New Hires Quality Index

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A Quality Index for New Job Hires

Brad Hershbein

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Much timely (monthly) government data on number of new jobs

But by industry, not occupation or much else
Introduction

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  - But almost always for incumbents, not new hires
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- 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
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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)
Occupations vs. Industries

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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
Most jobs added in Boston since recession called low-paying

By Katie Johnston | GLOBE STAFF SEPTEMBER 22, 2015

Many of the job gains have come in low-paying sectors such as food service, home health care, and janitorial services, while higher-paying fields such as information services, have not grown as rapidly.

The ‘low-wage recovery’ is a myth

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).
Examples of New Hire “Job Quality” Lamp-post Inference

The Low-Wage Recovery:
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Upjohn Institute New Hires Quality Index (NHQI)

- New monthly index tracks “quality” of new job hires (2001 →)

- 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

- Also yields hire volume, and index for many subgroups
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- 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
Hourly wage index is up nearly 5 percent from 2005
SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data
Summary of findings

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

2. Occupational mix rose sharply during recession, was flat during recovery, and rose again from mid-2014 through 2015
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

2001 2003 2005 2007 2009 2011 2013 2015 2017
Index (2005=100)

SOURCES:
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New Hires Quality Index: Monthly Volume

Volume of new jobs
Index (2005=100)

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
NOTE: Wage index is based on a 12-month lagged moving average of monthly data.
New Hires Quality Index: Hires per capita

Source: Upjohn Institute New Hires Quality Index

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4. Women have had a stronger recovery than men
New Hires Quality Index: Women and Men

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

Women index (2005=100)  Men Index (2005=100)
New Hires Quality Index: Women and Men, volume

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Women volume index (2005=100)
Men volume index (2005=100)
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5. In 2005, college graduates accounted for one-fifth of all hires; in 2016, they accounted for one-fourth
New Hires Quality Index: Volume by education

Source: Upjohn Institute New Hires Quality Index

Note: Wage index is based on a 12-month lagged moving average of monthly data.

Graph showing the percentage of new hires by education level from 2001 to 2017. The education levels include Less than HS, HS Grad, Some College, Bachelor's, and Grad Degree. The y-axis represents the percentage, ranging from 0% to 100%, and the x-axis represents the years from 2001 to 2017.

The graph shows a general trend of a decrease in the percentage of new hires across all education levels from 2001 to 2017, with the percentage of new hires for Less than HS showing a slight increase in recent years.
New Hires Quality Index: Wage bill by education

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

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

2. Occupational mix rose sharply during recession, was flat during recovery, and rose again from mid-2014 through 2015.

3. Volume of new hires has not recovered; wage bill has just barely; hires/person not at all.

4. Women have had a stronger recovery than men.

5. In 2005, college graduates accounted for one-fifth of all hires; in 2016, they accounted for one-fourth.

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.
New Hires Quality Index: Volume by Hire Type

SOURCE: Upjohn Institute New Hires Quality Index
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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)
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  - 96% successful links; 1 pp don’t match age/race/sex
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- Still, will check SIPP(?) to gauge magnitude of new hires who change residences
  - Probably positively selected...
Methodology: CPS2

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

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- 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 → 1990 Census codes
  - From 2003 through 2010 → 2000 Census codes
  - From 2011 to current → 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

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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

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: CPS4

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- 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
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- Thus, focus on 2000 → period
• Also need to harmonize industries, but only at 2-digit level
Methodology: CPS6

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- Much easier than trying detailed NAICS crosswalk

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

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

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  - At national level, available at cross of 6-digit SOC and 2-6 digit NAICS
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- 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
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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.
Methodology: Demographic Adjustment

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

1. Regress wages on non-demographics (time, worker type, hire type, occupation, industry).
2. Regress residuals, separately by 4-digit SOC, on sex, race, education, and quartic in age.
3. Use predicted values to adjust OES wages.
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.
  1. 1st: regress wages on non-demographics (time, worker type, hire type, occupation, industry).
  2. 2nd: regress residuals, separately by 4-digit SOC, on sex, race, education, and quartic in age.
  3. 3rd: Use predicted values to adjust OES wages.
- Calculate means, overall and for subgroups, each month

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

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New Hires Quality Index: Sample Size Over Time

Source: Upjohn Institute New Hires Quality Index; CPS
New Hires Quality Index: Sample Size, by group

SOURCE: Upjohn Institute New Hires Quality Index; CPS
Process

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  - Straightforward, intuitive, and easy to implement
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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)
NHQI: Robust to Demographic Adjustment

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

SOURCE: Upjohn Institute New Hires Quality Index
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With demo adj
Without demo adj

2001 2003 2005 2007 2009 2011 2013 2015 2017
Robustness: Median vs Mean

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Can also take \textit{median} instead of mean of new hires:

- Without demo adjustment, not very interesting...
- Captures \textbf{only} change in median occupation hired.
- Even with demo adjustment, misses rest of distribution.
Robustness: Median

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

$11.50
$11.75
$12.00
$12.25
$12.50
2001 2003 2005 2007 2009 2011 2013 2015 2017
With demo adj Without demo adj
Robustness: Quantiles

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  - Hires in highly paid occupations are older and more educated
  - Also permanent(?) shift in hiring demographics after GR (Hershbein and Kahn 2017)

- 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

- Growth is concentrated in right-tail occupations
Robustness: Quantiles

SOURCE: Upjohn Institute New Hires Quality Index
NOTE: Wage index is based on a 12-month lagged moving average of monthly data
Robustness: Quantiles (Index: 2005=1)

Source: Upjohn Institute New Hires Quality Index

Note: Wage index is based on a 12-month lagged moving average of monthly data

0.96
0.98
1.00
1.02
1.04
1.06
1.08
1.10
2001 2003 2005 2007 2009 2011 2013 2015 2017

p10 p25 p50 p75 p90
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.

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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?

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

- Growing imputation problem: Imputed share of wages rises from 1/4 in 1998 to 2/5 by 2016, lowering sample size to \( \approx 400 \) today

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

But also conceptual difference: \( X_s \) vs. \( \beta_s \)
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- 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 \(\approx 400\) today
  3. Composition and selection: Imputation may cause valid wages to cover different population than all new hires
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- But also conceptual difference: Xs vs. \( \beta s \)
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
NOTE: Wage index is based on a 12-month lagged moving average of monthly data
NHQI and CPS self-reports (2005=1)

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- 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

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2007</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Wage</td>
<td>Diff</td>
</tr>
<tr>
<td>Age</td>
<td>33.4</td>
<td>32.4</td>
<td><strong>−1.1</strong></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0.682</td>
<td>0.695</td>
<td><strong>0.012</strong></td>
</tr>
<tr>
<td>Black</td>
<td>0.137</td>
<td>0.123</td>
<td><strong>−0.014</strong></td>
</tr>
<tr>
<td>Asian</td>
<td>0.038</td>
<td>0.036</td>
<td><strong>−0.002</strong></td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.134</td>
<td>0.137</td>
<td><strong>0.003</strong></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; HS</td>
<td>0.242</td>
<td>0.252</td>
<td><strong>0.010</strong></td>
</tr>
<tr>
<td>HS grad</td>
<td>0.307</td>
<td>0.297</td>
<td><strong>−0.010</strong></td>
</tr>
<tr>
<td>Some college</td>
<td>0.279</td>
<td>0.291</td>
<td><strong>0.012</strong>** * *</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>0.124</td>
<td>0.116</td>
<td><strong>−0.008</strong>** * *</td>
</tr>
<tr>
<td>Grad degree</td>
<td>0.047</td>
<td>0.044</td>
<td><strong>−0.003</strong></td>
</tr>
<tr>
<td>Sector</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Goods</td>
<td>0.214</td>
<td>0.209</td>
<td><strong>−0.005</strong></td>
</tr>
<tr>
<td>Services</td>
<td>0.786</td>
<td>0.791</td>
<td><strong>0.005</strong></td>
</tr>
<tr>
<td>Hire type</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Newly employed</td>
<td>0.581</td>
<td>0.560</td>
<td><strong>−0.021</strong></td>
</tr>
<tr>
<td>Change employer</td>
<td>0.419</td>
<td>0.440</td>
<td><strong>0.021</strong></td>
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</tbody>
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**SOURCE:** Upjohn Institute New Hires Quality Index; CPS

**NOTE:** Wage index is based on a 12-month lagged moving average of monthly data
Composition bias

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

- Insufficient predictors
  - Can back out expected bias (from observables)
  - Run (valid) wage regression on $X$ and adjust for $\Delta X$
  - Results imply about 1% negative bias, mostly from age
  - Adding occupation and industry to $X$ increases bias slightly, to 2.7%
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Hershbein New Hires Quality Index 58/66
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- Tradeoff between simplicity and breadth of applicability
NHQI heterogeneity

- 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
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NHQI: Per-capita volume, by age (2005=100)

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NOTE: Per-capita volume is based on a 12-month lagged moving average of monthly data.
NHQI: Index, by age (2005=100)

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NHQI: Index, by education (2005=100)

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

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NOTE: Volume index is based on a 12-month lagged moving average of monthly data

2001 2003 2005 2007 2009 2011 2013 2015 2017
HSD BA

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

- Monthly index of new hires is possible with CPS
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Both measures show increases since 2005 and sharply since 2015, but demographics play a role