Debraj Ray, University of Warwick, Summer 2020

- **Slides 1**: Introduction
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- **Slides 3**: Functional Inequality: The Falling Labor Share
- **Slides 4**: Inequality and Conflict
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I. Inequality and Divergence: Introduction
The financial crisis sparked a new interest in inequality.

- But inequality has been historically high
- Growing steadily through late 20th century

Wolff, Piketty, Saez, Atkinson, many others

- A classical view (due to Kuznets 1955, 1963)
- Inequality rises and then falls with development

- Instead: The Great U-Turn
- Uneven versus compensatory changes
Figure I.1. Income inequality in the United States, 1910-2010

The top decile share in U.S. national income dropped from 45-50% in the 1910s-1920s to less than 35% in the 1950s (this is the fall documented by Kuznets); it then rose from less than 35% in the 1970s to 45-50% in the 2000s-2010s.

Source: Piketty (2014)
Figure 9.8. Income inequality: Europe vs. the United States, 1900-2010

Source: Piketty (2014)
The share of top percentile in total income rose since the 1970s in all Anglo-saxon countries, but with different magnitudes.

Source: Piketty (2014)
The share of the top 0.1% highest incomes in total income rose sharply since the 1970s in all Anglo-saxon countries, but with varying magnitudes.

Source: Piketty (2014)
Within-country:

- Kuznets

Cross-country:

- Solow

Neither story appears to work too well.
A recent book by Piketty:

- summarizes the evidence (compelling and useful)
- describes three “fundamental laws”
- is a runaway hit in the United States, touching a raw nerve
First Fundamental Law:

\[
\frac{\text{Capital Income}}{\text{Total Income}} = \frac{\text{Capital Income}}{\text{Capital Stock}} \times \frac{\text{Capital Stock}}{\text{Total Income}}.
\]

“Share of capital income = ROR on capital times the capital-output ratio”

- Useful in organizing our mental accounting system.
- Not an explanation.
Second Fundamental Law:

“Growth rate equals savings rate divided by capital-output ratio”

Derive:

\[ K(t + 1) = [1 - \delta(t)]K(t) + I(t) = [1 - \delta(t)]K(t) + s(t)Y(t) \]

Convert to growth rates:

\[ G(t) = \frac{s(t)}{\theta(t)} - \delta(t), \]

where \( G(t) = \frac{[K(t + 1) - K(t)]}{K(t)} \) and \( \theta(t) = \frac{K(t)}{Y(t)} \).

Approximate per-capita version: subtract population growth rate:

\[ g(t) \simeq \frac{s(t)}{\theta(t)} - \delta(t) - n(t), \]

Note: Not a theory unless you take a stand on one or more of the variables.
Piketty:

“If one now combines variations in growth rates with variations in savings rate, it is easy to explain why different countries accumulate very different quantities of capital... One particularly clear case is that of Japan: with a savings rate close to 15 percent a year and a growth rate barely above 2 percent, it is hardly surprising that Japan has over the long run accumulated a capital stock worth six to seven years of national income. This is an automatic consequence of the [second] dynamic law of accumulation.” (p.175)

“The very sharp increase in private wealth observed in the rich countries, and especially in Europe and Japan, between 1970 and 2010 thus can be explained largely by slower growth coupled with continued high savings, using the [second] law ...” (p. 183)
The Third Fundamental Law:

- $r > g$
“Whenever the rate of return on capital is significantly and durably higher than the growth rate of the economy, ... wealth originating in the past automatically grows more rapidly than wealth stemming from work.”

“This inequality expresses a fundamental logical contradiction ... the past devours the future ... the consequences are potentially terrifying, etc.”
$r > g$ in the data.
Return to Solow model with production function:

\[ Y_t = AK_t^\theta [(1 + \gamma)^t L_t]^{1-\theta}, \]

where \( \gamma \) is technical progress.

**Capital accumulation:**

\[ K(t + 1) = [1 - \delta(t)] K(t) + s(t)Y(t). \]

Impose \( s(t) = s \), \( \delta(t) = \delta \), and \( L_t \) growing at rate \( n \) to get:

\[ y_t = Ak_t^\theta \]

and

\[ (1 + n)(1 + \gamma)k_{t+1} = (1 - \delta)k_t + sAk_t^\theta \]

**Normalization:** \( k_t \equiv K_t/L_t(1 + \gamma)^t \) and \( y_t \equiv Y_t/L_t(1 + \gamma)^t \).
So far: \( y_t = A k_t^\theta \) and \((1 + n)(1 + \gamma)k_{t+1} = (1 - \delta)k_t + sA k_t^\theta\), so that
\[
k_t \to k^* \approx \left[ \frac{sA}{n + \gamma + \delta} \right]^{1/(1-\theta)}
\]

and
\[
y_t \to y^* \approx A^{1/(1-\theta)} \left[ \frac{s}{n + \gamma + \delta} \right]^{\theta/(1-\theta)}
\]

So the overall rate of growth converges to \( n + \gamma \).

On the other hand, \( r \) is given by the marginal product:
\[
r_t = \theta A \left[ K_t / (1 + \gamma)^t L_t \right]^{\theta-1}
\]
\[
= \theta A k_t^{\theta-1}
\]
\[
\to \theta A \left[ \frac{sA}{n + \gamma + \delta} \right]^{-1}
\]
\[
= \frac{\theta}{s} [n + \gamma + \delta],
\]
So down to comparing \( r = \frac{\theta}{s} [n + \gamma + \delta] \) with \( g = n + \gamma \).

\( \Rightarrow r > g \) if \( \theta \geq s \) (surely true empirically, but also for deeper reasons):

- \( s \) is **inefficient** if consumption can be improved in all periods.

- Easy example: \( s = 1 \), but there are others.

- Recall that \( \frac{Y_t}{L_t} \) converges to

\[
A^{1/(1-\theta)} (1 + \gamma)^t \left( \frac{s}{n + \gamma + \delta} \right)^{\theta/(1-\theta)}
\]

- and per-capita consumption converges to the path

\[
A^{1/(1-\theta)} (1 + \gamma)^t \left( \frac{s}{n + \gamma + \delta} \right)^{\theta/(1-\theta)} (1 - s).
\]

- It follows that if \( s > \theta \), the growth path is inefficient.

- **So efficiency implies** \( r > g \), but there is no prediction for inequality.
The Third Law is really a simple statement about differential savings rates.

For instance, assume that the rich earn predominantly capital income

\[ y_t = c_t + k_t \]

\[ k_t = sy_t, \quad y_{t+1} = rk_t \]

\[ y(t) = y(0)(1 + sr)^t \]

If initial rich share is \( x(0) \), and \( g \) is rate of growth, then \( t \) periods later:

\[ x(t) = x(0) \left( \frac{1 + sr}{1 + g} \right)^t \]

Can back out \( r \) if we know \( s \) and \( \{x(t)\} \):

\[ r = \frac{[x(t)/x(0)]^{1/t}(1 + g) - 1}{s} \]
Do the rich save more than the poor? (lifetime vs current income)

Estimates from Survey of Consumer Finances (SCF):

<table>
<thead>
<tr>
<th>Quintile</th>
<th>6-Yr Income Average</th>
<th>Instrumented By Vehicle Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintile 1</td>
<td>1.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Quintile 2</td>
<td>9.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Quintile 3</td>
<td>11.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Quintile 4</td>
<td>17.3</td>
<td>17.3</td>
</tr>
<tr>
<td>Quintile 5</td>
<td>23.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Top 5%</td>
<td>37.2</td>
<td>50.5</td>
</tr>
<tr>
<td>Top 1%</td>
<td>51.2</td>
<td>35.6</td>
</tr>
</tbody>
</table>

Source: Dynan-Skinner-Zeldes (2004), they provide other estimates
\[ r = \frac{[x(t)/x(0)]^{1/t}(1 + g) - 1}{s} \]

Some quick calculations for top 10% in the US:

- \( x_0 = 1/3 \) in 1970, rises to \( x_t = 47/100 \) in 2000.
- Estimate for \( g \): 2% per year.
- Estimate from Dynan et al for \( s \): 35% (optimistic).
- Can back out for \( r \): \( r = 9.7\% \).

Inflation-adjusted rate of return on US stocks over 20th century: 6.5%

- Much lower in the 1970s and 2000s, higher in the 1980s and 1990s.
\[ r = \frac{[x(t)/x(0)]^{1/t}(1 + g) - 1}{s} \]

- Similar calculations for top 1% in the US:
  - \( x_0 = 8/100 \) in 1980, rises to \( x_t = 18/100 \) in 2005.
  - Estimate for \( g \): 2% per year.
  - Estimate from Dynan et al for \( s \): 51%.
  - Can back out for \( r \): \( r = 10.5\% \).
$$r = \frac{[x(t)/x(0)]^{1/t}(1 + g) - 1}{s}$$

- Try the top 0.1% for the United States:
  - $x_0 = 2.2/100$ in 1980, rises to $x_t = 8/100$ in 2007.
  - Estimate for $g$: 2% per year.
  - If these guys also save at 0.5, then $r = 14.4\%$!
  - If they save $3/4$ of their income, then $r = 9.6\%$. 
$$r = \frac{[x(t)/x(0)]^{1/t}(1 + g) - 1}{s}$$

- Slightly better job for Europe, but not much. Top 10%:
  - $x_0 = 29/100$ in 1980, rises to $x_t = 35/100$ in 2010.
  - Estimate for $g$: 2% per year.
  - Estimate from Dynan et al for $s$: 35%.
  - Can back out for $r$: $r = 7.5\%$.
- High relative to $r$ in Europe.
  - UK the highest at 5.3% over 20th century, others appreciably lower.
\[ r = \left[ \frac{x(t)}{x(0)} \right]^{1/t} \left( 1 + g \right) - 1 \]

- Finally, top 1% for the UK:
  - \( x_0 = 6/100 \) in 1980, rises to \( x_t = 15/100 \) in 2005.
  - Estimate for \( g \): 2% per year.
  - Estimate from Dynan et al for \( s \): 51%.
  - Can back out for \( r \): \( r = 11.4\% \).

- Summary

- Differential savings rates explain some of the inequality, but far from all of it.
Two groups of answers:

I. **Physical access** to higher rates of return.

II. **Behavioral** access to higher rates of return.
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On I.

- Stocks, hedge funds?
- Private unincorporated businesses? (moral hazard, adverse selection)
- Human capital? (inalienability)
What Explains the Rates of Return to the Rich?

- Two groups of answers:
  - I. Physical access to higher rates of return.
  - II. Behavioral access to higher rates of return.

- On I.
  - Stocks, hedge funds?
  - Private unincorporated businesses? (moral hazard, adverse selection)
  - Human capital? (inalienability)

- On II.
  - Informational? (See Supplement)
  - Other behavioral reasons for underparticipation in capital markets + functional move away from labor to capital.