Work of the Past, Work of the Future

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Introduction

- Since the 1980's the average U.S. worker has become more educated and technologically equipped.
  - The skillset gained from educational attainment and technological prowess are concentrated among the high-skill occupations.
    - Productivty gains over the past 3-4 decades have come from these high-skill occupations.

- High, medium, and low-skill workers work side-by-side in a work enviromnent so productivity gains should be shared to some degree.
  - Can be thought as capital deepening without loss of generality.
  - We then expect real wages to rise for workers in low and high-skill occupations.

Summary of Results

- Non-college workers in middle-skill jobs (admin., clerical, production) have been forced into traditionally low-skill occupations.
- Encroachment of occupational polarization may (in part explain) the fall in real wages of non-college workers over the last three decades.
  - There is an important geographical component to this!
- Overall, the urban wage premium for non-college workers has disappeared. Dense cities are only alluring for college educated.
  - Autor says less migration will raise non-college wages.
  - Aging population in suburbs provides job creation for non-college workers.

Real Wages from 1963-2017

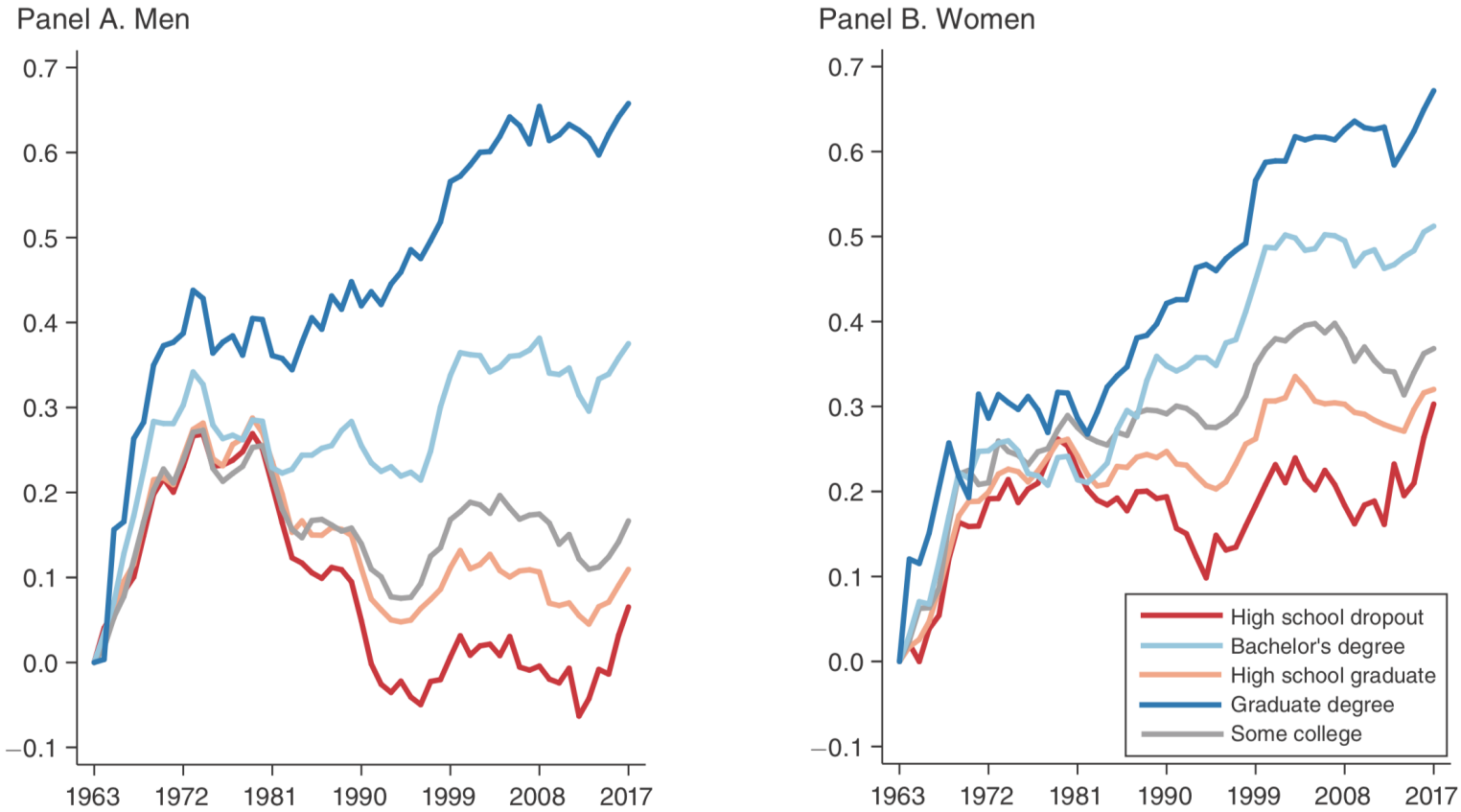

Figure: Cumulative Change in Real Weekly Earnings of Working-Age Adults Ages 18-64, 1963-2017

Interpreting Change in Real Wages

- Robust real wage growth for all education groups and genders from '63 to 72'.
- Real wages stagnate from '73 (first U.S. oil shock) to '79 across distribution of workers.
- Rising wage inequality from 1980 forward.
  - Well documented that productivity gains among high-skill ofset supply effects.
  - Real wages particularly fall sharply men with less than a bachelor's degree.
- If high and low-skill workers are gross complements (elasticity of substitution in production is greater than one) than low-skill worker wages should have risen as well.

Occupational Polarization

- Foundational assumption of the skill demand literature (Tinbergen, 1974): technological progress complementsand hence raises demand for educated workers
  - Hence, highly educated worker should see their work change.
  - Is this what we observe in the world?

- Descriptive analysis of changes in employments shares (by skill and education) show technology has affected low skill workers the most
  - From 1980 to 2016, non-college, middle-skill employment fell by 14 percentage points.
  - 87% of the decline is explained by the movement of those workers into traditionally low-skill work.

- Technological change has been deskilling for non-college workers, forcing them into low-skill, low-wage jobs.

Occupational Change from 1980-2016

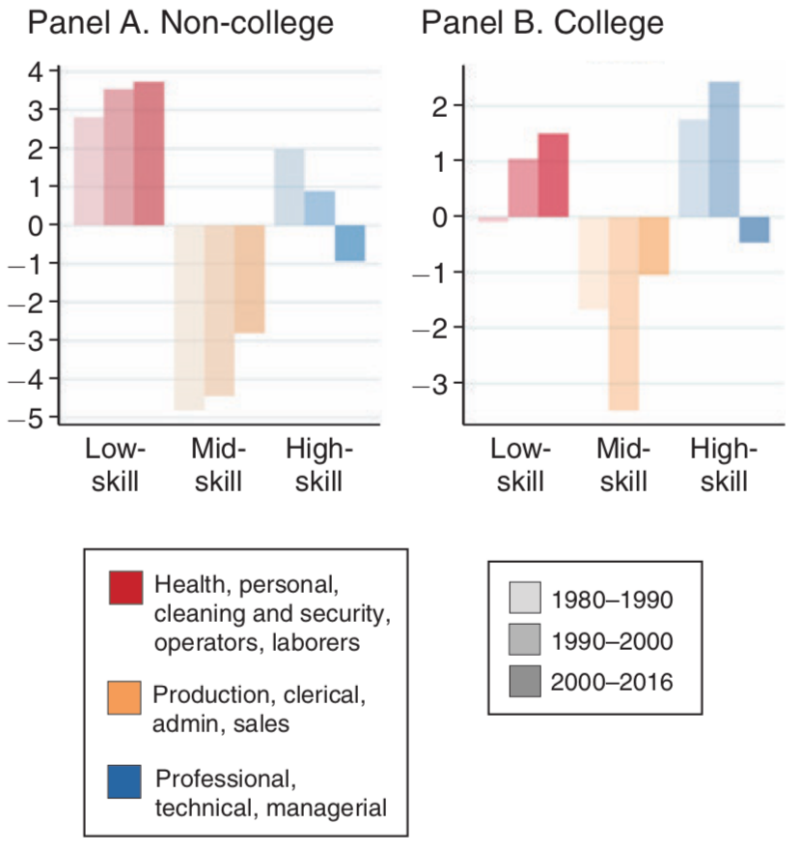

Figure: Change in occupational employment share among working-age adults, from 1980-2016;
low-skill: services, transportation, laborer, and construction workers;
mid-skill: clerical, administrative support, sales, and production workers;
high-skill: professional, technical, and managerial workers.

Can Occupational Changes Explain Wage Divergence

- Partial equilibrium calculation to construct counterfactual wages
  - Hold the occupational wage structure fixed at its 1978 level
  - Allow distribution of workers by education and gender to shift across occupations

- Let j denote education group and k denote occupation between years t_0 and t_1.

$$\Delta \bar{w}_{j\tau} = \sum_k \left(\alpha_{jkt_1} \omega_{jkt_1} - \alpha_{jkt_0} \omega_{jkt_0} \right)$$

,

- Isolate α while holding ω fixed.

$$\Delta \tilde{w}_{j\tau} = \sum_k \bar{w}_{jkt_0} \left(\alpha_{jkt_1} - \alpha_{jkt_0} \right) \tag{1}$$

Partial Equilibrium Effect of Occupational Change

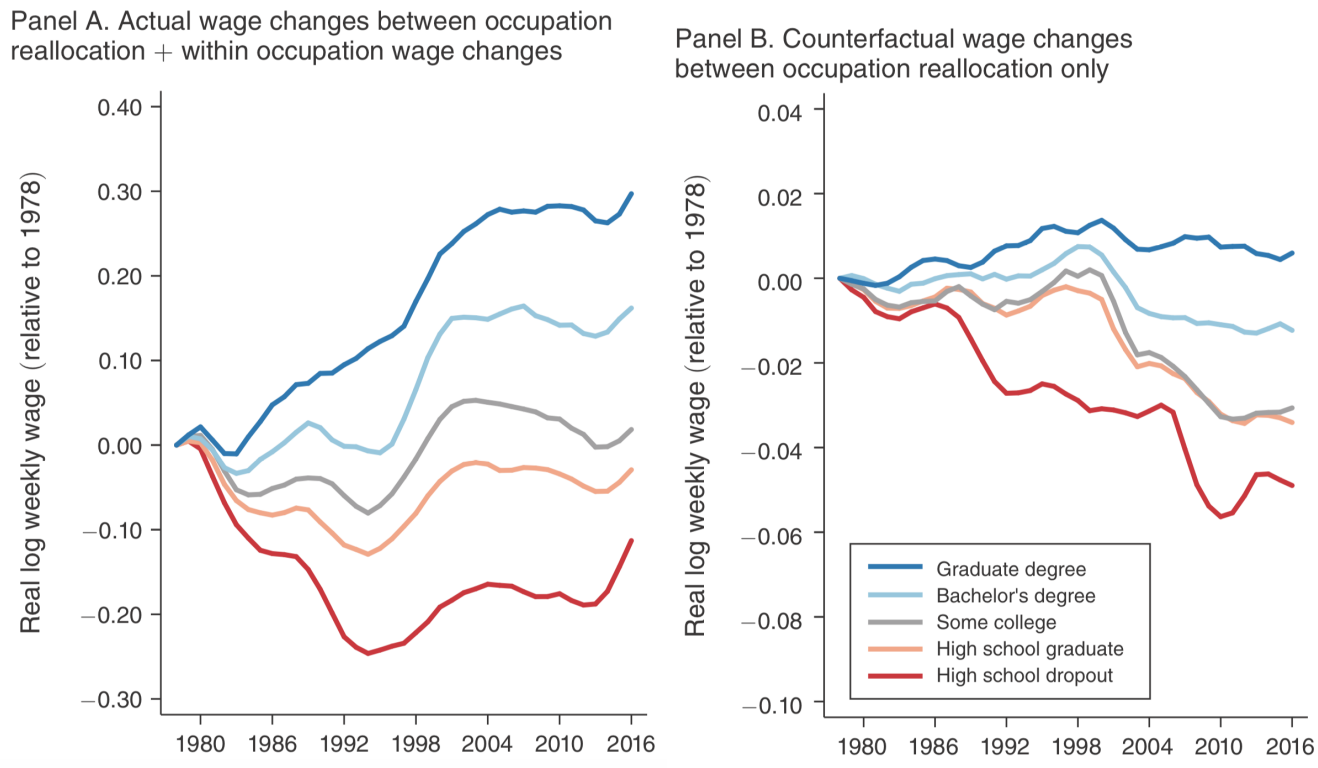

Figure: Real log wage growth by education group 1978 to 2016: 1978 to 2016: Observed versus Between Occupation Reallocation Component, 19702016

Problems with Partial Equilibrium

1. Miss the strong upward trend in college-educated real wages
   - real wages fixed at their 1978 levels, so series omits wage-augmenting productivity growth
2. Magnitude of change is way off (less than 5 times what we observe)
   - Assuption that the decline of middle-skill occupations has occurred at the average (log) wage level within each occupation-education-gender group.
   - Violated if the marginal declining (or growing) job within an occupation differed from the average of that occupation.

- Violation: the decline of middle-wage occupations were particularly concentrated in cities and metro areas where wage levels are consistently higher.

The Geography of Polarization

- High-skill occupations and industries tend to be concentrated in high-density cities with highly educated populations.

- Autor examines relationship between population density and occupational structure at commuting zone level between 1970 and 2015.
- For consistency, plot log population density in 1970 against binned employment share (weighted by population in each CZ).
  - Roughly 5% of population represented by each bin.

- Autor finds no change in relationship for low-skill occ., gradual inversion for middle-skill occ., and level shifts for high-skill occ.

Geographic Concentrations of Occupations by Skill-Level

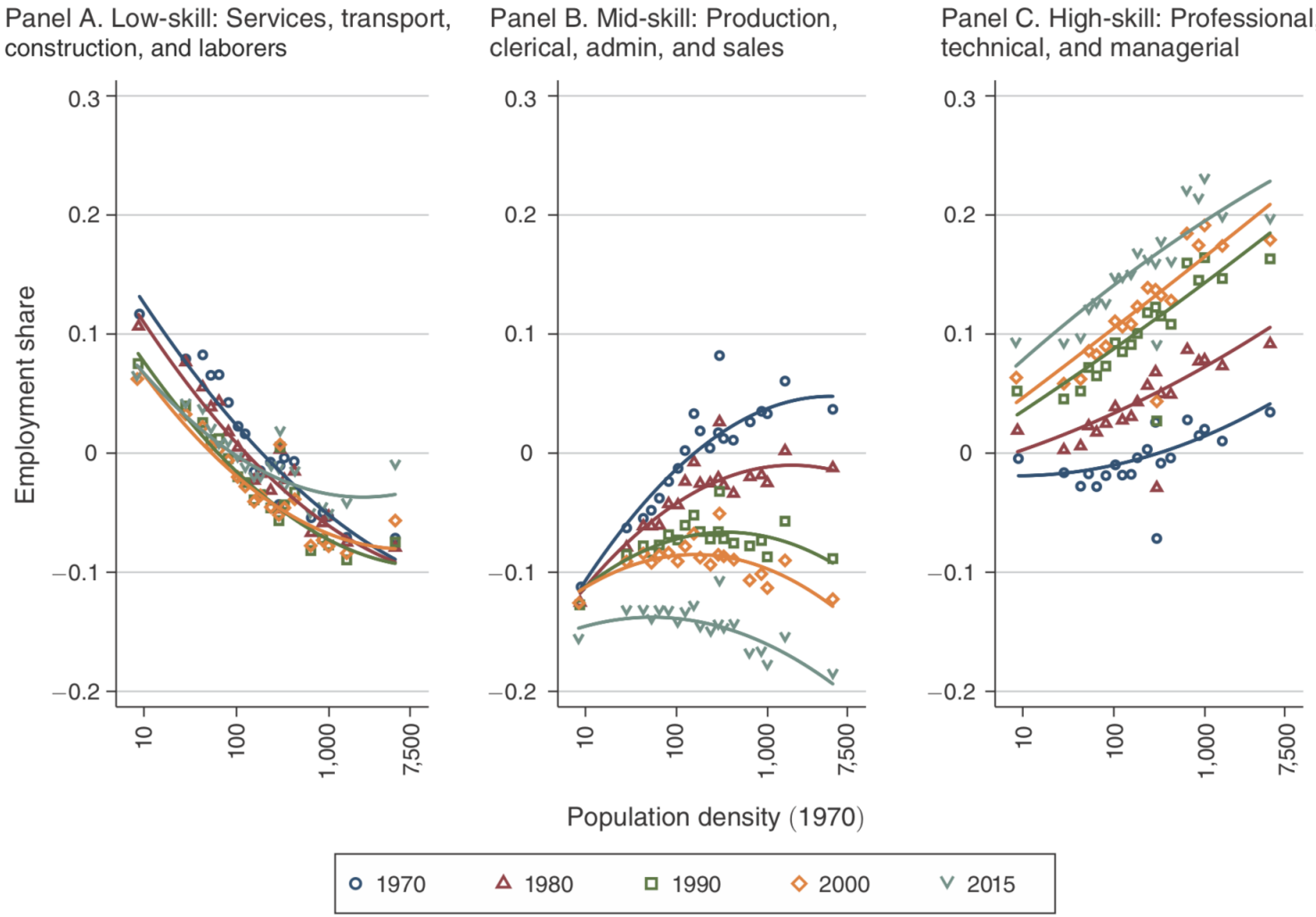

Figure: Occupational Employment Shares among Working-Age Adults by Commuting Zone Population Density, 19702015: Level Relative to 1970 Mean

Geographic Concentrations of Occupations by Skill-Level and Education (college)

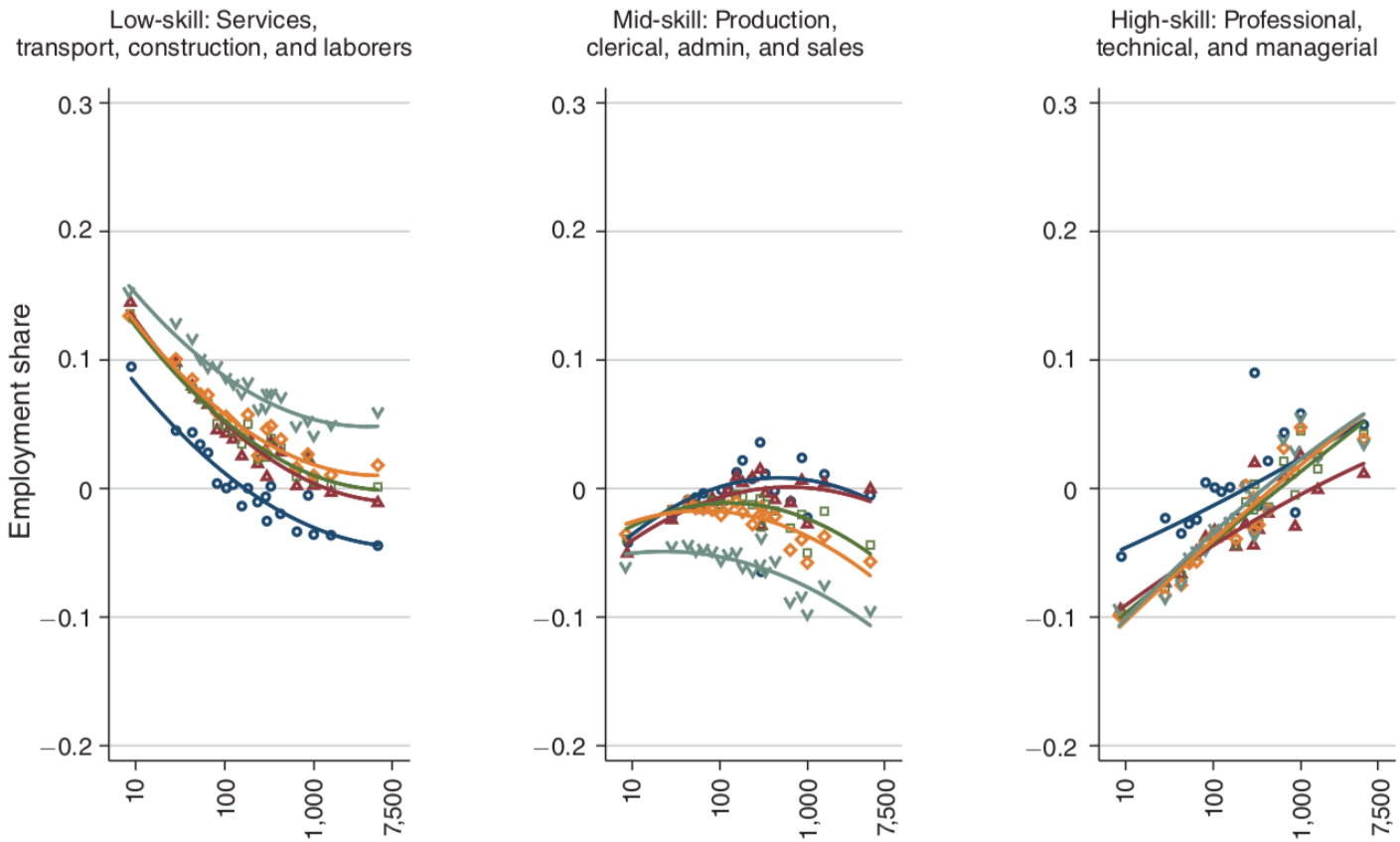

Figure: Occupational employment shares among college adults by commuting zone population density, 1970-2015: level relative to 1970 mean

Geographic Concentrations of Occupations by Skill-Level and Education (non-college)

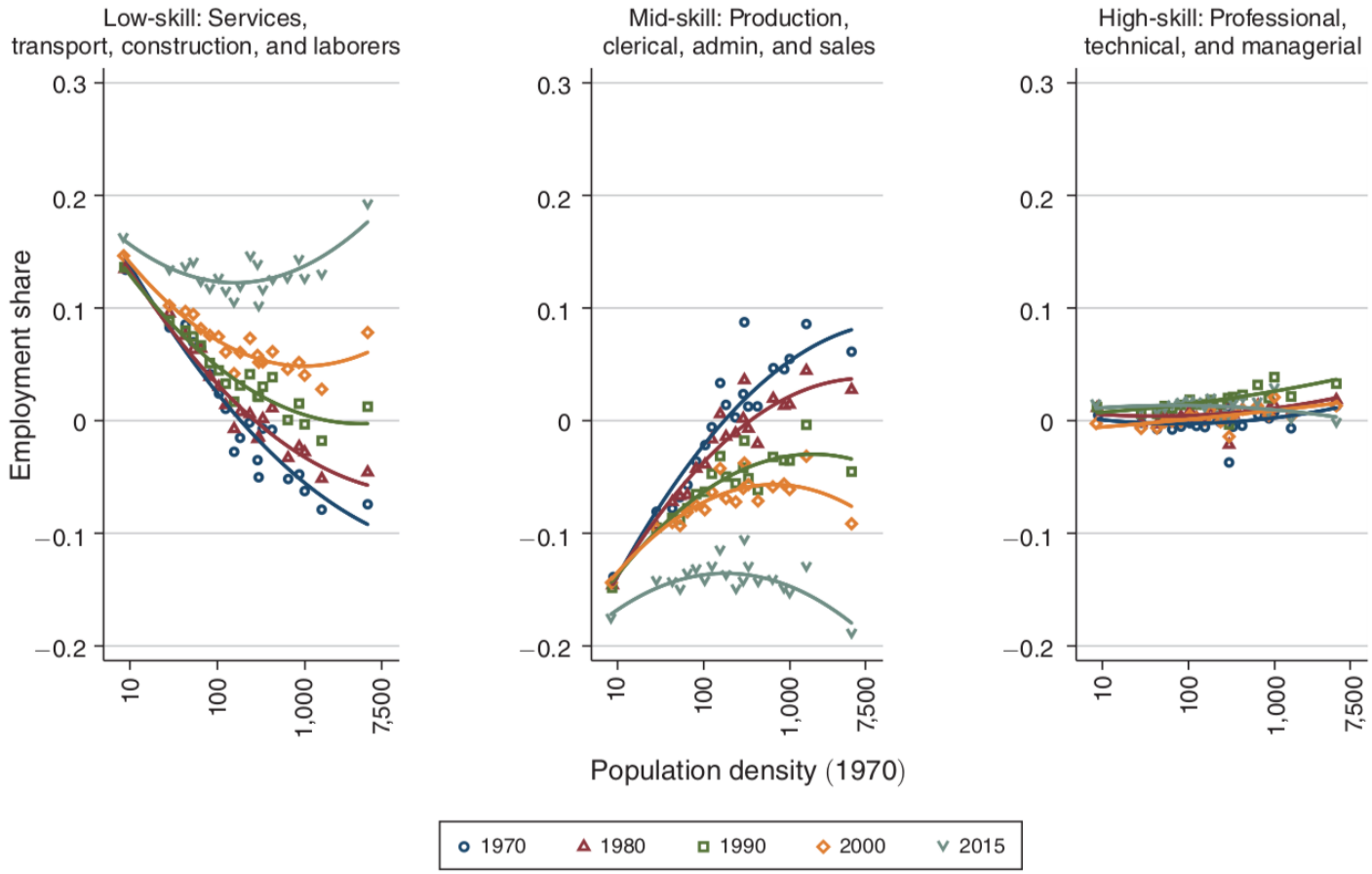

Figure: Occupational employment shares among non-college adults by commuting zone population density, 1970-2015: level relative to 1970 mean

Interpreting Changing Geographic Concentrations of Occupations

- In 1970, non-college workers in the densest CZs were approximately 25 percentage points more likely to work in middle-skill occupations.
  - The opposite is true today.
- Decline of middle-skill occupations has meant a profound reallocation of non-college workers in large cities from middle-skill production to low-skill, low-wage jobs.
- Possibile that the shifting density gradient in occ. structure from the increasingly bimodal educational and nativity structure of denser CZs.
  - Discussed in paper/lecture, but I won't talk about it.

Where were/are the Middle-skill Jobs?

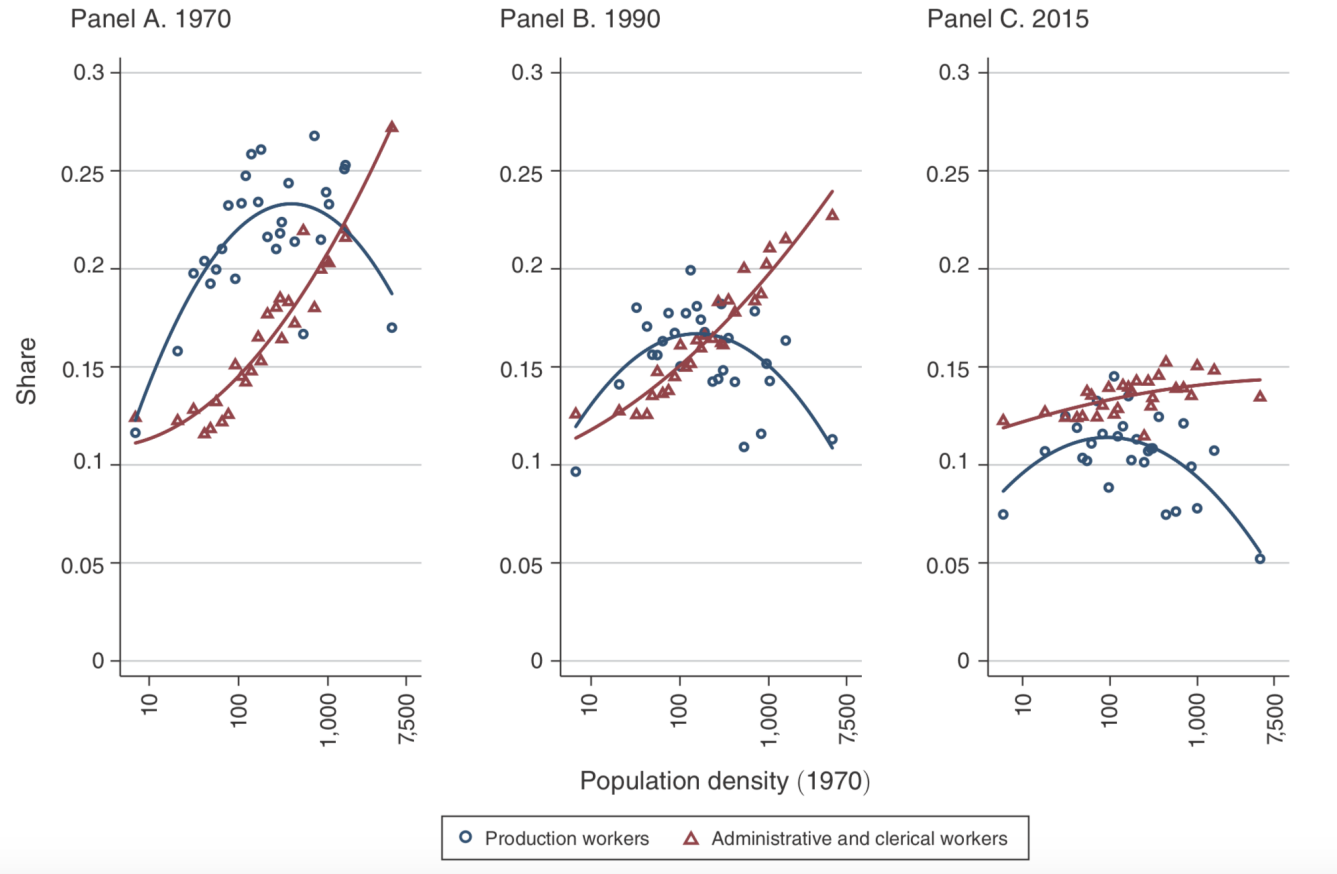

Figure: Production and Administrative and Clerical Employment Shares among Non-College Adults, 1970-2015

- Reversal of opportunity for better pay in urban areas for non-college workers

Non-college Urban Wage Premium

- Urban wage premium (widely documented) often explained by knowlegdge spillovers from college-education workers.
  - In urban areas, non-college worker are colocated alongside the highly-educated knowledge workers
  - Possible source for positive occupational and wage density gradient for non-college workers.
- Autor finds that urban wage-premium has in fact declined for non-college.
- Could be from shifting occ. structure of market, but could also be:
  1. Shifting age structure of across density gradient.
  2. Shifting educational structure of "non-college".
  3. Lingering after-effects of the Great Recession.

Unfiltered Urban Wage Premium

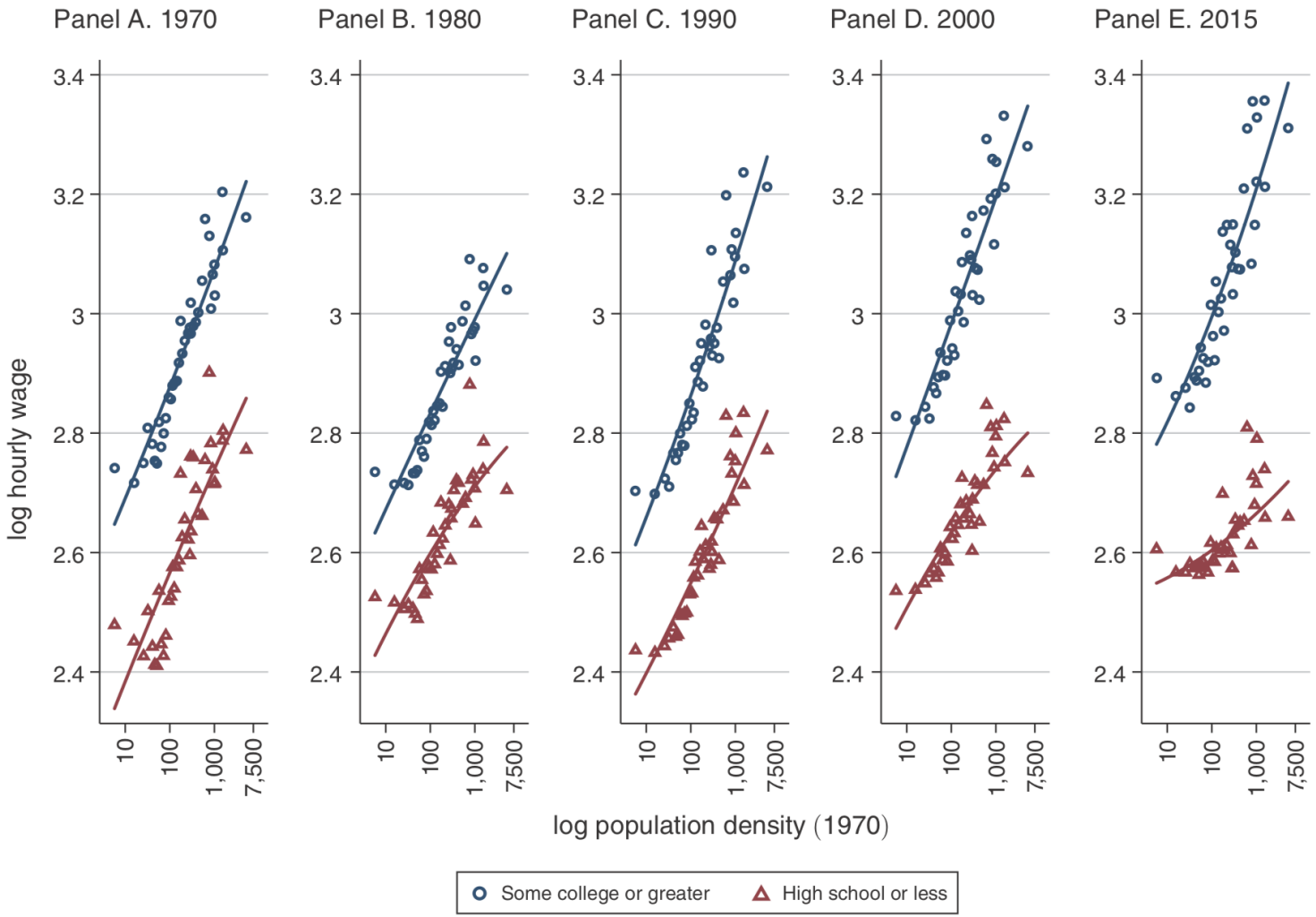

Figure: Figure plots real mean log hourly earnings among college and non-college workers in 1970, 1980, 2000, and 2015

Urban Wage Premium: Shifting Age Structure?

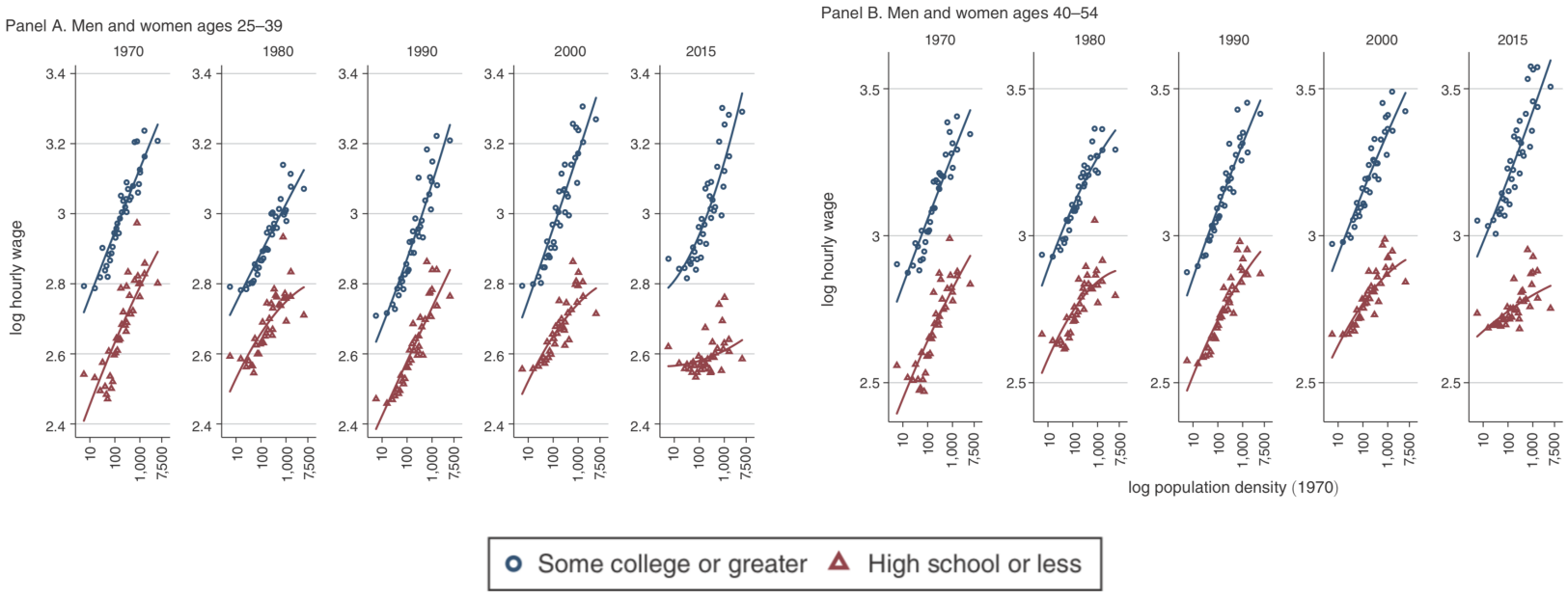

Figure: Real log Hourly Wages of College and Non-College Men and Women Ages (A) 25-39 and (B) 40-54

Urban Wage Premium: Changing Education Structure and Great Recession?

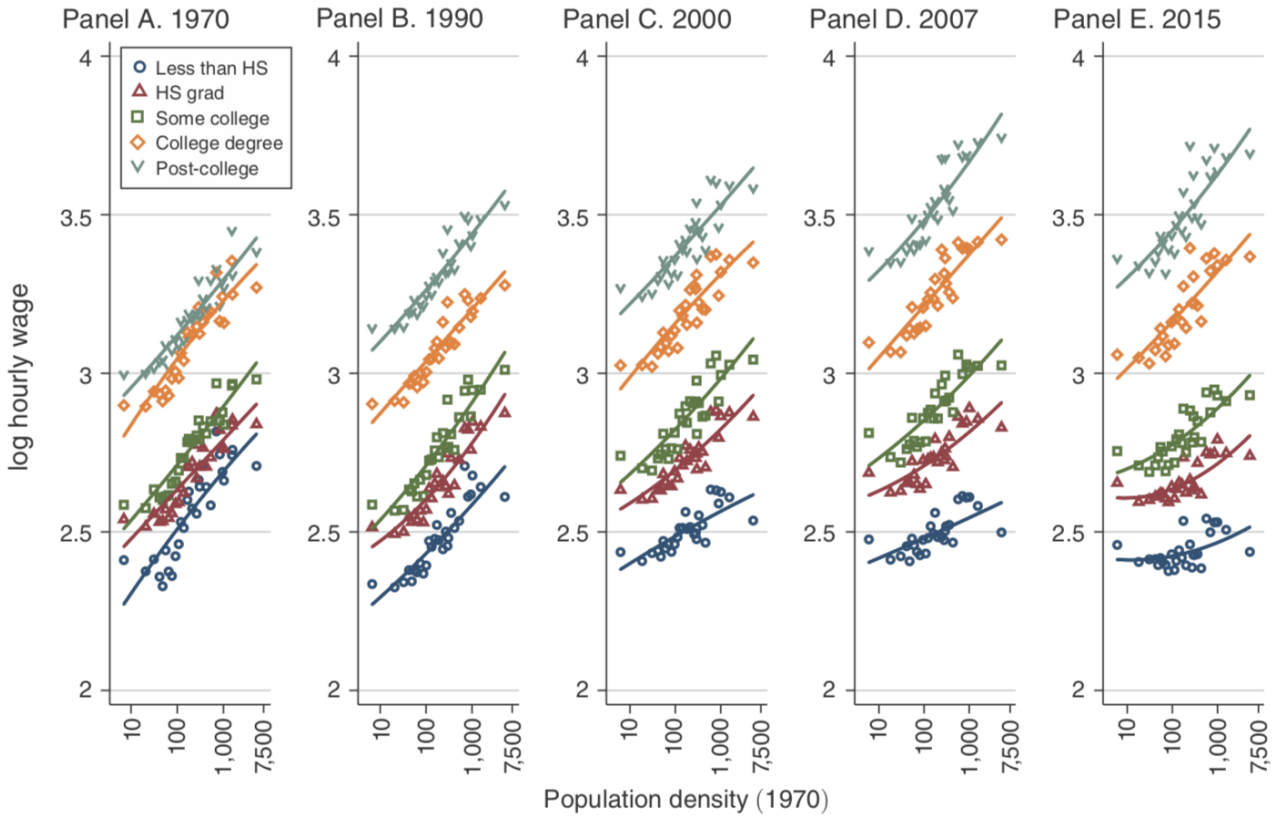

Figure: Real log Hourly Wages by Detailed Education Category, 1970-2015

- Urban wage premium for non-college workers commences well before the Great Recession

Regional Wage Divergence

- Figures on disappearing urban wage premium for non-college lend to regional wage divergence
- Structural models with capital skill-complementarity and urban agglomeration conform to this
  - Agglomerative forces for skilled workers have risen over time (Baum-Snow, Freedman, and Pavan, 2018).
  - Rising agglomerative forces for skilled labor that interact positively with SBTC (Giannone, 2018).

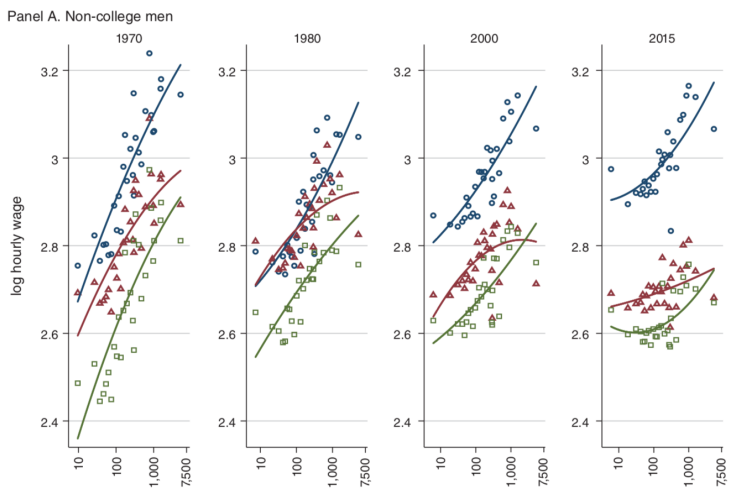

Figure: Real log Hourly Wages by Occ. Group for non-college men, 1970-2015

Accounting for the Geography of Polarization: Wage Implications

- How would the wages of college and non-college workers have changed between 1970 and 2015 had occupational composition and occupational geography evolved as observed while wage levels by occupation and location are held fixed at their 1970 levels?

- Going to use kernel density reweighting technique (DiNardo, Fortin, and Lemieux, 1996).
  - Assumes wage change within occ. and across location.
  - Varies quantities while holding prices fixed.

- Estimate will be a lower bound to the contribution of occupational change to wage changes by skill group.

Kernel Density Reweighting

- Start with observed wage distribution $f(w)$. Let Ω_x be domain of covariates.

$$f_{t_0}(w) = \int_{x \in \Omega_x} dF(w, x | t_{w,x} = t_0)$$

- Iterating expectations: distribution of w is conditioned on x and the distribution of x is conditioned on t_0,

$$f_{w_{t_0}}^{x_{t_0}}(w) = \int f(w|x, t_w = t_0) dF(x|t_x = t_0)$$

- Use identiy above to substitute in the distribution of x for time t_1

$$\begin{aligned} f_{w_{t_0}}^{x_{t_1}}(w) &= \int f(w|x, t_w = t_0) dF(x|t_x = t_1) \\ &= \int f(w|x, t_w = t_0) \times \phi_x(x) dF(x|t_z = t_0) \end{aligned}$$

Kernel Density Reweighting

$$f^{x_{t_1}}_{w_{t_0}}(w) = \int f(w|x, t_w = t_0) \times \underbrace{\phi_x(x)}_{\frac{dF(x|t_x=t_1)}{dF(x|t_x=t_0)}} \; dF(x|t_z = t_0)$$

- $\phi_x(x)$ reweights the distribution of covariates in period t_0 to match those in t_1 (i.e., quantities change).
- $f(w|x)$ held at time t_0 (i.e. prices are fixed).
- Excercise will be plotting:
  1. Data
  2. Reweight $f_{t_{1970}}(w)$ to reflect the changing occupational distribution during each subsequent decade
  3. (2) plus geographic component

Counterfactual Wage Changes

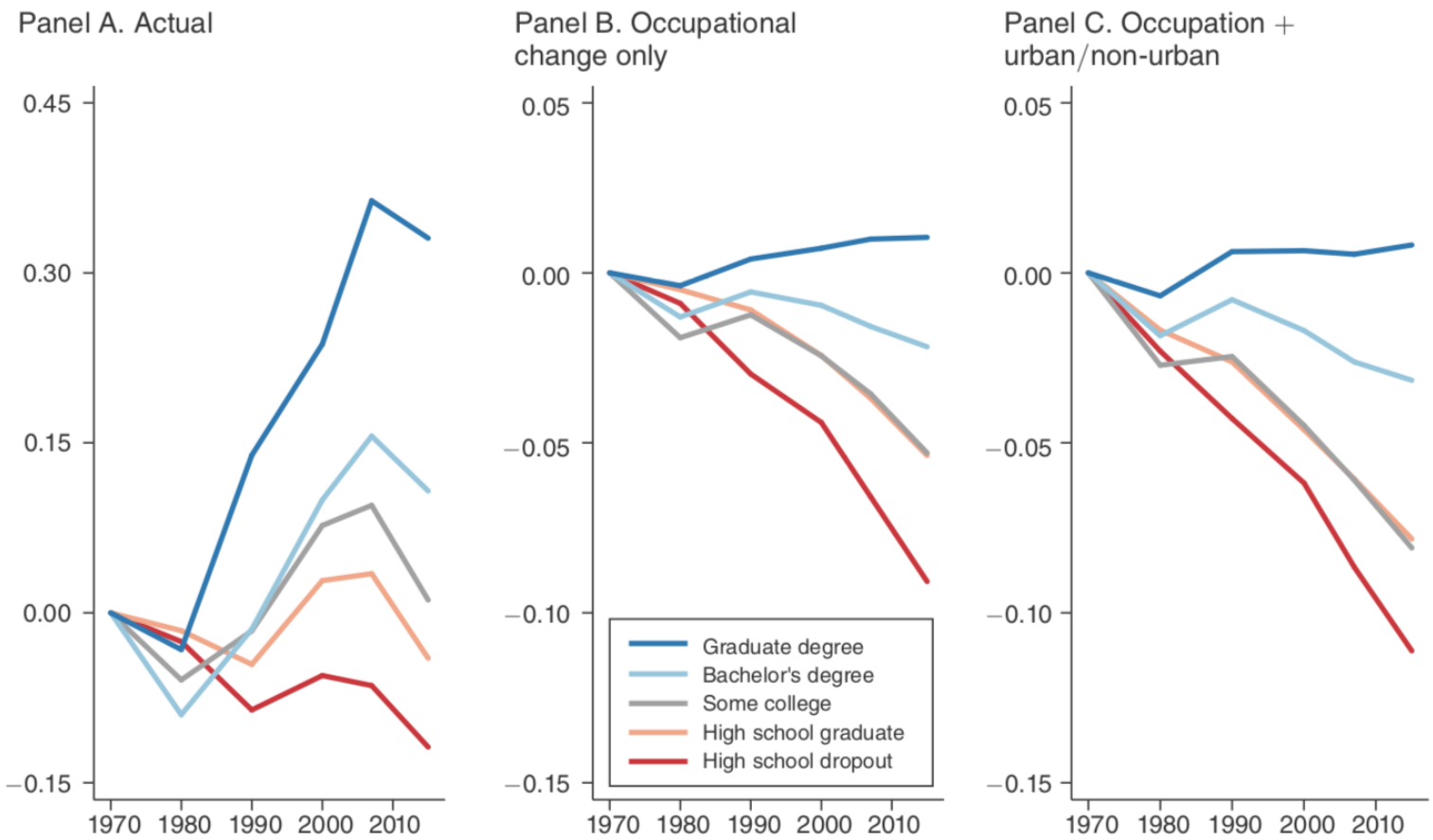

Figure: Observed and Counterfactual Changes in log Hourly Wages by Education Group, 1970-2015

Evaluation of Partial Equilibrium

- Occupational reallocation does decent job accounting for the fall in non-college wages over time interval.
- Adding geography confirms that polarization has occurred most among urban, non-college workers.
- Again, as earlier the partial equil. does not account for rise in college wages
  - Modest occupational change for college workers
  - Holding w at 1970 level omits all productivity growth among college educated (i.e. SBTC).
- Overall cannot account for:
  - Supply/demand forces on wages within and between occ.
  - Omits increased demand for high-skill workers on college wages.

Where is the Land of Opportunity?

- What forces could restore middle-skill jobs and raise non-college wages along density gradient?
- Firms have incentive to reinstate labors comparative advantage in a range of tasks (Acemoglu and Restrepo, 2018).
- New work (the creation of new Census occupational titles) is concentrated in cities (Lin, 2011).
  - Although, mostly held by college workers...
  - Some "wealth work" jobs being created, e.g. yoga instructor, dog groomer, sommelier (Autor and Salomons, 2019)
- Overall, growth is in cities, but only for college workers in high-skill jobs.
  - Dense cities are not alluring to low-skill occ.
  - This is good since less migration will boost non-college wages
  - Meanwhile, aging pop. in suburbs presents new opportunity for low-skill, labor-intensive jobs.