A Quality Index for New Job Hires

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Introduction

- Much timely (monthly) government data on number of new jobs
  - But by industry, not occupation or much else

- There are also considerable wage data for workers
  - But almost always for incumbents, not new hires

- The result is that we don't know much about the "quality" of new jobs

Motivation

- Understanding characteristics of new jobs, and workers in them, of key concern

  - An important coincident, and perhaps leading, indicator

  - Provides insight into cyclical labor markets

  - Can shed light on structural changes in skill demand

- But "quality" is always hard to define

  - Wage is often a useful summary statistic, but...

  - Other nuances important, especially volume of new hires

  - How much detail is possible? Useful?

- **Goal: Create a new index of job hires quality**

Occupations vs. Industries

- Economic literature has long recognized that what one does affects compensation more than where one does it

  - Roy (1951); Houty (1958, 1961); Groshen (1991)

  - And now task-based models of human capital: Spitz-Oener (2006); Gathmann & Schoenberg 2010; Acemoglu & Autor (2011); Autor (2013)

- Mincer-style wage regressions show that occupations explain 2–4 times the variance of industries, even with additional controls

- Despite this, armchair analysis on wages of new jobs is often based on industry, not occupation

  - Unlike for industries, no high-frequency occupation-level releases...

  - Result is lamp-post inference

NELP National Employment Law Project

DATA BRIEF
April 2014

The Low-Wage Recovery:
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By Katie Johnston | GLOBE STAFF SEPTEMBER 22, 2015

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The Washington Post

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To do this, she divided businesses into three groups by their pay. Today's average hourly pay is $25. Low-paying employment is dominated by restaurant and hotel jobs (2015 average hourly rate: $14.12) and retail jobs ($17.21). Midlevel jobs include manufacturing ($23.90), health care and education ($24.97) and construction ($26.91). Finally, high-paying jobs included professional and business services ($29.59), finance ($31.10) and utilities ($36.02).

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The Upshot

EVERYDAY ECONOMICS
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There are many highly paid managers working in the low-paid retail trade sector, just as there are many low-paid janitors working in the high-paid professional services sector

Figuring out whether the recovery is creating "good jobs" or "bad jobs" requires looking deeply into skill levels and job responsibilities

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Exactly. Why not do this?

The Washington Post
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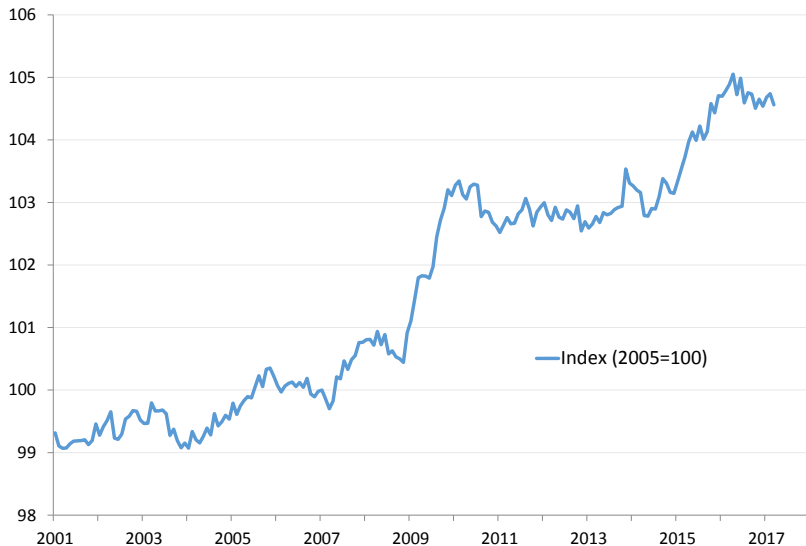
Upjohn Institute New Hires Quality Index (NHQI)

- New monthly index tracks "quality" of new job hires (2001 $\rightarrow$)

- Uses CPS to identify new hires: those switching in adjacent months from non-employment to employment or changing employers

- Detailed occupation in CPS merged with OES occupational wage data via SOC crosswalks
    - Overcomes some weaknesses of self-reported CPS wage data
    - Automatically adjusts for inflation

- Resulting index shows change in realized skill demand through *changes in occupation mix*
    - Adjust for new-hire demographics, but not within-occupation skill changes
        - compare with self-reported wages to understand differences
    - Also yields hire volume, and index for many subgroups

Summary of findings

1. Hourly wage index is up nearly 5 percent from 2005

New Hires Quality Index: Hourly Wages
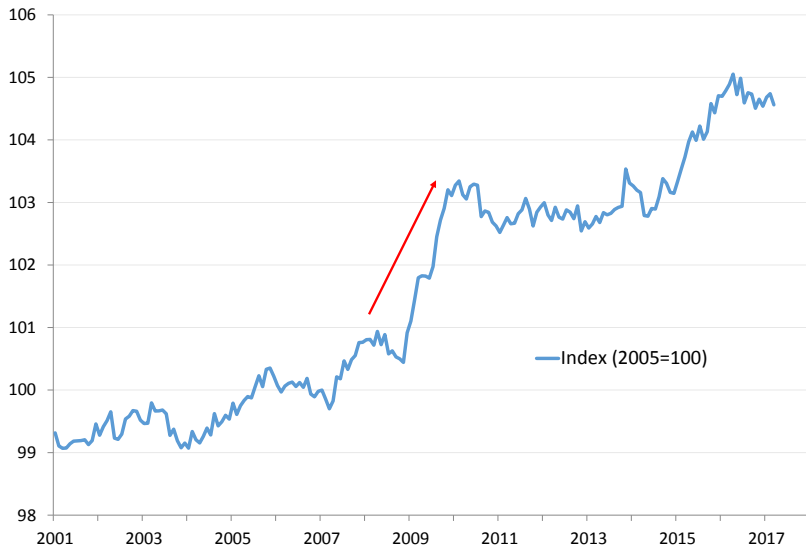

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

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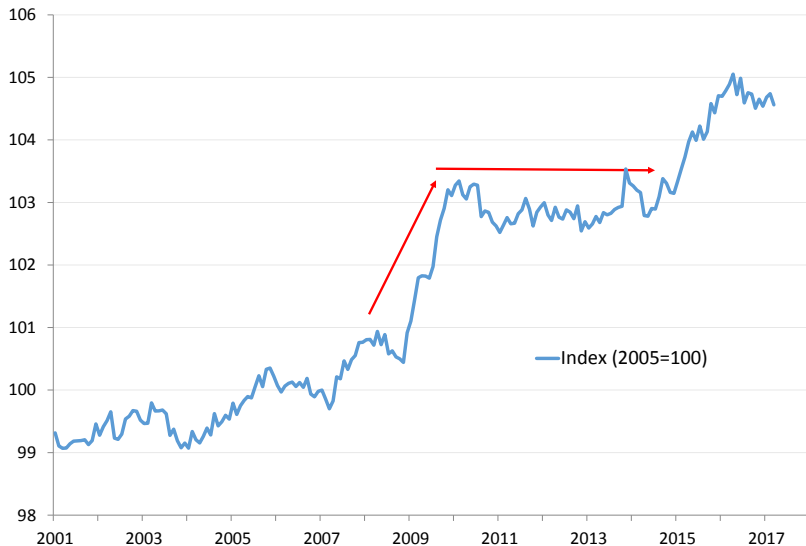
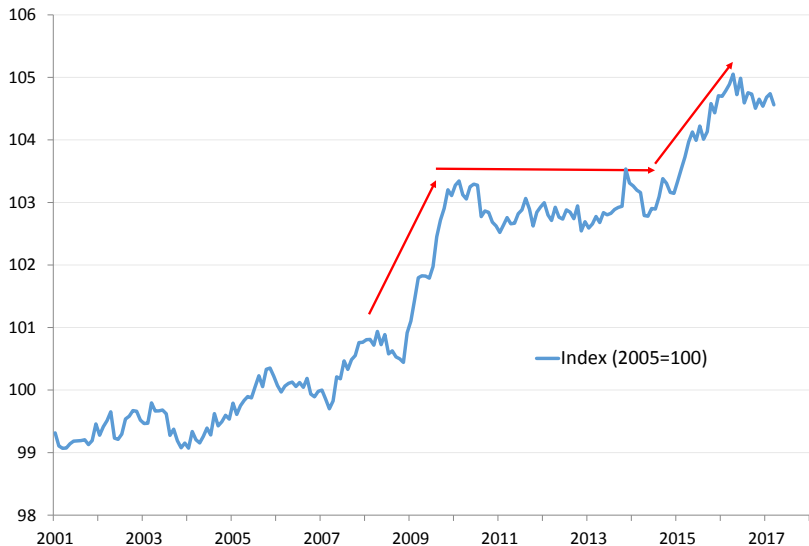# New Hires Quality Index: Hourly Wages

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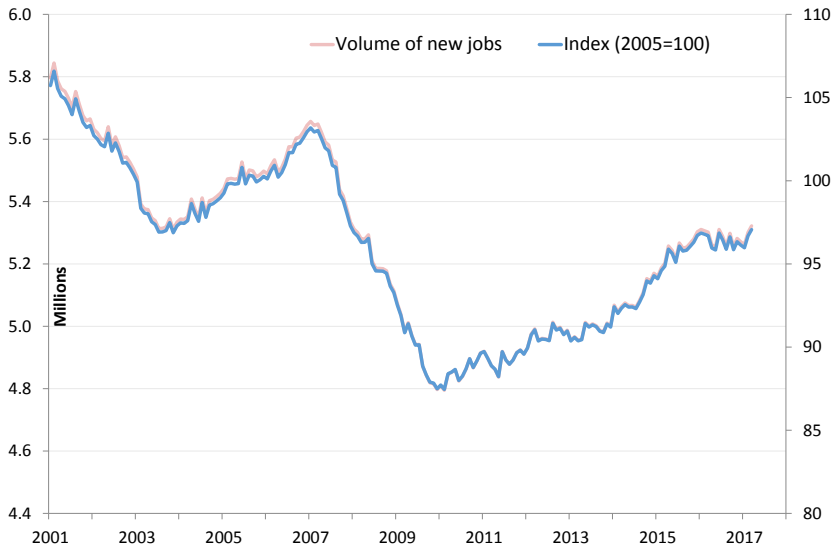SOURCE: Upjohn Institute New Hires Quality Index
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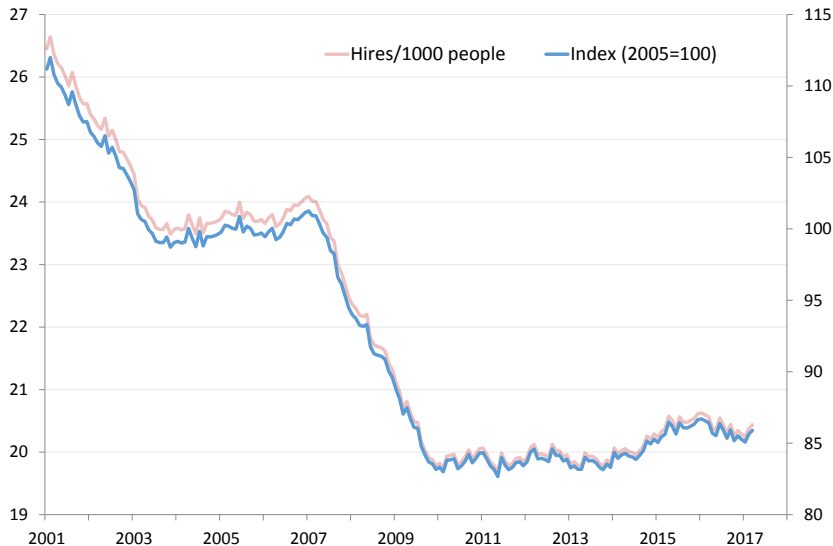
New Hires Quality Index: Monthly Volume

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

New Hires Quality Index: Monthly Wage Bill

SOURCE: Upjohn Institute New Hires Quality Index
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New Hires Quality Index: Hires per capita

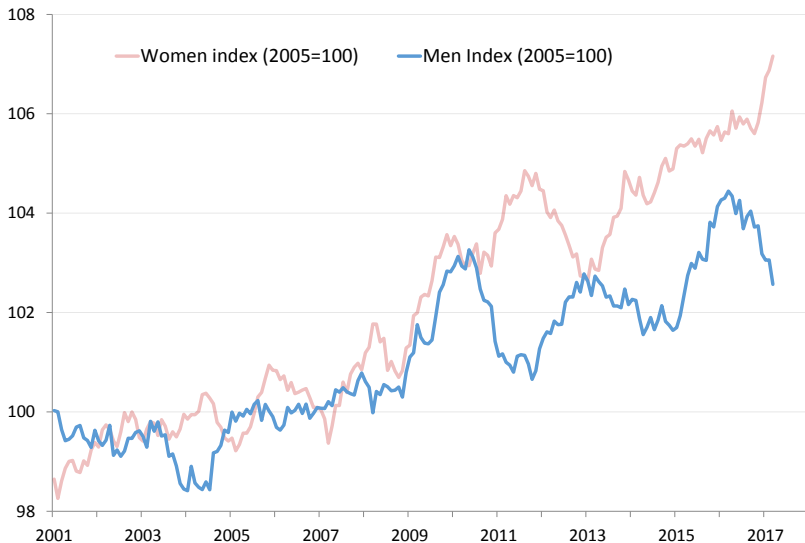SOURCE: Upjohn Institute New Hires Quality Index
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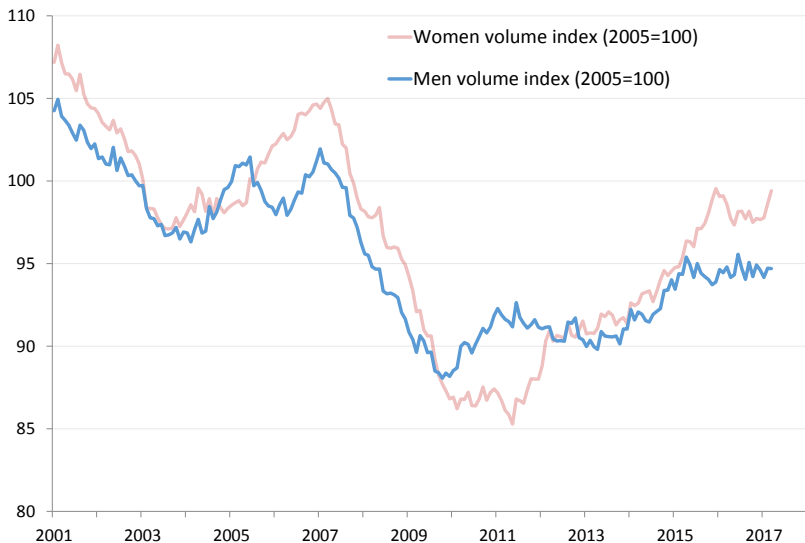
New Hires Quality Index: Women and Men

Women index (2005=100)   Men Index (2005=100)

SOURCE: Upjohn Institute New Hires Quality Index
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New Hires Quality Index: Women and Men, volume

Women volume index (2005=100)

Men volume index (2005=100)

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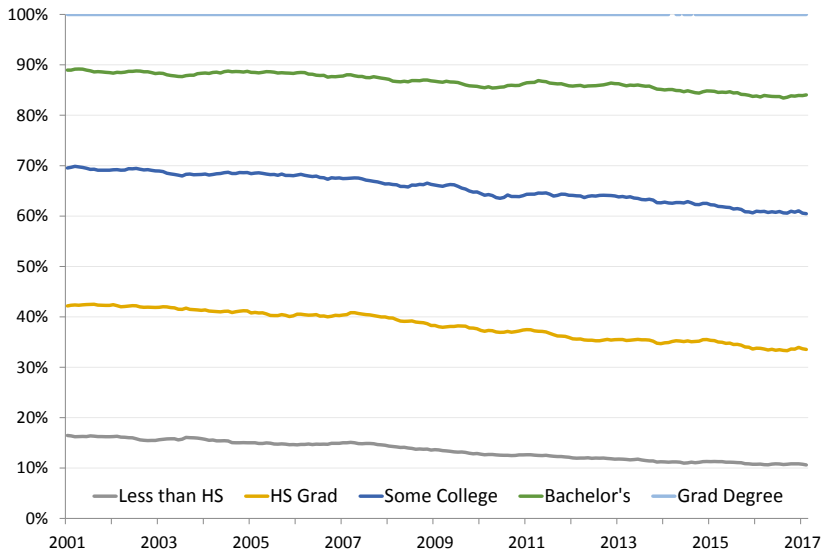# New Hires Quality Index: Volume by education
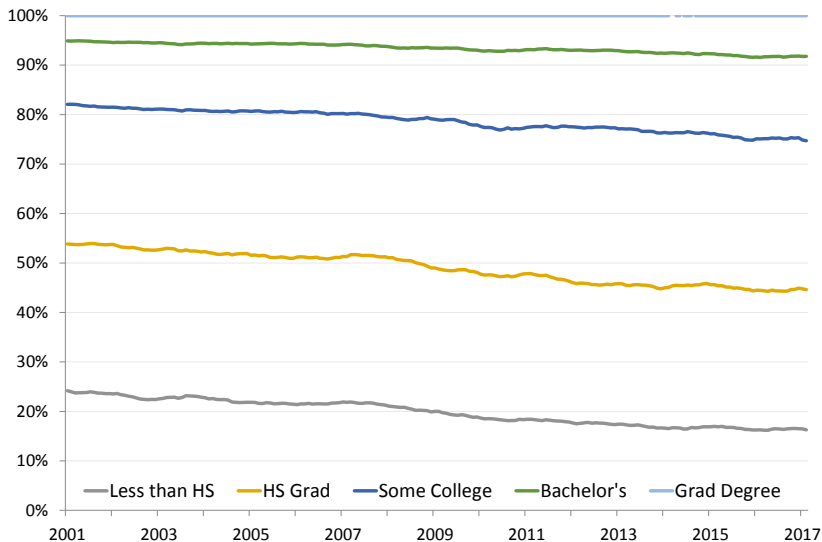
SOURCE: Upjohn Institute New Hires Quality Index
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New Hires Quality Index: Wage bill by education

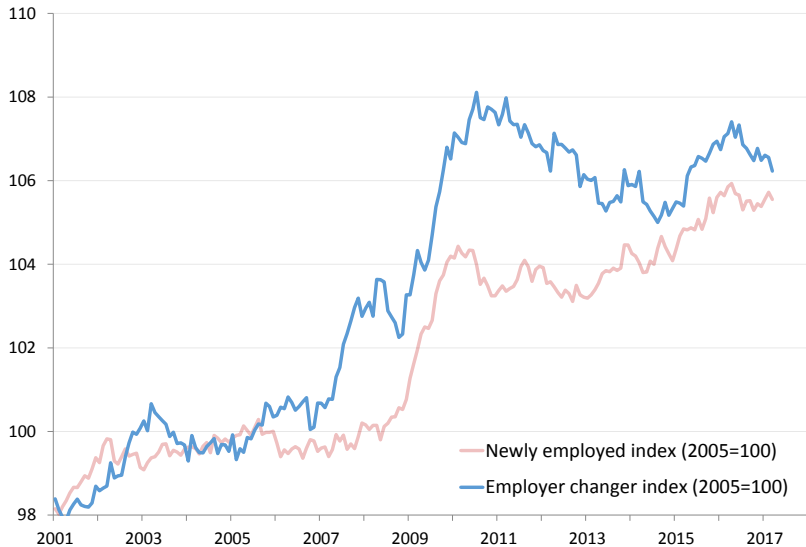SOURCE: Upjohn Institute New Hires Quality Index
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6. Wage index gains have been comparable for newly employed and employer changers, but volume growth of former vastly outpaces that of latter

New Hires Quality Index: Index by Hire Type

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

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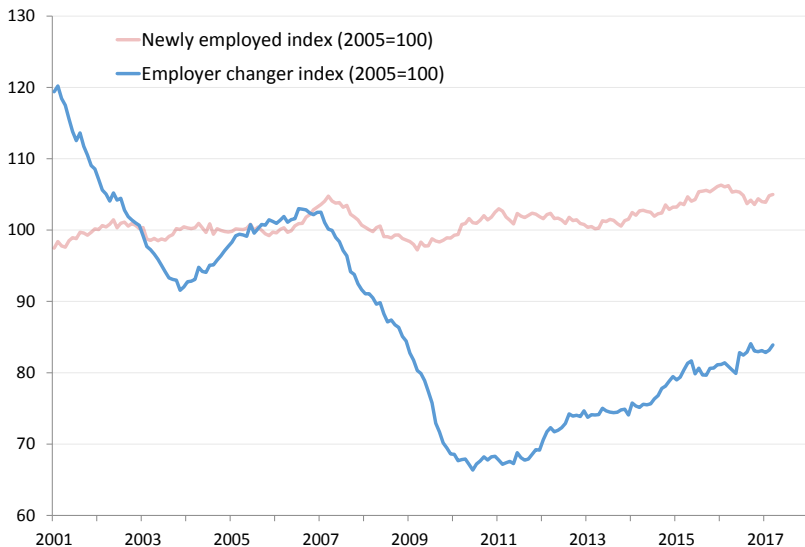
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Outline

1 Methodology

2 Robustness

3 What about actual reported wages?

4 Subgroups

5 Conclusions

Methodology: CPS1

- Longitudinally link CPS (adult civilian) respondents in adjacent months (Madrian and Lefgren 2000)

- In theory, can do this for $\frac{3}{4}$ of sample (rotation groups 1–3 and 5–7)

- Will necessarily miss individuals who leave the household or move (or die)
  - Drew, Flood, and Warren (2014) show match rates of 95% of theoretical max
  - 96% successful links; 1 pp don't match age/race/sex

- Still, will check SIPP(?) to gauge magnitude of new hires who change residences
  - Probably positively selected...

Methodology: CPS2

- How to identify new hires (excluding self-employed)?

- For NE $\rightarrow$ E transitions, straightforward to observe change from unemployed/NILF to employed using labor recode

- For E $\rightarrow$ E new job transitions, exploit post-1994 variable (puiodp1) on whether employer is same as last month's

  - Will not count occupation changes with same employer (ignore internal labor market); too arbitrary and problematically measured

- Weighted aggregates compare reasonably well with JOLTS, but less cyclical

  - Conceptual differences, and JOLTS undercounts relative to QWI

CPS New Hires Volume vs JOLTS
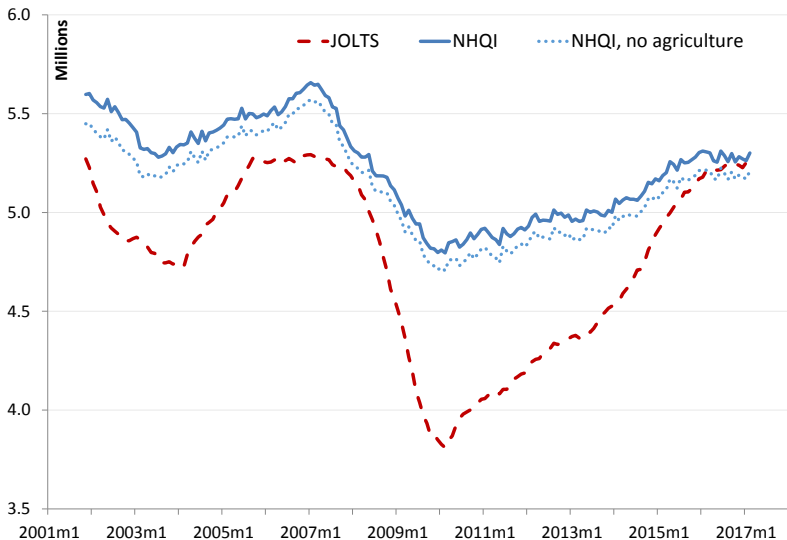
SOURCE: Upjohn Institute New Hires Quality Index; JOLTS (BLS)
NOTE: Both measures based on a 12-month lagged moving average of NSA monthly data

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- Weighted aggregates compare reasonably well with JOLTS, but less cyclical

- Simple correlation is 0.92, and some conceptual differences in samples (reference period, unpaid leave, informal work)

Methodology: CPS3

- Need to harmonize occupation codes over time
  - From 1994 through 2002 $\rightarrow$ 1990 Census codes
  - From 2003 through 2010 $\rightarrow$ 2000 Census codes
  - From 2011 to current $\rightarrow$ 2010 Census codes

- Goal is to map to 2010 SOC codes (what OES now uses)

- For 2010 Census codes, Census crosswalk maps 532 occ codes to 532 SOC codes (out of 820)
  - Occ codes are coarser than SOCs, so some occs maps to 4- or 5-digit SOCs

- The 2011 $\rightarrow$ period is straightforward...

Methodology: CPS4

- For 2000 Census codes, IPUMS crosswalk maps 505 occ codes to 505 SOC codes (out of 801)

  - Again, occ codes are coarser than SOCs, so some occs maps to 4- or 5-digit SOCs

- But need to map 2000 SOCS $\rightarrow$ 2010 SOCS

  - Some simple 1:1 recodes or combinations, but also several splits

  - For splits, randomly assign based on empirical shares from ACS over 2010–2012

- These adjustments are minor, as most splits are into similarly paid occupations

  - Many splits into same 5-digit SOC, a few into same 4-digit SOC

Methodology: CPS5

- For pre-2003 period (1990 Census codes), crosswalking is a problem

- 1990 to 2000 change was very significant, reflected evolution to service-based economy
  - Census "crosswalks" show almost every occupation split into others in *both* directions

- IPUMS provides crosswalk between 1990 and 2010 occ codes
  - But it uses majority-split rule, not stochastic assignment
  - As a result, 499 1990 occ codes are mapped to only 352 2010 occ codes

- Partial solution: CPS extracts
  - BLS-released 2000–2002 files with 2000 Census codes

- Thus, focus on 2000 $\rightarrow$ period

- Also need to harmonize industries, but only at 2-digit level

- Much easier than trying detailed NAICS crosswalk

- Census industry codes map into 3-digit NAICS easily in 2003 $\rightarrow$ period

- In pre-2003 period, mapping isn't exact, but still quite good
  - And CPS extracts solve 2000–2002 period

Methodology: OES

- Occupational Employment Statistics (OES) provides annual occupation-level wage data
  - At national level, available at cross of 6-digit SOC and 2-6 digit NAICS
  - Also available at MSA, state, and some state-industry levels

- Provides wage distribution (hourly or annual) at key quantiles and mean

- Merge 25th percentile occupational wages using SOC to CPS new hires
  - This quantile better approximates wages of new hires

- Merge on 6-digit SOC by 2-digit NAICS
  - Hierarchical process; use coarser SOCs for unsuccessful matches

Methodology: Demographic Adjustment

- Assigning wages by occupation means wages will be the same for a 20-year-old LPN on her first job as for a 35-year-old LPN switching hospitals

- Desirable to adjust for these types of demographic differences in new hires, within occupation

- Use data on actual, valid self-reported (log hourly) wages to estimate adjustment factors

  - 1st: regress wages on non-demographics (time, worker type, hire type, occupation, industry)

  - 2nd: regress residuals, separately by 4-digit SOC, on sex, race, education, and quartic in age

  - 3rd: Use predicted values to adjust OES wages

Process

- Calculate means, overall and for subgroups, each month

- To smooth out noise and seasonals, take 12-month lagged moving average
  - Straightforward, intutive, and easy to implement
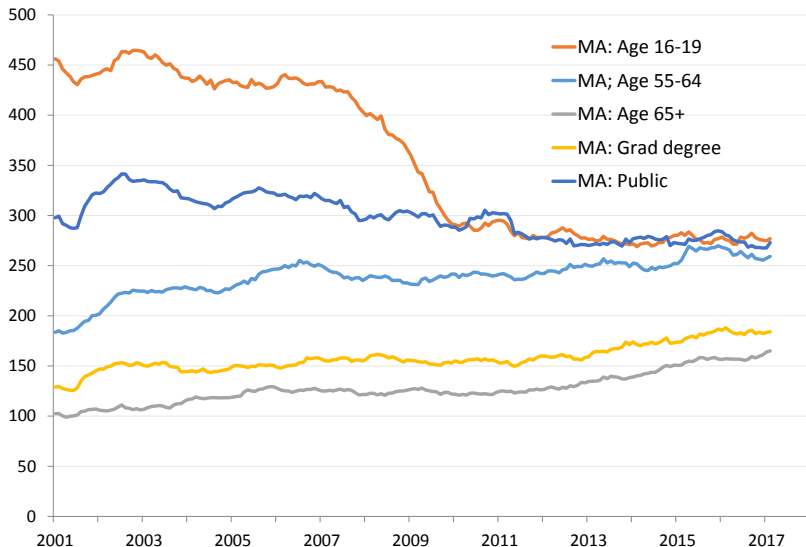 - Generally yields results similar to X-13 ARIMA SA process or HP filter

New Hires Quality Index: Sample Size Over Time

SOURCE: Upjohn Institute New Hires Quality Index; CPS
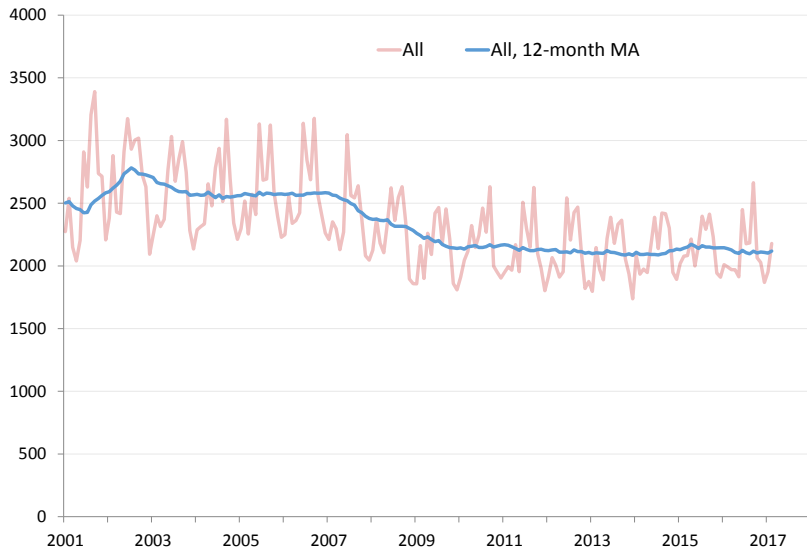
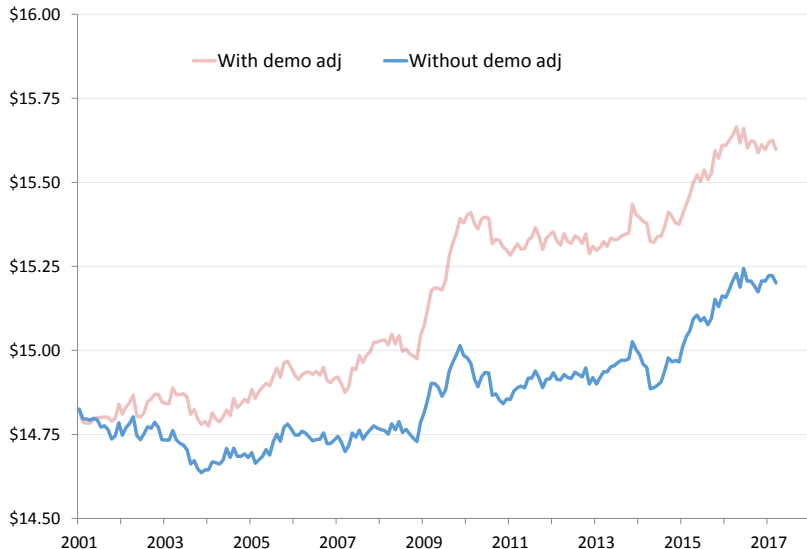SOURCE: Upjohn Institute New Hires Quality Index; CPS

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- Taking means weights right-tail occupations more heavily
  - Could look at quantiles, too

Robustness: Demographic adjustment

- Adjustment is mostly a level shift up, overall, and again after recession

    - Hires in highly paid occupations are older and more educated

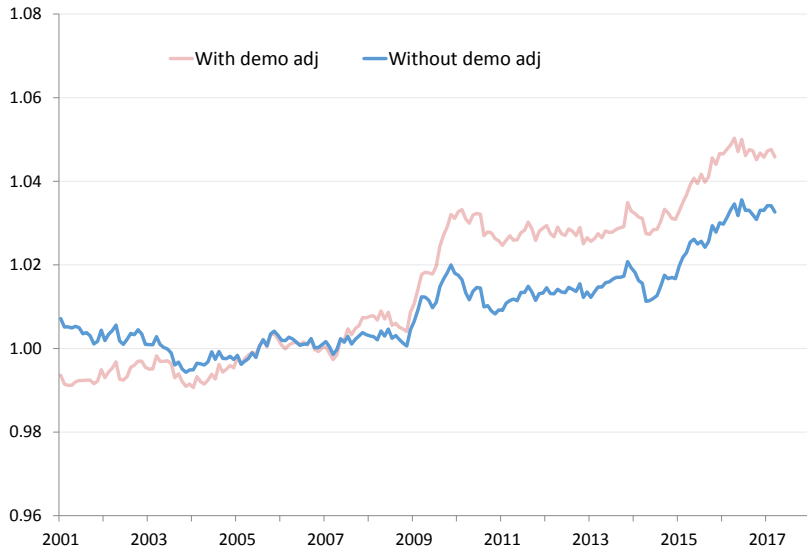   - Also permanent(?) shift in hiring demographics after GR (Hershbein and Kahn 2017)

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

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Robustness: Robust to Demographic Adjustment

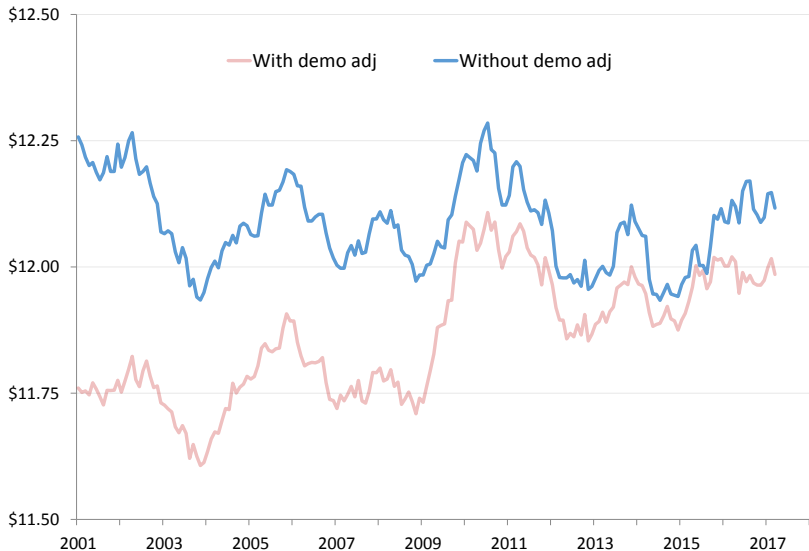SOURCE: Upjohn Institute New Hires Quality Index
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Robustness: Median vs Mean

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- Can also take *median* instead of mean of new hires

  - Without demo adjustment, not very interesting...

  - Captures **only** change in median occupation hired

  - Even with demo adjustment, misses rest of distribution

Robustness: Median

Legend: With demo adj — Without demo adj

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Robustness: Quantiles

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- Growth is concentrated in right-tail occupations

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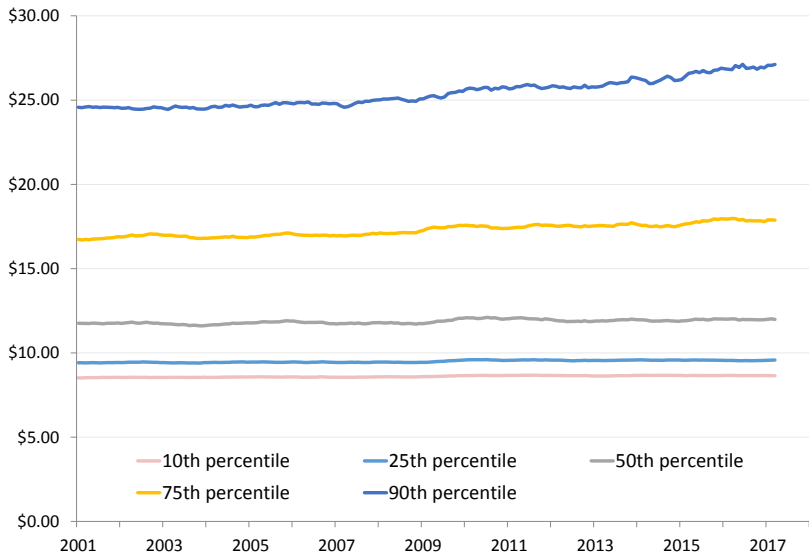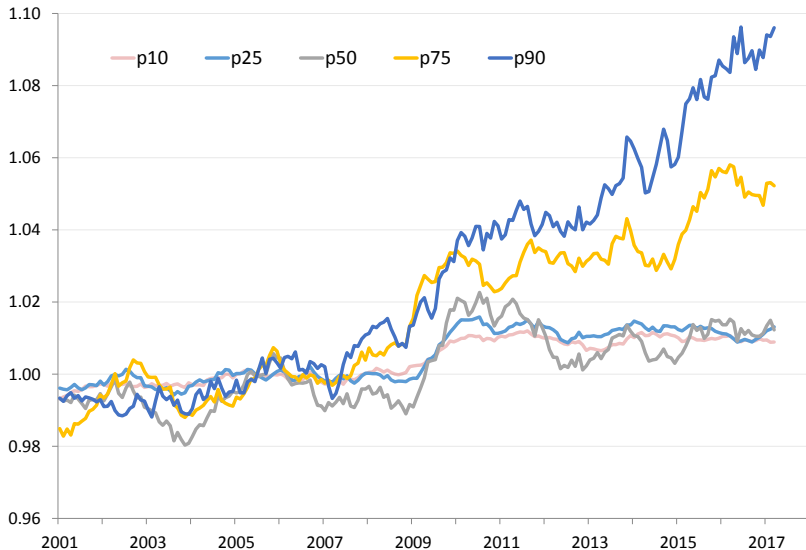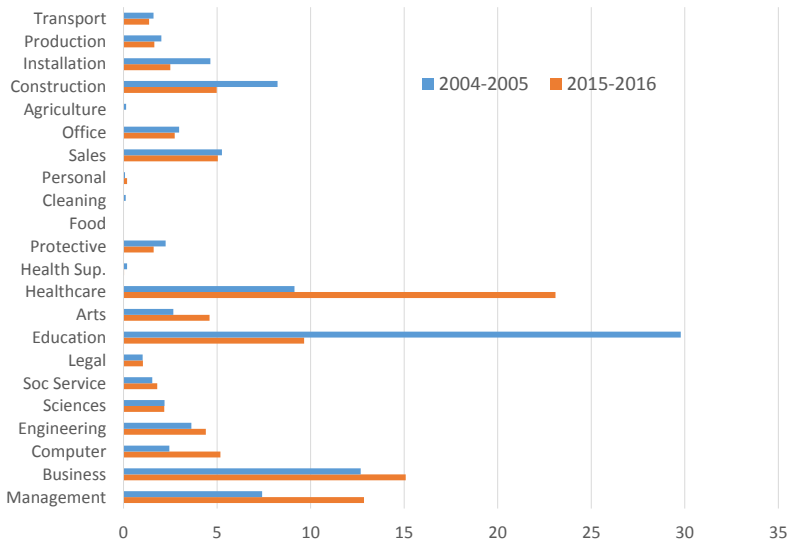

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Robustness: Quantiles (Index: 2005=1)

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Occupational Distribution at 90th percentile

SOURCE: Upjohn Institute New Hires Quality Index; CPS
NOTE: Data are for 89th–91st percentile of wage index for years shown.

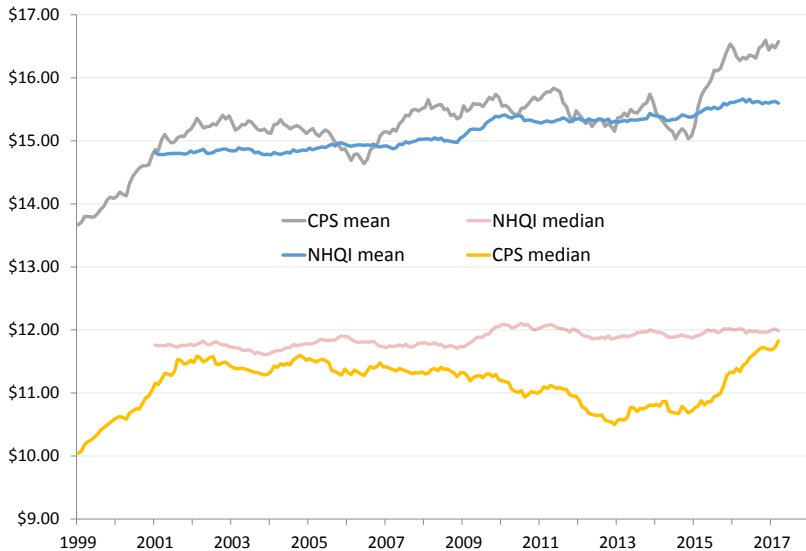W.E. UPJOHN INSTITUTE
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What about self-reported wages?

- Individuals report hourly (weekly) wages in ORG months... and consistent since 1994... why not use them?

- Three issues:

1. Much smaller sample size: ORG restriction cuts to $1/4$ size, from about 2,500 to 625 per month

2. Growing imputation problem: Imputed share of wages rises from $1/4$ in 1998 to $2/5$ by 2016, lowering sample size to ≈ 400 today

3. Composition and selection: Imputation may cause valid wages to cover different population than all new hires

- But also conceptual difference: Xs vs. βs

What about self-reported wages?

- Reduced sample sizes, when averaged, sufficient for index...
  - ... but not so much for subgroups
  - ... and overall index still volatile, even when averaged

NHQI and CPS self-reports

SOURCE: Upjohn Institute New Hires Quality Index; CPS
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NHQI and CPS self-reports (2005=1)
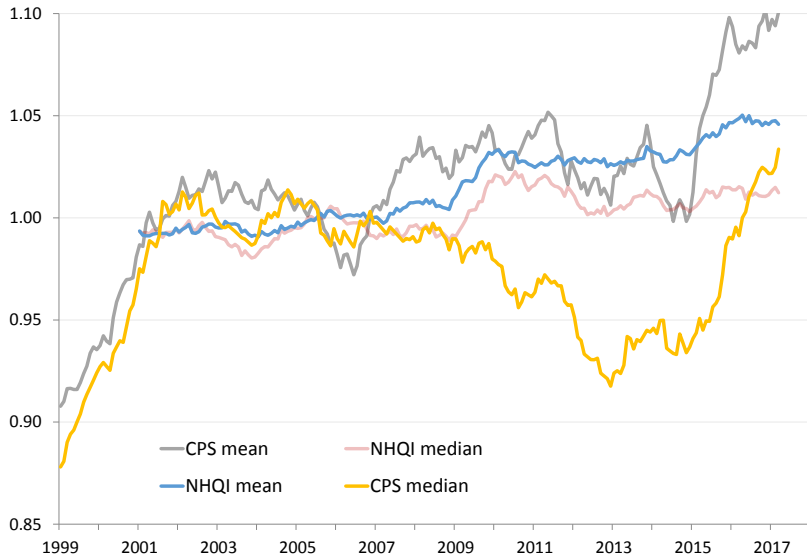

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- Strong real wage growth before 2002 (well known) and over 2015–2016 (not well known)

- Wages flat or falling even as positive occupation shift during GR

- Ocular evidence suggests roles for within-occupation and cross-occupation change at different times
  - But need to address composition bias

Composition Bias: All new hires and valid wages

	1999			2007			2016		
	All	Wage	Diff	All	Wage	Diff	All	Wage	Diff
Age	33.4	32.4	**−1.1**	35.2	34.0	**−1.2**	36.9	35.6	**−1.3**
Race									
White	0.682	0.695	**0.012**	0.628	0.651	**0.024**	0.572	0.588	**0.016**
Black	0.137	0.123	**−0.014**	0.130	0.108	**−0.023**	0.140	0.119	**−0.021**
Asian	0.038	0.036	−0.002	0.047	0.042	−0.005	0.058	0.056	−0.002
Hispanic	0.134	0.137	0.003	0.175	0.177	0.002	0.205	0.209	0.005
Education									
< HS	0.242	0.252	0.010	0.212	0.219	0.006	0.165	0.163	−0.002
HS grad	0.307	0.297	−0.010	0.300	0.296	−0.004	0.284	0.278	−0.006
Some college	0.279	0.291	**0.012****	0.282	0.281	−0.002	0.304	0.318	0.014
Bachelor's	0.124	0.116	**−0.008****	0.143	0.142	−0.001	0.165	0.162	−0.003
Grad degree	0.047	0.044	−0.003	0.062	0.062	0.000	0.082	0.079	−0.003
Sector									
Goods	0.214	0.209	−0.005	0.194	0.194	−0.000	0.167	0.156	−0.010
Services	0.786	0.791	0.005	0.806	0.806	0.000	0.833	0.843	0.010
Hire type									
Newly employed	0.581	0.560	**−0.021**	0.646	0.614	**−0.032**	0.675	0.617	**−0.058**
Change employer	0.419	0.440	**0.021**	0.354	0.386	**0.032**	0.325	0.383	**0.058**

SOURCE: Upjohn Institute New Hires Quality Index; CPS
NOTE: Wage index is based on a 12-month lagged moving average of monthly data
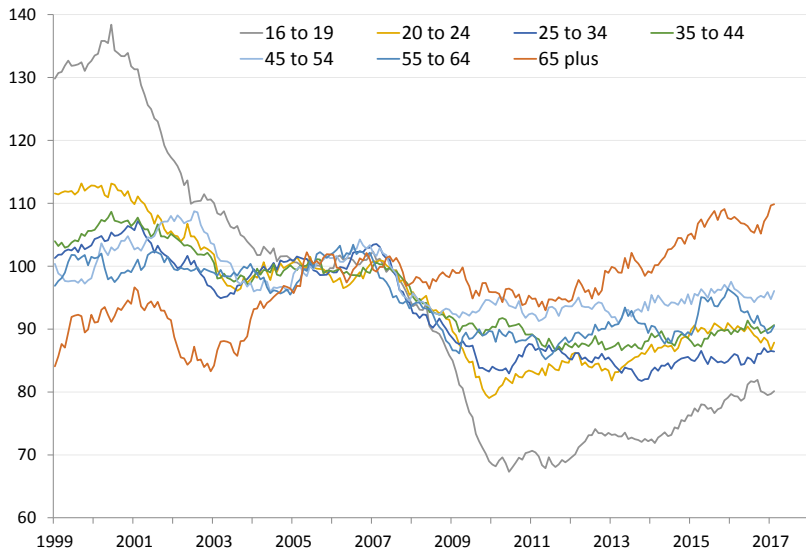
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Composition bias

- On most observables, seems small
  - Valid-wage sample is younger, less Black, and more E→E

- Tried reweighting valid wage sample to all new hires, but did not work well
  - Insufficient predictors

- Can back out expected bias (from observables)
  - Run (valid) wage regression on **X** and adjust for Δ**X**
  - Results imply about 1% negative bias, mostly from age
  - Adding occupation and industry to **X** increases bias slightly, to 2.7%
  - Stable over time, for offsetting reasons

Self-reported wages?

- Could potentially use for index
  - Bias is apparently small

- But n is too small for subgroups, even when averaging

- Tradeoff between simplicity and breadth of applicability

NHQI heterogenity

- Index is currently calculated for 26 subgroups
  - Sex, age, education, sector, region, hire type

- But could do for others:
  - Ethnicity, marital status, occupation or industry groups

- In each case, calculate level and index of wage, volume, and wage bill

- For age, also calculate per-capita volume
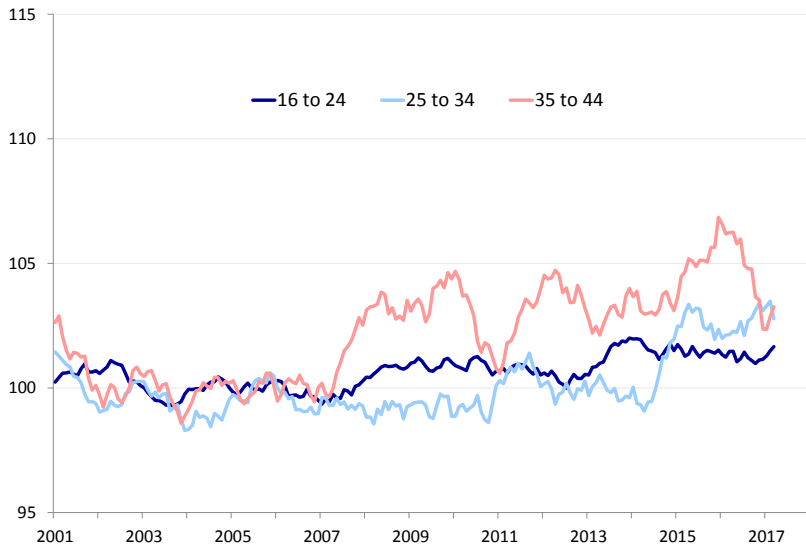
NHQI: Per-capita volume, by age (2005=100)

Upjohn Institute New Hires Quality Index
NOTE: Per-capita volume is based on a 12-month lagged moving average of monthly data

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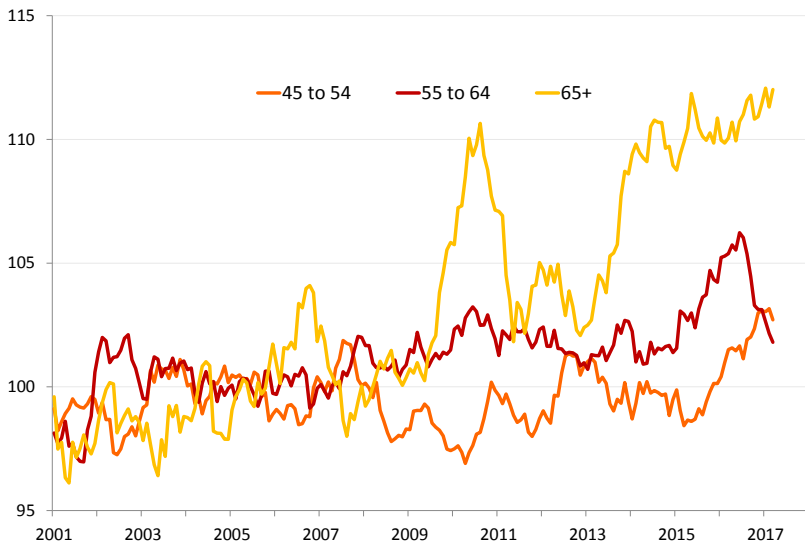
NHQI: Index, by age (2005=100)
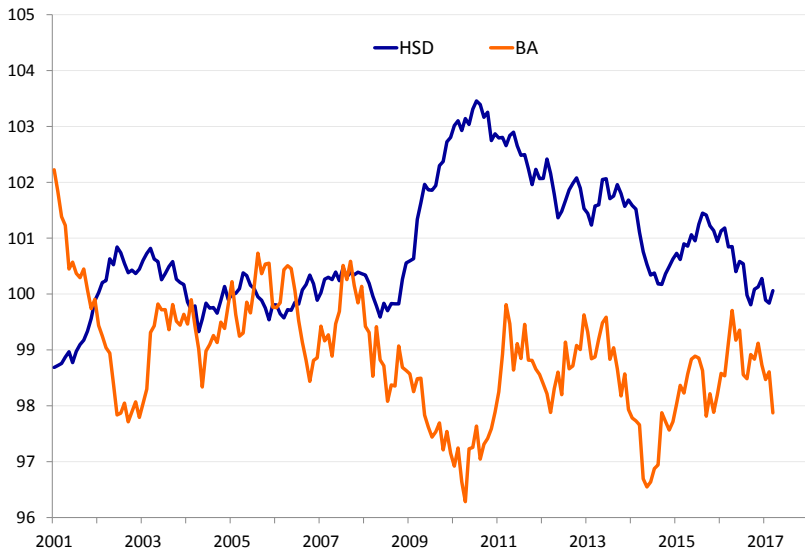

16 to 24 — 25 to 34 — 35 to 44

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

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NHQI: Index, by age (2005=100)

Legend: 45 to 54 — 55 to 64 — 65+

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

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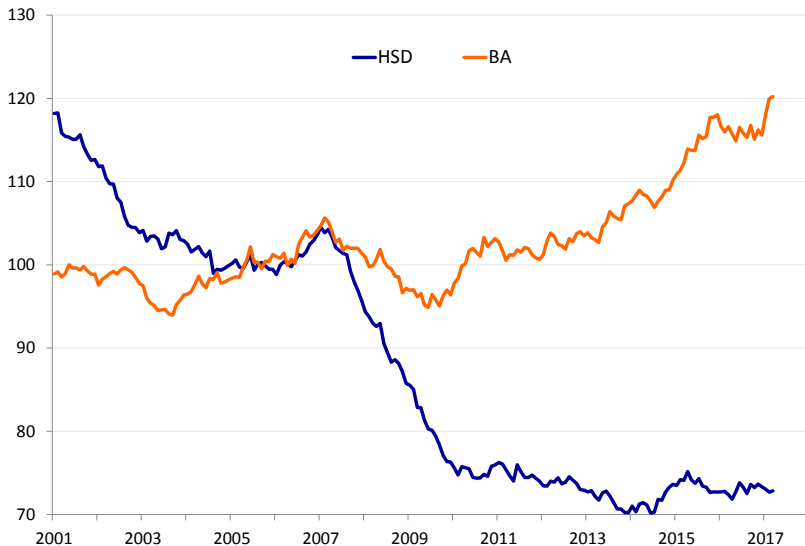FOR EMPLOYMENT RESEARCH

NHQI: Index, by education (2005=100)

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data

NHQI: Volume index, by education (2005=100)

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Volume index is based on a 12-month lagged moving average of monthly data

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Conclusion

- Monthly index of new hires is possible with CPS

- Can easily create metrics for volume, overall and for subgroups

- Hourly wage is also possible, with more caveats

  - OES-occupation wages allow matches for all new hires per month ($\rightarrow$ subgroup trends), but miss within-occupation changes and available only from 2001

  - Self-reported wages capture total wage change and available longer, but smaller sample sizes limit subgroups and stability

- Both measures show increases since 2005 and sharply since 2015, but demographics play a role