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
**Share of Each Group in High Skill Occupations**

**High-skill occupations** are lawyers, doctors, engineers, scientists, architects, mathematicians and executives/managers.
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
$N$ 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

\( w_i \) = the wage per unit of human capital in occupation \( i \) (endogenous)

\( \phi_i \) = the elasticity of human capital wrt time invested for occupation \( i \)

\( \tau_{ig}^w \) = labor market barrier facing group \( g \) in occupation \( i \)

\( \tau_{ig}^h \) = barrier to building human capital facing group \( g \) for \( i \)
Timing

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

They also see $\phi_i$, $\tau_{ig}^w$, and $\tau_{ig}^h$.

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:

$$\tau_{ig} \equiv \frac{(1 + \tau^h_{ig})\eta}{1 - \tau^w_{ig}}$$

But not $\tau^w_{ig}$ and $\tau^h_{ig}$ separately.

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

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

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

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

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

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

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

- \(\theta\) governs the dispersion of skills
- \(T_{ig}\) 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

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

**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 \( i \):

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

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

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

The wage gap between groups is the same across occupations:

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

- 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.
Inferring Barriers

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

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.
Aggregates

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.
Solution in a Special Case

- $\rho = 1$ so that $w_i = A_i$
- 2 groups, men and women
- $\phi_i = 0$ (no schooling time), $\tau^h = 0$
- $A$ and $\tau^w$ are joint lognormal

Then:

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

\[
\ln \frac{\bar{wage}_w}{\bar{wage}_m} = \frac{1}{1-\eta} \left( \ln(1 - \bar{\tau}^w) - \frac{1}{2} (\theta - 1) \text{Var}(\ln(1 - \tau_i^w)) \right).
\]
Outline

1. Model

2. Evidence

3. Counterfactuals
Data

- 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
Change in Wage Gaps for White Women, 1960–2008

Change in log wage gap, 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><strong>Occupational Similarity to White Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<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><strong>Wage Gap vs. White Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<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:

- 25%                                               | 3.44                            |
- 50%                                               | 4.16                            |
- 75%                                               | 5.61                            |
- 90%                                               | 8.41                            |

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

**Adjustments** = transitory wages, AFQT score, education
Estimated Barriers ($\tau_{ig}$) for White Women
Estimated Barriers ($\tau_{ig}$) for Black Men
Average Values of $\tau_{ig}$ over Time

Average $\tau$ across occupations

White Women
Black Women
Black Men
Variance of $\log \tau_{ig}$ over Time

Variance of $\log \tau$

White Women
Black Women
Black Men

Year

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>Frictions in all occupations</th>
<th>$\tau^h$ case</th>
<th>$\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frictions in “brawny” occupations</td>
<td>20.4%</td>
<td>18.9%</td>
</tr>
<tr>
<td>No frictions in “brawny” occupations</td>
<td>15.9%</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>
</tbody>
</table>
## 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.
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...
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?
Extra Slides
Average quality of white women vs. white men

\[ \tau^h \text{ case} \]

\[ \tau^w \text{ case} \]
Counterfactuals in the $\tau^h$ Case

Total output, $\tau^h$ case

Baseline

Constant $\tau$’s

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Total output, $\tau^w$ case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>100</td>
</tr>
<tr>
<td>1965</td>
<td>110</td>
</tr>
<tr>
<td>1970</td>
<td>120</td>
</tr>
<tr>
<td>1975</td>
<td>130</td>
</tr>
<tr>
<td>1980</td>
<td>140</td>
</tr>
<tr>
<td>1985</td>
<td>150</td>
</tr>
<tr>
<td>1990</td>
<td>160</td>
</tr>
<tr>
<td>1995</td>
<td>170</td>
</tr>
<tr>
<td>2000</td>
<td>180</td>
</tr>
<tr>
<td>2005</td>
<td>190</td>
</tr>
<tr>
<td>2010</td>
<td>200</td>
</tr>
</tbody>
</table>

Baseline

Final gap is 11.3%

Constant $\tau$’s
## 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><strong>Baseline</strong></td>
<td>20.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td><strong>Counterfactual: wage gaps halved</strong></td>
<td>12.5%</td>
<td>13.7%</td>
</tr>
<tr>
<td><strong>Counterfactual: zero wage gaps</strong></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>Year</th>
<th>Dispersion</th>
<th>Mean and Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960Eliminating 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></th>
<th>Baseline</th>
<th>$\rho = \frac{2}{3}$</th>
<th>$\rho = -90$</th>
<th>$\rho = -1$</th>
<th>$\rho = \frac{1}{3}$</th>
<th>$\rho = .95$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing $\rho$</td>
<td></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></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></td>
<td>20.4%</td>
<td>20.7%</td>
<td>21.0%</td>
<td>21.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\eta = \frac{1}{4}$</td>
<td>$\eta = 0.01$</td>
<td>$\eta = .05$</td>
<td>$\eta = .1$</td>
<td>$\eta = .5$</td>
</tr>
<tr>
<td>Changing $\eta$</td>
<td></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>Baseline</th>
<th>( \rho = \frac{2}{3} )</th>
<th>( \rho = -90 )</th>
<th>( \rho = -1 )</th>
<th>( \rho = \frac{1}{3} )</th>
<th>( \rho = .95 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing ( \rho )</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>( \eta = \frac{1}{4} )</td>
<td>( \eta = 0 )</td>
<td>( \eta = .05 )</td>
<td>( \eta = .1 )</td>
<td>( \eta = .5 )</td>
<td></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 ($\beta$)
### Female Labor Force Participation

<table>
<thead>
<tr>
<th>Data</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Women’s LF participation</strong></td>
<td>Due to changing $\tau^h$’s</td>
</tr>
<tr>
<td>1960 = 0.329</td>
<td>0.235</td>
</tr>
<tr>
<td>2008 = 0.692</td>
<td>Due to changing $\tau^w$’s</td>
</tr>
<tr>
<td></td>
<td>0.262</td>
</tr>
<tr>
<td><strong>Change, 1960 – 2008</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.364</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>
<th></th>
<th></th>
<th></th>
</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>
<th></th>
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<th></th>
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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.