Economics 1011B
Section 5

Spring 2023

Today's Outline

- Logistics
  - Early Exam Feedback
  - Course/Section Feedback

- Inequality
  - Motivation
  - Empirics
  - Theory: Skill-Biased Technological Change
  - Theory: Superstar Hypothesis

Midterm 1

- We're almost done grading the first midterm - grades will be back before Tuesday's class, likely this weekend.

- Early feedback: great job! We were very pleased with everyone's performance on the exam.

- Most common mistake: visualizing the extension of the Solow model with human capital as a phase diagram. Some of you wrote down essentially the phase diagram from the 'Big Push' model, which was slightly different. That's OK - this was the hardest part of the long answer problem!

- We will be handing back exams (if you want them) at the end of sections starting next week.

Course Feedback

- As Ludwig mentioned this week - we're collecting midterm course feedback through the Q evaluations tool (link on lecture slides). This is a really useful tool for us - we are very eager to hear your thoughts about how the course has been going. We value feedback at the end of the semester, but that comes too late for you!

- On top of the general course feedback survey, I have created a survey just to get a sense for how you feel section is going. I am particularly interested in hearing about what has worked and also what has not worked about sections.

- Both of these surveys are of course completely optional, but you're doing us a big favor by answering. We are eager to hear your thoughts!

- You can find my informal section survey here (clickable from slides): https://forms.gle/foxRcWvWyG7sAZ919

Motivation

- What determines how income is split? What is an equitable split of resources? How can we think about the equity-efficiency trade-offs (size of pie vs. equal distribution of pie)? All very important macroeconomic questions!

- But all of the models that we have seen so far assume representative agents: single household and single firm.

- This is, of course, a very strong assumption!

- If we are only interested in aggregate quantities (aggregate output, consumption, etc), this may be a reasonable starting point.

- However, we're often not just concerned with aggregate quantities like aggregate consumption and output; but also how these are distributed across agents.

Inequality: Theory

- Income inequality is one of the hottest topics in economics, both for theory and empirics.

- Ludwig works here! State-of-the-art workhorse for modern macroeconomics: heterogeneous agent New Keynesian (HANK) models.

- Two key advantages to models with heterogeneous agents:
  1. Can study inequality directly: with a distribution of agents, models will directly speak to (yield predictions about) things like how government spending impacts the *distribution* of income. Could not study this with a representative household!
  2. Enriches existing models: inequality and/or heterogeneity within households and/or firms can enrich 'standard' topics, like the transmission of monetary policy.

- ... But this approach is largely too (mathematically) difficult for this course! Only simple types of heterogeneity (e.g. two types of households) remain tractable. So we're not going to discuss a full-blown 'model of inequality', because it would be too mathematically difficult.

Inequality: Empirics

- Instead, we can start by describing some trends in income and wealth inequality (mostly in the United States) over the last 50-100 years.

- These days, us economists have really good evidence on how income inequality has evolved over time. Why? Remarkable increase in the availability of high-quality administrative data on households and businesses (e.g. tax data; social security data; large-scale survey data).

- In economics, there has been relatively more focus on studying *income* inequality rather than *wealth* inequality: even with tax data, wealth is extremely difficult to measure!

- Discussion question: Why is wealth hard to measure (relative to income)? What are we trying to measure with wealth?

Models with Inequality

- At a high-level, today we'll show that by most empirical measures, there has been a striking increase in income inequality in the US since 1970.

- Increase in US income inequality driven by rise in top incomes (90th percentile and above).

- Business and capital income is relatively more important at the top of the distribution, but capital/business and labor income have all become more unequal since 1970.

- Many potential explanations for rise in inequality with varying degrees of empirical support. We will briefly discuss a few of these explanations.

Measures of Dispersion in Income/Wealth Distributions

- What is the appropriate way to measure inequality in a distribution?

- The empirical distribution of income is a rich object; no one statistic fully captures it. Many possibilities: standard deviations; quantile ratios (p90/p50, p50/p10, p99/p90, etc), for instance.

- The p90/p50 quantile ratio tells you: how much more does a person at the 90th percentile of the income distribution earn than someone at the 50th percentile?

- Another popular option: *inequality indices*, an index defined such that 0 indicates perfect equality (degenerate distribution) and 1 captures perfect inequality (all income to one person). You probably know of Gini coefficients; others exist (e,g, Atkinson indices).

- We can also think about 'top income/wealth shares' – how much total income or wealth is owned by the top $x\%$, and how does this change over time? (Inverse cumulative distribution).

Empirical Trends on Income Inequality in the US

- Education premium has risen enormously: the causal return to a college education, we believe, is much higher now than 50 years ago. Diverging income trends for college grads vs. non-college grads.

- 50-10 quantile ratio stable: little change in relative income of median vs. poor over time (exception: female 50-10 ratio).

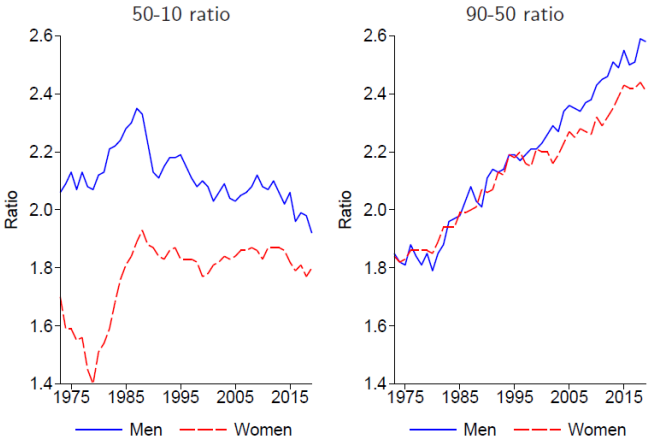
- 90-50 quantile ratio increasing: top incomes growing faster than median.

- Explosive growth at the very top: *massive* increase in income and wealth at the very top (top 0.1%) of the income/wealth distributions.

- "U-curve" for top-end income and wealth inequality over time: period between 1945-1980 marked by relatively low inequality.

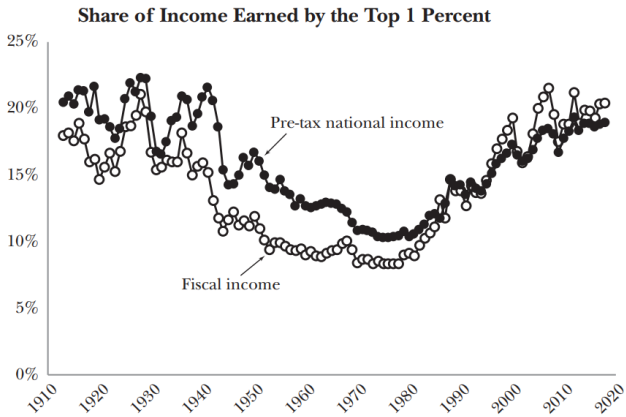
- Growth in inequality since 1980 has many potential explanations: skill-biased technological change, job polarization, income shifting (response to tax reforms).

Quantile Ratios of Income in US, 1973-2018



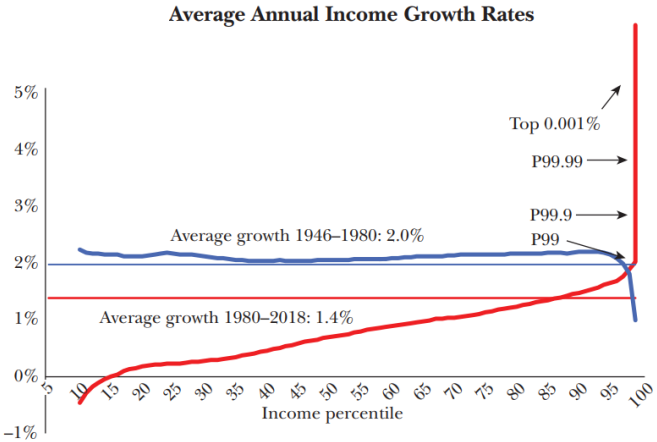
- Large increase in p90/p50 ratio: 90th percentile growing relative to median
- No trend increase in p50/p10 ratio: income at the middle and bottom of distribution grows at roughly the same rate
- Notable exception: female p50/p10 ratio sharply increases starting in late 1980 (why?)

Top 1% Income Share in US, 1910-2018



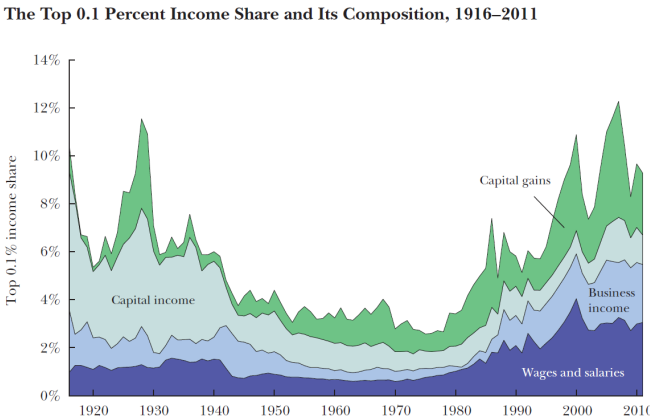
- The share of income in the U.S. earned by the top 1% of earners exhibits a 'U-curve' over time.
- High before 1930; low from the 1940s through 1980; increasing since.

Income Growth Across the Distribution, 1946-1980 vs. 1980-2018



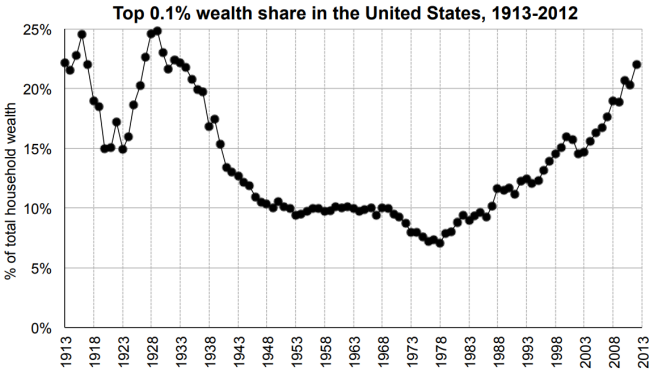
- **1946-1980**: Average (real) income growth of approx. 2%/year across entire distribution, slightly lower (1%) for top earners.
- **1980-2018**: much lower growth for almost all earners, growth increasing in income. Growth of 0% at the bottom of the income distribution, up to 5% growth at the very top of the income distribution.

Components of Income for Top 0.1% Over Time



- What are the components of income for top earners?
- Top earners earn a lot of capital income, business income, and wage income - so the story isn't as simple as rising capital income.

Top 0.1% Wealth Shares Over Time in the U.S.

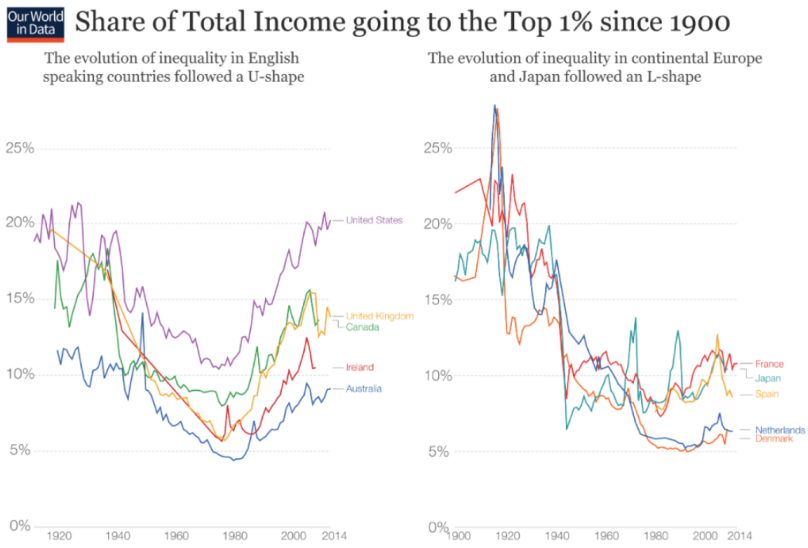


This figure depicts the share of total household wealth held by the 0.1% richest families, as estimated by capitalizing income tax returns. In 2012, the top 0.1% includes about 160,000 families with net wealth above $20.6 million. Source: Appendix Table B1.

- Wealth is hard to measure: but by our best guess, the share of total wealth in the US accruing to the top 1% or top 0.1% of households has increased dramatically, too.

- A 'U-curve' in wealth inequality over time: relatively low from 1940-1980, increasing thereafter.

Top 1% Income Shares Over Time in OECD Countries



Growth in Inequality: Why? (Skill-biased technological change)

- The empirical evidence is crystal clear: there has been a large rise in income and wealth inequality over time in the U.S. The period 1940-1980 was 'special': marked by relatively low inequality.

- Natural questions, with a possible role for theory:
  - Why have income and wealth inequality gone up?
  - How should government respond to rise in inequality?

- We are going to largely focus on the first question. The second question is an enormous sub-field of public economics: the theory of optimal taxation. Takes very seriously the notion of trading off equity for efficiency. Could spend a whole semester there!

Growth in Inequality: Why? (Skill-biased technological change)

- One hypothesis for rising income inequality: skill-biased technological change (SBTC).

- Simplest case: suppose that production of goods depends on two types of labor inputs, 'unskilled' (L_1) and 'skilled' (L_2):

$$Y = F(K, A_1 L_1, A_2 L_2)$$

- What if technological change has been 'biased' towards skilled labor L_2?

- Potential examples: Rise of computing leads to explosive growth of finance, tech industries since 1970s suggests growth has been biased in favor of these industries.

Growth in Inequality: Why? (Skill-biased technological change)

- What happens if A_2 goes up? In a competitive equilibrium (e.g. neoclassical growth), $A_2 \uparrow$ increases the marginal product of high skill labor ($F_{L_2} \uparrow$), so in equilibrium should expect high-skill wage to rise. What about to L_1 and L_2 when $A_2 \uparrow$?

- Two competing effects on L_2, as Ludwig mentioned in lecture:
  1. $A_2 \uparrow$ reduces demand for L_2, because firms need less L_2 to produce the same Y
  2. $A_2 \uparrow$ increases demand for L_2, because $A_2 \uparrow$ reduces marginal costs, firm can sell at loewr price to more people for more profit

- Which of these effects 'dominates', i.e. what is the overall sign? Depends on how (relatively) strong the second channel is, which is captured by the elasticity of demand.

- If demand elasticity is high (lowering price causes big increase in demand), second effect dominates: $A_2 \uparrow \implies L_2 \uparrow$. We say that A_2 is biased toward L_2, since growth in A_2 will increase usage of the input L_2. Otherwise, we say A_2 is biased against L_2.

Growth in Inequality: Why? (Skill-biased technological change)

- What's the evidence? How much of the rise in income inequality since 1970 can a story based on skill-biased technological change explain? (a good survey is here if interested)

- Traditional story: computers become widespread in 1980s, disproportionately used on the job by office workers, raising their marginal product and wages relative to blue-collar workers. Leads to both rise in wages and increased employment share of high-skill workers in the US.

- But SBTC as an explanation for the rise in income inequality runs into some difficulties, too: inequality was stagnant in the 1990's, despite massive increase in the availability and capability of computing technology.

Growth in Inequality: Why? (Import competition)

- Another piece of the puzzle: collapse in U.S. manufacturing industries due to increased competition.

- We have not discussed 'open economies' quite yet in this course. But from Ec 10, we might remember that free trade is 'good for both parties' on net - if foreign countries can produce goods more cheaply, it benefits U.S. consumers, and in aggregate both countries benefit (gains from trade).

- ... but this does **not** imply everyone in both countries benefit! Trade liberalization will clearly be a negative for workers more exposed to import competition (e.g. manufacturing). Just because the U.S. is better off in aggregate does not mean gains from trade are distributed equally.

- In the US: increased exposure to imports good for consumers (cheaper imports), high-skill workers (higher demand for their goods/services as exports). Bad for low-skill workers (import competition reduces demand for their goods/services).

Growth in Inequality: Why? (Import competition)

- Well-studied example: 'China shock' of Autor, Dorn, and Hanson (2013). Large increase in trade between US and China, particularly over the period 1990-2007.

- Autor, Dorn, and Hanson (2013) look across places within the United States, noting that places (e.g. towns with manufacturing firms in certain industries that faced a lot of import competition) were more exposed to import competition than others.

- They exploit 'quasi-exogenous' variation in import competition (e.g. compare two places that are similar, except for 'as-good-as-random' variation in exposure to this trade shock) and find that trade liberalization explains about 25% of the decline in US manufacturing employment over the same period.

- Clearly, *not* the full reason for the decline of US manufacturing, but one puzzle piece that's now better understood and appreciated.

Growth in Inequality: Why? (Import competition)

- The 'China shock' and import competition can also be construed as a story involving SBTC, if you think of production of goods by U.S. companies as involving the possibility of substituting between e.g. foreign workers/factories and domestic workers/factories.

- In this sense, rise in foreign imports represents increase in productivity with a high demand elasticity - US corporations substitute away from US labor and towards cheaper labor from abroad.

- But even for manufacturing employment, the industries that should be most exposed, China shocks explain only a fraction (perhaps 25%) of the decline in manufacturing. Clearly not sufficient on its own to explain rise in inequality. Further, cheap goods from abroad are good for all consumers, particularly lower-income consumers, so welfare impacts of trade not obvious.

Growth in Inequality: Why? (Import competition)

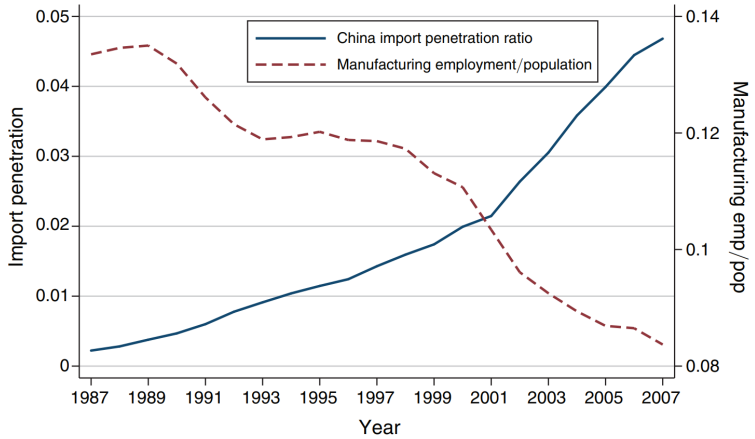


FIGURE 1. IMPORT PENETRATION RATIO FOR US IMPORTS FROM CHINA (*left scale*), AND SHARE OF US WORKING-AGE POPULATION EMPLOYED IN MANUFACTURING (*right scale*)

Growth in Inequality: Wrapping Up

- Very clear empirical evidence that both income and wealth inequality has gone up in the U.S. since 1980.

- Why? Many explanations put forth. We discussed two: increased import competition from China and skill-biased technological change.

- Both of these explanations can explain *some* of the rise. Other explanations exist too (not in this course) - real answer is likely a combination of many factors.