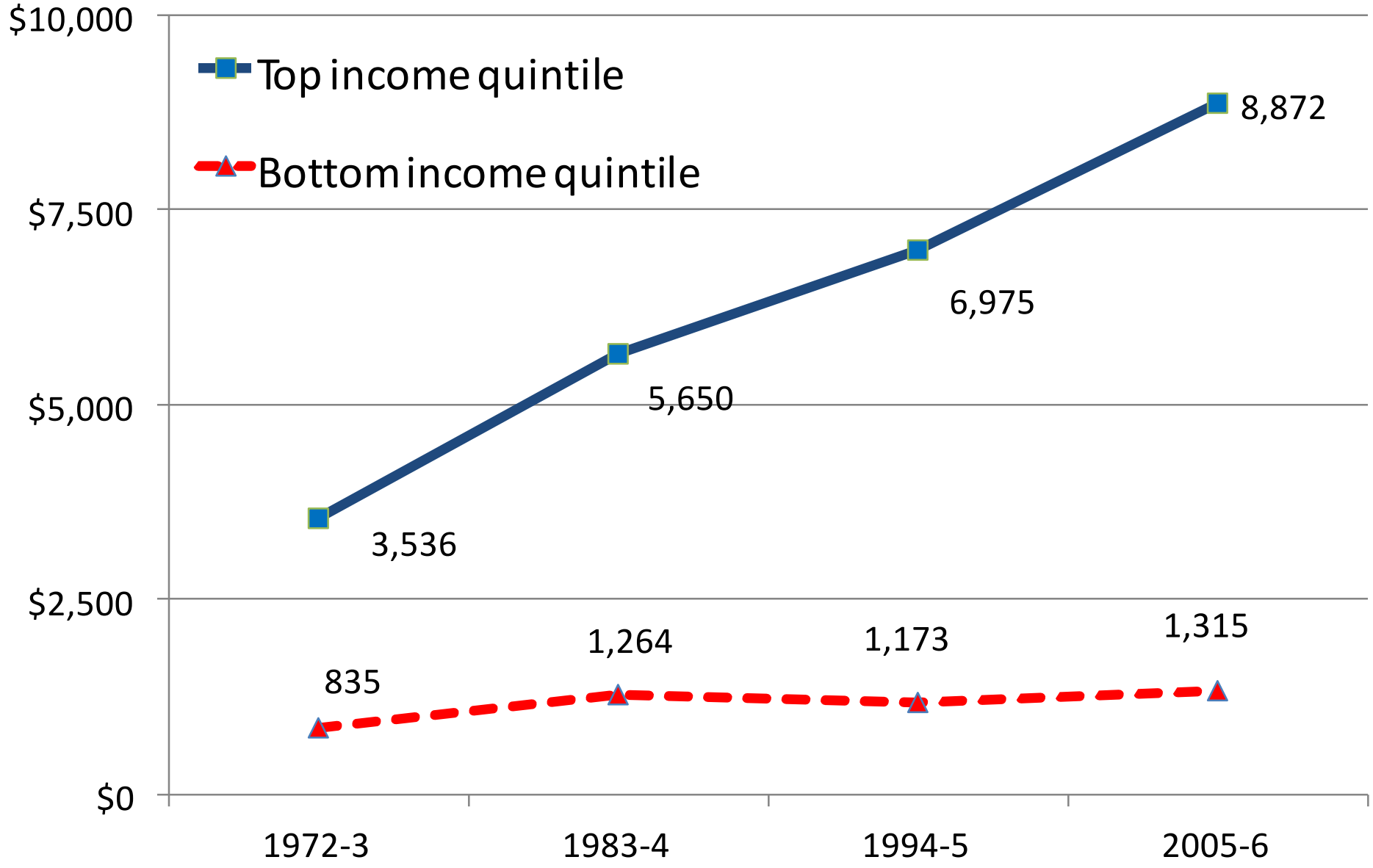
Autor and Wasserman 2013

Changes in Female Marriage Rates vs. Changes in Male Earnings 1979 – 2008, Ages 25 – 39



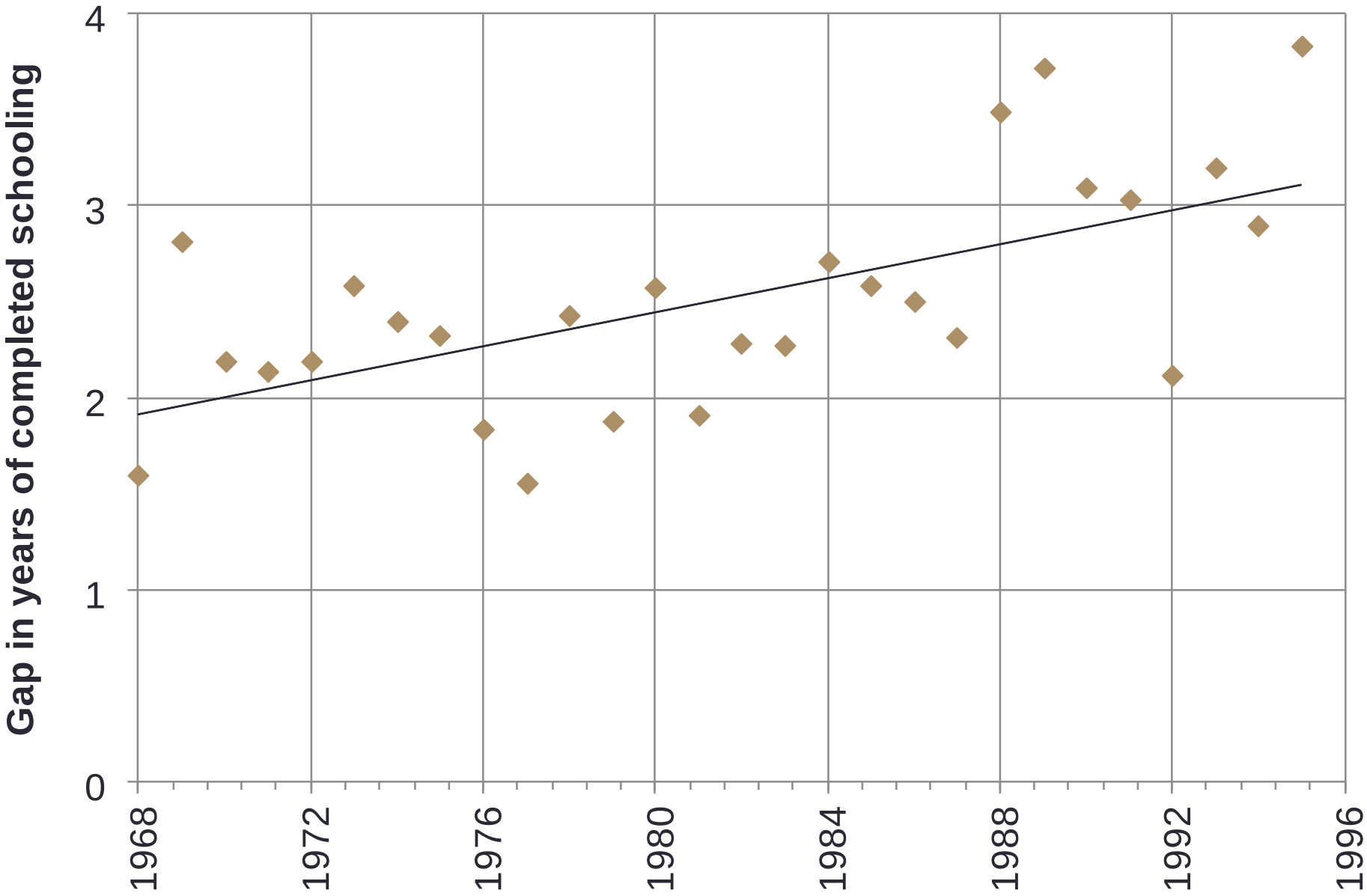
Autor and Wasserman 2013

Per Capita Enrichment Expenditures on Children ($2008) Top versus Bottom Quartile of Households



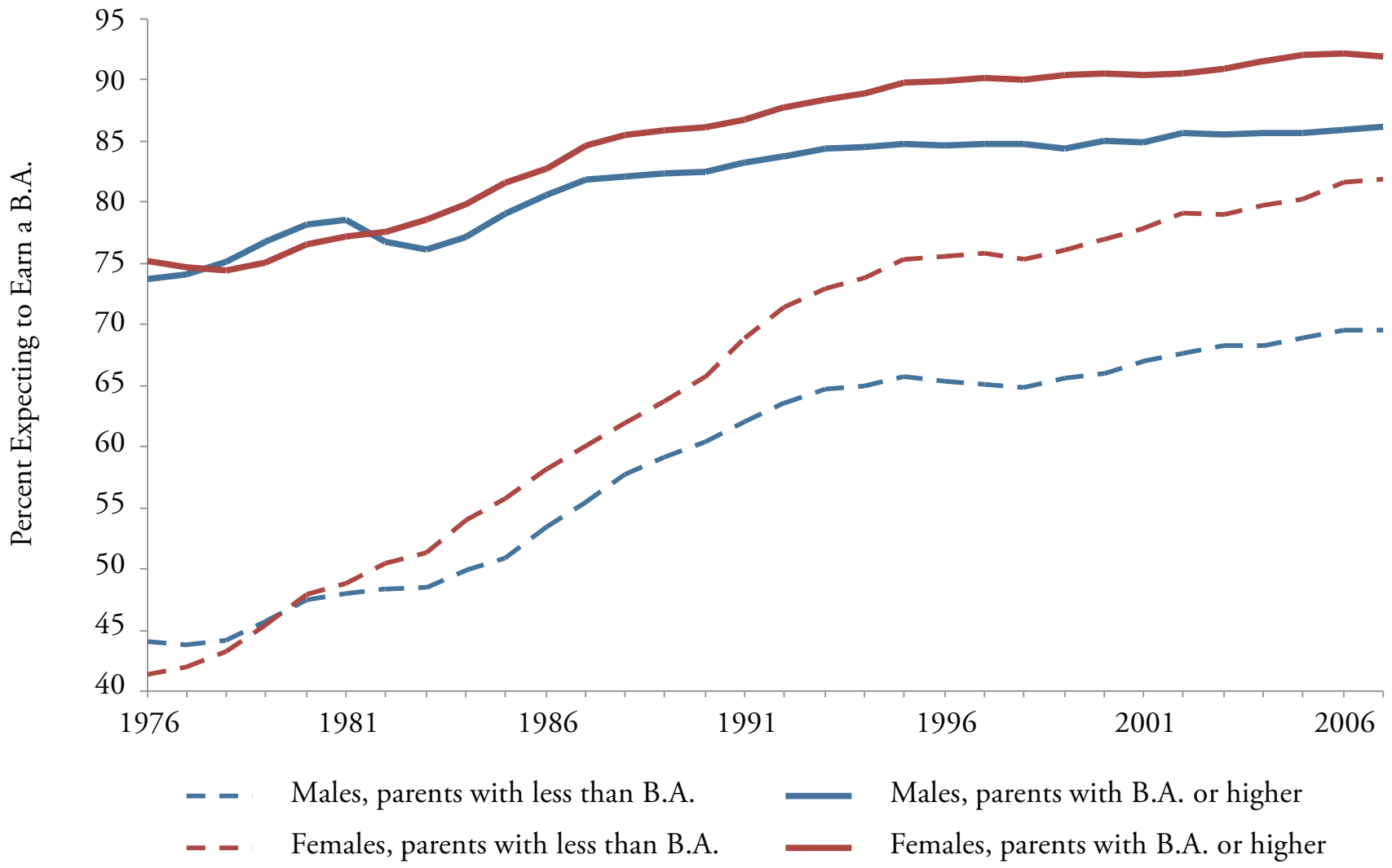
Source: Duncan and Murnane, 2011

Gap in years of Completed Schooling: Students with family Income in the Top vs. Bottom quintiles (by Year of Birth-14)



Source: Duncan and Murnane, 2011

Fraction of Twelfth-Graders Expecting to Obtain a B.A. by Sex and Parents' Education, 1979-2007



Source: Brian L. Jacob and Tamara Linkow Wilder, Using data from the Monitoring the Future survey.

Source: Jacob, Linkow and Wilder, 2011

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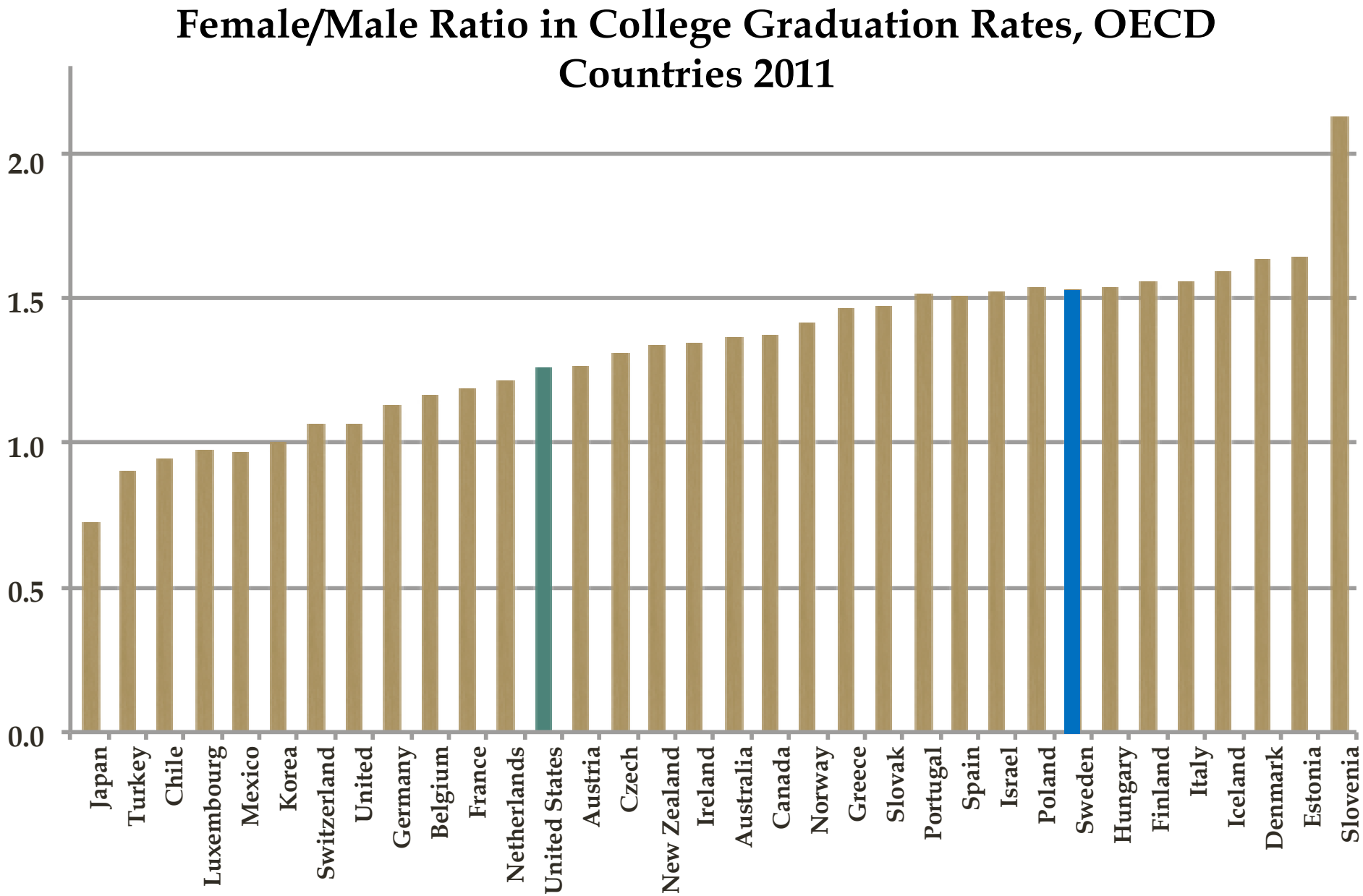
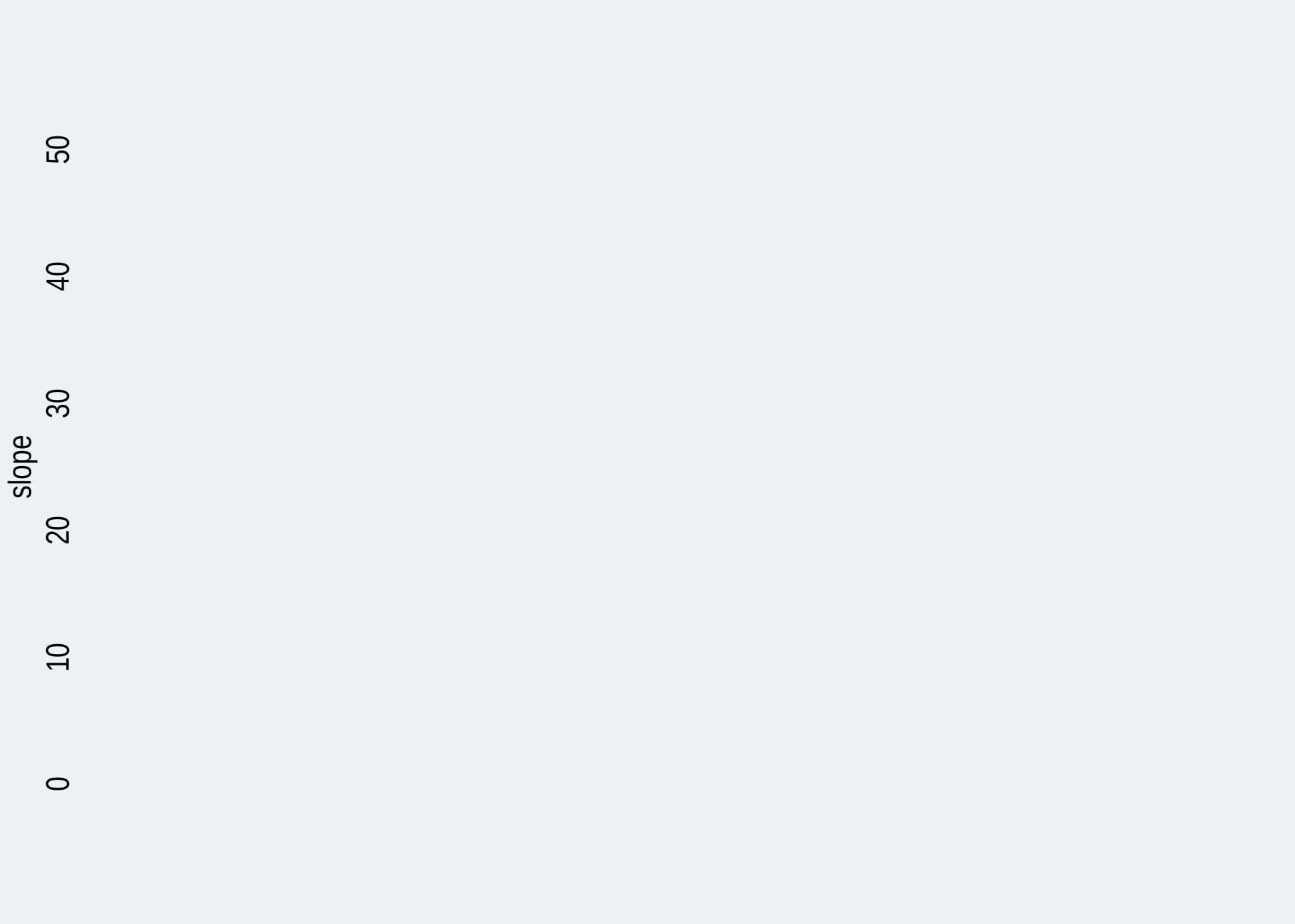


Source: OECD

Commuting Zones with Higher Fraction of Mother-Headed HH's Have Lower Mobility



Source: Chetty, Hendren, Kline, and Hendren, 2013

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1. **Encouraging news**
   - Rising inequality is mostly (not entirely) about skills – Still a meritocracy rather than a pure plutocracy
2. **Rising skill returns largely due to two forces**
   - Slowing supply of new college grads after 1980
   - Secularly rising demand for human expertise, creativity, adaptability
3. **Recent technological leads to job polarization**
   - But does not necessarily raise wages for 'service' workers
4. **Intergenerational mobility has not (yet) declined**
   - But reason for worry: Labor market → Marriage market → Adverse impact on children

Types of Jobs that Will Surely Exist in 50 Years

I. **Technical and creative experts and leaders**
II. **Medical professionals**
III. **Developers and testers of new ideas**
IV. **Teachers, especially K-12**
V. **Entertainers: Athletes, Musicians, Actors, Chefs, Comedians**
VI. **Building and installation workers**
VII. **Skilled repair workers**
VIII. **Personal helpers, coaches, assistants and consultants**
IX. **Sex workers**