What does education do?

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The plan

1. Rising economic inequality and the importance of education

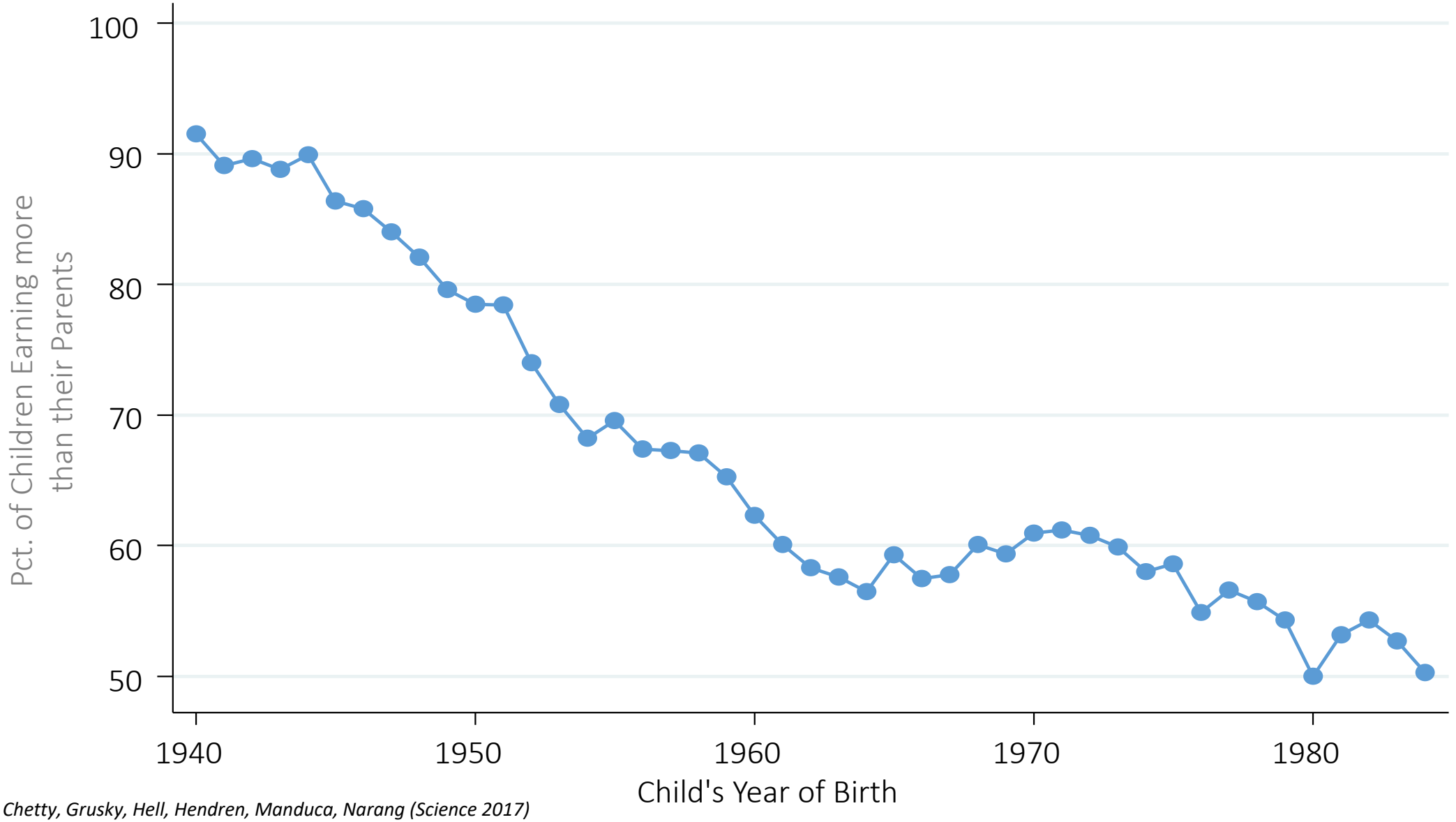
2. U.S. postsecondary attainment – inequality in resources and access
   - Losing the “race”

3. If the demand for college skills is growing….what are “college” skills?

4. What skills will be required for the work of the future? Does education build those skills?

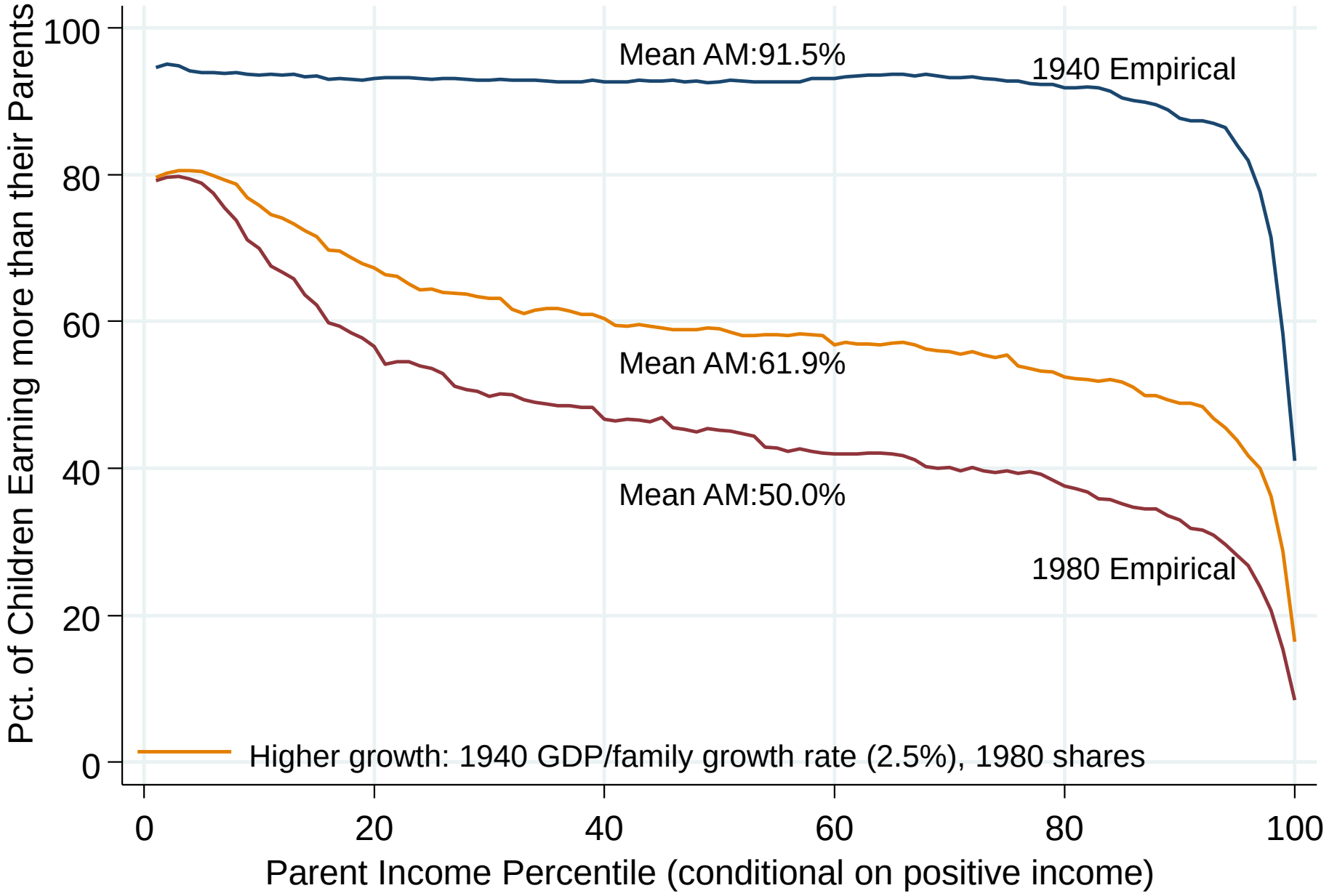
The Fading American Dream

Percent of Children Earning More than Their Parents, by Year of Birth



Source: Chetty, Grusky, Hell, Hendren, Manduca, Narang (Science 2017)

Counterfactual Rates of Absolute Mobility by Parent Income Percentile



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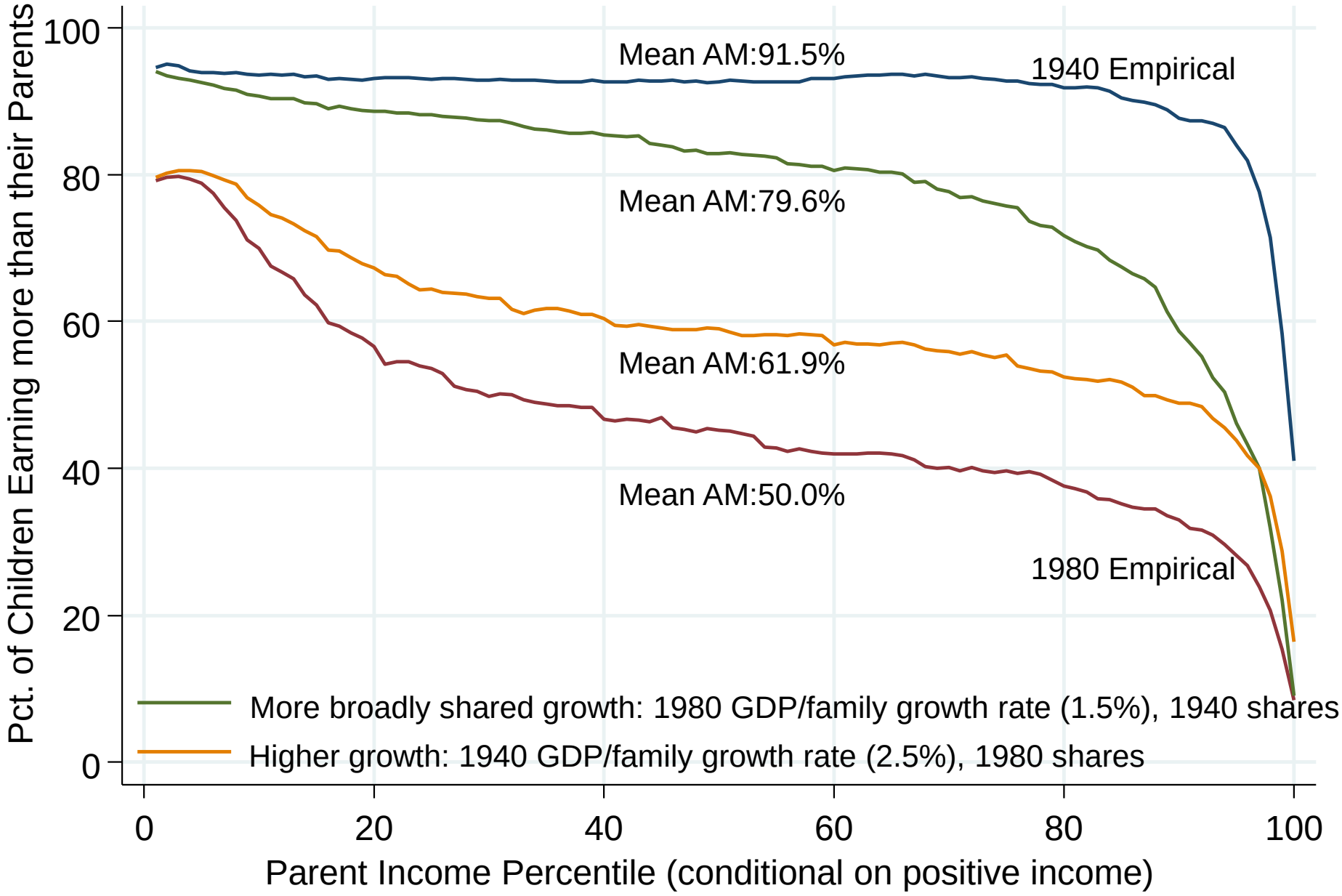


Figure 2: Intergenerational income mobility – income ranks

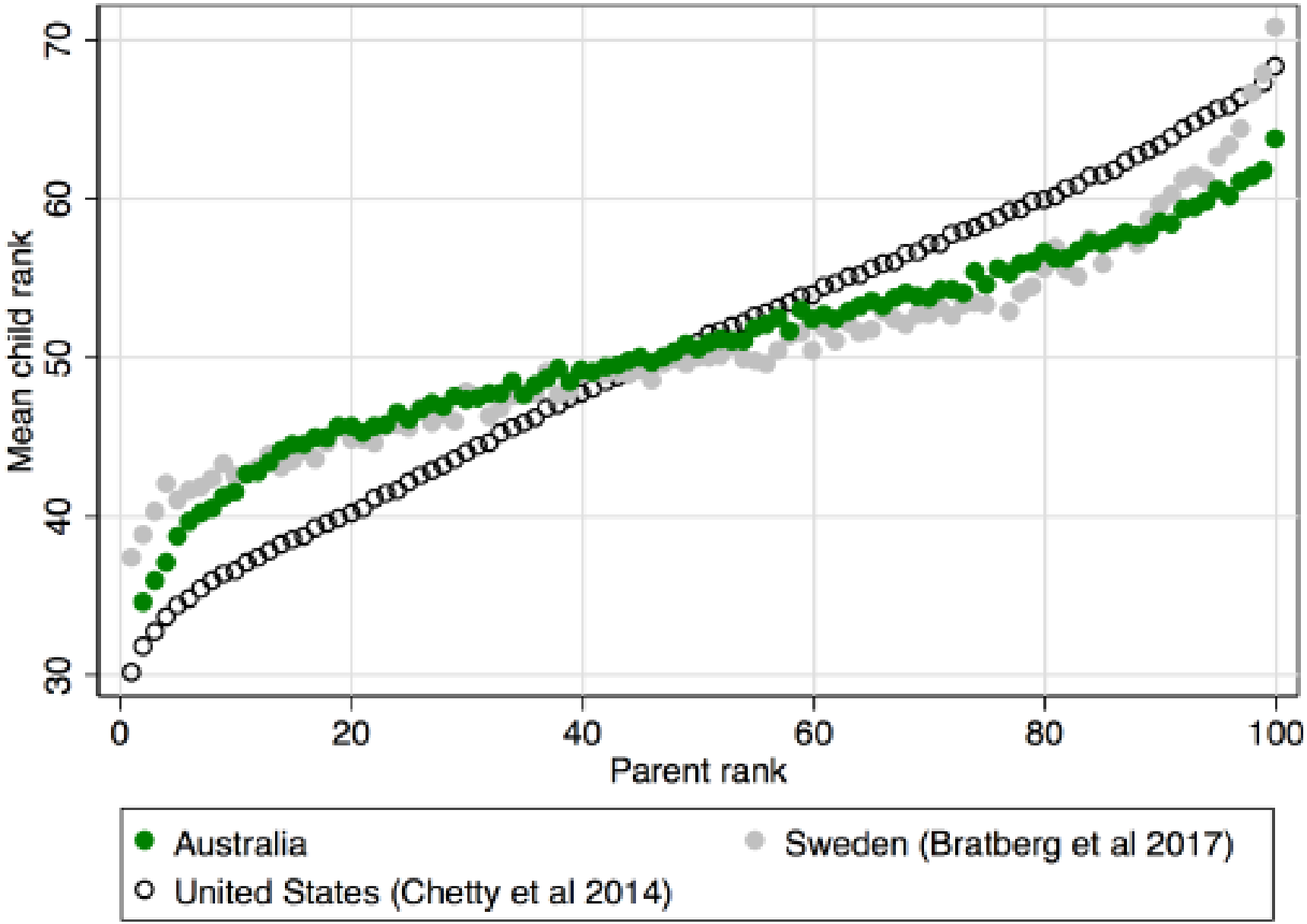
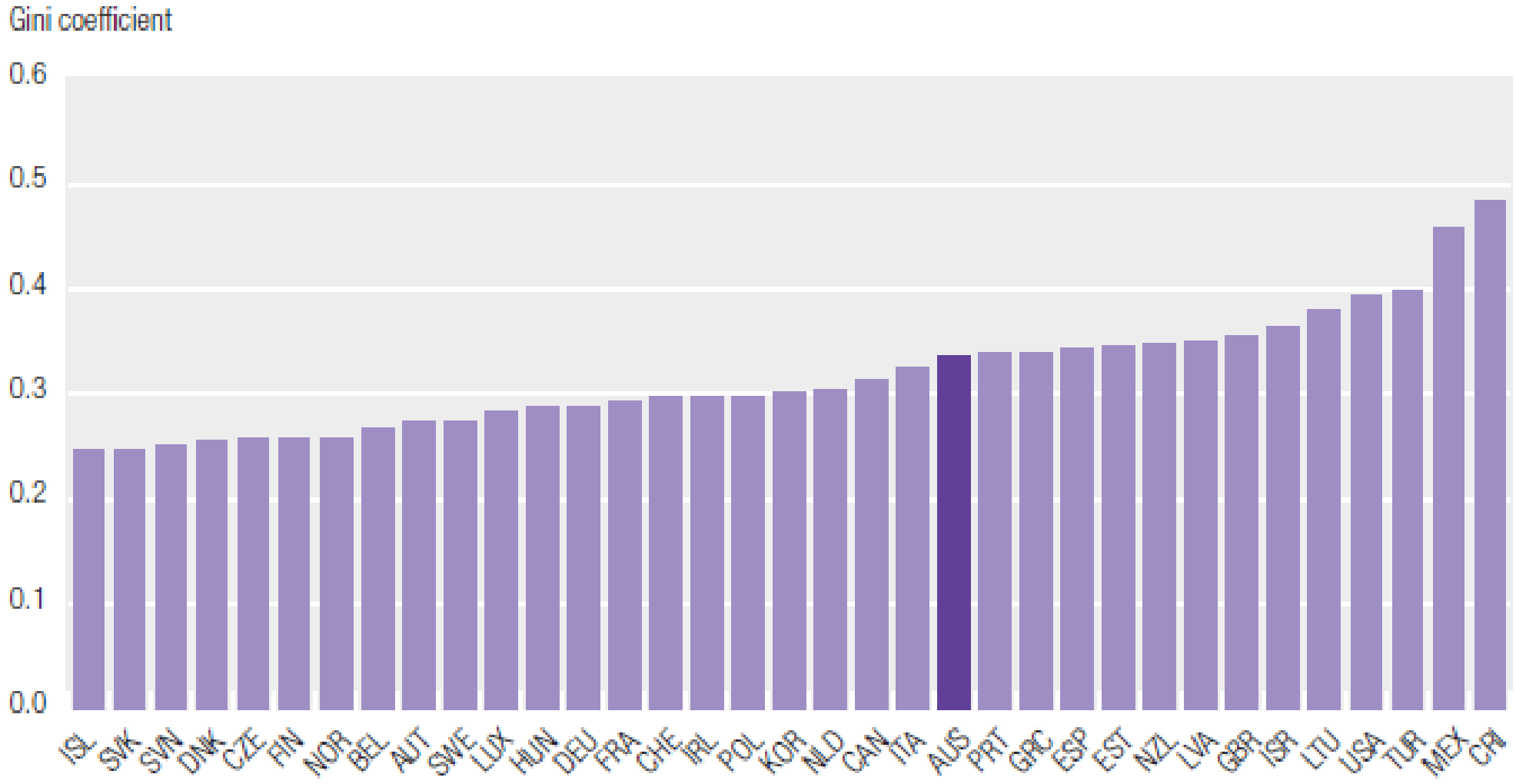
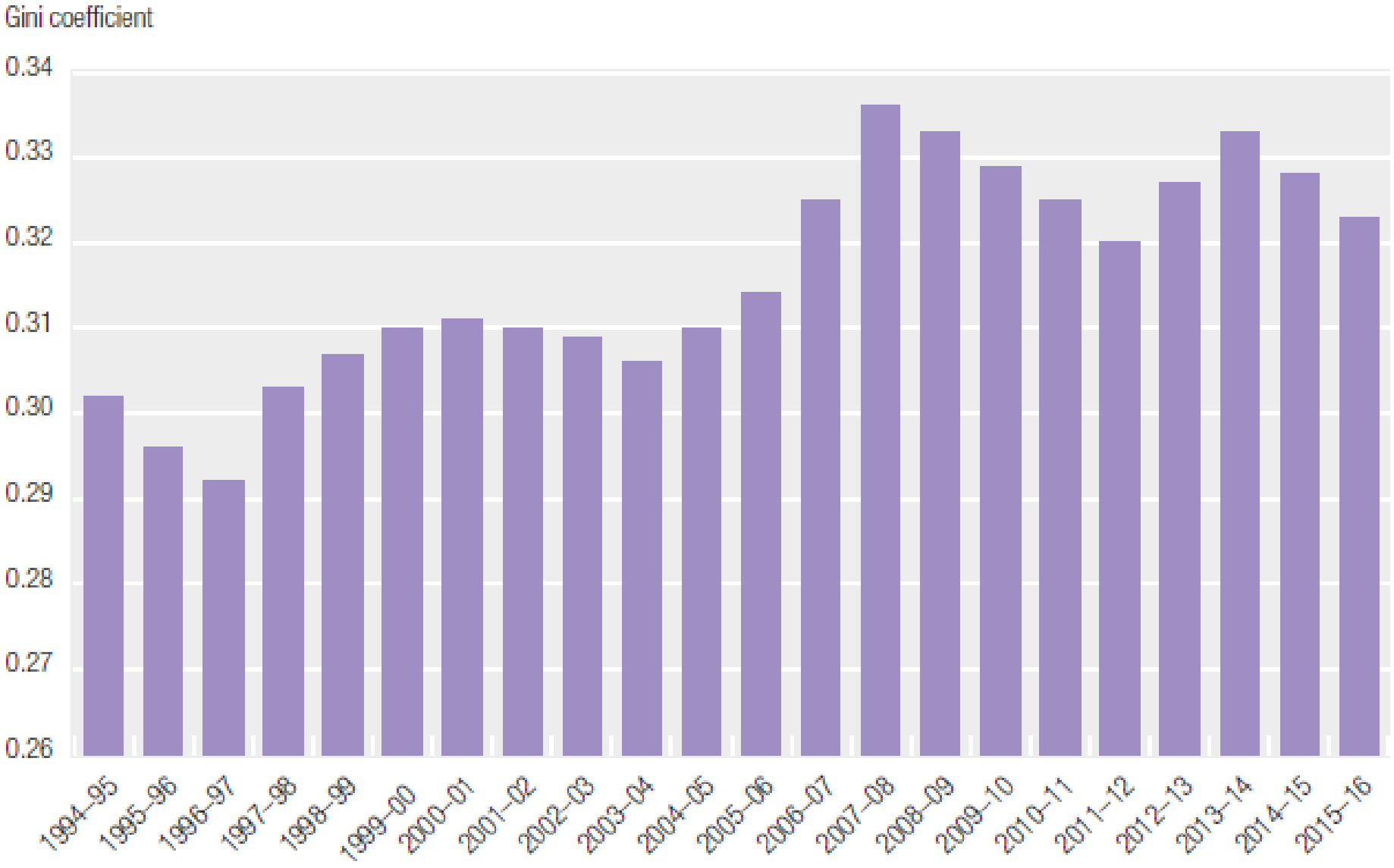


FIGURE 4
INCOME INEQUALITY ACROSS THE OECD (GINI COEFFICIENT, 2014)



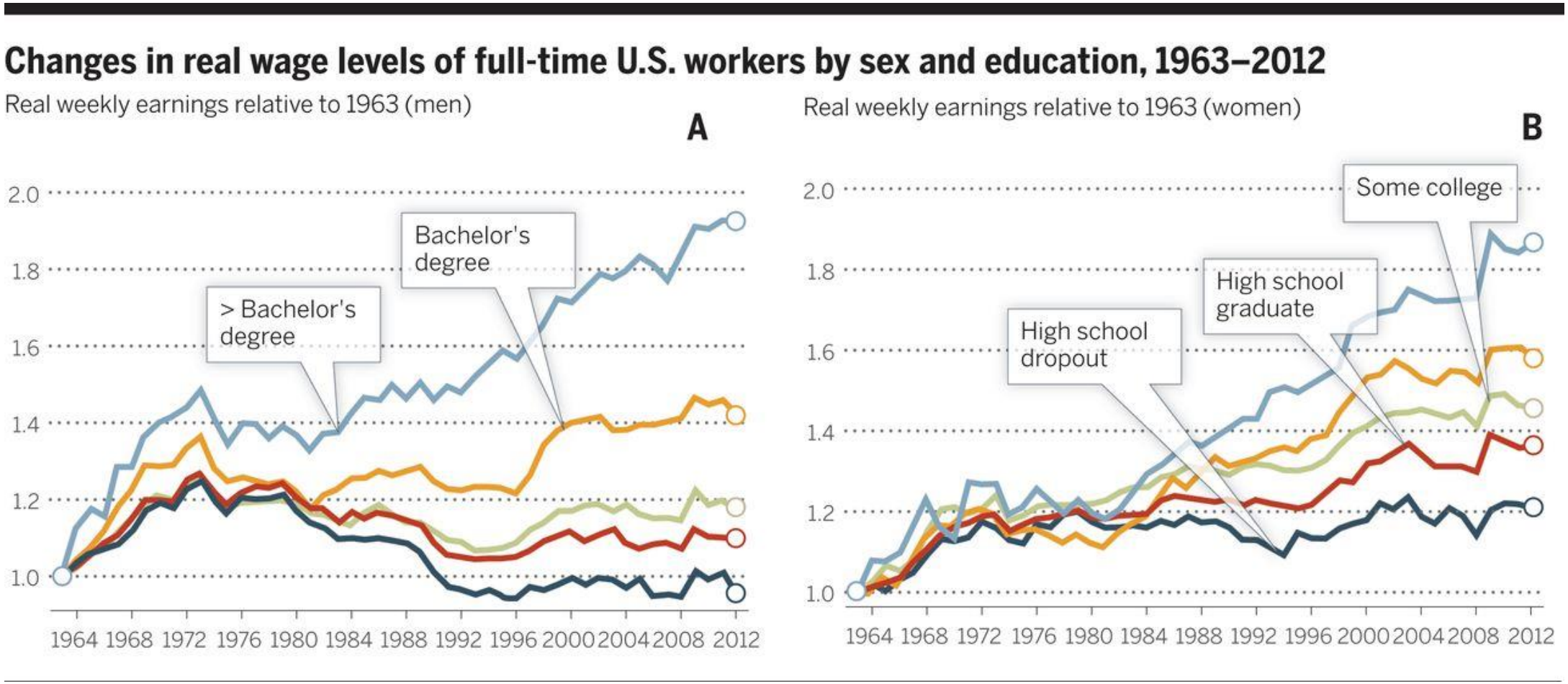
Source: OECD (2018) Income inequality (indicator). doi: 10.1787/459aa7f1-en (Accessed on 08 March 2018)

FIGURE 5
TREND IN AUSTRALIAN GINI COEFFICIENTS: 1994–95 TO 2015–16



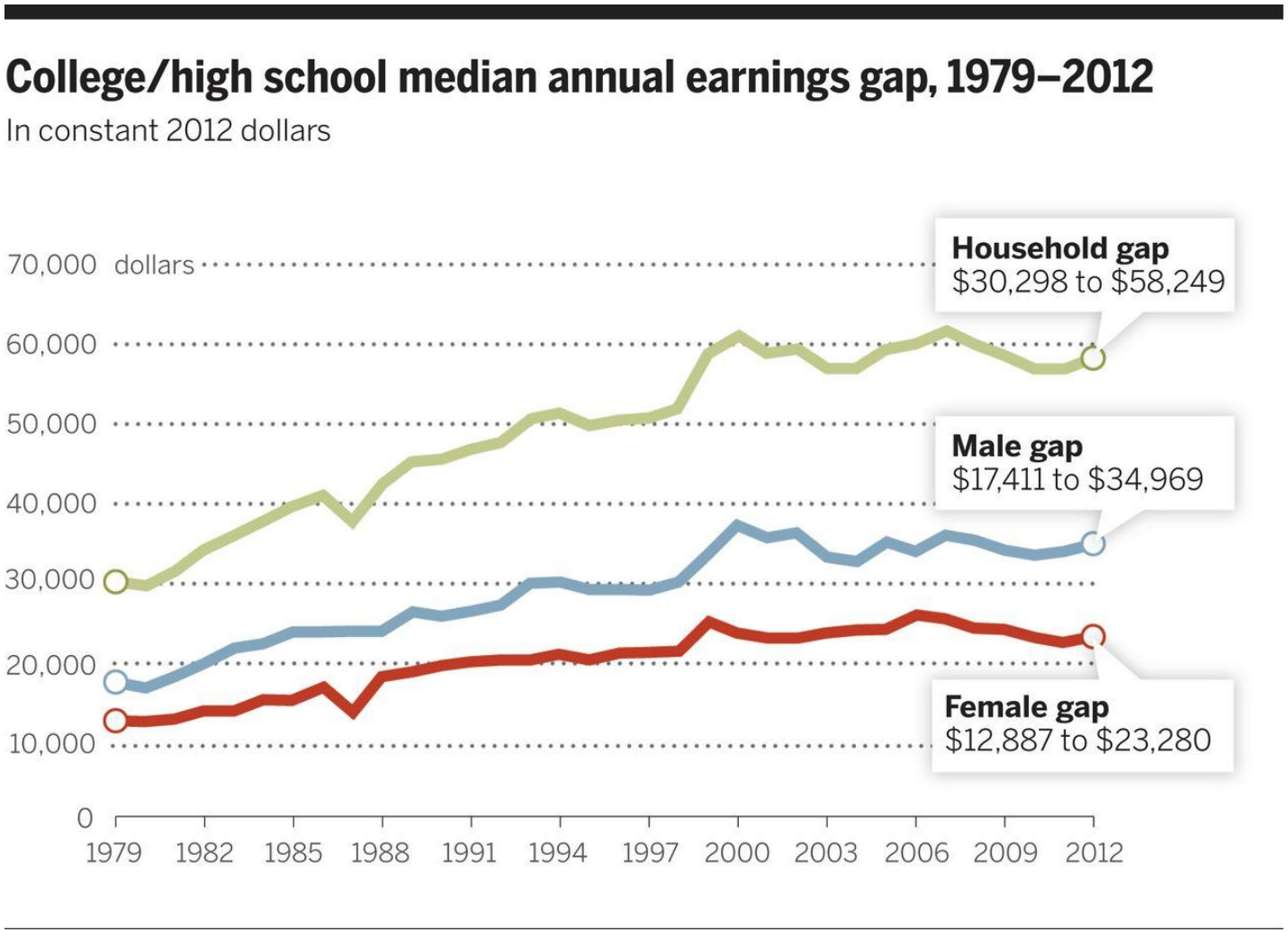
Source: Australian Bureau of Statistics. http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6523.02013-14?OpenDocument.

Fig. 6 Change in real wage levels of full-time workers by education, 1963–2012.



David H. Autor Science 2014;344:843-851

Fig. 1 College/high school median annual earnings gap, 1979–2012.



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Rising inequality

- Critical role of education in explaining rising inequality
- Growth in inequality between non-college and college-educated families is 4 times larger than growth of top 1% share
- What about resource distribution?

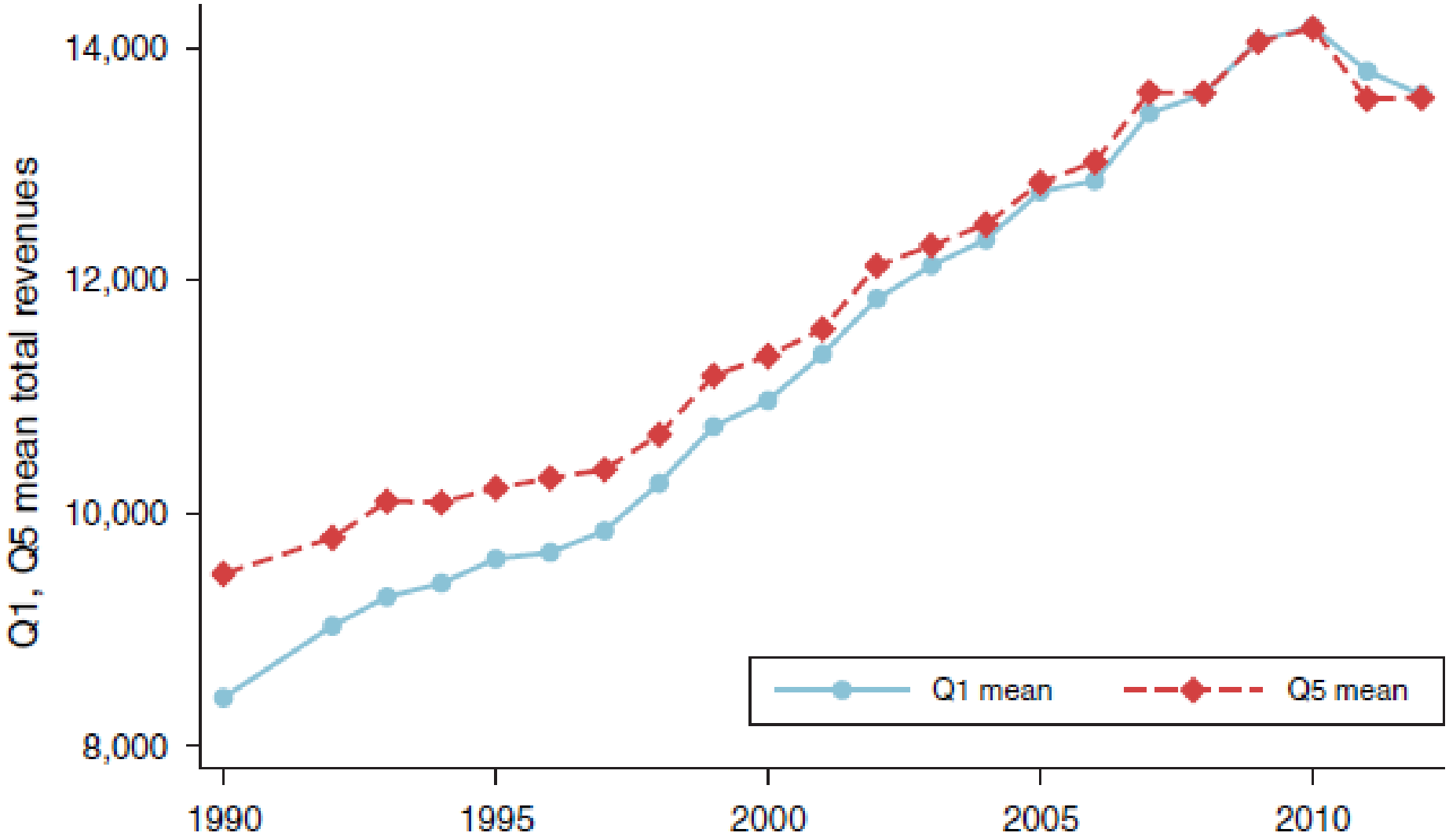


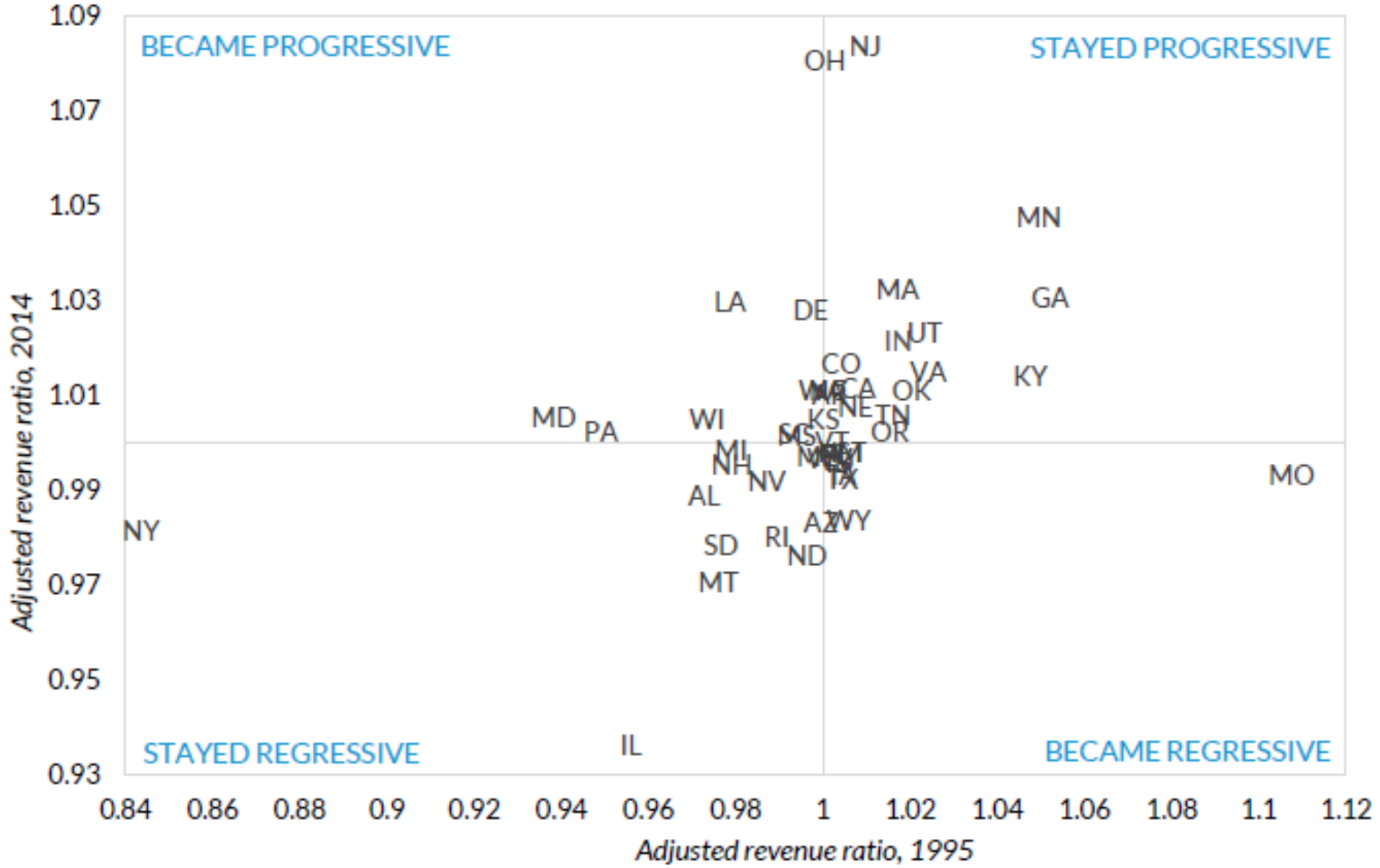
FIGURE 1. MEAN REVENUES PER PUPIL FOR HIGHEST AND LOWEST INCOME SCHOOL DISTRICTS, 1990–2012

Source: Lafortune, Rothstein and Schanzenbach (2018)

FIGURE 5

Progressivity of State and Local Funding

1994–95 and 2013–14



K-12 per pupil spending ranges from $8k in UT to $23k in NY

Most states are progressive

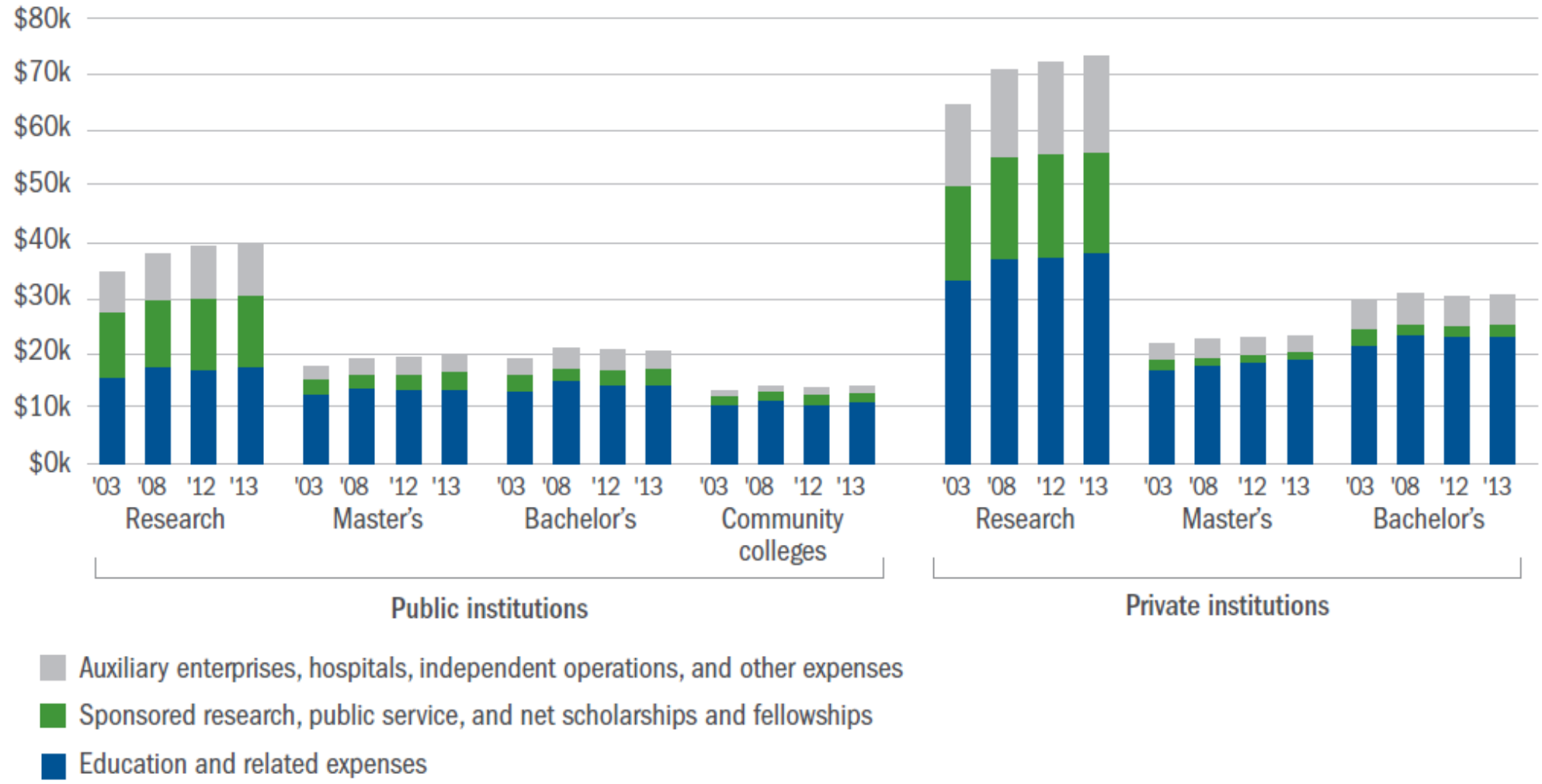
Most regressive is IL ($14,359 vs. $14,820)

Source: Blagg and Chingos (2017)

Much different resource distribution in higher ed….

Figure 3.

Total Expenditures per FTE Student by Grouped Expense Categories, FY 2003–2013 (in 2013 Dollars)



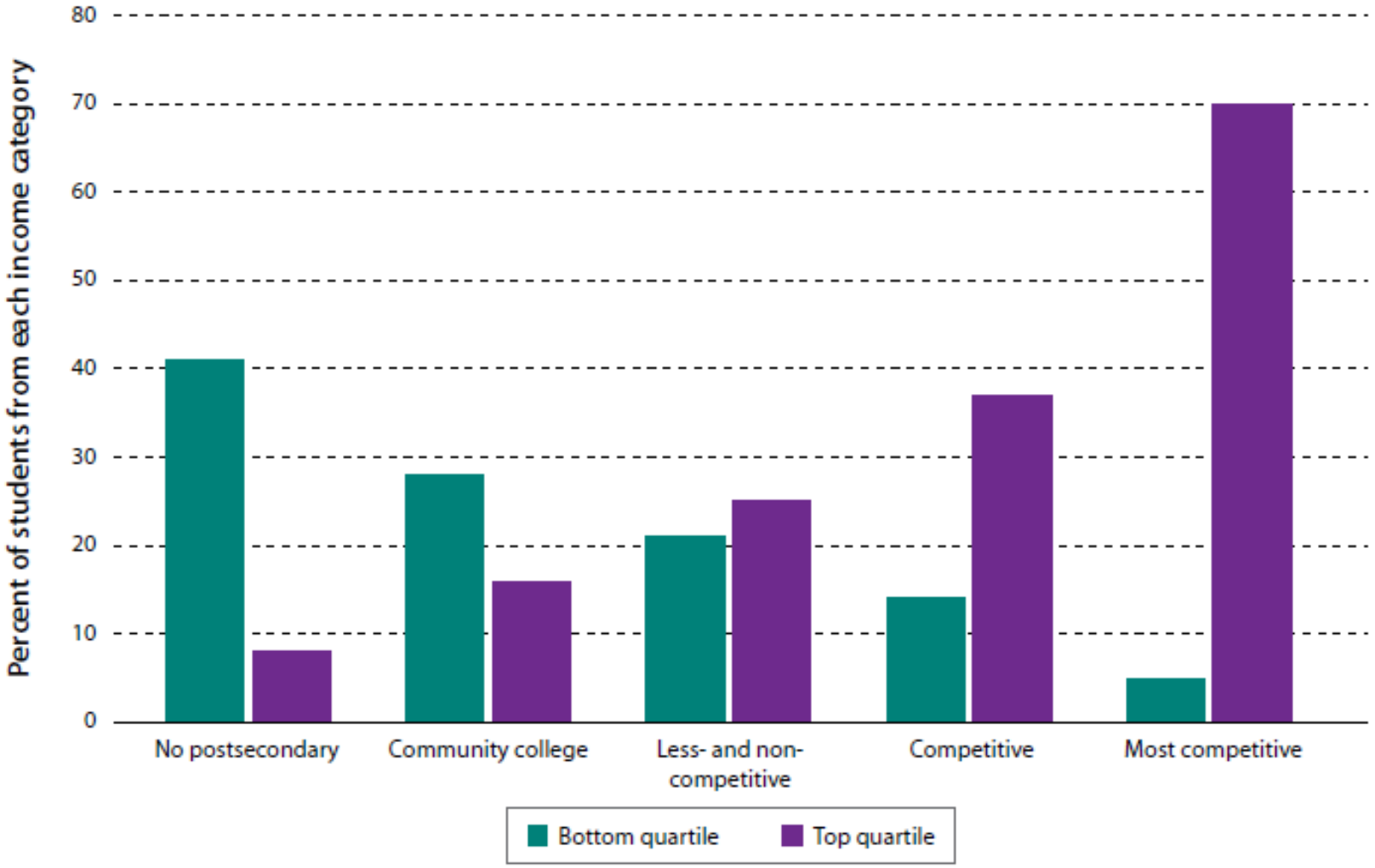
Source: Delta Cost Project IPEDS Database 1987–2013 (11-year matched set).

And big differences in access by family income…..

FIGURE 8.

Socioeconomic Distribution at Colleges by Selectivity

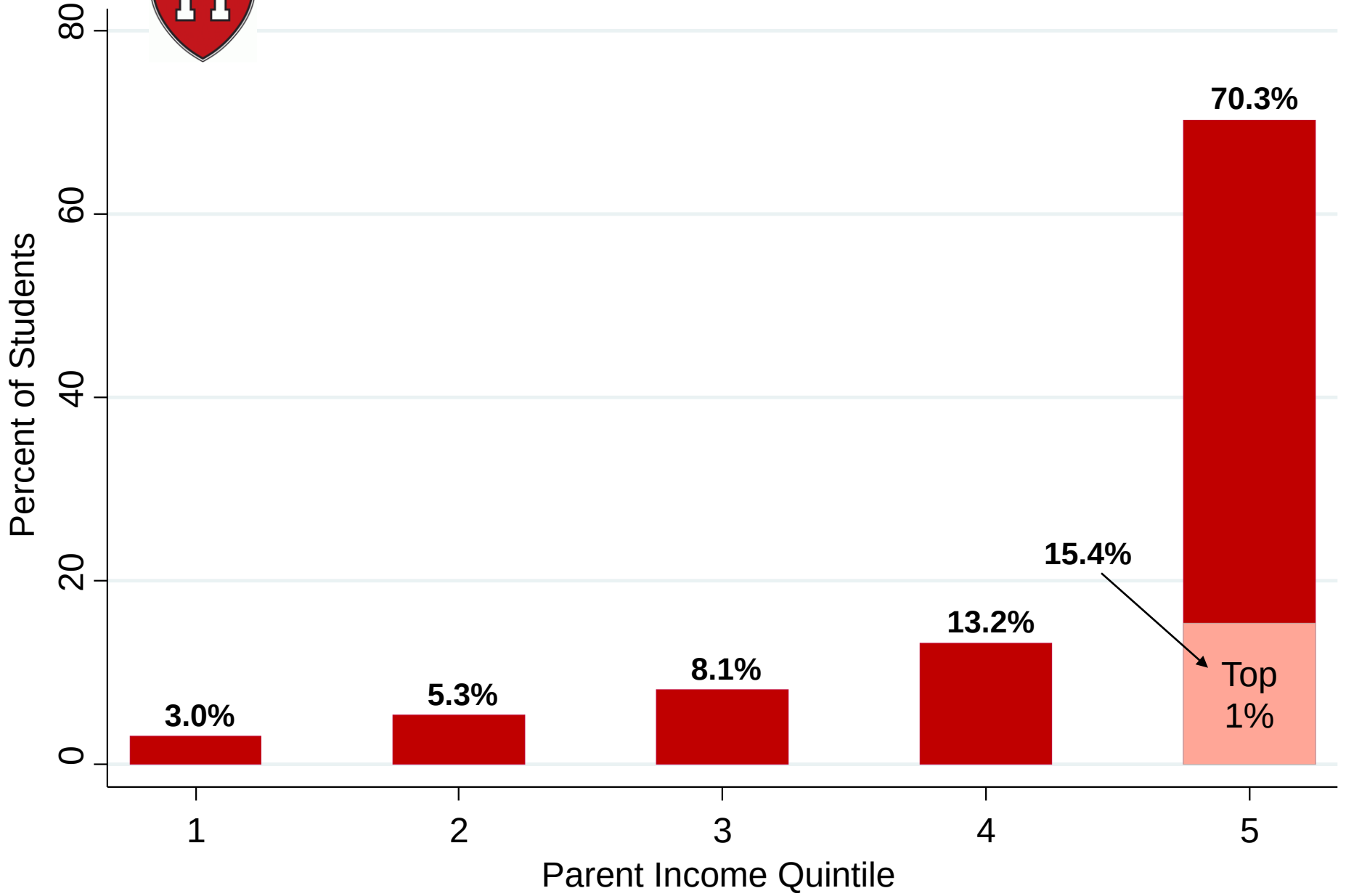
A student at one of America's most-selective universities is fourteen times more likely to be from a high-income family than from a low-income family.



Source: Carnevale and Strohl (2010)

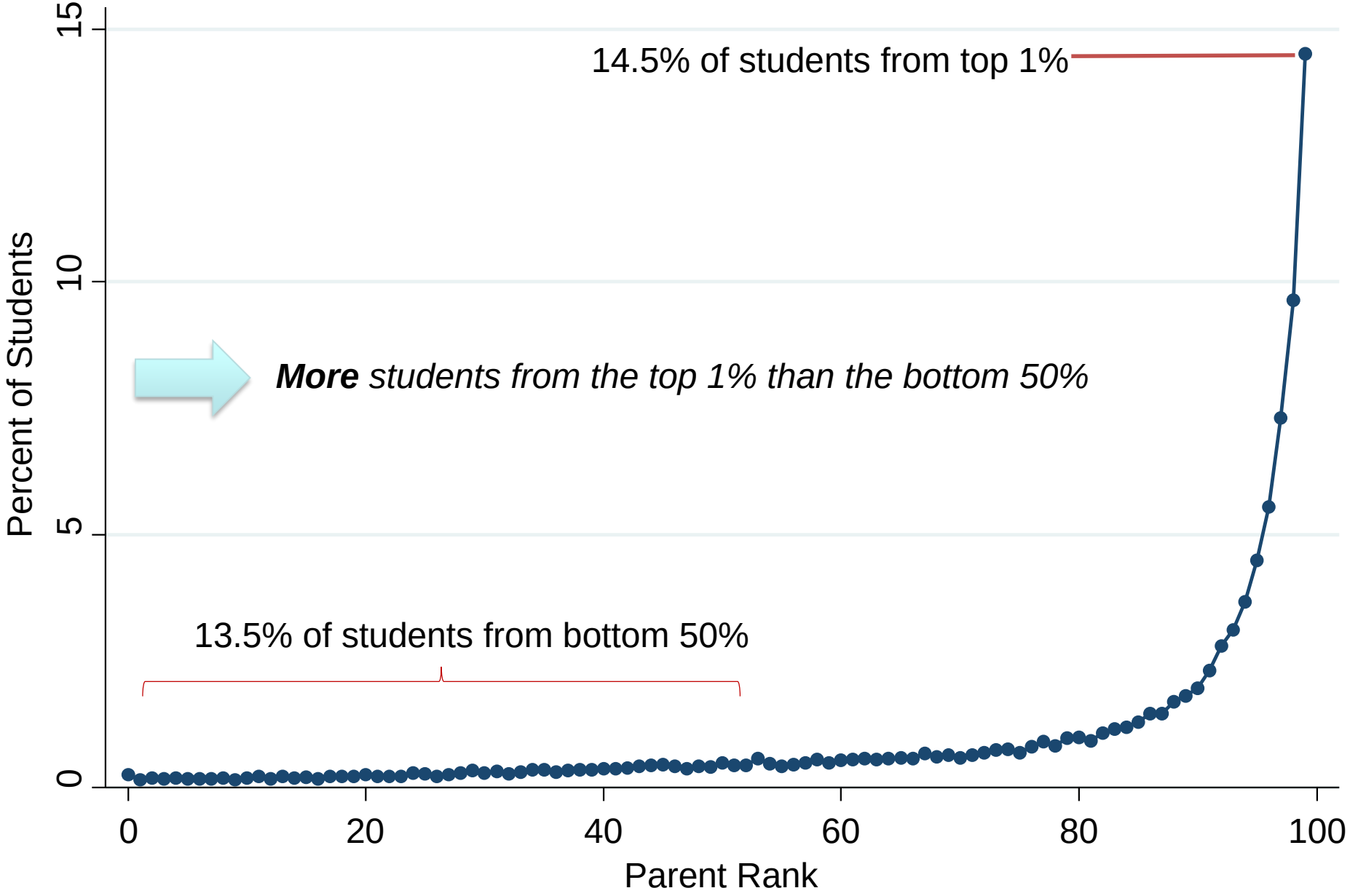
Parent Income Distribution at Harvard

1980-82 Child Birth Cohorts



Parent Income Distribution by Percentile

Ivy Plus Colleges



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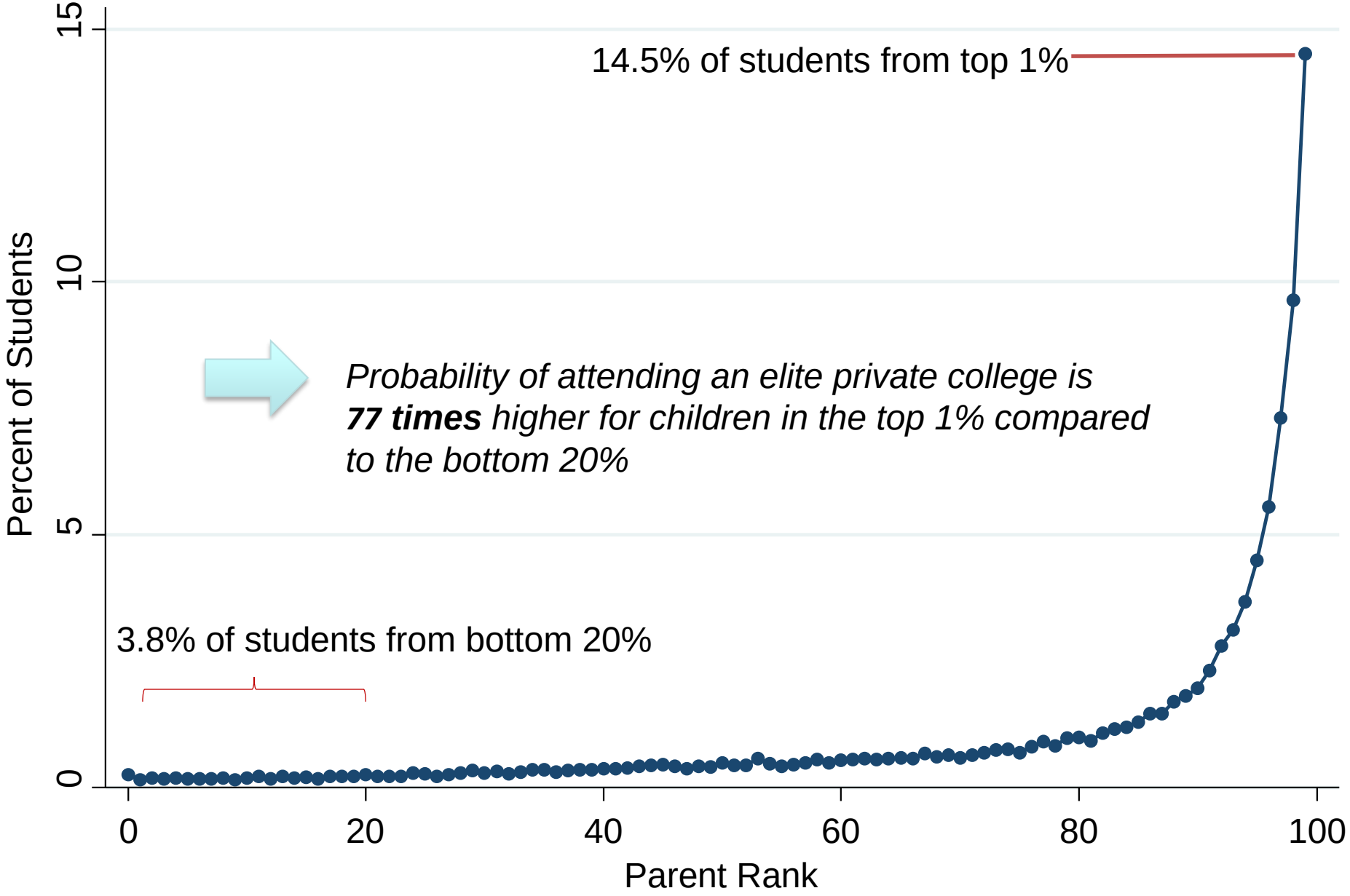
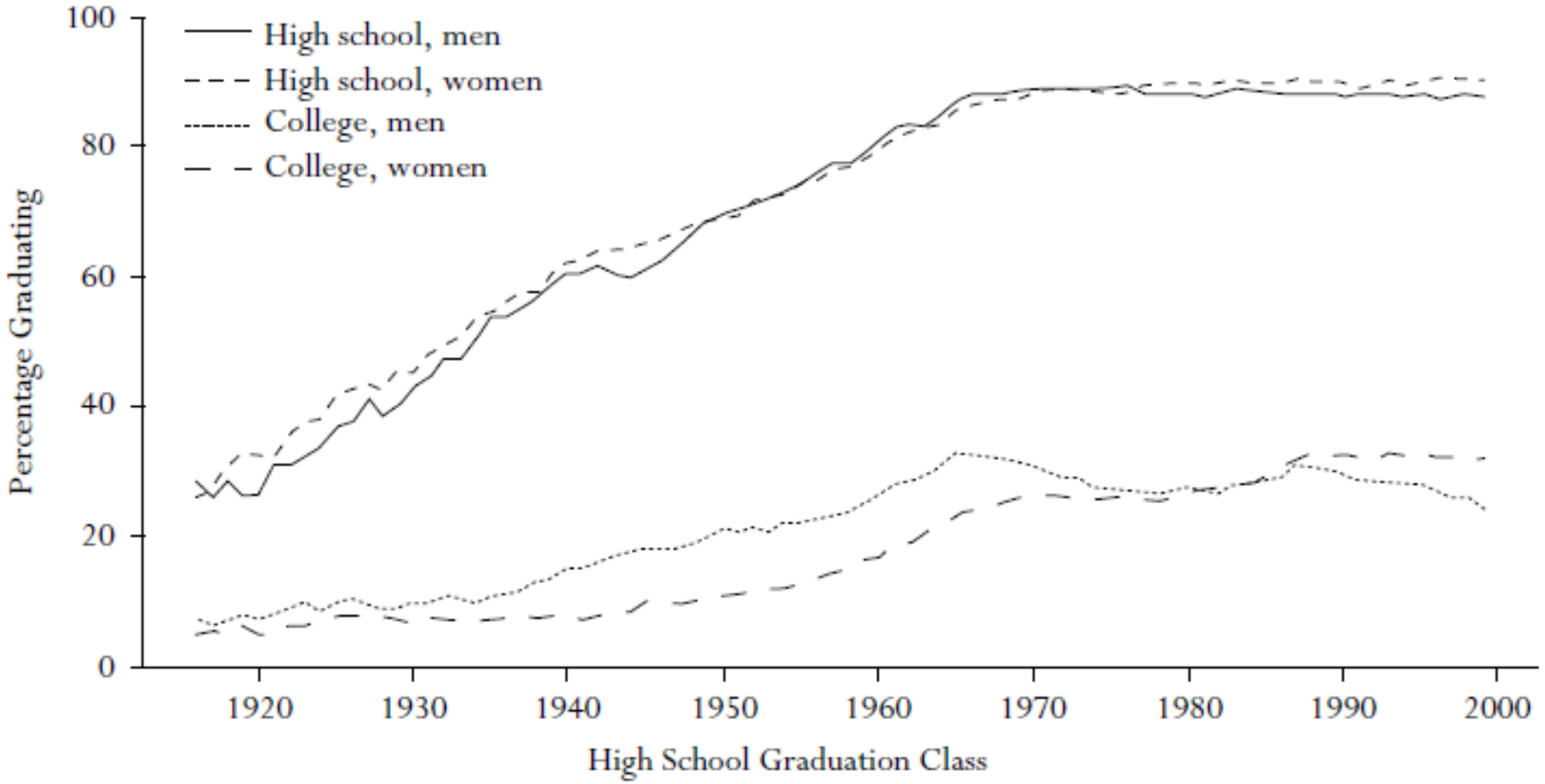


College attainment stalled exactly when inequality started to rise….

FIGURE 8.1 *Percentage Graduating from High School and College, by High School Graduating Class and Gender; Persons Twenty-Seven to Sixty-Four Years Old at Time of Interview*

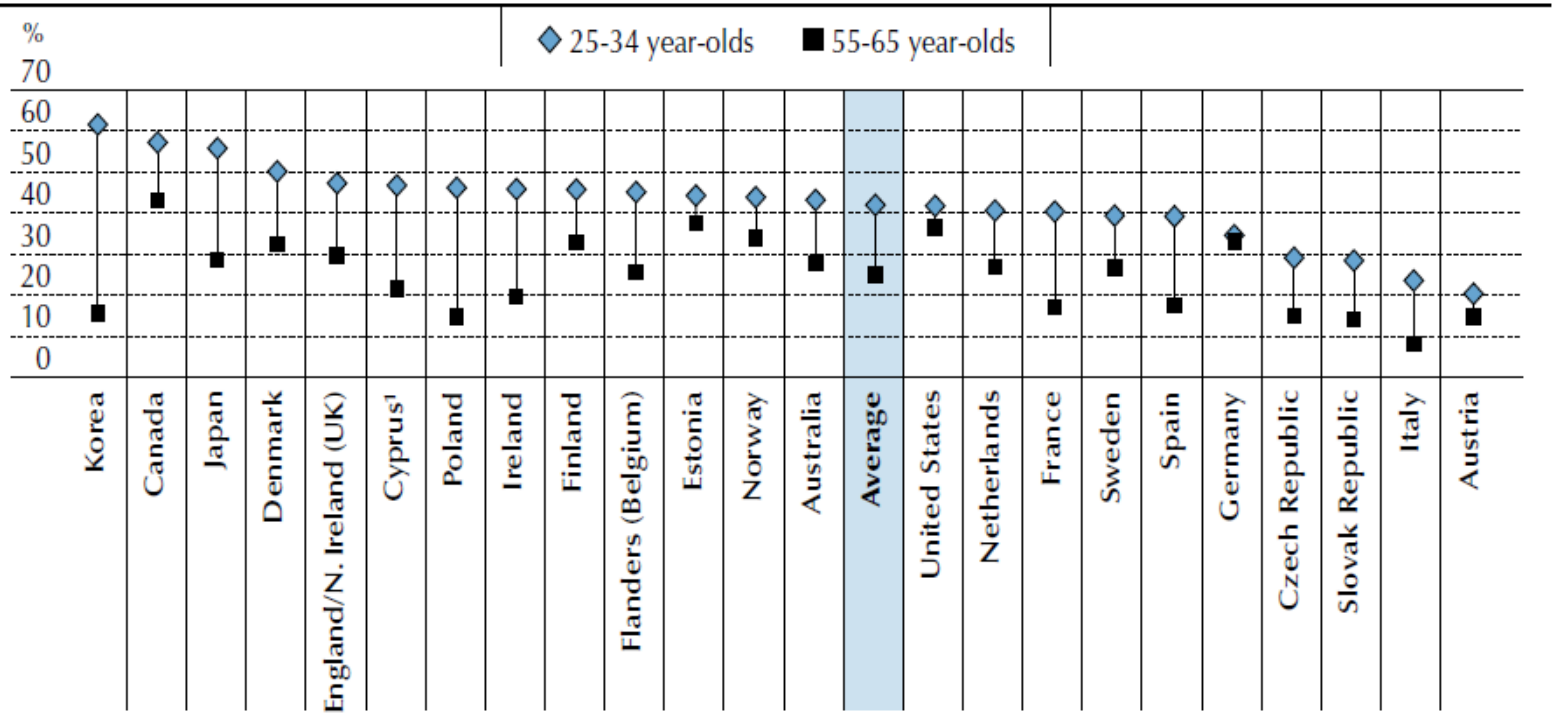


Source: Hout and Janus (2011)

Tertiary Education Completion in OECD Countries as of 2012 by Age Groups, 25 – 34 and 55 – 65

Population with tertiary education

Percentage, by age group

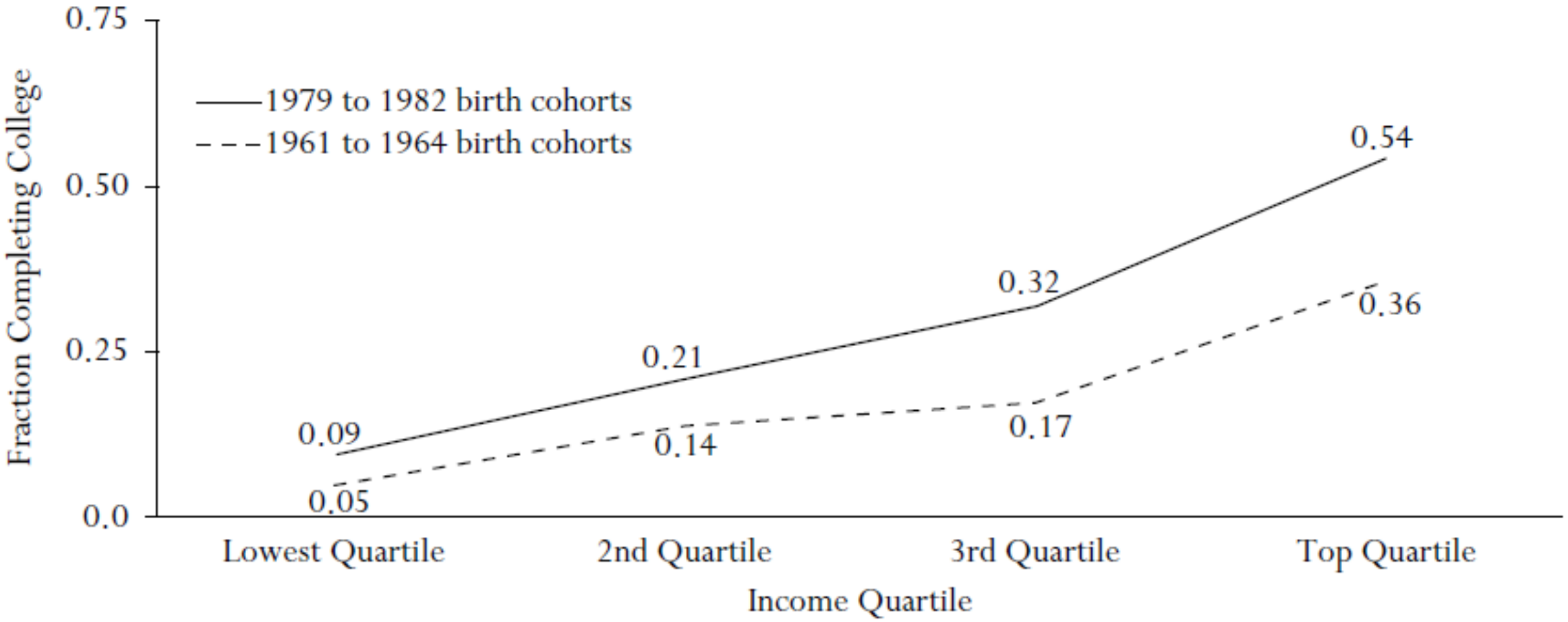


1. See notes at the end of this chapter.

Countries are ranked in descending order of the percentage of 25-34 year-olds with tertiary education.

Source: Survey of Adult Skills (PIAAC) (2012), Table B2.2 in Annex B.

FIGURE 6.3 *Fraction of Students Completing College, by Income Quartile and Birth Year*



Source: Authors' calculations based on data from National Longitudinal Survey of Youth, 1979 and 1997 (U.S. Bureau of Labor Statistics 2010a, 2010b).

Source: Bailey and Dynarski (2011)

Inequality in Postsecondary Attainment

- Unlike K-12 schooling, access is not guaranteed
  - Larger private market, more cost-sharing

- Large income differences in postsecondary resource allocation

- Trends in college attainment line up closely with trends in economic inequality

My conclusion:

If we want to reduce economic inequality – at least in in the U.S. - we must find a way to equalize access to postsecondary resources.

CLIMB
INITIATIVE

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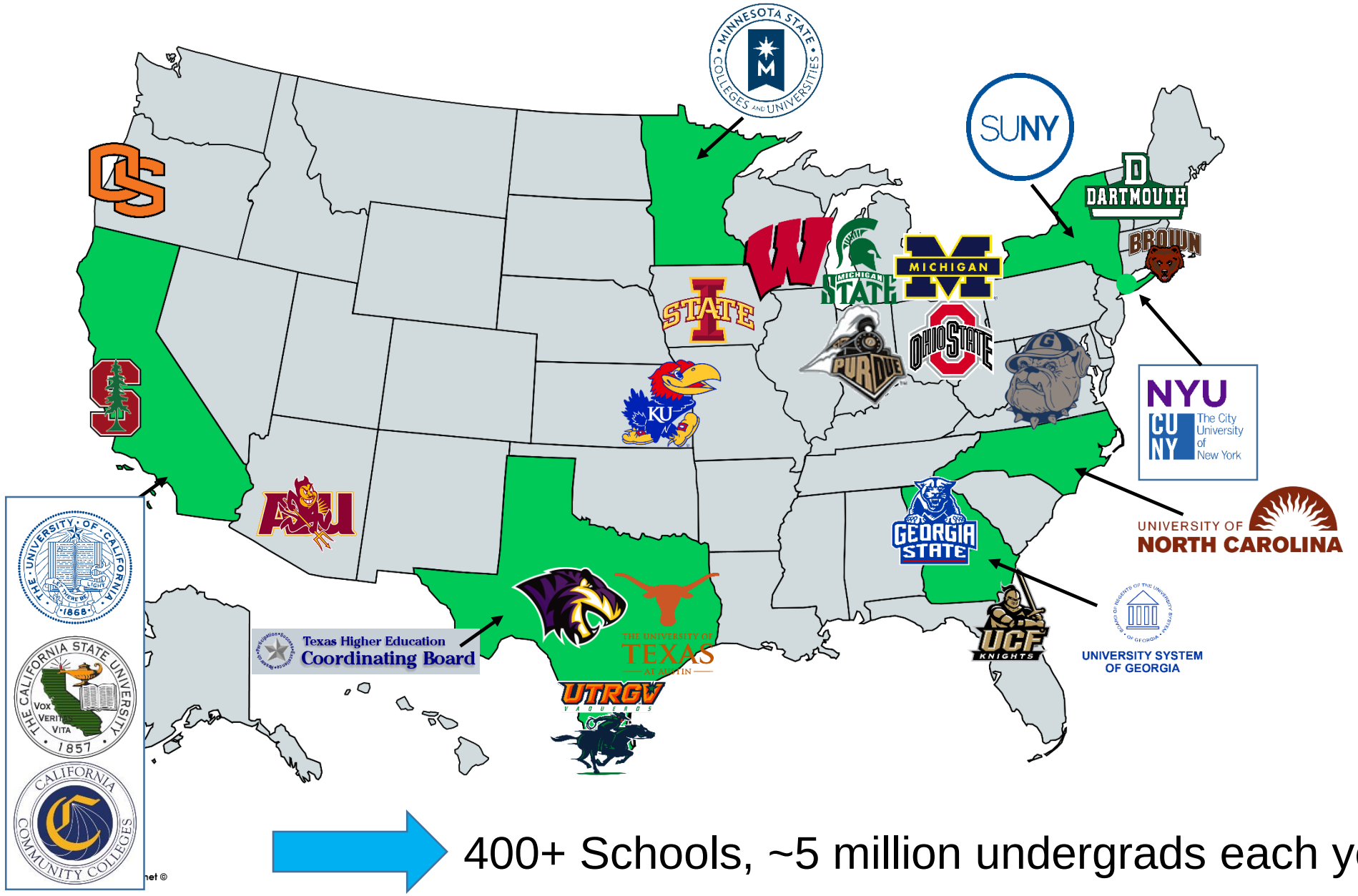
John N. Friedman

Associate Professor of Economics and International and Public Affairs, Brown University

CLIMB Initiative Schools (some pending)



400+ Schools, ~5 million undergrads each year

The Race Between Education and Technology

- Resources highly unequally distributed in postsecondary education
  - Less so in K-12, and this was deliberate

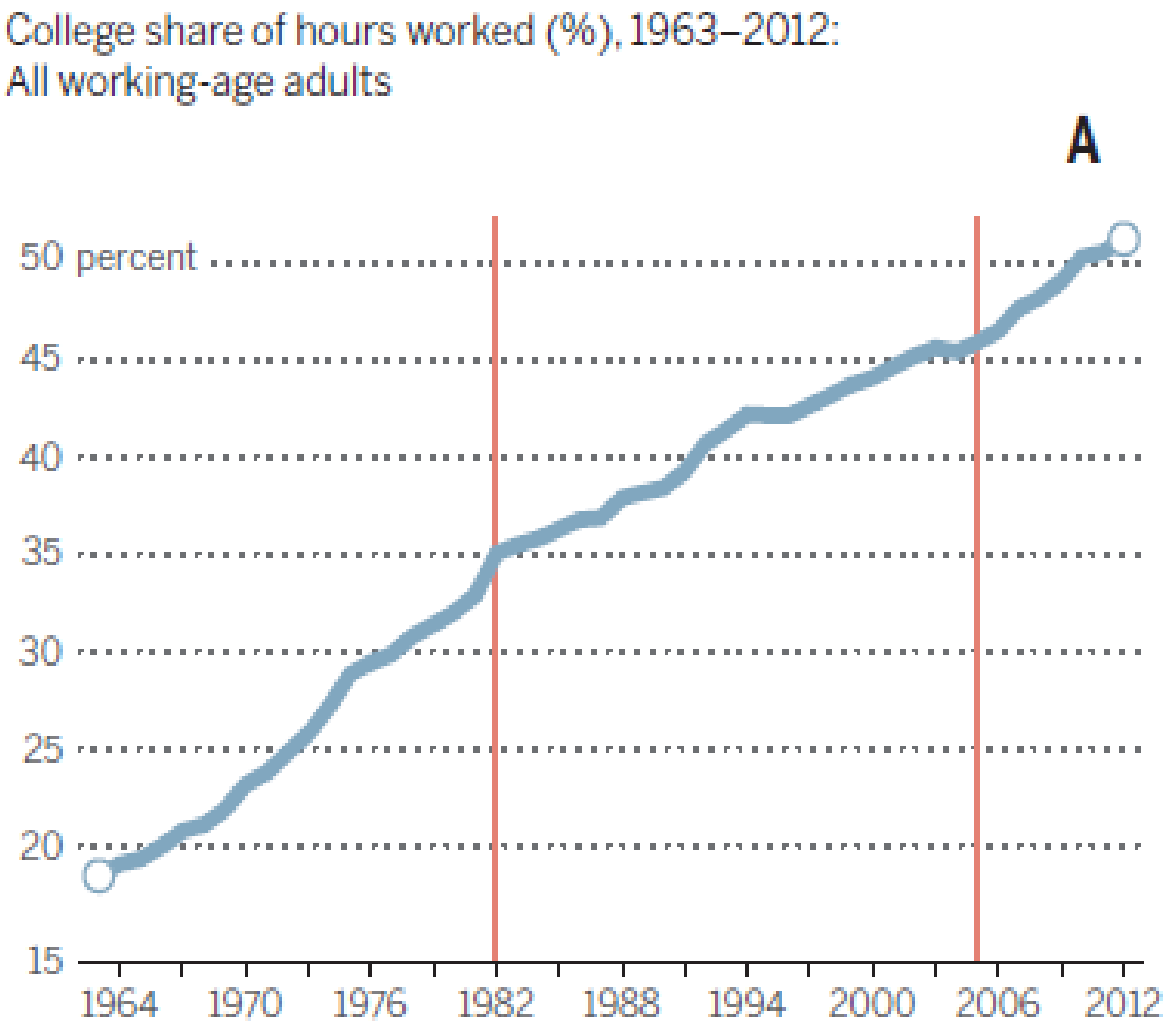
- Slow growth in the supply of skills – what about demand?

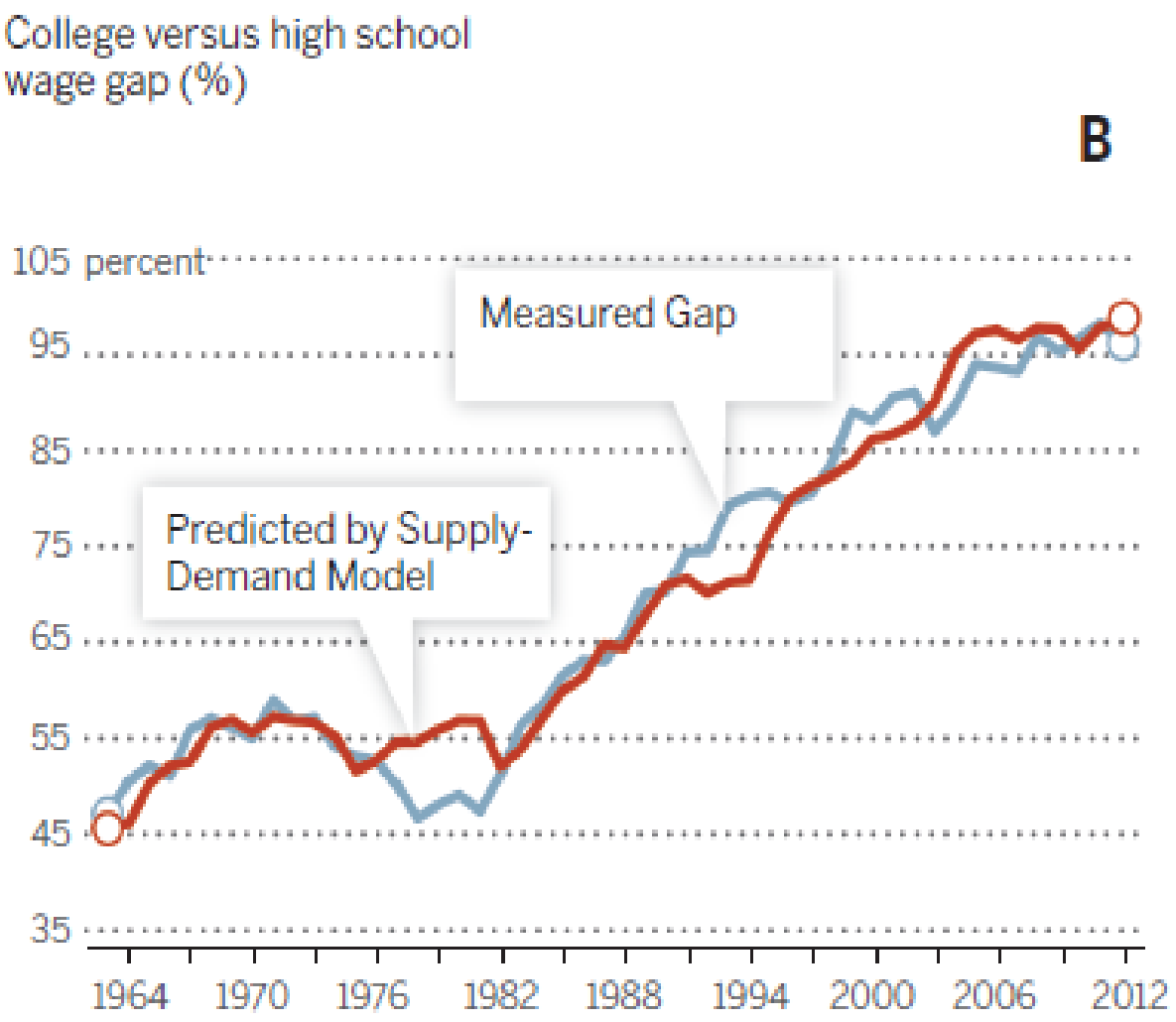
- SDI framework (Katz and Murphy 1992, Goldin and Katz 2009) predicts college premium using:
  1. Supply of skills – Ratio of college grads to high school grads
  2. Time trend (flexible)

- Ask whether changes in the (relative) frequency of college grads is strongly correlated with changes in the *economic return* to a college degree.

- If supply is growing, and college premium still rising, demand must have grown *faster*

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





Source: Autor (2014)

Why is a college education so important?

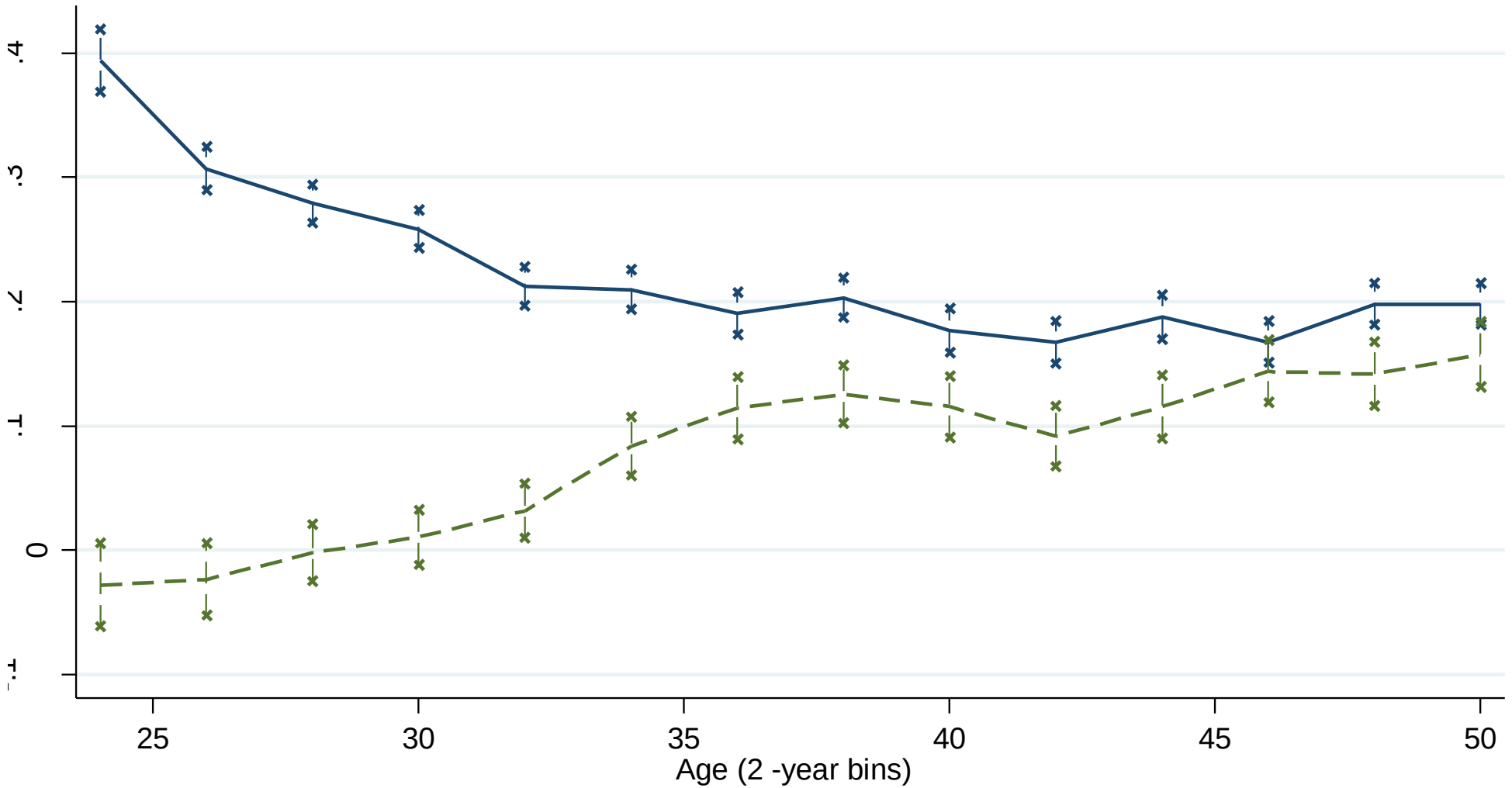
- Strong *causal* evidence that college education affects earnings, other important non-pecuniary outcomes (Oreopoulos and Salvanes 2011)
  - contra Heckman, higher returns for marginal enrollees (e.g. Zimmerman 2014, Denning, Marx and Turner 2018)

- But we have little or no evidence on mechanisms.

- What about field of study? Perhaps a technically strong STEM education is increasingly necessary in the 21st century economy….

Declining Life-Cycle Returns to Majoring in STEM

2009-2016 ACS

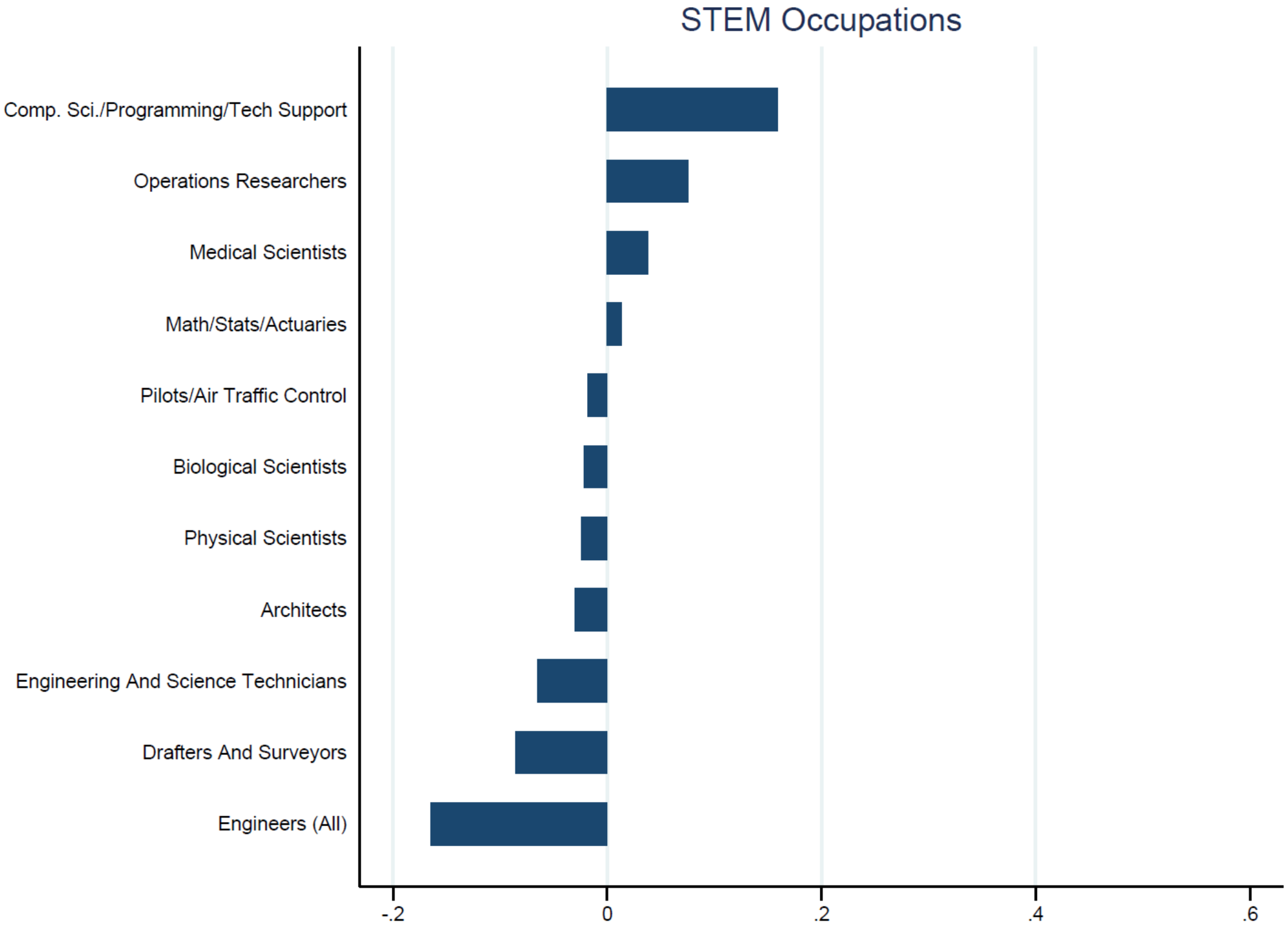


Sample is full-time working men with at least a college degree; 2009-2016 ACS

Left-out category is all other majors; includes demographic controls and age and year fixed effects

Source: Deming and Noray (2018)

U.S. Employment Growth in high-skilled occupations, 2000-2012



Source: Deming (2017)

U.S. Employment Growth in high-skilled occupations, 2000-2012

Source: Deming (2017)

STEM *skills* are scarce, not STEM workers
(Deming and Noray 2018)

- STEM graduates in CS/Engineering earn high initial wages because they learned job-relevant skills in school

- Yet job tasks change over time, especially in fields near the technology frontier
  - We show directly using job vacancy data from Burning Glass Technologies, 2007-2017

- Technological progress makes the skills of older STEM workers obsolete
  - Flatter wage growth, exit over time from STEM professions

- Pattern holds in a variety of data sources (ACS, NSCG, CPS, NLSY), samples, specs

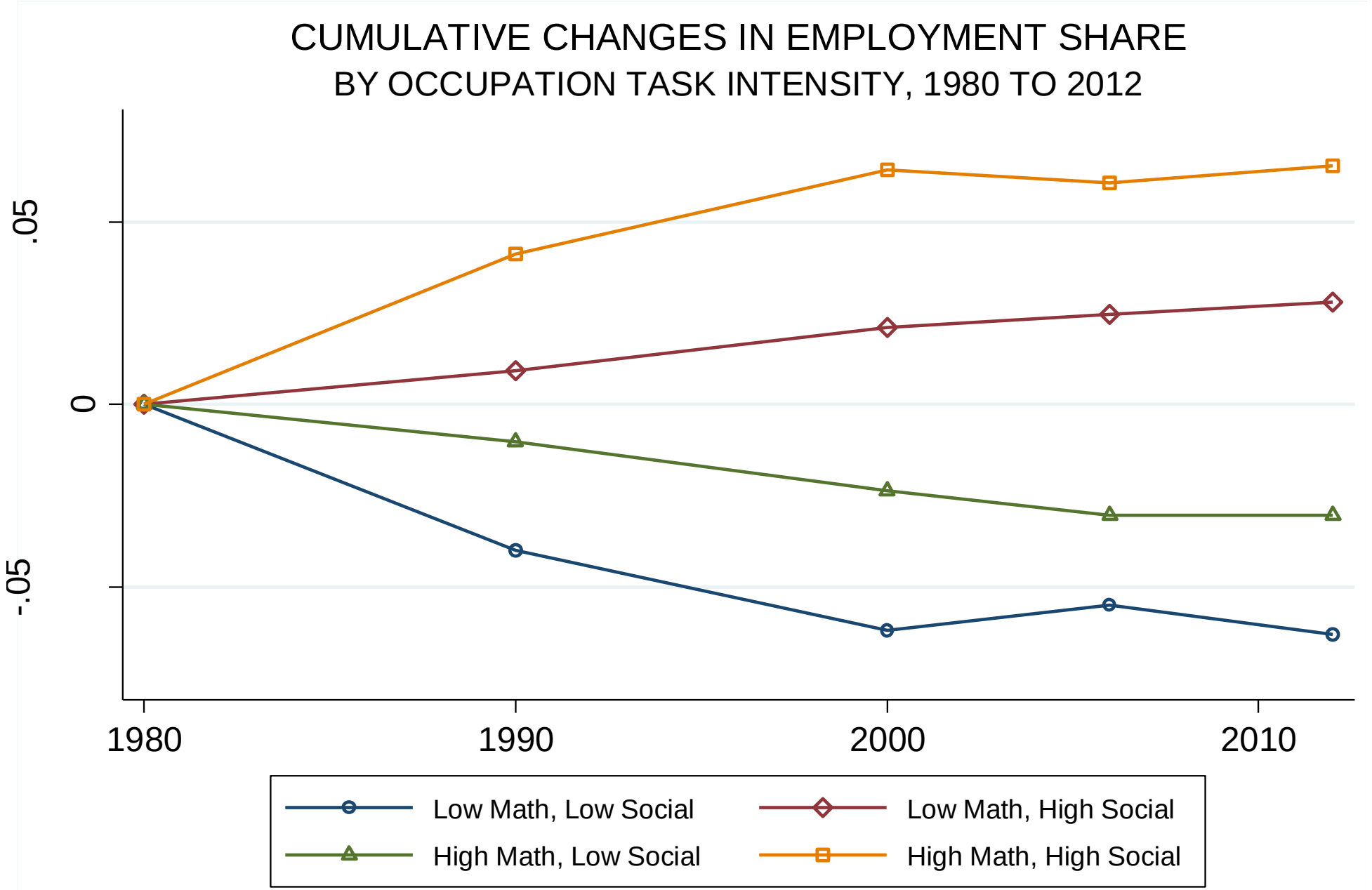
Education is about more than just hard (STEM) skills

- Rising return to education coincided with the computer and ICT revolution. How have computers changed the labor market?

- Computers execute procedural, rules-based logic with ruthless efficiency
  - Substitute for human labor in such “routine” tasks

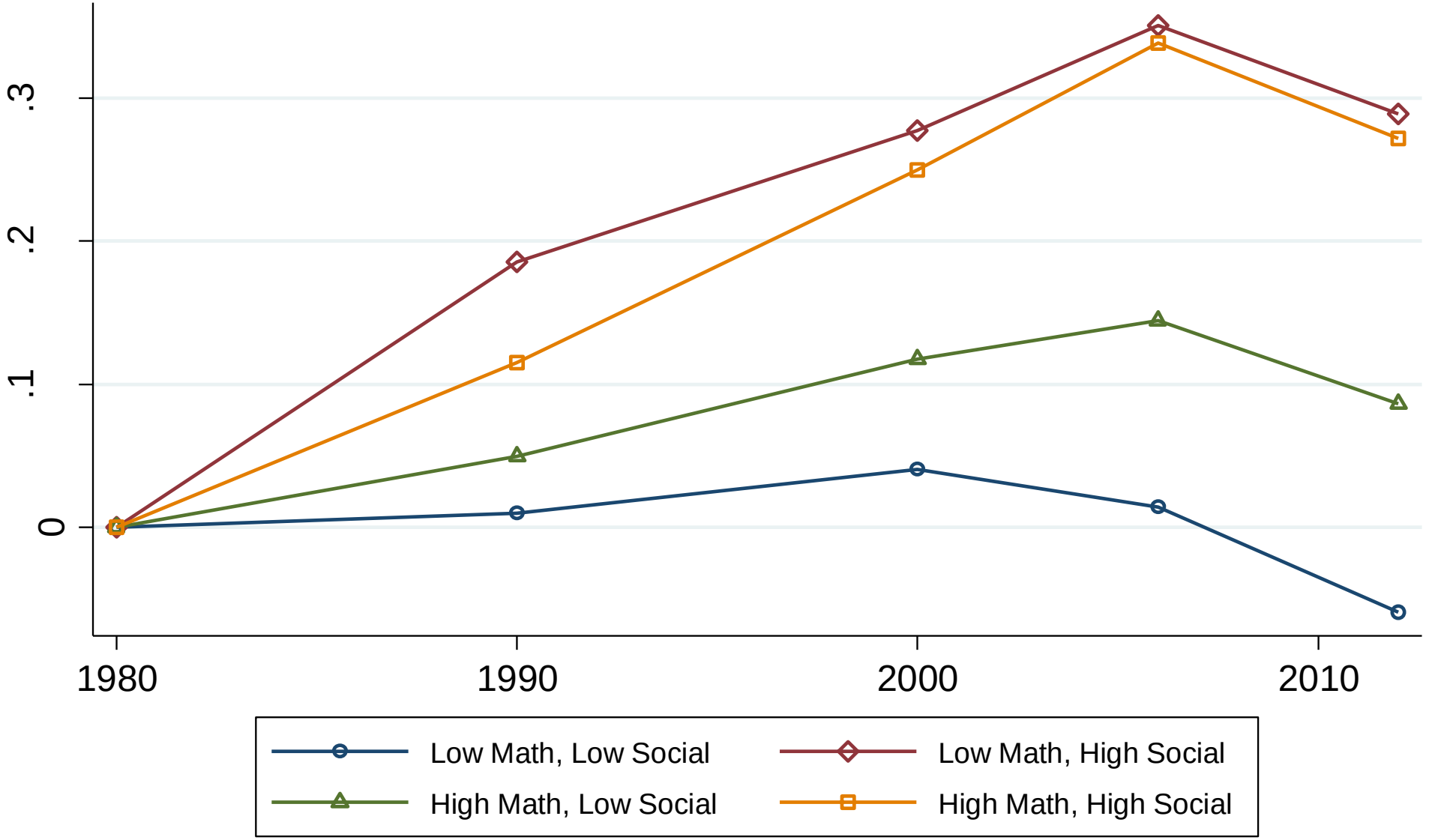
- Can also make non-routine tasks (and the workers who perform them) *more* productive
  - MS Excel
  - Statistical analysis
  - Google

- What skills are hard to automate, but also learned in college?



Source: Deming (2017)

CUMULATIVE CHANGES IN REAL HOURLY WAGES
BY OCCUPATION TASK INTENSITY, 1980 to 2012



Occupational Task Intensity based on 1998 O*NET

Sources: 1980-2000 Census, 2005-2013 ACS

Source: Deming (2017)

The growing importance of social skills

- Employment and wage growth since 1980 in *social-skill intensive* occupations
  - Slower growth for STEM jobs
  - Complementarity (a.k.a. “decline of the nerds”)

- Lower down the income distribution, service jobs are growing as well

- Why are people jobs (and people skills) more important than ever?
  - Computers complement social interaction, not calculus

Polanyi's Paradox – "we know more than we can tell"

- Also called Moravec's Paradox
  - Interpersonal interaction and sensorimotor coordination have evolved over thousands of years
  - Calculus, formal logical reasoning much more recent

- Environmental control
  - (Re)define the problem space to something more manageable, and humans do the rest
  - Roads and railroad tracks; Kiva; airline pilots and automation

- Machine learning
  - Inductive reasoning based on human judgment and "ground truth"
  - Can machine learning techniques simulate intuitive skills like conversation, common sense and creativity?

"Ultimately, what makes an object a chair is that it is purpose-built for a human being to sit upon. Machine-learning algorithms may have fundamental problems with reasoning about "**purposiveness**" and intended uses….One is reminded of Carl Sagan's (1980, p. 218) remark, "If you wish to make an apple pie from scratch, you must first invent the universe."

Theory of mind - the ability to attribute mental states to others based on their behavior….to “put oneself into another’s shoes”

The elusive definition of “common sense”…

Can an alligator run the 100 meter hurdles?


“ You need to start understanding me Siri ”
I’ll make a note of that.
“ Yeah you better make a note of that ”
Got it:
Of that

The Winograd schemas

- Statements that are:
  - Easily disambiguated by the reader (i.e. common sense)
  - Not solvable through logical restrictions (if-then statements)
  - “google-proof”

The town counselors refused to give the angry demonstrators a permit because they feared (advocated) violence. Who feared (advocated) violence?

Joan made sure to thank Susan for all the help she had given (received). Who had given (received) the help?

- $25,000 prize to programmers that can achieve 90 percent accuracy
  - Highest score in 2016 was 58 percent (on a/b questions!)

Can social interaction be automated?

- There are empathetic robots that can recognize and respond to human emotion

- Yet this is an impoverished theory of mind
  - We search our own minds for clues about the motivations of others
  - Empathy, judgment, common sense and creativity – all require shared understanding
  - Specifically require us to *think like other humans*


O2-UK 3G
08:37
37%
“What's the meaning of life”
Life: the condition that distinguishes animals and plants from inorganic matter, including the capacity for growth, reproduction, functional activity, and continual change preceding death.

Summing up

- Increasing access to postsecondary education is critically important for tackling economic inequality.

- Not just *more* education, but *better* education. That means more resources and more access. But it also means building an educational system that prepares young people for the modern economy.

- Skills employers want – teamwork, communication, flexibility, "problem-solving"
  - Decision-making in complex environments with uncertainty, and multiple stakeholders and perspectives
  - Robot-proof

- A broad, high-quality college education teaches you to absorb, categorize, and filter information into useful "schemes" that aid decision-making.
  - Economists' conceptualization of "human capital" is not very helpful here