

# Labor Market Data

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“Nothing exists until it is measured.” - Niels Bohr

# US Data

- **Labor Force Stats & Wages**

- Current Population Survey (CPS) [link](#)
- National Longitudinal Survey of Youth 1979& 1997 (NLSY79, NLSY97) [link](#)
- Panel Study of Income Dynamics (PSID) [link](#)
- Survey of Income and Program Participation (SIPP) [link](#)

- **Job Search Information**

- American Time Use Survey (ATUS) [link](#)
- Survey of Consumer Expectations, Main & Labor Market Supplement (SCE) [link](#)

# US Data

- **Occupational Tasks**
  - O\*Net [link](#)
- **Vacancy Data**
  - Job Openings and Labor Turnover Survey (JOLTS) [link](#)
  - Burning Glass Technologies (\$\$\$)
  - Various (sometimes pricey) job board data sets

# European Data

- **Labor Market & Wages**
  - UK Labour Force Survey [link](#)
  - Eurostat [link](#)
    - Microdata: public use files (PUF) and scientific use files (SUF) [link](#)
    - summary stats available online
  - German Socio-Economic Panel (SOEP) [link](#)

# European Data

- **Job Search Information**

- UK Time Use Survey [link](#)
- Harmonized European Time Use Survey [link](#)

- **Vacancy Data**

- Job Vacancy Rate (Eurostat) [link](#)

# Current Population Survey

- **Getting the data:** use **IPUMS** for assignment
  - full micro files at **Census**
- **Basic Monthly**
  - Sample is at the address level
  - All people living at the address are in the sample
  - Called 4 months in a row (“in”)
  - Not called for 8 months (“out”)
  - Called for 4 months (“in”)
  - Out forever

# Current Population Survey

- **Outgoing Rotation Group**

- Addresses in the 4th month of begin “in”
- Asked more specific questions about work
  - wages
  - hours

- **March Supplement**

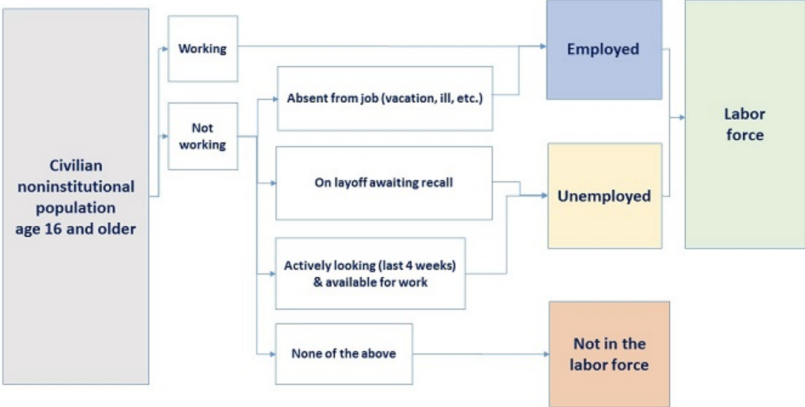
- All addresses that are “in” in March
- Asked about all income sources of previous calendar year



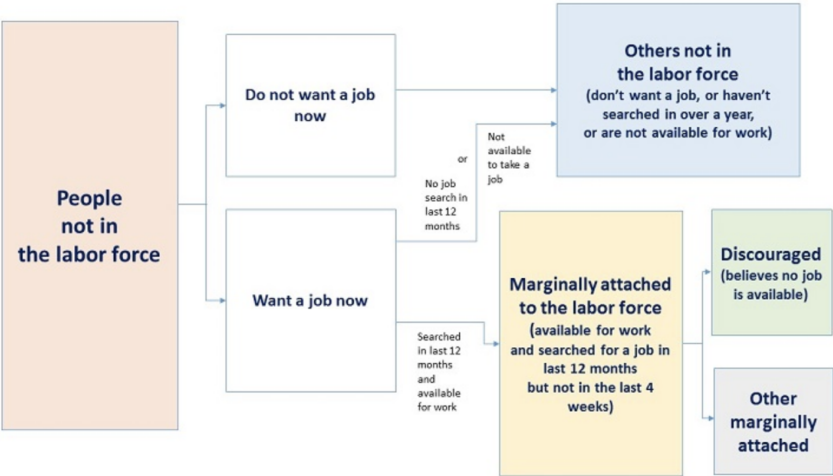
# Current Population Survey

- Labor Market Status
  - Employed: working for pay
  - Unemployed: one active effort to find job in past 4 weeks & available to work
    - going to an interview, filling out job applications, going to employment agency, asking friends and relatives, ect..
  - Out of the Labor Force: everyone else
    - discouraged workers
    - marginally attached
- Definition of unemployment is standard across OECD countries

# Current Population Survey



# Current Population Survey

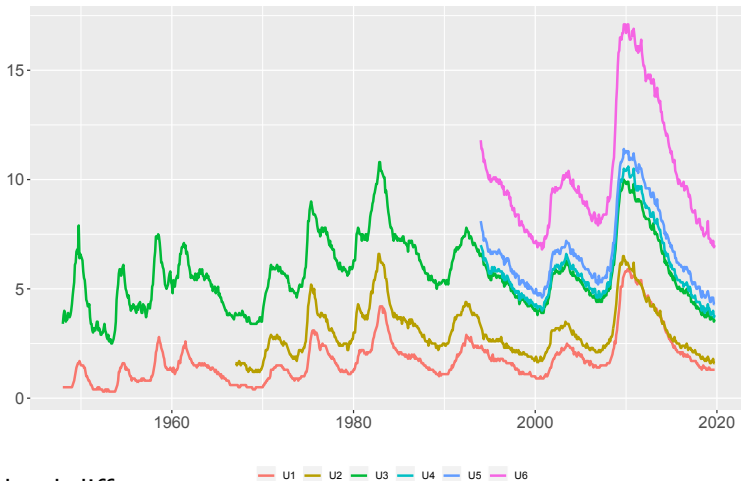


# How Is Unemployment Measured?

- U1: unemployed for at least 15 weeks
- U2: unemployed b/c lost job or end of temp job
- U3: standard unemployment rate (all unemployed)
- U4: U3 + discouraged workers
- U5: U4 + marginally attached
- U6: U5 + working part time for economic reasons

# How Is Unemployment Measured?

## US Unemployment Rates



- level differences
- cyclical properties are similar

# How are Flows Measured?

- **Cross-sectional method:**
  - use data on total unemployment, employment and short term unemployment each month
  - ignores movement into and out of labor force
- **Pannel approach:**
  - use observations of individuals over consecutive months
  - includes movements into and out of the labor force
- See Shimer (2012)

## Cross-sectional method

- Data is observed only over discrete time intervals  $[t, t + 1)$ 
  - $F_t$ : job finding probability during period  $t$ ,  $F_t = 1 - e^{-f_t}$
  - $X_t$ : emp. exit probability during period  $t$ ,  $X_t = 1 - e^{-\chi_t}$
  - $u_t$ : total unemployed in period  $t$
  - $u_t^s$ : total short term ( $< 4$  weeks) unemployed in period  $t$

## Cross-sectional method

- First find the job finding probability and rate

$$u_{t+1} = (1 - F_t)u_t + u_{t+1}^s$$

$$F_t = 1 - \frac{u_{t+1} - u_{t+1}^s}{u_t}$$

$$f_t = -\log(1 - F_t)$$

- Then find the emp. exit rate and probability

$$u_{t+1} = \frac{(1 - e^{-f_t - \chi_t})\chi_t}{f_t + \chi_t}(u_t + e_t) + e^{-f_t - \chi_t}u_t$$

$$\chi_t = 1 - e^{-\lambda t}$$



# Pannel Method

- Can match individuals in households over months in CPS
  - maximum of 3/4 of sample matched each month
  - reality: 2/3 of sample matched
- Potentially up to 4 months
- Can track changes in labor force status
  - E: employed
  - U: unemployed
  - O: out of the labor force

## Pannel Method

- $UE_t$ : total number observed in U at  $t - 1$  and E at  $t$
- $P_t^{UE}$ : Probability of moving from unemp. to emp.

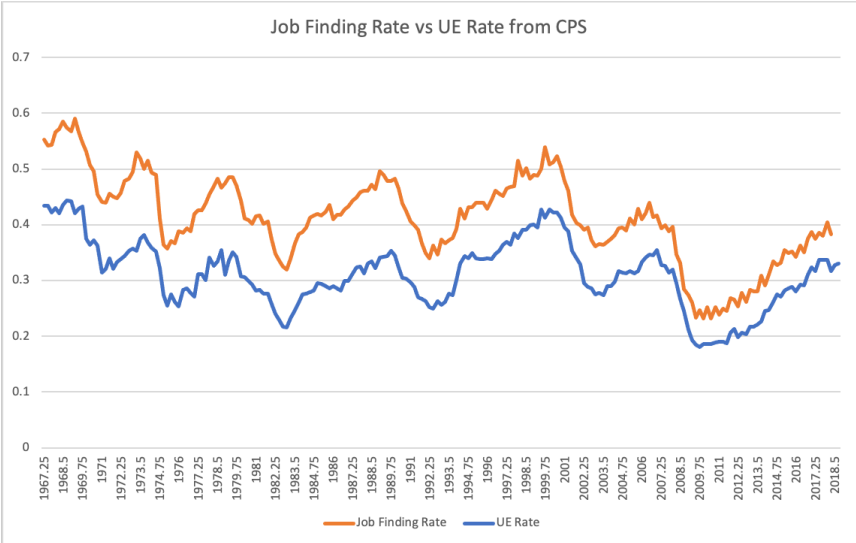
$$P_t^{UE} = \frac{UE_t}{UE_t + UU_t + UO_t}$$

- Can do this for all pairs to get transition probability matrix

$$\begin{bmatrix} P_t^{EE} & P_t^{EU} & P_t^{EO} \\ P_t^{UE} & P_t^{UU} & P_t^{UO} \\ P_t^{OE} & P_t^{OU} & P_t^{OO} \end{bmatrix}$$

- See Shimer (2012) to get continuous time rates

# Cross Sectional vs Pannel Method



# Measurement Error in Labor Force Status

- Reinterview Surveys (stopped in the 90's), Abowd & Zellner (1985), Poterba & Summers (1986)

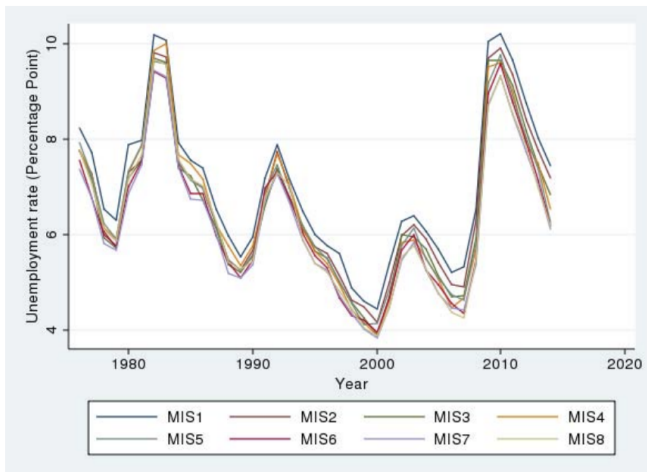
Abowd and Zellner (1985) estimates of classification errors (%).

Original interview status	Status determined on reinterview		
	Employed	Unemployed	Non-participant
Employed	98.78	1.91	0.50
Unemployed	0.18	88.57	0.29
Non-participant	1.03	9.52	99.21

- Use this matrix to correct flows, time invariant and on an aggregate level

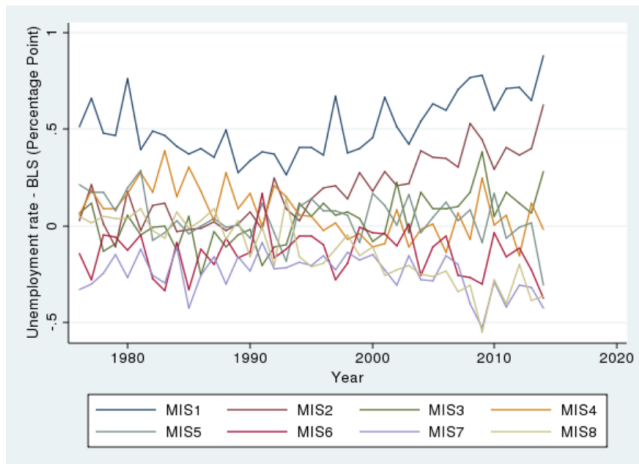
# Measurement Error in Labor Force Status

- Krueger, Mas, and Niu (2017) show that if we calculate the unemployment rate by month in sample, significantly different values, “rotation group bias”



# Measurement Error in Labor Force Status

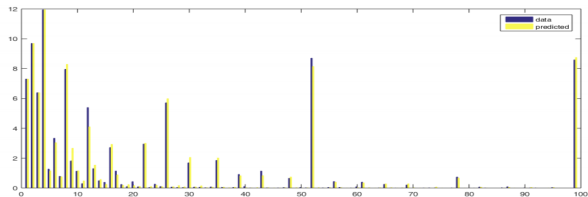
- Krueger, Mas, and Niu (2017) show that if we calculate the unemployment rate by month in sample, significantly different values, “rotation group bias”



# Measurement Error in Labor Force Status

- Ahn & Hamilton (WP2019) match individuals in CPS and show 2/3 of people who are NU say they have been looking for work for 5+ weeks.

Figure 3. Reported and predicted unemployment durations in rotation 2 for individuals who were not in the labor force in rotation 1 and unemployed in rotation 2.



# Correcting for Measurement Error

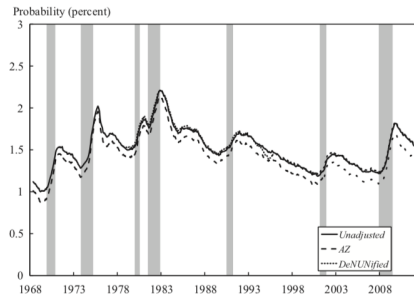
- Unemployment rate
  - Feng & Hu (2013): structural model of misclassification error, 2.1 percentage point increase in unemployment rate
  - Shibata (WP2019): slightly different assumptions about misclassification error, 0.8 percentage point increase in unemployment rate
  - Ahn & Hamilton (WP2019): 2.2 percentage point increase in unemployment rate
- Labor Market Flows
  - Abowd & Zellner (1985): decreases UN flow by about  $1/2$ , other flows mostly the same
  - Elsby, Hobjin, and Sahin (2015): de“NUN”ification decreases UN flow by  $1/2$



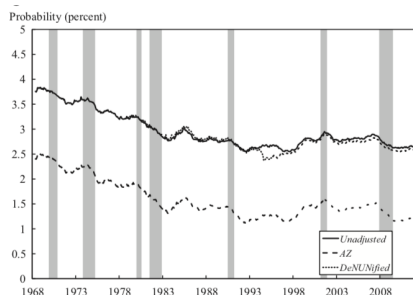
# Correcting for Measurement Error

Employment to

Unemployment



Out of the Labor Force

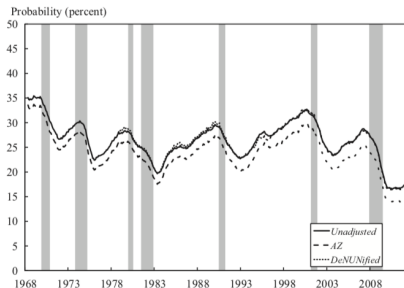


Source: Elsby, Hobjin, Sahin (2015)

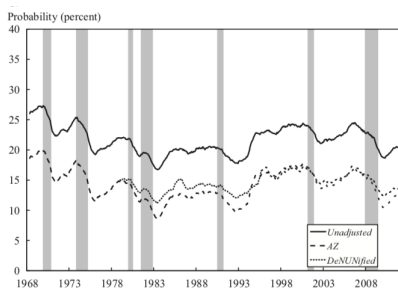
# Correcting for Measurement Error

## Unemployment

### Employment



### Out of the Labor Force

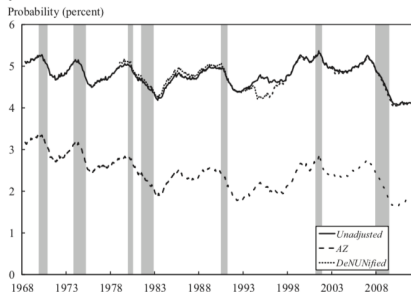


Source: Elsbj, Hobjin, Sahin (2015)

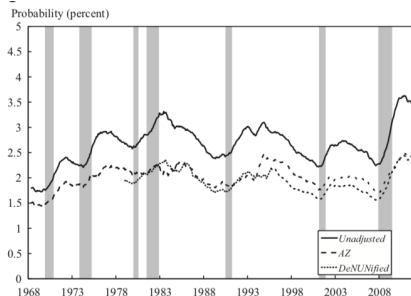
# Correcting for Measurement Error

## Out of the Labor Force

### Employment



### Unemployment



Source: Elsby, Hobjin, Sahin (2015)

# From the Firms Side

- We want to understand
  - the total number of vacancies
  - job filling rate, vacancy duration
  - separation rate
- Davis, Faberman, Haltiwanger (2013)
  - explore these things in the establishment level data from JOLTS

# Davis, Faberman, Haltiwanger (2013)

- Establishment level JOLTS panel data
  - 16,000 establishments per month
  - report hires and separations per month
  - employment in the pay period for the month
  - job openings a month's end

# Davis, Faberman, Haltiwanger (2013)

- Hires Rate at time t

$$\frac{\text{hires}_t}{\frac{1}{2}(\text{Emp}_t + \text{Emp}_{1-1})}$$

- Separation Rate at time t

$$\frac{\text{separations}_t}{\frac{1}{2}(\text{Emp}_t + \text{Emp}_{1-1})}$$

- Vacancy Rate at time t

$$\frac{\text{vac}_t}{\text{vac}_t + \frac{1}{2}(\text{Emp}_t + \text{Emp}_{1-1})}$$

- Vacancy Yield at time t

$$\frac{\text{hires}_t}{\text{vac}_{t-1}}$$

# Davis, Faberman, Haltiwanger (2013)

TABLE II  
ADDITIONAL STATISTICS ON HIRES AND VACANCIES

Statistic	Percent
Employment at establishments with no hires in $t$	34.8
Employment at establishments with no vacancies at end of $t - 1$	45.1
Vacancies at end of $t$ at establishments with no vacancies at end of $t - 1$	17.9
Hires in $t$ at establishments with no vacancies at end of $t - 1$	41.6

- 45% percent of employment is at est. w/o vacancies
- 42% of hires at est. w/o vacancies last month
  - time aggregation problem
  - calculate daily vacancy filling rates from monthly data

# A model of daily hiring

- $h_{s,t}$ : hires on day  $s$  in month  $t$
- $v_{s,t}$ : vacancies on day  $s$  in month  $t$
- $f_t$ : daily job filling rate (assumed constant over month)
- $\theta_t$ : daily flow of new vacancies (assumed constant over month)
- $\delta_t$ : daily rate at which vacancies expire without being filled (assumed constant over month)



## A model of daily hiring

- let  $\tau$  be the number of workdays in a month
- hires on day  $s$  in month  $t$

$$h_{s,t} = f_t v_{s-1,t}$$

- law of motion for daily vacancies

$$v_{s,t} = [(1 - f_t)(1 - \delta_t)]v_{s-1,t} + \theta_t$$

- cumulative vacancies in month  $t$

$$v_t = (1 - f_t - \delta_t + \delta_t f_t)^\tau v_{t-1} + \theta_t \sum_{s=1}^{\tau} (1 - f_t - \delta_t + \delta_t f_t)^{s-1} \quad (1)$$

- cumulative hires in month  $t$

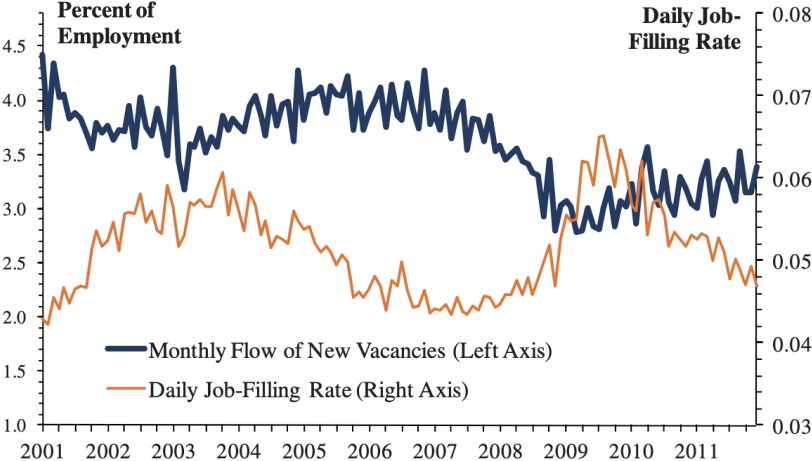
$$\begin{aligned} H_t &= \sum_{s=1}^{\tau} h_{s,t} \\ &= f_t v_{t-1} \sum_{s=1}^{\tau} (1 - f_t - \delta_t + \delta_t f_t)^{s-1} + f_t \theta_t \sum_{s=1}^{\tau} (\tau - s) (1 - f_t - \delta_t + \delta_t f_t)^{s-1} \end{aligned} \quad (2)$$

# A model of daily hiring

- Given data for total hires per month  $H_t$  and vacancies  $v_t, v_{t-1}$  and  $\delta_t$ , equation (1) and (2) identify the average daily job-filling rate  $f_t$  and the daily flow of new vacancies  $\theta_t$
- assume  $\tau\delta_t =$  monthly layoff rate
- Davis, Faberman, Haltiwanger estimate these for
  - aggregate level
  - industry
  - size of establishment
  - turnover bins
  - growth rate bins

# Davis, Faberman, Haltiwanger (2013)

$$f_t \text{ and } \theta_t$$



# Davis, Faberman, Haltiwanger (2013)

TABLE IV

ACCOUNTING FOR HIRES AT ESTABLISHMENTS WITH NO REPORTED VACANCY

Percent of hires at establishments with no vacancy at end of previous month	
From data	41.6
Implied by model of daily hiring dynamics	
Industry (12) × Size (6) disaggregation	25.2
Industry (12) × Turnover (6) disaggregation	26.0
Size (6) × Turnover (6) disaggregation	27.0
Industry (12) × Size (2) × Turnover (6) disaggregation	26.7
Industry (2) × Size (6) × Turnover (up to 15) disaggregation	27.4

- hires from vacancies posted within the month

$$f_t \theta_t \sum_{s=1}^{\tau} (\tau - s) (1 - f_t - \delta_t + \delta_t f_t)^{s-1}$$

- model implies about 2/3 of observed hires at firms without vacancies in previous month is accounted for by aggregation

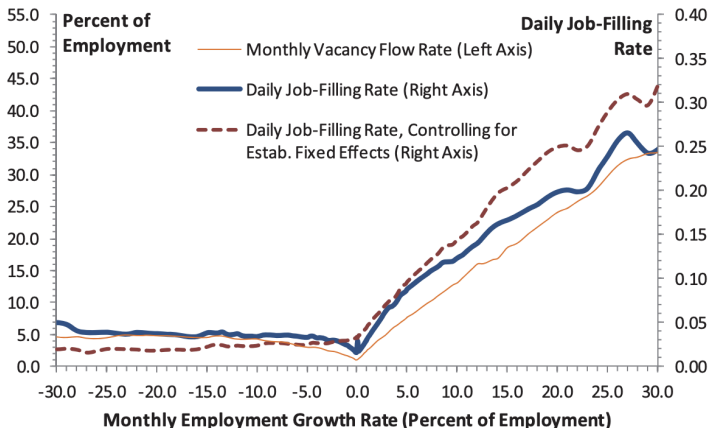
# Davis, Faberman, Haltiwanger (2013)

- standard assumptions about job filling
  - CRS matching function
  - number of vacancies is typically the only instrument that employers can use to change hiring rate
- $v_{e,t}$ : vacancies in month  $t$  from employer  $e$

$$h_{e,t} = f_t v_{e,t}$$

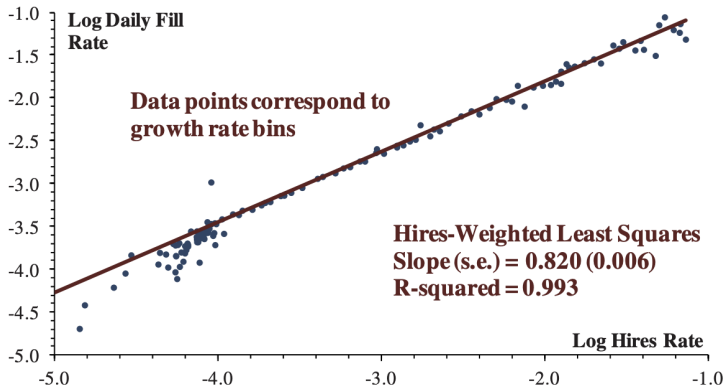
hires are proportional to vacancies in the cross-section, i.e. conditional on market tightness.

# Davis, Faberman, Haltiwanger (2013)



- hires are not proportional to vacancies, strong positive correlation between employment growth rate and job filling rate

# Davis, Faberman, Haltiwanger (2013)



- empirical elasticity of job filling rate w.r.t. hires rate is 0.82
- holds even within establishments (0.56)
- show that there is evidence of increasing returns to scale at the employer level

# What can account for IRS?

- increased advertising for vacancies
- screen applicants more quickly
- relax hiring standards
- it may be easier to attract applicants when the employer has a variety of open positions



# What we still don't know

- most often we observe the decision to hire or search for a job and the outcome of that decision
  - how long to fill/find a job
  - the wage
- we know very little about what happens in between
  - **Firms**: how are applicants screened?
  - **Firms**: what's the expected number of offers extended per position? how many of their job offers get rejected?
  - **Workers**: how many job offers do they get? how many do they reject?
  - **Wages**: how are they really determined? does a posted wage imply no bargaining?