Big changes in the occupational distribution

White Men in 1960:
94% of Doctors, 96% of Lawyers, and 86% of Managers

White Men in 2008:
63% of doctors, 61% of lawyers, and 57% of managers

Sandra Day O’Connor...
High-skill occupations are lawyers, doctors, engineers, scientists, architects, mathematicians and executives/managers.
Our question

Suppose distribution of talent for each occupation is identical for whites, blacks, men and women.

Then:


How much of productivity growth between 1960 and 2008 was due to the better allocation of talent?
1. Model

2. Evidence

3. Counterfactuals
Model

$N$ occupations, one of which is “home”.

Individuals draw talent in each occupation $\{\epsilon_i\}$.

Individuals then choose occupation $(i)$ and human capital $(s, e)$.

Preferences

$$U = c^\beta(1 - s)$$

Human capital

$$h = s^{\phi_i} e^{\eta} \epsilon$$

Consumption

$$c = (1 - \tau_w)wh - (1 + \tau_h)e$$
What varies across occupations and/or groups

\[ w_i = \text{the wage per unit of human capital in occupation } i \text{ (endogenous)} \]

\[ \phi_i = \text{the elasticity of human capital wrt time invested for occupation } i \]

\[ \tau_{ig}^w = \text{labor market barrier facing group } g \text{ in occupation } i \]

\[ \tau_{ig}^h = \text{barrier to building human capital facing group } g \text{ for } i \]
Timing

Individuals draw and observe an $\epsilon_i$ for each occupation.

They also see $\phi_i$, $\tau^w_{ig}$, and $\tau^h_{ig}$.

They anticipate $w_i$.

Based on these, they choose their occupation, their $s$, and their $e$.

$w_i$ will be determined in GE (production details later).
Some Possible Barriers

**Acting like** $\tau^w$

- Discrimination in the labor market.

**Acting like** $\tau^h$

- Family background.
- Quality of public schools.
- Discrimination in school admissions.
Empirically, we will be able to identify:

\[ \tau_{ig} \equiv \frac{(1 + \tau_{ig}^h) \eta}{1 - \tau_{ig}^w} \]

But not \( \tau_{ig}^w \) and \( \tau_{ig}^h \) separately.

For now we analyze the composite \( \tau_{ig} \) or one of two polar cases:

- All differences are from \( \tau_{ig}^h \) barriers to human capital accumulation (\( \tau_{ig}^w = 0 \))
- Or all differences are due to \( \tau_{ig}^w \) labor market barriers (\( \tau_{ig}^h = 0 \)).
The solution to an individual’s utility maximization problem, given an occupational choice:

$$s_i^* = \frac{1}{1 + \frac{1 - \eta}{\beta \phi_i}}$$

$$e_{ig}^*(\epsilon) = \left( \frac{\eta w_i s_i^{\phi_i} \epsilon}{\tau_{ig}} \right)^{\frac{1}{1-\eta}}$$

$$c_{ig}^*(\epsilon) = \bar{\eta} \left( \frac{w_i s_i^{\phi_i} \epsilon}{\tau_{ig}} \right)^{\frac{1}{1-\eta}}$$

$$U(\tau_{ig}, w_i, \epsilon_i) = \bar{\eta}^\beta \left( \frac{w_i s_i^{\phi_i} (1 - s_i) \frac{1 - \eta}{\beta \epsilon_i}}{\tau_{ig}} \right)^{\frac{\beta}{1-\eta}}$$
We assume Fréchet for analytical convenience:

\[ F_i(\epsilon) = \exp(-T_i \epsilon^{-\theta}) \]

- \( \theta \) governs the dispersion of skills
- \( T_i \) scales the supply of talent for an occupation

**Benchmark case:** \( T_{ig} = T_i \) — identical talent distributions

\( T_i \) will be observationally equivalent to production technology parameters, so we normalize \( T_i = 1 \).
Result 1: Occupational Choice

\[ U(\tau_{ig}, w_i, \epsilon_i) = \bar{\eta}^\beta \left( \frac{w_i s_i^{\phi_i} (1 - s_i)^{1-\eta} \epsilon_i}{\tau_{ig}} \right)^{\frac{\beta}{1-\eta}} \]

**Extreme value theory:** $U(\cdot)$ is Fréchet $\Rightarrow$ so is $\max_i U(\cdot)$

Let $p_{ig}$ denote the fraction of people in group $g$ that work in occupation $i$:

\[
p_{ig} = \frac{\tilde{w}_{ig}^\theta}{\sum_{s=1}^{N} \tilde{w}_{sg}^\theta} \quad \text{where} \quad \tilde{w}_{ig} \equiv \frac{T_{ig}^{1/\theta} w_i s_i^{\phi_i} (1 - s_i)^{1-\eta}}{\tau_{ig}}.
\]

**Note:** $\tilde{w}_{ig}$ is the reward to working in an occupation for a person with average talent
Result 2: Wages and Wage Gaps

Let $\overline{\text{wage}}_{ig}$ denote the average earnings in occupation $i$ by group $g$:

$$\overline{\text{wage}}_{ig} \equiv \frac{(1 - \tau_{ig}^w) w_i H_{ig}}{q_g p_{ig}} = (1 - s_i)^{-1/\beta} \gamma \bar{\eta} \left( \sum_{s=1}^{N} \tilde{w}_{sg}^\theta \right)^{1/\theta} \cdot \frac{1}{1-\eta}$$

The wage gap between groups is the same across occupations:

$$\frac{\overline{\text{wage}}_{i,\text{women}}}{\overline{\text{wage}}_{i,\text{men}}} = \left( \frac{\sum_s \tilde{w}_{s,\text{women}}^{-\theta}}{\sum_s \tilde{w}_{s,\text{men}}^{-\theta}} \right)^{1/\theta} \cdot \frac{1}{1-\eta}$$

- Selection exactly offsets $\tau_{ig}$ differences across occupations because of the Fréchet assumption.
- Higher $\tau_{ig}$ barriers in one occupation reduce a group’s wages proportionately in all occupations.
Therefore:

\[
\frac{p_{ig}}{p_{i,wm}} = \frac{T_{ig}}{T_{i,wm}} \left( \frac{\tau_{ig}}{\tau_{i,wm}} \right)^{-\theta} \left( \frac{\text{wage}_g}{\text{wage}_{wm}} \right)^{-\theta(1-\eta)}
\]

Misallocation of talent comes from dispersion of \( \tau \)'s across occupation-groups.
We infer high $\tau$ barriers for a group with low average wages.

We infer particularly high barriers when a group is underrepresented in an occupation.

We pin down the *levels* by assuming $\tau_{i,wm} = 1$. The results are similar if we instead impose a zero average $\tau$ in each occupation.
Human Capital

\[ H_i = \sum_{g=1}^{G} \int h_{jgi} \, dj \]

Production

\[ Y = \left( \sum_{i=1}^{I} (A_i H_i)^\rho \right)^{1/\rho} \]

Expenditure

\[ Y = \sum_{i=1}^{I} \sum_{g=1}^{G} \int (c_{jgi} + e_{jgi}) \, dj \]
1. Given occupations, individuals choose $c, e, s$ to maximize utility.
2. Each individual chooses the utility-maximizing occupation.
3. A representative firm chooses $H_i$ to maximize profits:

$$\max_{\{H_i\}} \left( \sum_{i=1}^{I} (A_i H_i)^{\rho} \right)^{1/\rho} - \sum_{i=1}^{I} w_i H_i$$

4. The occupational wage $w_i$ clears each labor market:

$$H_i = \sum_{g=1}^{G} \int h_{jgi} \, dj$$

5. Aggregate output is given by the production function.
A Special Case

- $\rho = 1$ so that $w_i = A_i$.
- 2 groups, men and women.
- $\phi_i = 0$ (no schooling time).

\[
\overline{\text{wage}_m} = \left( \sum_{i=1}^{N} A_i^{\theta} \right)^{\frac{1}{\theta} \cdot \frac{1}{1-\eta}}
\]

\[
\overline{\text{wage}_f} = \left( \sum_{i=1}^{N} \left( \frac{A_i (1 - \tau_i^w)}{(1 + \tau_i^h \eta)} \right)^\theta \right)^{\frac{1}{\theta} \cdot \frac{1}{1-\eta}}
\]
Adding the assumption that $A_i$ and $1 - \tau^w_i$ are jointly log-normal:

$$
\ln \bar{\text{wage}}_f = \ln \left( \sum_{i=1}^{N} A^\theta_i \right)^{\frac{1}{\theta} \cdot \frac{1}{1-\eta}}
$$

$$
+ \frac{1}{1-\eta} \cdot \ln (1 - \bar{\tau}^w) - \frac{1}{2} \cdot \frac{\theta-1}{1-\eta} \cdot \text{Var}(\ln(1 - \tau^w_i)).
$$

or

$$
\ln \bar{\text{wage}}_f = \ln \left( \sum_{i=1}^{N} A^\theta_i \right)^{\frac{1}{\theta} \cdot \frac{1}{1-\eta}}
$$

$$
- \frac{\eta}{1-\eta} \cdot \ln (1 + \bar{\tau}^h) - \frac{\eta}{1-\eta} \cdot \frac{\eta\theta+1}{2} \cdot \text{Var}(\ln(1 + \tau^h_i)).
$$
Main weaknesses of setup:

- Talent of teachers does not affect human capital of students
  - Very talented women teachers in the 1960s are now doctors and lawyers?

- No childbearing
  - Within a broad occupation, women may choose jobs with lower pay but more flexibility (e.g. optometry vs surgery)

- No dynamics
1. Model

2. Evidence

3. Counterfactuals
- American Community Survey for 2006-2008
- 67 consistent occupations, one of which is the “home” sector.
- Look at full-time and part-time workers, hourly wages.
- Prime-age workers (age 25-55).
Examples of Baseline Occupations

Health Diagnosing Occupations
- Physicians
- Dentists
- Veterinarians
- Optometrists
- Podiatrists
- Health diagnosing practitioners, n.e.c.

Health Assessment and Treating Occupations
- Registered nurses
- Pharmacists
- Dietitians
Occupational Wage Gaps for White Women in 1980

Occupational wage gap (logs)

Relative propensity, p(ww)/p(wm)
Change in Wage Gaps for White Women, 1960–2008

Change in log wage gap, 1960–2008

Change in log p(ww)/p(wm), 1960–2008
### Test of Model Implications: Changes by Schooling

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Educated White Women</td>
<td>0.38</td>
<td>0.59</td>
<td>0.21</td>
</tr>
<tr>
<td>Low-Educated White Women</td>
<td>0.40</td>
<td>0.46</td>
<td>0.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Educated White Women</td>
<td>-0.50</td>
<td>-0.24</td>
<td>-0.26</td>
</tr>
<tr>
<td>Low-Educated White Women</td>
<td>-0.56</td>
<td>-0.27</td>
<td>-0.29</td>
</tr>
</tbody>
</table>
Estimating $\theta(1 - \eta)$

\[
\frac{\tau_{ig}}{\tau_{i,wm}} = \left( \frac{T_{ig}}{T_{i,wm}} \right)^{\frac{1}{\theta}} \left( \frac{p_{ig}}{p_{i,wm}} \right)^{-\frac{1}{\theta}} \left( \frac{\text{wage}_g}{\text{wage}_{wm}} \right)^{-(1-\eta)}
\]

Under Fréchet, wages within an occupation-group satisfy

\[
\frac{\text{Variance}}{\text{Mean}^2} = \frac{\Gamma(1 - \frac{2}{\theta(1-\eta)})}{\left( \Gamma(1 - \frac{1}{\theta(1-\eta)}) \right)^2} - 1.
\]

- Assume $\eta = 1/4$ for baseline (midway between 0 and 1/2).
- Then use this equation to estimate $\theta$.
- Attempt to control for “absolute advantage” as well (next slide).
Estimating $\theta(1 - \eta)$ (continued)

<table>
<thead>
<tr>
<th>Adjustments to Wages</th>
<th>Estimates of $\theta(1 - \eta)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base controls</td>
<td>3.11</td>
</tr>
<tr>
<td>Base controls + Adjustments</td>
<td><strong>3.44</strong></td>
</tr>
</tbody>
</table>

Wage variation due to absolute advantage:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td><strong>3.44</strong></td>
</tr>
<tr>
<td>50%</td>
<td>4.16</td>
</tr>
<tr>
<td>75%</td>
<td>5.61</td>
</tr>
<tr>
<td>90%</td>
<td>8.41</td>
</tr>
</tbody>
</table>

**Base controls** = potential experience, hours worked, occupation-group dummies

**Adjustments** = transitory wages, AFQT score, education
Assumed Barriers ($\tau_{ig}$) for White Men

Barrier measure, $\tau$

Year

Estimated Barriers ($\tau_{ig}$) for White Women

Barrier measure, $\tau$

Construction
Lawyers
Doctors
Teachers
Home
Secretaries

Year

Estimated Barriers ($\tau_{ig}$) for Black Men

Barrier measure, $\tau$

Year


0.8 1 1.2 1.4 1.6 1.8 2
Estimated Barriers (τ_{ig}) for Black Women

Barrier measure, \( \tau \)

- Home
- Doctors
- Lawyers
- Secretaries
- Construction
- Teachers

Year

Average Values of $\tau_{ig}$ over Time

Average $\tau$ across occupations

White Women
Black Women
Black Men

Year

Year

Variance of \( \tau_{ig} \) over Time

- **White Women**
- **Black Women**
- **Black Men**

Year:
- 1960
- 1965
- 1970
- 1975
- 1980
- 1985
- 1990
- 1995
- 2000
- 2005
- 2010

Variance of log \( \tau \)
Allow $A_i$, $\phi_i$, $\tau_{ig}$, and population to vary across time to fit observed employment and wages by occupation and group in each year.

$A_i$: Occupation-specific productivity

- Average size of an occupation
- Average wage growth

$\phi_i$: Occupation-specific return to education

- Wage differences across occupations

$\tau_{ig}$: Occupational sorting

Trends in $A_i$ could be skill-biased and market-occupation-biased.
## Baseline Parameter Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\theta(1 - \eta)$</td>
<td>3.44</td>
<td>wage dispersion within occupation-groups</td>
</tr>
<tr>
<td>$\eta$</td>
<td>0.25</td>
<td>midpoint of range from 0 to 0.5</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.693</td>
<td>Mincerian return across occupations</td>
</tr>
<tr>
<td>$\rho$</td>
<td>2/3</td>
<td>elasticity of substitution b/w occupations of 3</td>
</tr>
<tr>
<td>$\phi_{min}$</td>
<td>by year</td>
<td>schooling in the lowest-wage occupation</td>
</tr>
</tbody>
</table>
Outline

1. Model

2. Evidence

3. Counterfactuals
Main Finding

What share of labor productivity growth is explained by changing barriers?

<table>
<thead>
<tr>
<th></th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frictions in all occupations</td>
<td>20.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>No frictions in “brawny” occupations</td>
<td>18.9%</td>
<td>14.1%</td>
</tr>
<tr>
<td>No frictions in 2008</td>
<td>20.4%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Market sector only</td>
<td>26.9%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Ages 25 to 35 only</td>
<td>28.7%</td>
<td>23.6%</td>
</tr>
</tbody>
</table>
Counterfactuals in the $\tau^h$ Case

Total output, $\tau^h$ case

Year

Constant $\tau$'s

Baseline

Final gap is 15.2%
Counterfactuals in the $\tau^w$ Case

- Total output, $\tau^w$ case
- Baseline
- Constant $\tau$’s
- Final gap is 11.3%
## Potential Remaining Productivity Gains

<table>
<thead>
<tr>
<th></th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative gain, 1960–2008</td>
<td>15.2%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Remaining gain from zero barriers</td>
<td>14.3%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Sources of productivity gains in the model

Better allocation of human capital investment:

- White men over-invested in 1960
- Women, blacks under-invested in 1960
- Less so in 2008

Better allocation of talent to occupations:

- Dispersion in $\tau$’s for women, blacks in 1960
- Less in 2008
The calculation:

- Take wages of white men as exogenous.
- Growth from faster wage growth for women and blacks?

Answer = 12.8%

Versus 20.4% gains in our $\tau^h$ case, 15.9% in our $\tau^w$ case.

Why do these figures differ?

- We are isolating the contribution of $\tau$’s.
- We take into account GE effects.
## Sensitivity of Gains to the Wage Gaps

<table>
<thead>
<tr>
<th></th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>20.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Counterfactual: wage gaps halved</td>
<td>12.5%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Counterfactual: zero wage gaps</td>
<td>2.9%</td>
<td>11.8%</td>
</tr>
</tbody>
</table>
## Wage Growth Due to Changing $\tau$’s

<table>
<thead>
<tr>
<th></th>
<th>Actual Growth</th>
<th>Due to $\tau^h$’s</th>
<th>Due to $\tau^w$’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>White men</td>
<td>77.0%</td>
<td>-5.8%</td>
<td>-7.1%</td>
</tr>
<tr>
<td>White women</td>
<td>126.3%</td>
<td>41.9%</td>
<td>43.0%</td>
</tr>
<tr>
<td>Black men</td>
<td>143.0%</td>
<td>44.6%</td>
<td>44.3%</td>
</tr>
<tr>
<td>Black women</td>
<td>198.1%</td>
<td>58.8%</td>
<td>59.5%</td>
</tr>
</tbody>
</table>

Note: $\tau$ columns are % of growth explained.
## Decomposing the Gains: Dispersion vs. Mean Barriers

<table>
<thead>
<tr>
<th></th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960 Eliminating Dispersion</td>
<td>22.2%</td>
<td>14.9%</td>
</tr>
<tr>
<td>1960 Eliminating Mean and Variance</td>
<td>26.9%</td>
<td>18.6%</td>
</tr>
<tr>
<td>2008 Eliminating Dispersion</td>
<td>16.6%</td>
<td>7.8%</td>
</tr>
<tr>
<td>2008 Eliminating Mean and Variance</td>
<td>14.3%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Robustness: $\tau^h$ case

<table>
<thead>
<tr>
<th>Baseline</th>
<th>$\rho = 2/3$</th>
<th>$\rho = -90$</th>
<th>$\rho = -1$</th>
<th>$\rho = 1/3$</th>
<th>$\rho = .95$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing $\rho$</td>
<td>20.4%</td>
<td>19.7%</td>
<td>19.9%</td>
<td>20.2%</td>
<td>21.0%</td>
</tr>
<tr>
<td></td>
<td>3.44</td>
<td>4.16</td>
<td>5.61</td>
<td>8.41</td>
<td></td>
</tr>
<tr>
<td>Changing $\theta$</td>
<td>20.4%</td>
<td>20.7%</td>
<td>21.0%</td>
<td>21.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\eta = 1/4$</td>
<td>$\eta = 0.01$</td>
<td>$\eta = 0.05$</td>
<td>$\eta = 0.1$</td>
<td>$\eta = 0.5$</td>
</tr>
<tr>
<td>Changing $\eta$</td>
<td>20.4%</td>
<td>20.5%</td>
<td>20.5%</td>
<td>20.5%</td>
<td>20.3%</td>
</tr>
</tbody>
</table>

Note: Entries are % of output growth explained.
### Robustness: $\tau^W$ case

<table>
<thead>
<tr>
<th>Changing $\rho$</th>
<th>$\rho = 2/3$</th>
<th>$\rho = -90$</th>
<th>$\rho = -1$</th>
<th>$\rho = 1/3$</th>
<th>$\rho = .95$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.9%</td>
<td>12.3%</td>
<td>13.3%</td>
<td>14.7%</td>
<td>18.4%</td>
</tr>
<tr>
<td></td>
<td>3.44</td>
<td>4.16</td>
<td>5.61</td>
<td>8.41</td>
<td></td>
</tr>
<tr>
<td>Changing $\theta$</td>
<td>15.9%</td>
<td>14.6%</td>
<td>12.9%</td>
<td>11.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\eta = 1/4$</td>
<td>$\eta = 0$</td>
<td>$\eta = .05$</td>
<td>$\eta = .1$</td>
<td>$\eta = .5$</td>
</tr>
<tr>
<td>Changing $\eta$</td>
<td>15.9%</td>
<td>13.9%</td>
<td>14.4%</td>
<td>14.8%</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

Note: Entries are % of output growth explained.
More robustness

**Gains are not sensitive to:**

- More detailed occupations (331 for 1980 onward)
- A broader set of occupations (20)
- Weight on consumption vs. time in utility ($\beta$)
Gains when changing only the dispersion of ability

<table>
<thead>
<tr>
<th>Value of $\theta(1 - \eta)$</th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.44</td>
<td>20.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>4.16</td>
<td>18.6%</td>
<td>15.1%</td>
</tr>
<tr>
<td>5.61</td>
<td>9.5%</td>
<td>8.0%</td>
</tr>
<tr>
<td>8.41</td>
<td>8.4%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>
Summary of other findings

Changing barriers also led to:

- 40+ percent of WW, BM, BW wage growth
- A 6 percent reduction in WM wages
- Essentially all of the narrowing of wage gaps
- 70+ percent of the rise in female LF participation
- Substantial wage convergence between North and South

Extensive range of robustness checks in paper...
<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s LF participation</td>
<td>1960 = 0.329  2008 = 0.692</td>
<td>Due to changing $\tau^h$’s</td>
</tr>
<tr>
<td>Change, 1960 – 2008</td>
<td>0.364</td>
<td>Due to changing $\tau^w$’s</td>
</tr>
</tbody>
</table>
## Education Predictions, $\tau^h$ case

<table>
<thead>
<tr>
<th></th>
<th>Actual 1960</th>
<th>Actual 2008</th>
<th>Actual Change</th>
<th>Change vs. WM</th>
<th>Due to $\tau$’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>White men</td>
<td>11.11</td>
<td>13.47</td>
<td>2.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White women</td>
<td>10.98</td>
<td>13.75</td>
<td>2.77</td>
<td>0.41</td>
<td>0.63</td>
</tr>
<tr>
<td>Black men</td>
<td>8.56</td>
<td>12.73</td>
<td>4.17</td>
<td>1.81</td>
<td>0.65</td>
</tr>
<tr>
<td>Black women</td>
<td>9.24</td>
<td>13.15</td>
<td>3.90</td>
<td>1.55</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Note: Entries are years of schooling attainment.
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>All groups</td>
<td>19.7%</td>
<td>20.9%</td>
<td>20.4%</td>
</tr>
<tr>
<td>White women</td>
<td>11.3%</td>
<td>18.2%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Black men</td>
<td>3.3%</td>
<td>0.9%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Black women</td>
<td>5.1%</td>
<td>1.9%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

Note: Entries are % of growth explained. “All” includes white men.
North-South wage convergence, $\tau^h$ case

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Actual wage convergence</td>
<td>20.7%</td>
<td>-16.5%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Due to all $\tau$’s changing</td>
<td>4.9%</td>
<td>1.5%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Due to black $\tau$’s changing</td>
<td>3.6%</td>
<td>1.9%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Note: Entries are percentage points. “North” is the Northeast.
Average quality of white women vs. white men

\( \tau^h \) case

\( \tau^w \) case

Year

Average quality, women / men

Doctors

Managers

Teachers

Home
Distinguishing between $\tau^h$ and $\tau^w$ empirically:

- Assume $\tau^h$ is a cohort effect, $\tau^w$ a time effect.
- Early finding: mostly $\tau^h$ for white women, a mix for blacks.

Absolute advantage correlated with comparative advantage:

- Talented 1960 women went into teaching, nursing, home sector?
- As barriers fell, lost talented teachers, child-raisers?

Separate paper:
Rising inequality from misallocation of human capital investment?