Inequality

Lorenzo Neri

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Inequality and the wage structure

- One of the most important changes in the US (and not only) labor market in the past 45 years: dramatic increase in wage inequality.

- Surprisingly, only recently has inequality really become part of the public discourse:
  - Occupy Wall Street movement (Summer 2011)
  - Thomas Piketty, "Capital in the 21st Century", publishing sensation.

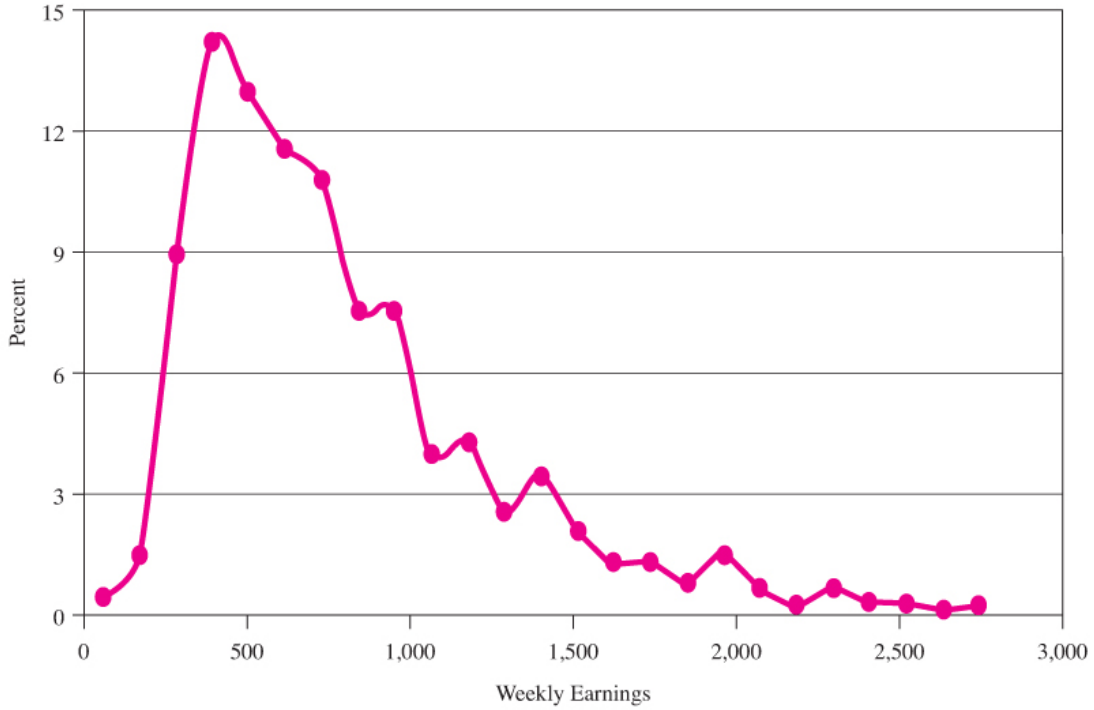
- This lecture:
  - Measuring inequality
  - Basic facts: overall inequality, between groups, within groups.
  - Explanations?

Measuring Inequality

- Fact 1: there is substantial heterogeneity in wages.
- Fact 2: The wage distribution is skewed to the right: consistent with model of human capital where more able workers invest more in education

FIGURE 7-1 **The Wage Distribution in the United States, 2006**

Source: U.S. Bureau of Labor Statistics, *Current Population Survey, Outgoing Rotation Group,* 2006.



[2] A good description of the characteristics of the U.S. income distribution is given by Frank Levy, *The New Dollars and Dreams: American Incomes and Economic Change,* New York: Russell Sage, 1999.

- How do we measure inequality?

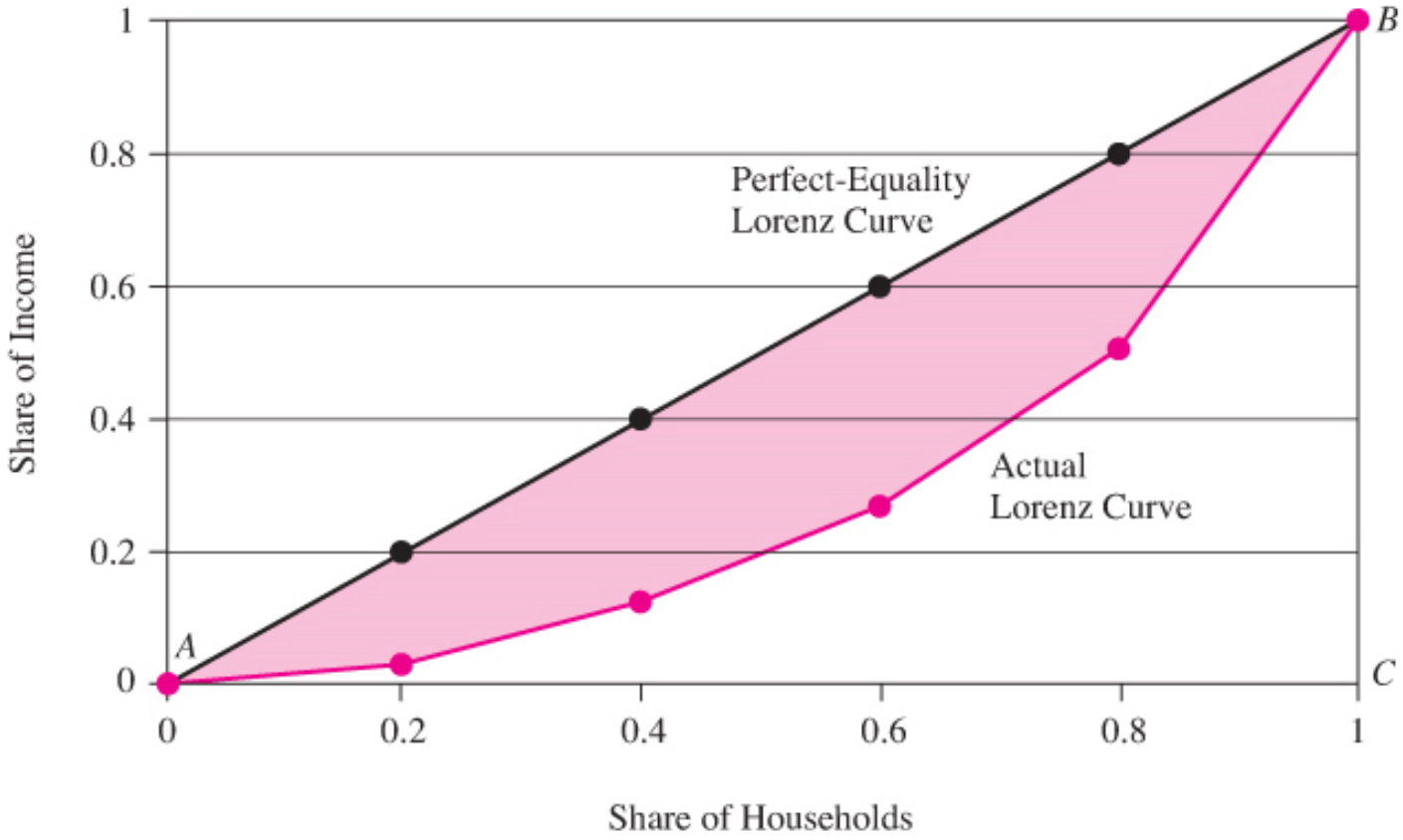
- Several possibilities
  - Standard Deviation (SD) of wages
  - Coefficient of variation = SD/Mean
  - Gini Coefficient: area between the Lorenz curve and 45 degree line

- SD sensitive to outliers, Gini coefficient depends on what goes on in the middle of the distribution in a not very transparent manner.

- Measures most commonly used today: 90-10 wage differential
  - also 90-50 and 50-10 wage differentials, allows you to understand what happens at the top and bottom of the distribution separately.

FIGURE 7-3 The Lorenz Curve and the Gini Coefficient

The "perfect-equality" Lorenz curve is given by the line *AB*, indicating that each quintile of households gets 20 percent of aggregate income, while the Lorenz curve describing the actual income distribution lies below it. The ratio of the shaded area to the area in the triangle *ABC* gives the Gini coefficient.



- Also, what should we measure?
  - Wage inequality?
  - Income inequality? (including capital income, capital gains, etc.)
  - Wealth inequality? (including stocks, etc.)
  - Consumption inequality?
  - Before or after taxes?
  - At the individual level, or at the household level?

- Depending on what we measure, we may get (slightly) different picture about the extent of inequality and the trends over time.

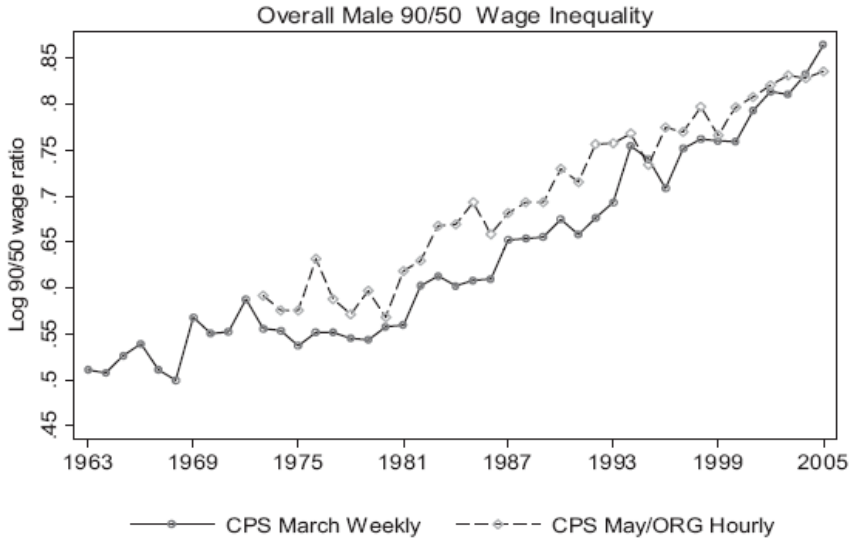
Basic facts about the wage structure

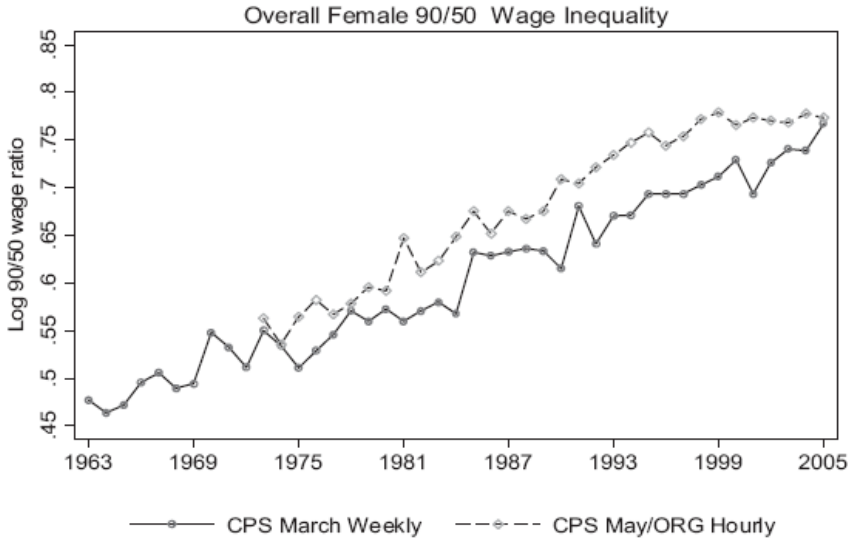
FIGURE 1.—CHANGE IN LOG REAL WEEKLY WAGE BY PERCENTILE, FULL-TIME WORKERS, 1963–2005

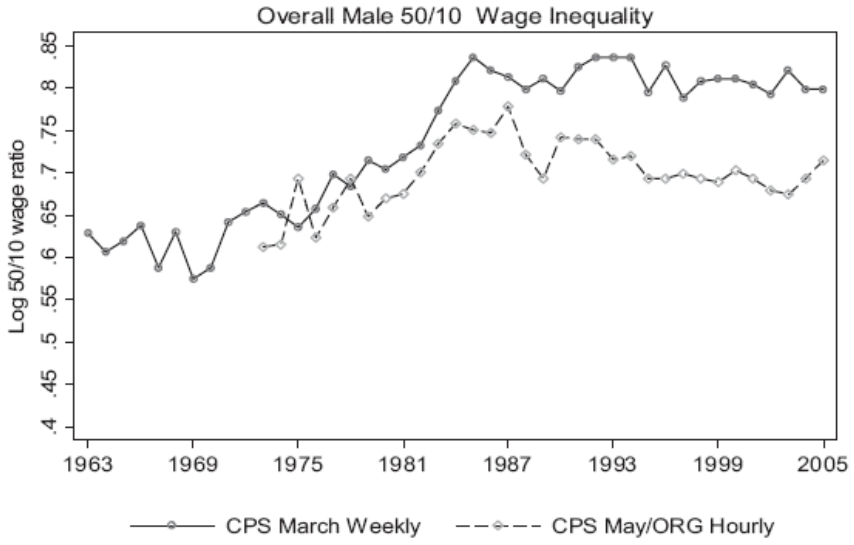
Source: March CPS data for earnings years 1963–2005, full-time, full-year workers ages 16 to 64 with 0 to 39 years of potential experience whose class of work in their longest job was private or government wage/salary employment. Full-time, full-year workers are those who usually worked 35-plus hours per week and worked forty plus weeks in the previous year. Weekly earnings are calculated as the logarithm of annual earnings divided by weeks worked. Calculations are weighted by CPS sampling weights and are deflated using the personal consumption expenditure (PCE) deflator. Earnings of below $67/week in 1982 dollars ($112/week in 2000 dollars) are dropped. Allocated earnings observations are excluded in earnings years 1967 forward using either family earnings allocation flags (1967–1974) or individual earnings allocation flags (1975 earnings year forward).

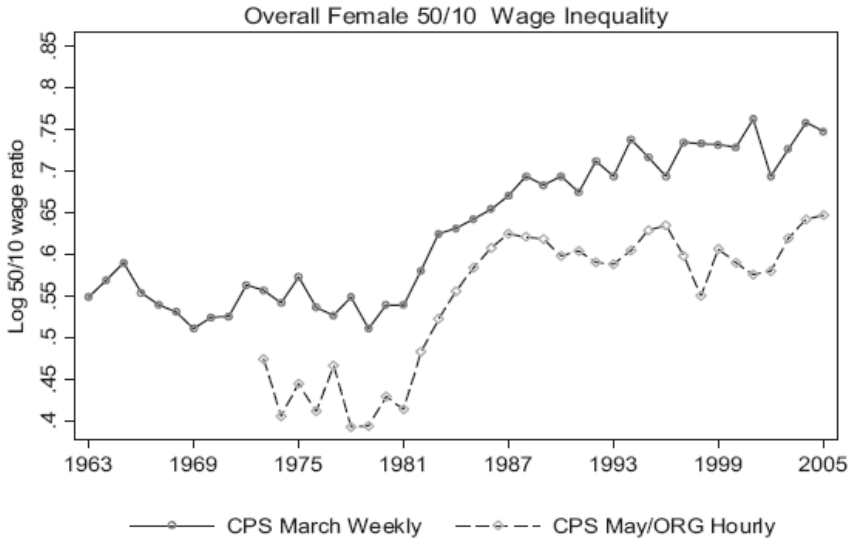
Stagnant wages at the bottom of the distribution, large increases at the top (Autor, Katz and Kearney, 2007).

FIGURE 3.—90/50 AND 50/10 WEEKLY WAGE INEQUALITY IN MARCH (FULL-TIME WORKERS) AND HOURLY WAGE INEQUALITY IN MAY/ORG (ALL WORKERS) CPS SERIES, 1963–2005









See notes to figure 2 for details on samples and data processing.

- Differences across decades

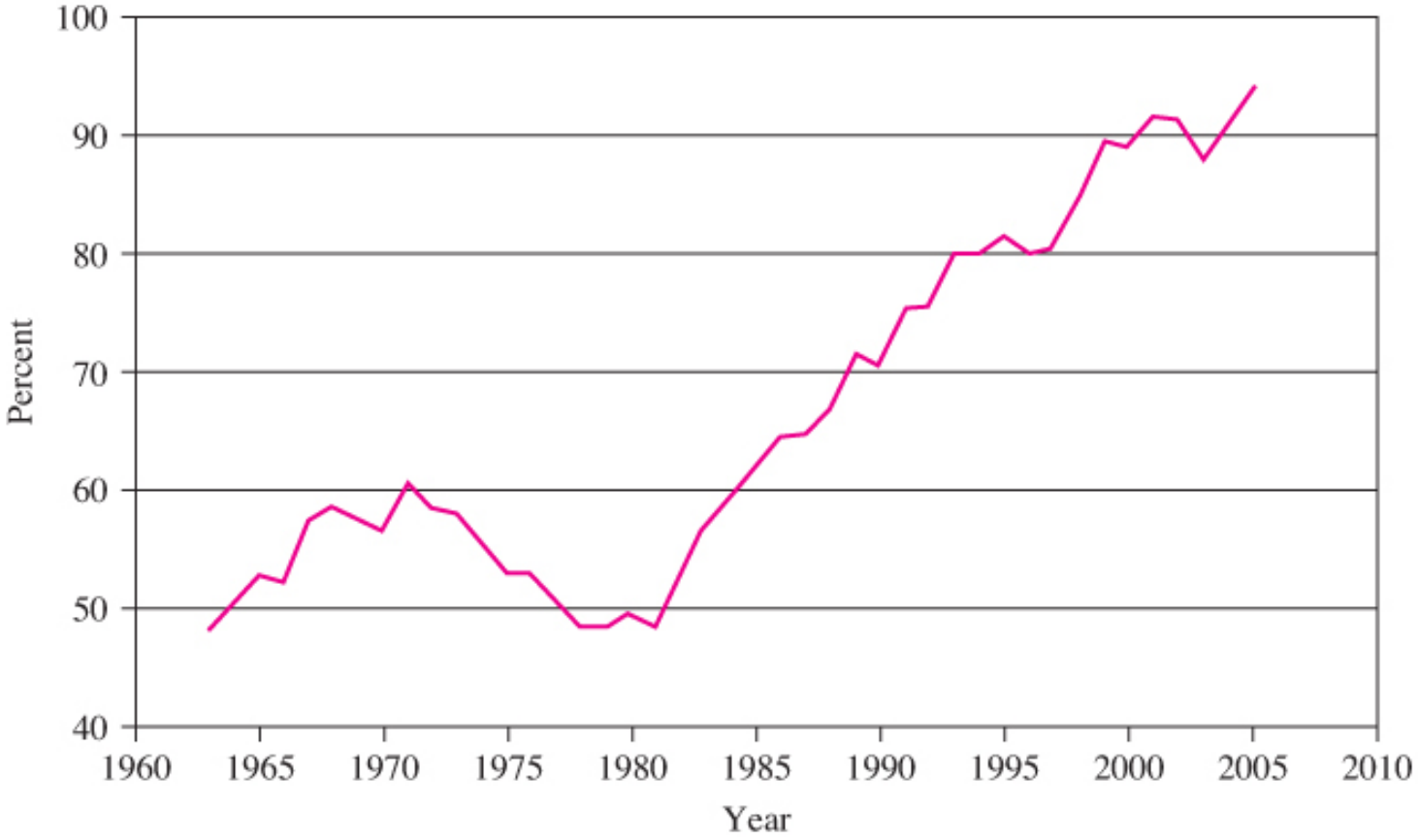
- In the 1980s, the whole distribution spread out:
  - 90^{th} percentile relative to 50^{th} percentile,
  - 50^{th} percentile relative to 10^{th} percentile.

- In the 1990s, the gap between 90^{th} percentile and 50^{th} percentile continues to grow, but 50-10 gap is constant.

- What is the source of these gaps?
  - Difference in the distribution of observed skills?
  - Differences in the returns to observable skills?
  - Differences in unobservables?

FIGURE 7-5 **Wage Differential between College Graduates and High School Graduates, 1963–2005**

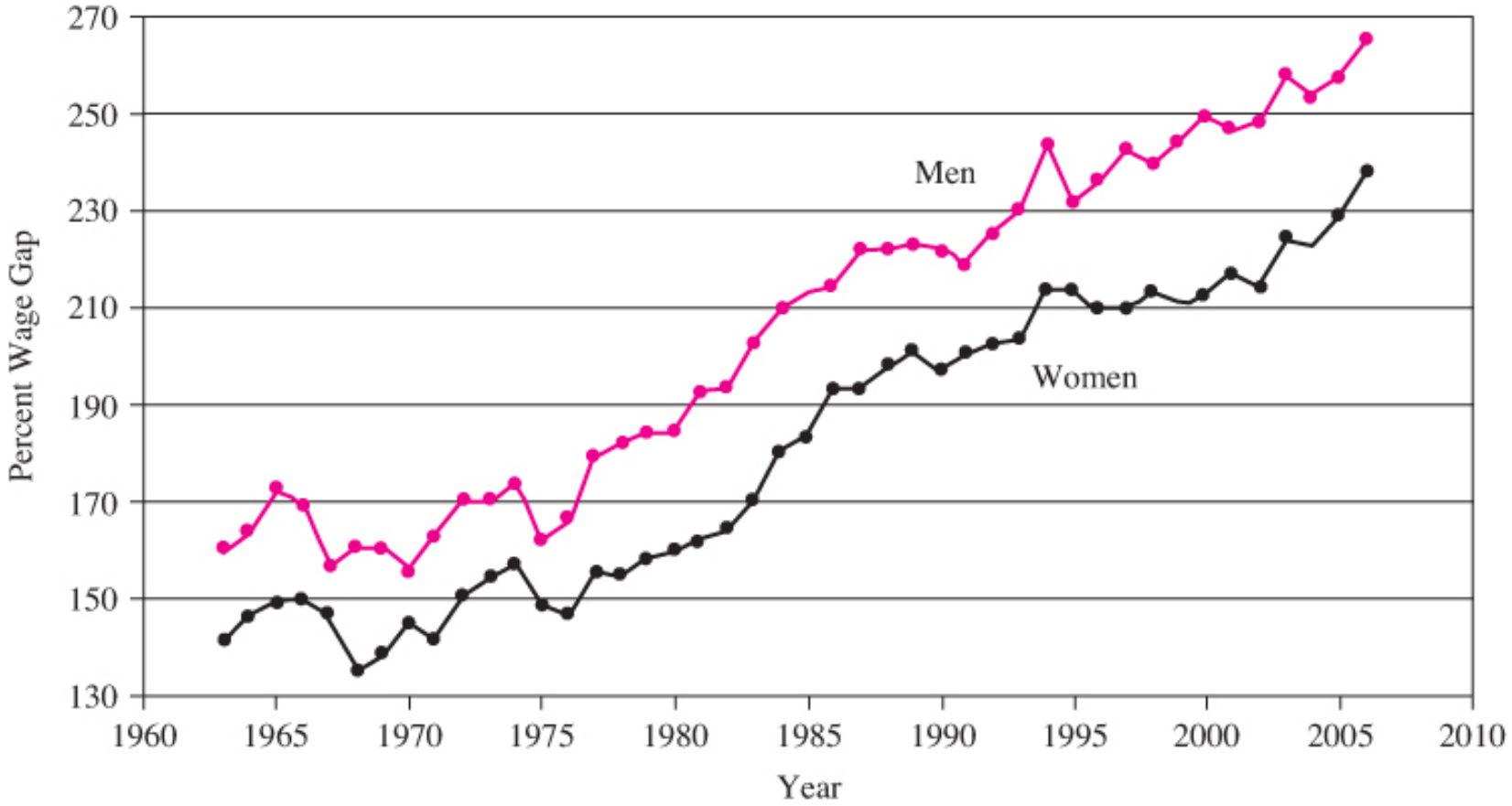
Source: David H. Autor, Lawrence F. Katz, and Melissa S. Kearney, "Trends in U.S. Wage Inequality: Revising the Revisionists," *Review of Economics and Statistics* 90 (May 2008): 300–23. The percent wage differentials give the differences in weekly earnings for full-time, full-year workers who are 18 to 65 years old.



- The college premium falls in the 1970s, but increases very rapidly from the 1980s onwards.

FIGURE 7-6 Trend in the "Residual" 90-10 Wage Gap, 1963–2006

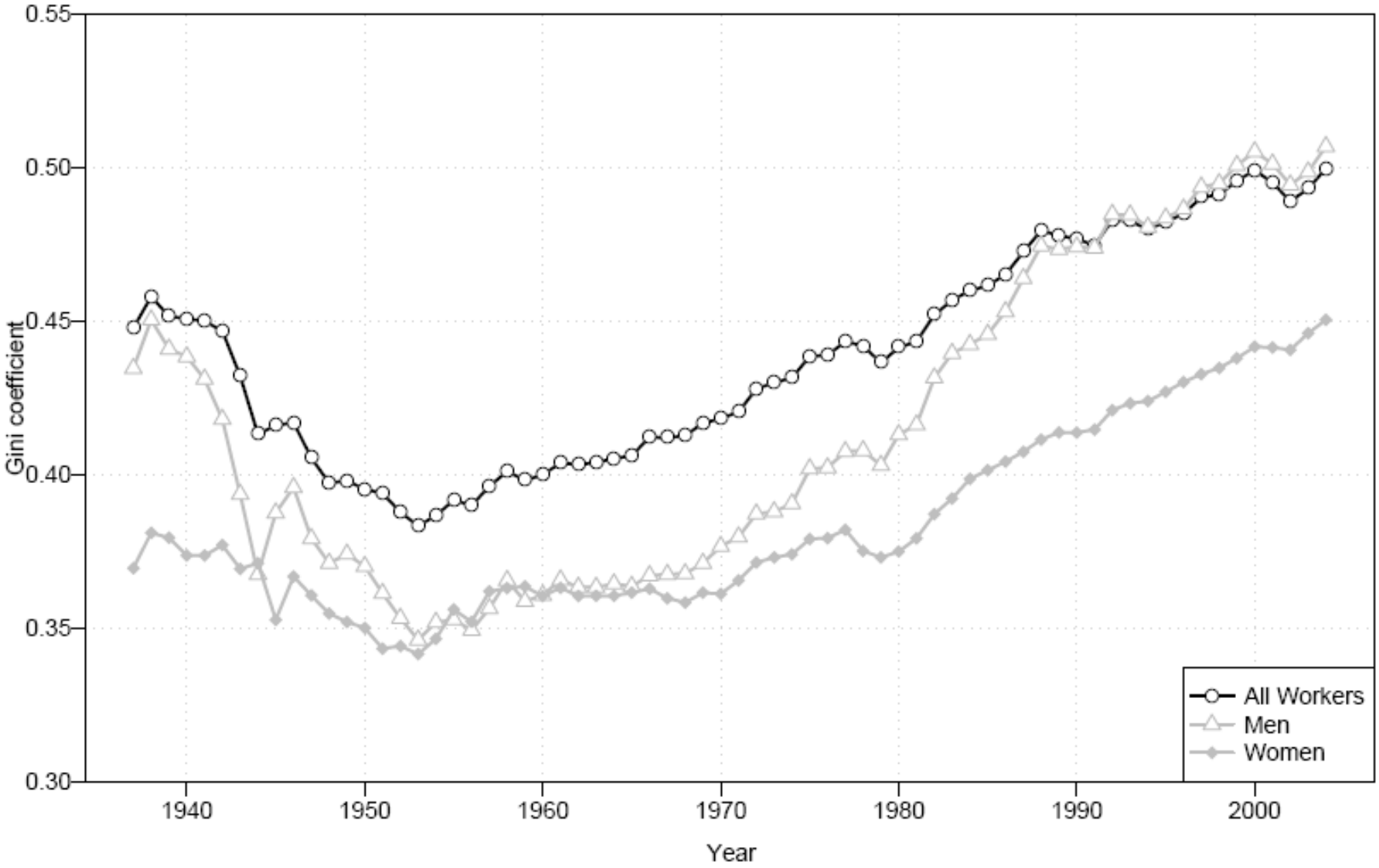
Source: David H. Autor, Lawrence F. Katz, and Melissa S. Kearney, "Trends in U.S. Wage Inequality: Revising the Revisionists," *Review of Economics and Statistics* 90 (May 2008): 300–23. The wage differentials give the differences in weekly earnings for full-time, full-year workers who are 18 to 65 years old and have similar socioeconomic characteristics, including education, age, and race.



- But there is also a very large and steady increase in "residual" inequality, i.e., inequality in wages after controlling for education, experience, marital status, race, geography, etc. (unobservables)

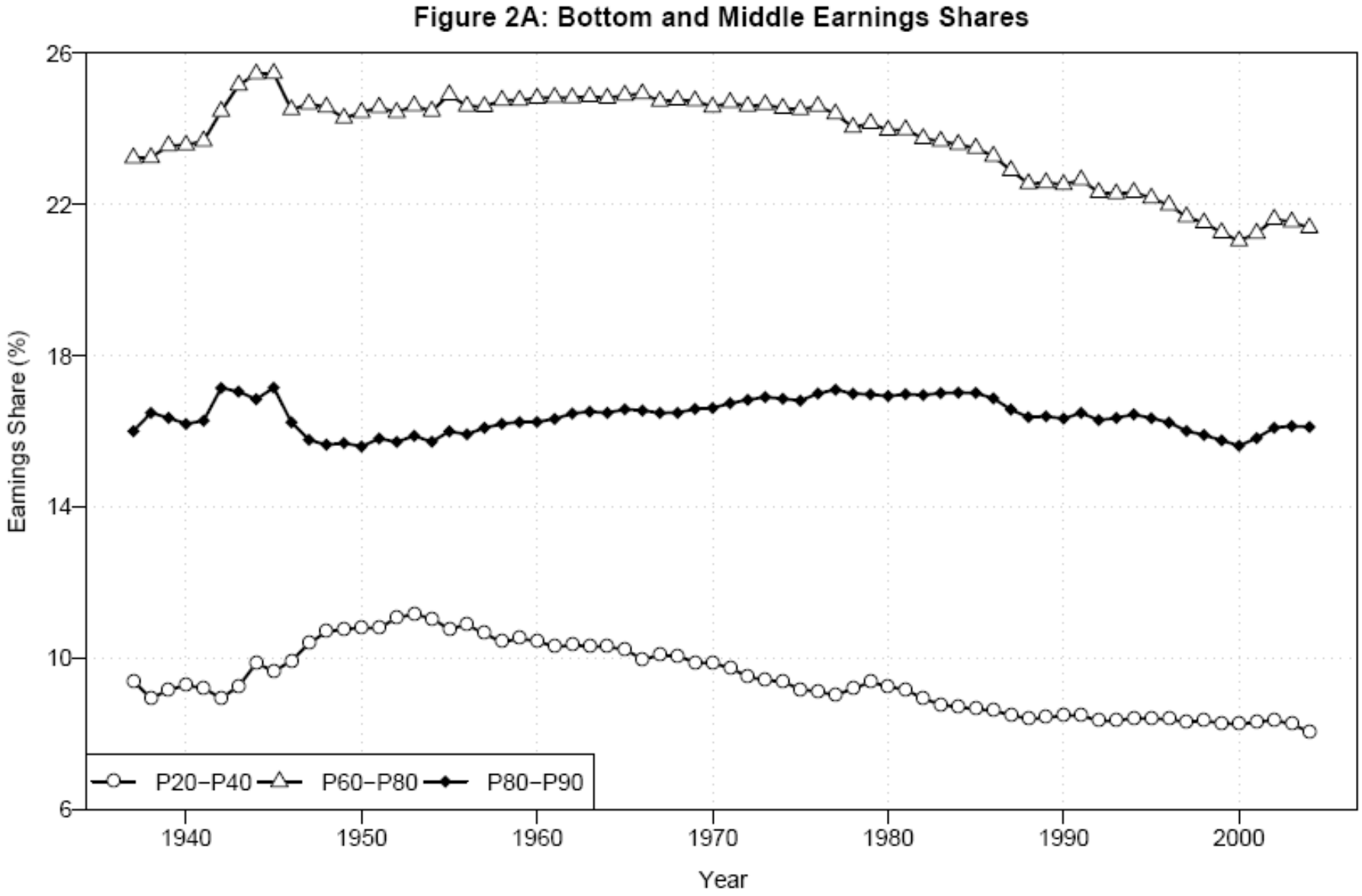
- Most rapid increase during the 1980s

Figure 1: Gini coefficient

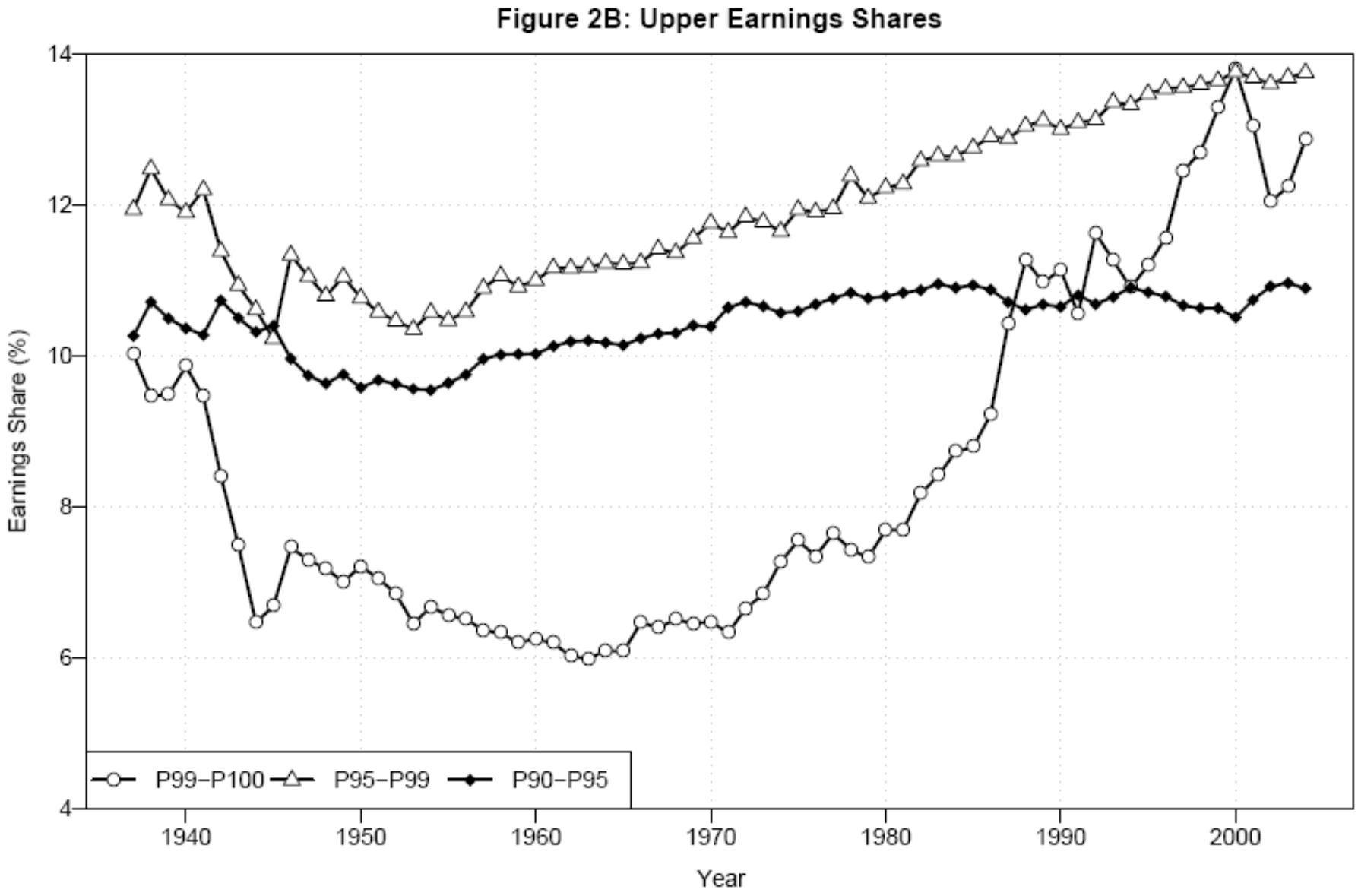


- Historical perspective (Kopczuk et al., QJE 2010): inequality is higher now than at any point in the 20th Century (based on Social Security earnings).

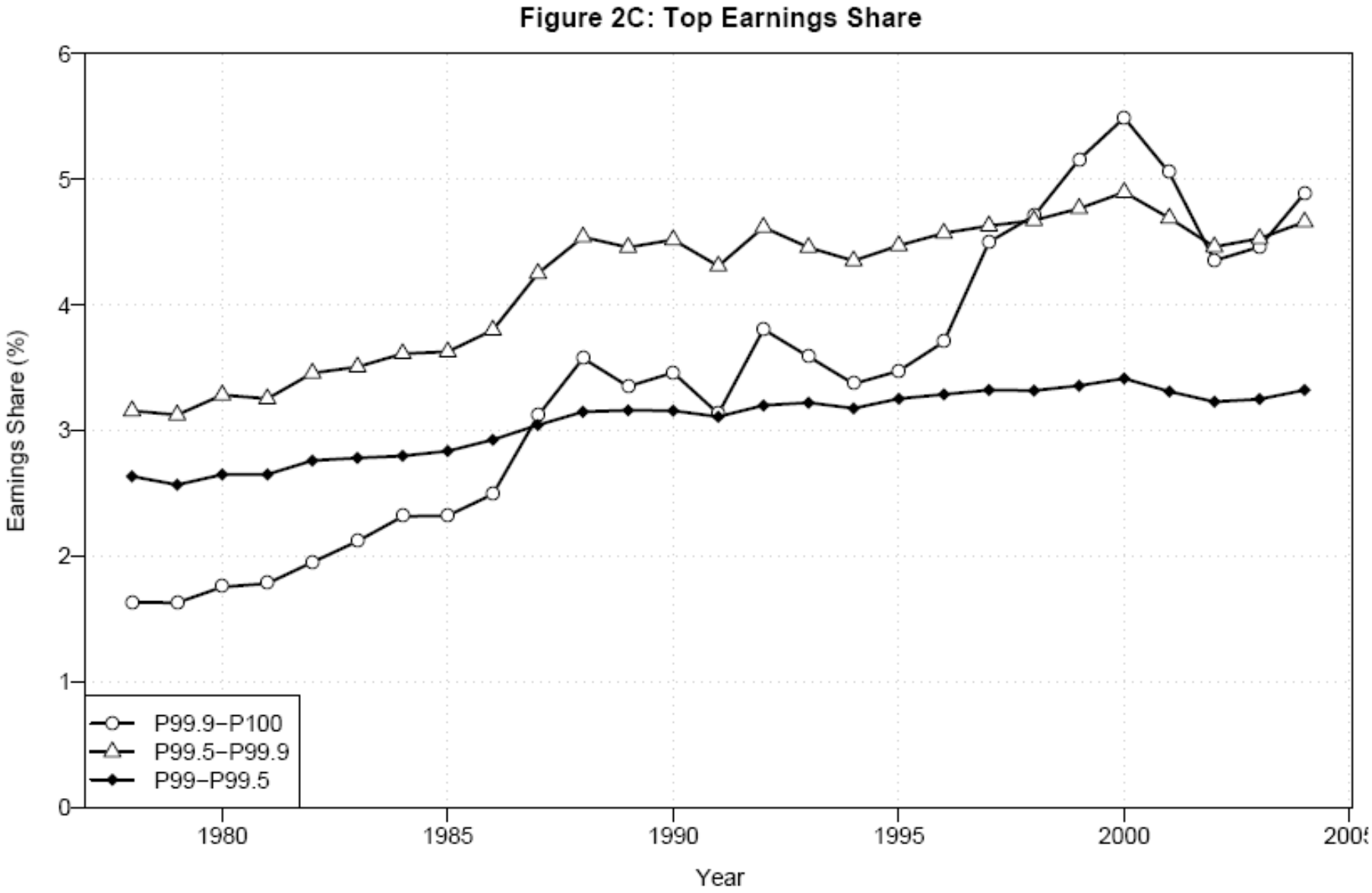
- "Great Compression" between 1940 and 1960.



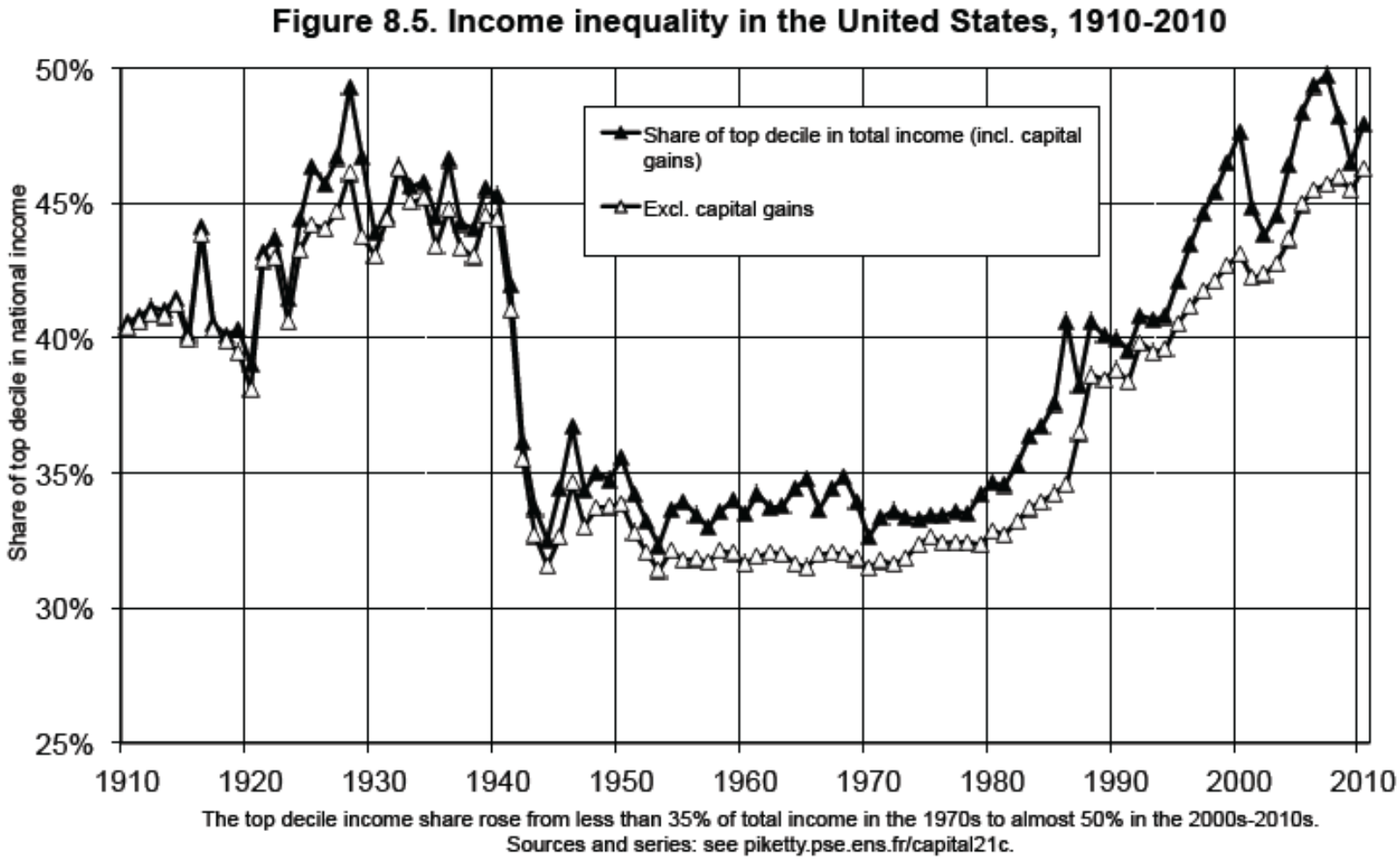
- The share of earnings accruing to the bottom half of the distribution is pretty flat.



- But large increases since 1970 at the very top…



- And at the very very top…



- Upper income shares in the US have continued to grow since 2000. (Piketty, 2014, Figure 8.5)

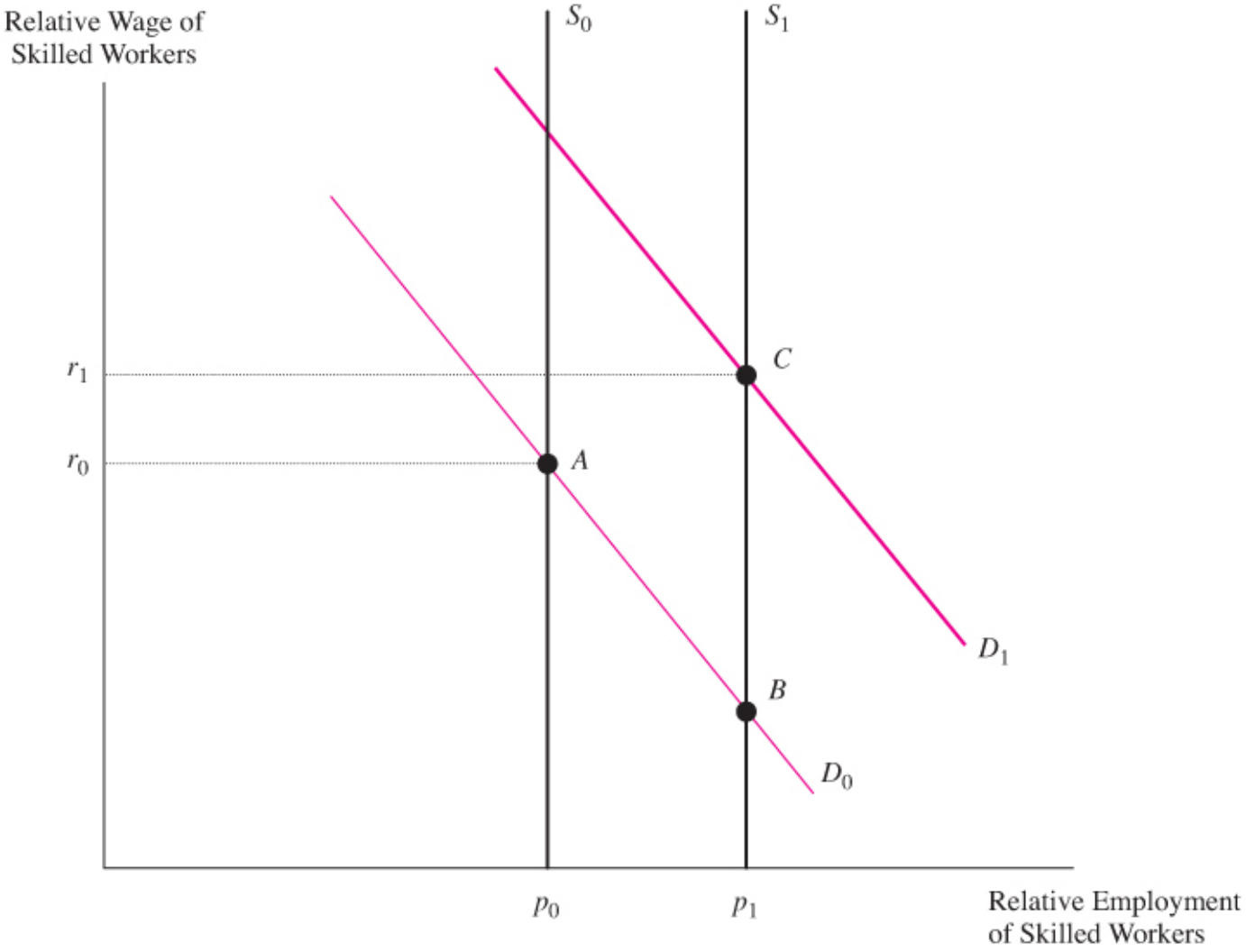
- Atkinson, Saez and Piketty (2011)

Explanations?

- Supply and demand
  - Technology
  - Trade
- Institutions
  - Unions
  - Minimum wage
  - Superstars

Changes in the relative supply of skills

FIGURE 7-7 **Changes in the Wage Structure Resulting from Shifts in Supply and Demand**
The downward-sloping demand curve implies that employers wish to hire relatively fewer skilled workers when the relative wage of skilled workers is high. The perfectly inelastic supply curve indicates that the relative number of skilled workers is fixed. Initially, the labor market is in equilibrium at point *A*. Suppose the relative supply of skilled workers increased to S_1. The rising relative wage of skilled workers can then be explained only if there was a sizable outward shift in the relative demand curve (ending up at point *C*).



- Large increase in the wage of high skilled workers can be explained by:
  - Relative increase in demand for skilled workers.
  - Relative decrease in the supply of skilled workers.

- Overall, there has been a large increase in the share of highly educated workers. Relative demand for skilled workers has increased even more rapidly than relative supply.

TABLE 7-3 **Educational Composition of the Workforce (Percent Distribution of Workers by Education)**

Source: David H. Autor, Lawrence F. Katz, and Alan B. Krueger, "Computing Inequality: How Computers Changed the Labor Market," *Quarterly Journal of Economics* 113 (November 1998): 1169–213, Table 1.

Year	High School Dropouts	High School Graduates	Some College	College Graduates
1960	49.5%	27.7%	12.2%	10.6%
1970	35.9	34.7	15.6	13.8
1980	19.1	38.0	22.0	20.9
1990	12.7	36.2	25.1	26.1
1996	9.4	33.4	28.9	28.3

Changes in the relative demand for skill

- Trade
  - Large increase in the volume of trade [(IM + EX) / GDP], especially with LDCs. 1970: 8%, 1996: 19%
  - Trade theory: US specializes in skill-intensive goods, imports low-skill-intensive goods
  - Jobs in low-skill intensive industries move abroad, increase in the relative demand for high-skill workers.

- Skill-biased technical change:
  - Based on the idea of technology-skill complementarity.
  - A decrease in the price of technology (computers, IT revolution, robots, etc.) will lower demand for low-skill workers (substitutes for technology), and raise the demand for high-skill workers (complements to technology).

- Both explanations are theoretically appealing. How to tell them apart?

Autor, Dorn and Hanson (2013): "The China Syndrome: Local Labor Market Effects of Import Competition in the United States

- Did commuting zones (CZs) more exposed to import competition from China experience larger drops in (manufacturing) employment and wages?

- Regress change in employment/wages on an index of exposure to import competition from China
  - Exposure: based on the share of a CZ's labor force employed at the beginning of the period in industries that see large increase in imports from China.

- To isolate just the demand-driven shock, instrument for growth in Chinese imports with growth in Chinese imports in eight other developed countries.

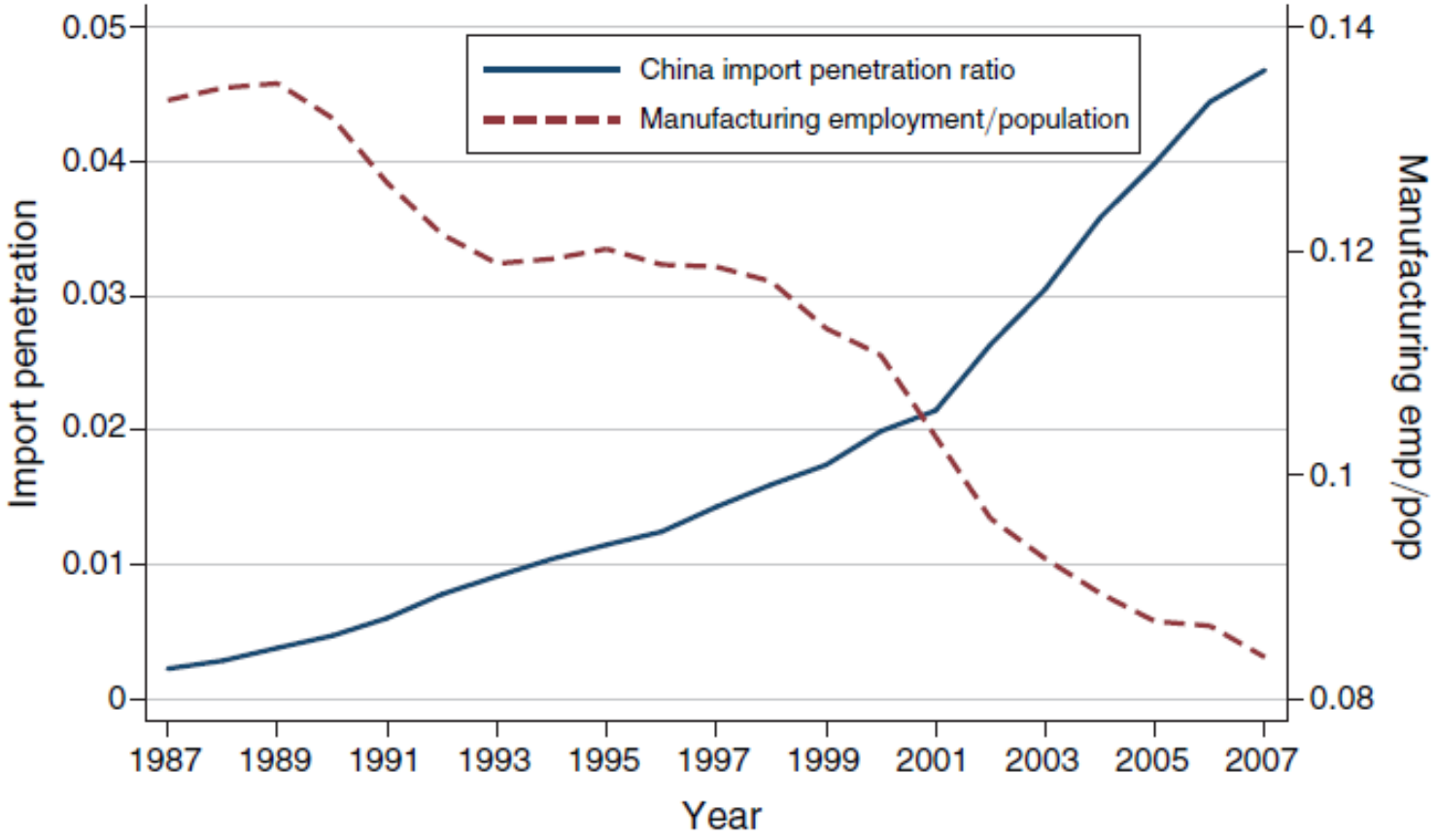


FIGURE 1. IMPORT PENETRATION RATIO FOR US IMPORTS FROM CHINA (*left scale*), AND SHARE OF US WORKING-AGE POPULATION EMPLOYED IN MANUFACTURING (*right scale*)

Source: Autor, Dorn and Hanson, "The China Syndrome: Local Labor Market Effects of Import Competition in the United States" *AER*, 2013.

TABLE 2—IMPORTS FROM CHINA AND CHANGE OF MANUFACTURING EMPLOYMENT IN CZS, 1970–2007: 2SLS ESTIMATES

Dependent variable: 10 × annual change in manufacturing emp/working-age pop (in % pts)

	I. 1990–2007			II. 1970–1990 (pre-exposure)		
	1990–2000	2000–2007	1990–2007	1970–1980	1980–1990	1970–1990
	(1)	(2)	(3)	(4)	(5)	(6)
(Δ current period imports from China to US)/worker	−0.89***	−0.72***	−0.75***			
	(0.18)	(0.06)	(0.07)			
(Δ future period imports from China to US)/worker				0.43***	−0.13	0.15
				(0.15)	(0.13)	(0.09)

Notes: $N = 722$, except $N = 1{,}444$ in stacked first difference models of columns 3 and 6. The variable "future period imports" is defined as the average of the growth of a CZ's import exposure during the periods 1990–2000 and 2000–2007. All regressions include a constant and the models in columns 3 and 6 include a time dummy. Robust standard errors in parentheses are clustered on state. Models are weighted by start of period CZ share of national population.

- Exposure to import competition strongly affects manufacturing employment.

TABLE 5—IMPORTS FROM CHINA AND EMPLOYMENT STATUS OF WORKING-AGE POPULATION WITHIN CZs, 1990–2007: 2SLS ESTIMATES

Dependent variables: Ten-year equivalent changes in log population counts and population shares by employment status

	Mfg emp	Non-mfg emp	Unemp	NILF	SSDI receipt
	(1)	(2)	(3)	(4)	(5)
Panel A. 100 × log change in population counts					
(Δ imports from China to US)/worker	−4.231***	−0.274	4.921***	2.058*	1.466***
	(1.047)	(0.651)	(1.128)	(1.080)	(0.557)
Panel B. Change in population shares					
All education levels					
(Δ imports from China to US)/worker	−0.596***	−0.178	0.221***	0.553***	0.076***
	(0.099)	(0.137)	(0.058)	(0.150)	(0.028)
College education					
(Δ imports from China to US)/worker	−0.592***	0.168	0.119***	0.304***	—
	(0.125)	(0.122)	(0.039)	(0.113)	
No college education					
(Δ imports from China to US)/worker	−0.581***	−0.531***	0.282***	0.831***	—
	(0.095)	(0.203)	(0.085)	(0.211)	

- Drop in manufacturing translates into higher unemployment and dropping out of labor force, especially for low skill workers.

TABLE 6—IMPORTS FROM CHINA AND WAGE CHANGES WITHIN CZs, 1990–2007: 2SLS ESTIMATES

Dependent variable: Ten-year equivalent change in average log weekly wage (in log pts)

	All workers (1)	Males (2)	Females (3)
Panel A. All education levels			
(Δ imports from China to US)/worker	−0.759***	−0.892***	−0.614***
	(0.253)	(0.294)	(0.237)
R^2	0.56	0.44	0.69
Panel B. College education			
(Δ imports from China to US)/worker	−0.757**	−0.991***	−0.525*
	(0.308)	(0.374)	(0.279)
R^2	0.52	0.39	0.63
Panel C. No college education			
(Δ imports from China to US)/worker	−0.814***	−0.703***	−1.116***
	(0.236)	(0.250)	(0.278)
R^2	0.52	0.45	0.59

Notes: $N = 1{,}444$ (722 CZs × two time periods). All regressions include the full vector of control variables from column 6 of Table 3. Robust standard errors in parentheses are clustered on state. Models are weighted by start of period CZ share of national population.

- Also a negative effect on wages (could be a lower bound on the composition-constant effect, if lower ability workers more likely to lose jobs).

Skill-biased technical change

- Problems with the SBTC explanation
  - Timing not quite right: SBTC even higher in the 1990s, but earnings inequality slowed down somewhat.
  - Only indirect evidence: how do you measure technical change?
  - Bartel and Sicherman (JPE, 1999): wages and education premium are higher in industries with high rates of technical change, measured by:
    - TFP growth
    - Investment in computers out of total investment
    - Ratio of R&D to sales
    - Number of patents
    - Scientists and engineers out of total employment
  - Still, is this causal effect of technical change, or is it because more able workers (whose demand increased) sort into industries that had higher technical change?

- Krueger (QJE, 1994): workers who use a computer at work earn higher wages…

TABLE II
OLS REGRESSION ESTIMATES OF THE EFFECT OF COMPUTER USE ON PAY
(DEPENDENT VARIABLE: ln (HOURLY WAGE))

Independent variable	October 1984			October 1989		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	1.937	0.750	0.928	2.086	0.905	1.094
	(0.005)	(0.023)	(0.026)	(0.006)	(0.024)	(0.026)
Uses computer at work (1 = yes)	0.276	0.170	0.140	0.325	0.188	0.162
	(0.010)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Years of education	—	0.069	0.048	—	0.075	0.055
		(0.001)	(0.002)		(0.002)	(0.002)
Experience	—	0.027	0.025	—	0.027	0.025
		(0.001)	(0.001)		(0.001)	(0.001)
Experience-squared ÷ 100	—	−0.041	−0.040	—	−0.041	−0.040
		(0.002)	(0.002)		(0.002)	(0.002)
Black (1 = yes)	—	−0.098	−0.066	—	−0.121	−0.092
		(0.013)	(0.012)		(0.013)	(0.012)
Other race (1 = yes)	—	−0.105	−0.079	—	−0.029	−0.015
		(0.020)	(0.019)		(0.020)	(0.020)
Part-time (1 = yes)	—	−0.256	−0.216	—	−0.221	−0.183
		(0.010)	(0.010)		(0.010)	(0.010)
Lives in SMSA (1 = yes)	—	0.111	0.105	—	0.138	0.130
		(0.007)	(0.007)		(0.007)	(0.007)
Veteran (1 = yes)	—	0.038	0.041	—	0.025	0.031
		(0.011)	(0.011)		(0.012)	(0.011)
Female (1 = yes)	—	−0.162	−0.135	—	−0.172	−0.151
		(0.012)	(0.012)		(0.012)	(0.012)
Married (1 = yes)	—	0.156	0.129	—	0.159	0.143
		(0.011)	(0.011)		(0.011)	(0.011)
Married*Female	—	−0.168	−0.151	—	−0.141	−0.131
		(0.015)	(0.015)		(0.015)	(0.015)
Union member (1 = yes)	—	0.181	0.194	—	0.182	0.189
		(0.009)	(0.009)		(0.010)	(0.010)
8 Occupation dummies	No	No	Yes	No	No	Yes
R^2	0.051	0.446	0.491	0.082	0.451	0.486

Notes. Standard errors are shown in parentheses. Sample size is 13,335 for 1984 and 13,379 for 1989. Columns (2), (3), (5), and (6) also include three region dummy variables.

- DiNardo and Pischke (1996): …but also workers who use a pencil at work. Have pencils changed the wage structure too?

TABLE III
OLS REGRESSION FOR THE EFFECT OF DIFFERENT TOOLS ON PAY
DEPENDENT VARIABLE: LOG HOURLY WAGE
(STANDARD ERRORS IN PARENTHESES)

Independent variable	Germany 1979	Germany 1985–86	Germany 1991–92	Germany 1979	Germany 1979	Germany 1985–1986	Germany 1991–1992
Occupation indicators	No	No	No	501	501	742	1071
Grades and father's Occupation[a]	No	No	No	No	Yes	No	No
				Tools entered separately			
Computer	0.112	0.157	0.171	0.025	0.022	0.076	0.083
	(0.010)	(0.007)	(0.006)	(0.011)	(0.011)	(0.008)	(0.007)
Calculator	0.087	0.128	0.129	0.027	0.025	0.061	0.054
	(0.007)	(0.006)	(0.006)	(0.008)	(0.008)	(0.007)	(0.006)
Telephone	0.131	0.114	0.136	0.060	0.057	0.059	0.072
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Pen/pencil	0.123	0.112	0.127	0.055	0.052	0.055	0.050
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Work while sitting	0.106	0.101	—	0.042	0.041	0.036	—
	(0.006)	(0.007)		(0.008)	(0.008)	(0.008)	
Hand tool	−0.117	−0.086	−0.091	−0.048	−0.045	−0.020	−0.020
(e.g., hammer)	(0.007)	(0.006)	(0.006)	(0.009)	(0.009)	(0.008)	(0.008)

Institutions

- Institutional explanation 1: Decline in unionization:
  - 24% unionization rate in 1973, 12% in 2006.
  - Union workers earn a 15% wage premium
  - Mostly blue-collar workers, medium and low skill.

- Institutional explanation 2:
  - Nominal minimum wage constant throughout the 1980s
  - Sharp decline in the real value of the MW.
  - In practice: minimum wage became much less likely to be binding in late 1980s.

- But cannot explain what happens at the very top. Perhaps increase in bonuses and incentive pay for top executives?

The Economics of Superstars

- In some professions, a very small number of workers get a very large share of the rewards.
  - 2014 income of highest paid actress (Sandra Bullock): $51M.
  - Vast majority of actresses: waiting tables and unemployed.
  - Highest paid baseball player, 2015: Clayton Kershaw, LA Dodgers, $32.5M
  - Lowest paid player on the Dodgers major league roster (Joc Pederson): $510,000
  - Rookie minor-leaguer: $850 a month
- "Superstar phenomenon".
- Not in every occupation: top university professor earns at most 5-6 times as much as entry-level assistant professor.

- Why superstars?

- Workers are not perfect substitutes, some people are more skilled than others at a particular task.

- Demand for the most talented much larger than demand for the average
  - You would much rather attend one game with Leo Messi than many mediocre (MLS?) games.
  - Heart surgeon whose survival rate is 5 percent better than any other will command much more than a 5 percent wage premium.

- Krueger: “The Economics of Real Superstars” (JOLE, 2005)
- Study about ticket prices for popular music concerts.
- Concert ticket prices increased dramatically between 1997 and 2003 (82%, versus 17% CPI).
- Why?

- Krueger's explanation: changing technology of the music business means that revenues from record/CD sales have plummeted.

- Therefore, concert revenues make up an increasing fraction of artists' total revenues.

- Concerts are the only area in which superstars can control access to their output.

- Have the returns to superstardom increased?

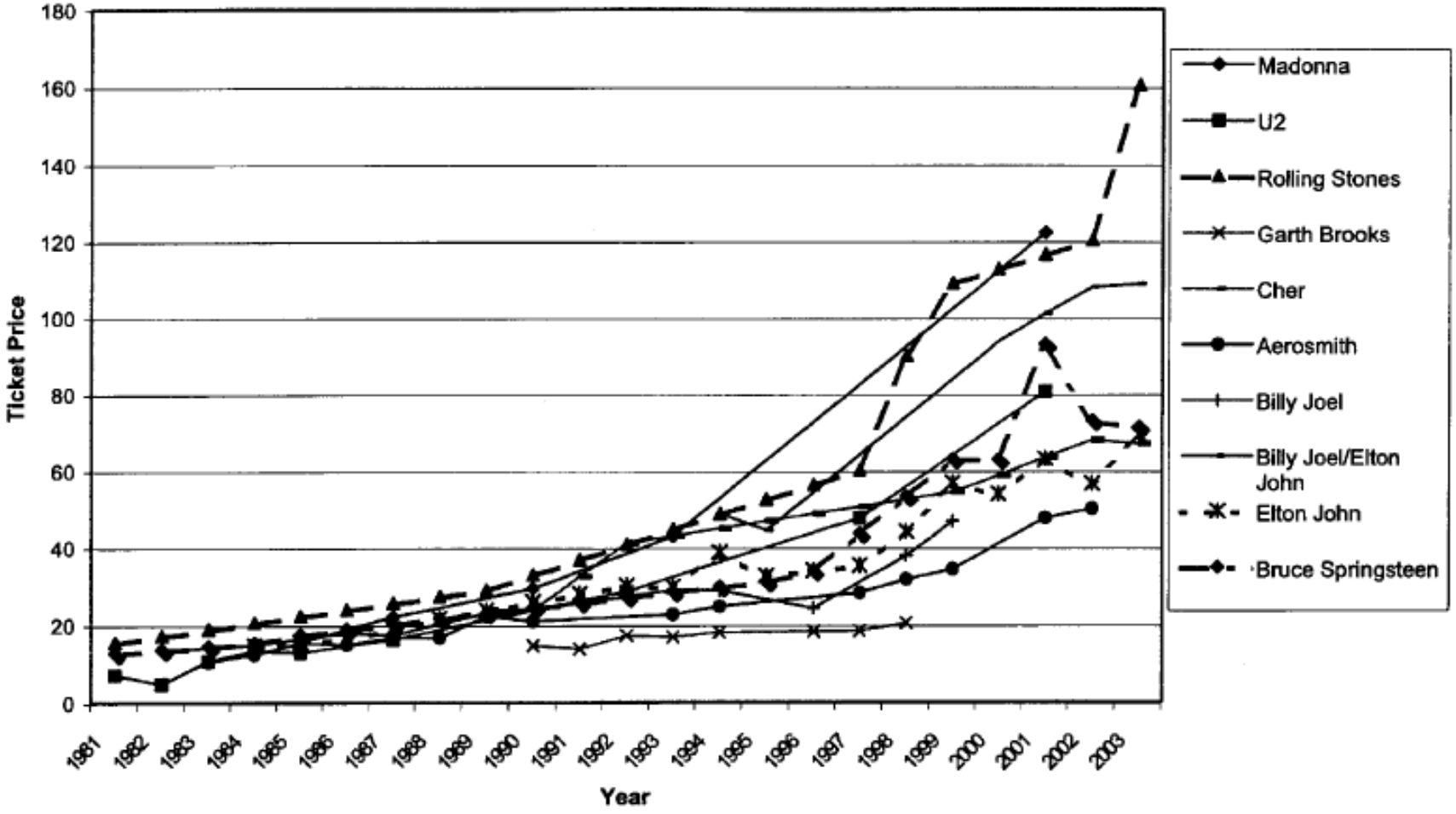


FIG. 2.—Average concert ticket price, selected artists

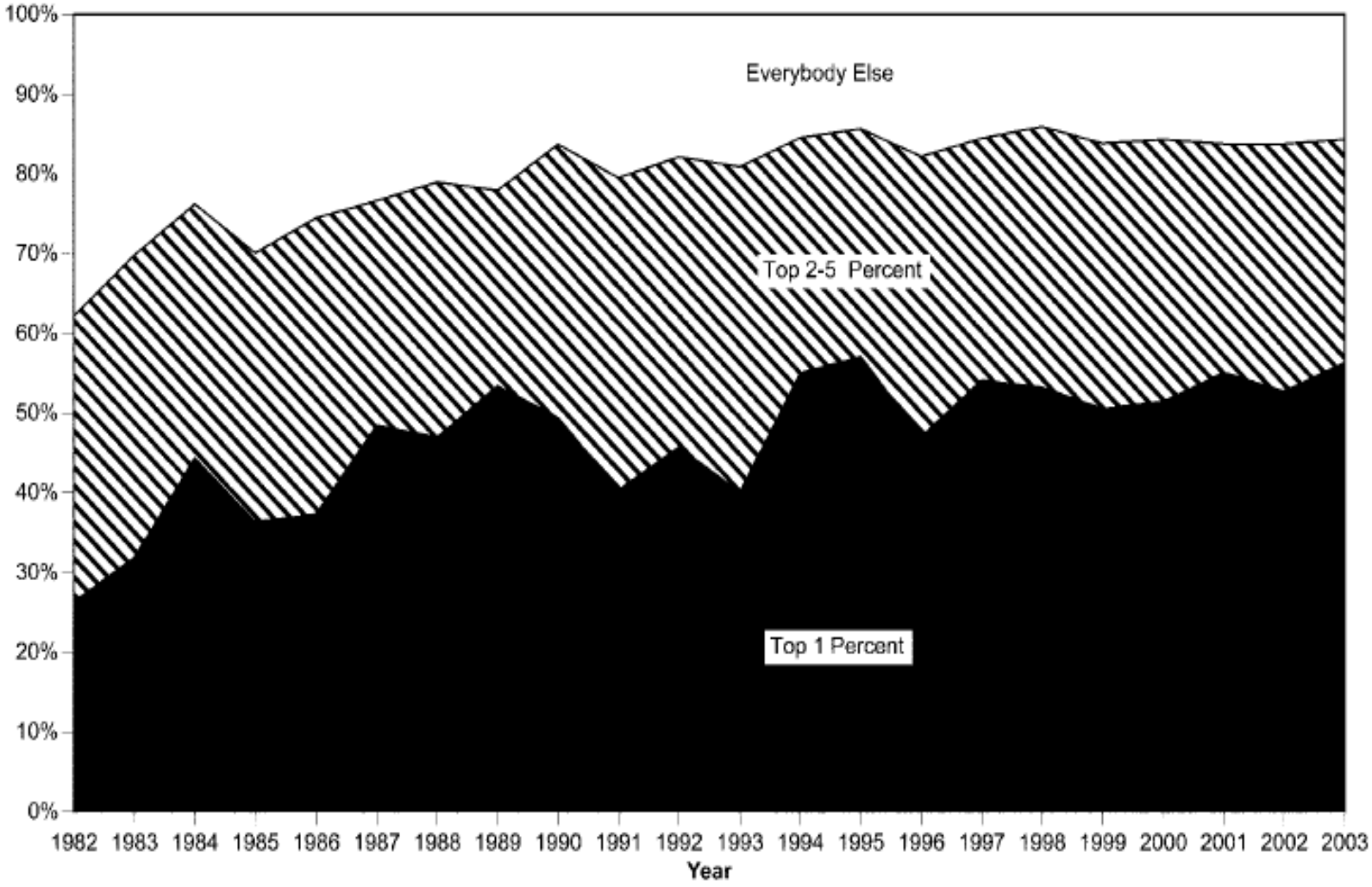


FIG. 6.—Share of total ticket revenue accruing to top performers, 1982–2003

Table 2
Price, Revenue, and Revenue per Show Regressions for All Artists

Variable	Log Price (1)	Log Annual Revenue (2)	Log Revenue per Show (3)
Intercept	2.261**	9.493**	9.277**
	(.053)	(.121)	(.143)
Star quality × 1981–86	.234**	3.513**	2.413**
	(.058)	(.228)	(.175)
Star quality × 1987–91	.289**	4.555**	3.090**
	(.043)	(.220)	(.189)
Star quality × 1992–96	.523**	5.222**	3.495**
	(.065)	(.240)	(.240)
Star quality × 1997–2003	.700**	5.508**	3.571**
	(.066)	(.234)	(.240)
Number of support acts	.0003	.094**	.024**
	(.0003)	(.003)	(.001)
R-squared	.518	.366	.359
N	35,835	35,835	35,835

NOTE.—Robust standard errors are in parentheses. All equations include year dummies. Col. 1 is estimated by weighted least squares, where the weights are tickets sold; column 2 is estimated by ordinary least squares; and col. 3 is estimated by weighted least squares, where weights are the number of shows performed in the year. Star quality is millimeters of space devoted to the artist in the *Rolling Stone Encyclopedia*, divided by 1,000.

** $p < .01$.

Measure of star quality: the number of millimeters of print columns (including photos) devoted to each artist in *The Rolling Stone Encyclopedia of Rock & Roll*.

- Can the economics of superstars explain the increase in incomes at the very top?

- Kaplan and Rauh (Review of Financial Studies, 2010): analysis of CEOs of publicly traded companies, investment bankers, hedge fund managers, lawyers, athletes, entertainers.

- Most of the increase at the very top is due to Wall Street.

- Their explanation: technological changes have allowed top fund managers, corporate lawyers to manage much larger sums of money than in the past → increased rewards to the superstars.