

***New Evidence on Job Vacancies,
the Hiring Process,
and Labor Market Flows***

Steven J. Davis

University of Chicago

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Overview

New evidence

- The role of job vacancies in the hiring process
- The behavior of quits and layoffs in the cross section and over time

Based mainly on analyses of micro data in the BLS Job Openings and Labor Turnover Survey (JOLTS)

Joint work with J. Faberman and J. Haltiwanger

“The Establishment-Level Behavior of Vacancies and Hiring,” working paper, 2009

“Labor Market Flows and Vacancies in the Cross Section and Over Time,” working paper, 2009

“Adjusted Estimates of Worker Flows and Job Openings in JOLTS,” NBER/CRIW volume, forthcoming in 2010 (with Ian Rucker)

“The Flow Approach to Labor Markets: New Data Sources and Micro-Macro Links,” J. of Economic Perspectives, 2006

Key Results

- 1. Other Response Margins:** Employers respond in a major way on other margins, in addition to the number of job vacancies, as they vary hires.
 - 2. Multiple Hiring Channels:** Employers hire workers through multiple channels, i.e., they use more than one hiring technology.
- A large percentage of hires are not mediated through vacancies, as the concept is defined in JOLTS.

Key Results

3. Hockey-Stick Relations for Hires & Separations

- Hires and separations are highly nonlinear functions of establishment growth rates in the cross section (C-S), with sharp kinks and sign changes at zero growth.

4. Layoffs are tightly linked to job destruction in the cross section

- Layoff rates are not very sensitive to aggregate labor market tightness, conditional on own employer growth.

Key Results

5. Cyclical Sensitivity of Quit Rates

- Quit rates are highly sensitive to labor market tightness, conditional on own employer growth.
 - Conditional quit rate falls sharply in recessions – more so at contracting employers
- C-S and T-S patterns in quits suggest major roles for on-the-job search and pro-cyclical variation in the mobility of employed workers.

JOLTS Data

- Sample of ~16,000 establishments per month
 - Employment as of pay period covering 12th of month
 - *Flow* of hires, separations, layoffs, quits during month
 - *Stock* of vacancies on last business day of month
- Vacancy Definition (Job Openings):
 - “A specific position exists, work could start within 30 days, and [the establishment is] actively seeking workers from outside this location to fill the position.”
 - Broad definition of “actively seeking workers”

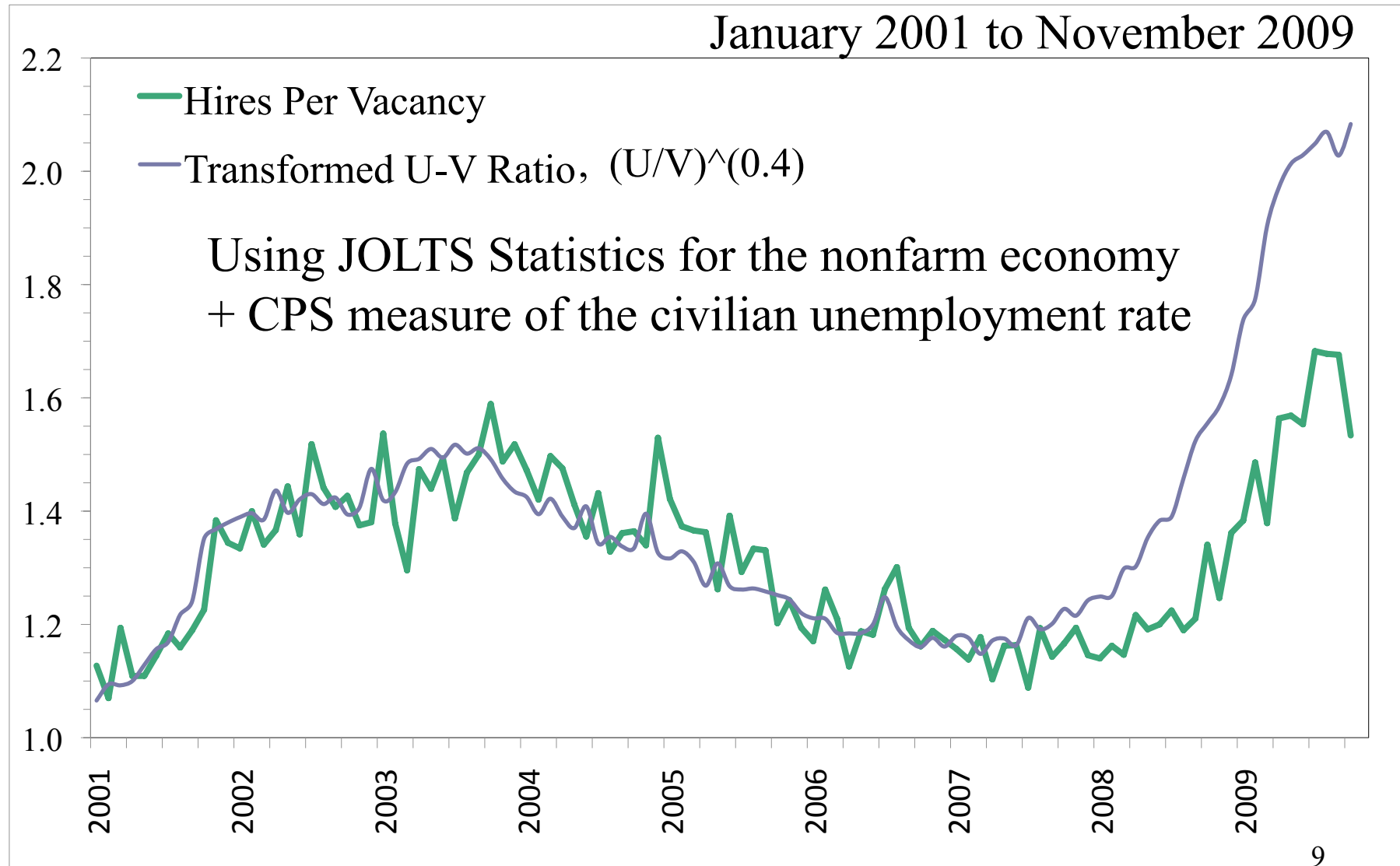
Vacancy Yield and Market Tightness

A standard matching function:

$$h = \mu v^{1-\alpha} u^{\alpha} \iff \frac{h}{v} = \mu \left(\frac{u}{v} \right)^{\alpha}$$

- Vacancy yield is a log-linear transformation of market tightness (V-U ratio), with elasticity $-\alpha$
- Pro-cyclical tightness \iff counter-cyclical vacancy yield
- C-S differences in the vacancy yield reflect differences in labor market tightness, the matching technology, or both

Two Measures of (Inverse) Market Tightness




How can hires occur without a recorded vacancy in the JOLTS data?

- Stock-flow distinction
- 30-day restriction
- Respondent error
- Conceptual fuzziness of V
- Opportunistic and passive hiring behavior
- Temps and contract workers converted to employee status

Analysis Sample (for most of Talk)

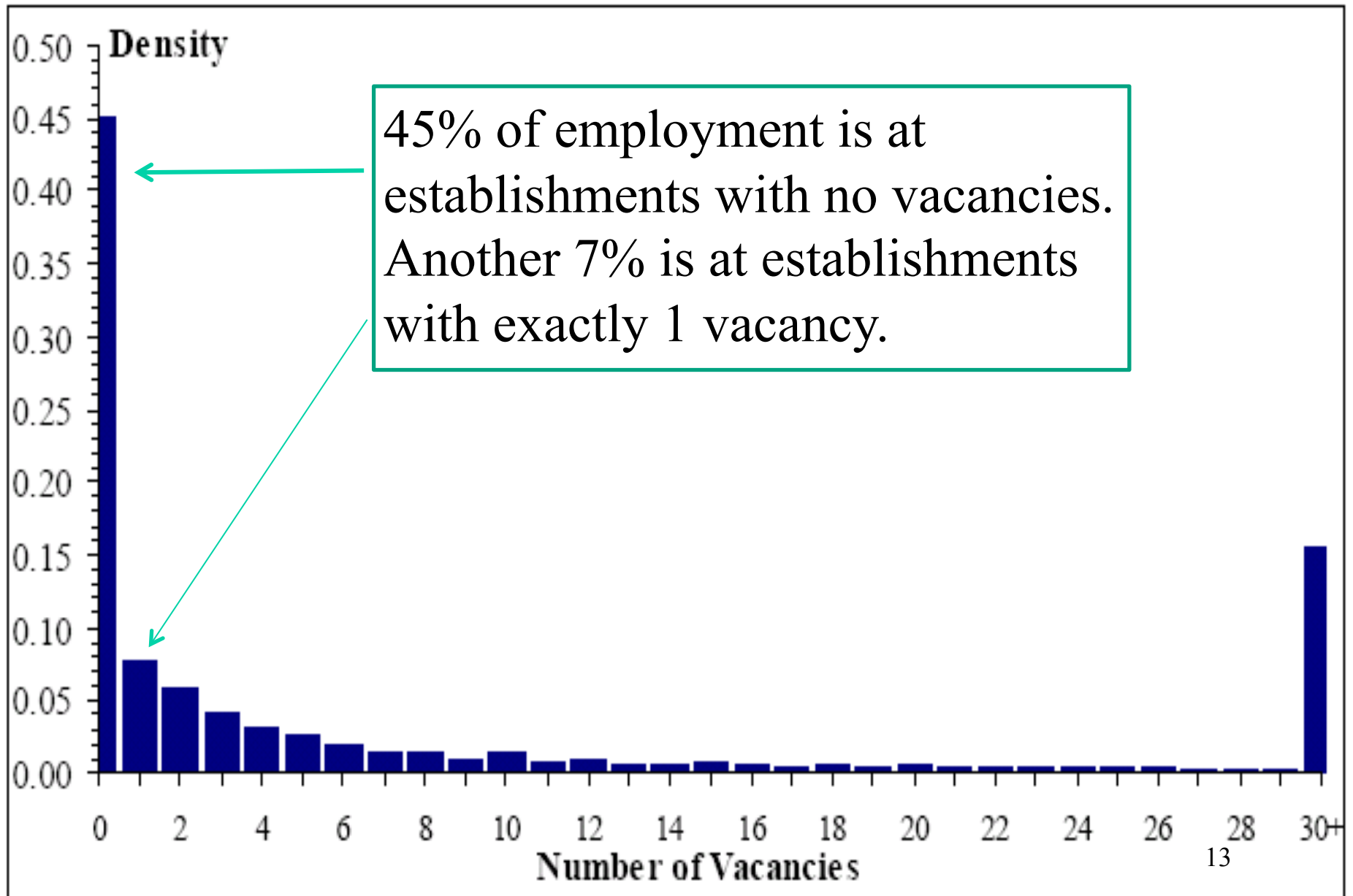
- JOLTS micro data, Dec. 2000 to Dec. 2006
- Drop observations that are not part of a sequence of at least two consecutive monthly observations
 - To calculate vacancy yield in t as
$$(\text{hires in month } t) / (\text{vacancy stock at end of } t-1)$$
 - Loses 7% of observations – little impact on aggregate estimates for vacancies, hires, etc.
 - Resulting analysis sample contains about 577,000 establishment-level observations

Employment at establishments with No Hires during month	Employment at establishments w/ No Vacancies at end of previous month	Hires at establishments w/No Vacancies at end of previous month
35%	45%	42%

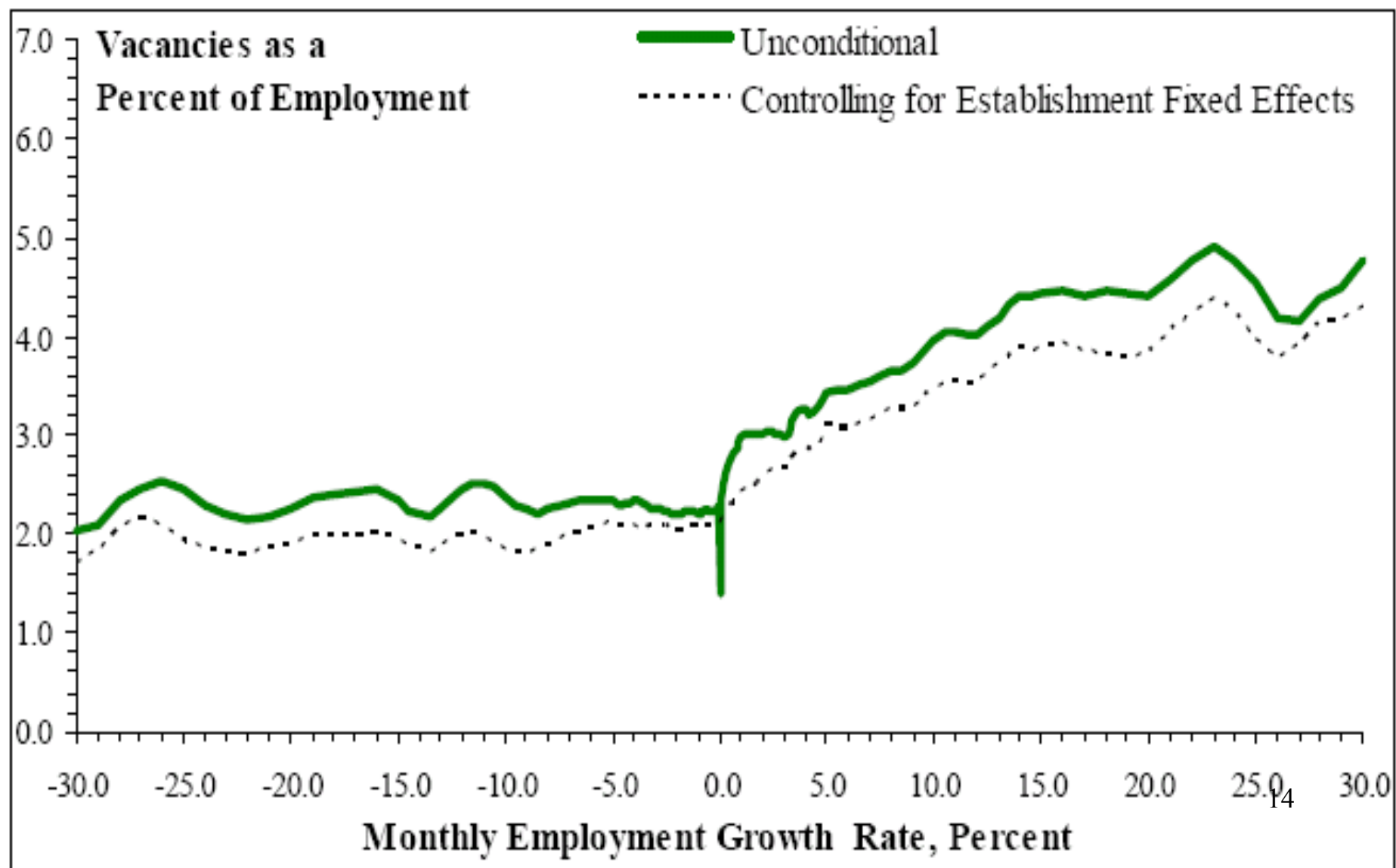


Entirely stock-flow distinction?
Or something else, too?

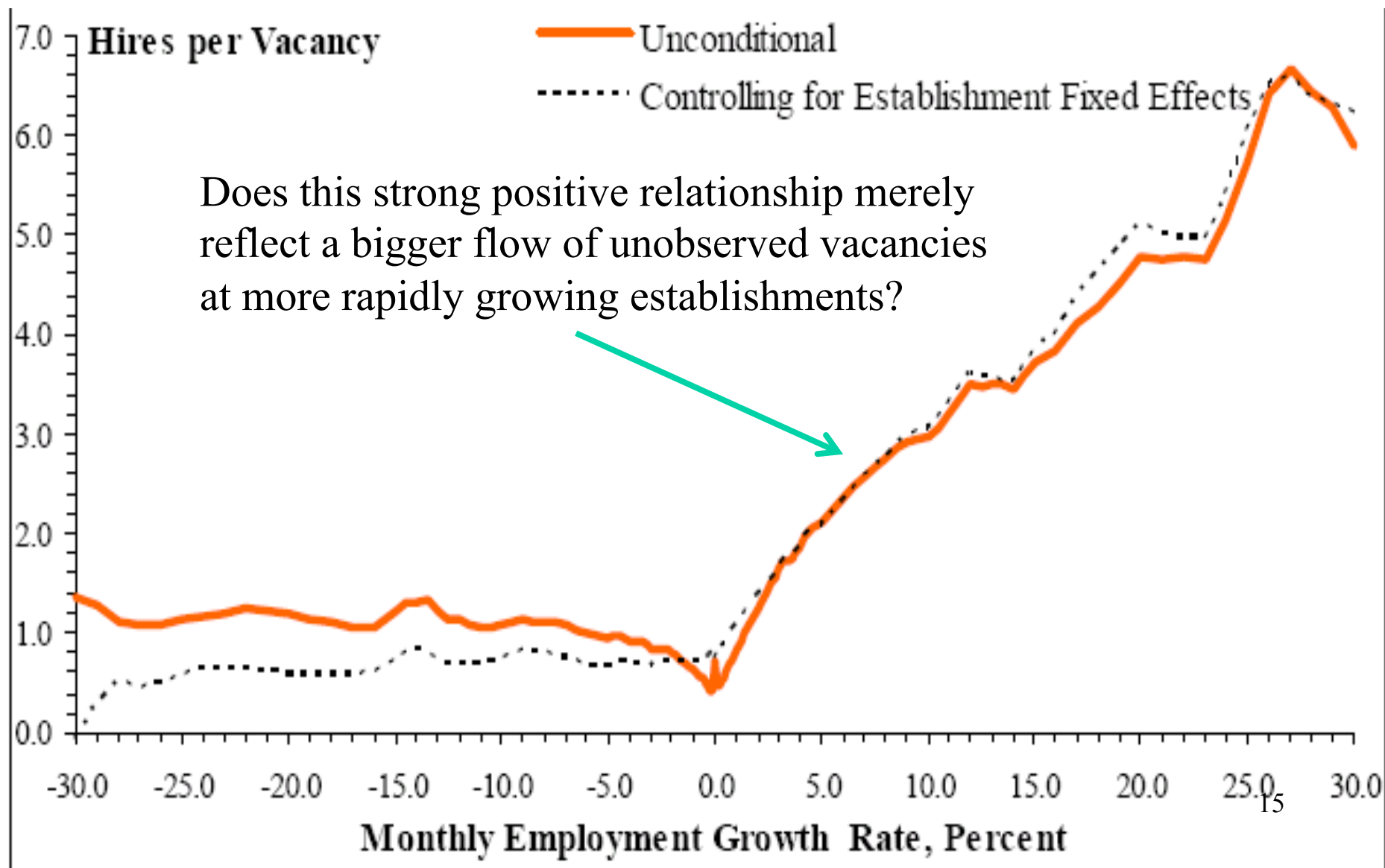
Distribution of Vacancy Numbers



Vacancy Rate and Establishment Growth in the Cross Section



Vacancy Yields and Establishment Growth in the Cross Section



A Model of Daily Hiring Dynamics

Daily laws of motion for flow of hires and vacancy stock:

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

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

- Where s indexes days, f_t is the daily job-filling rate in month t , δ_t is the rate at which unfilled vacancies lapse, and θ_t is the daily flow of new vacancies.

Solving for the job-filling rate and vacancy flows

Use laws of motion to derive two equations relating end-of-month vacancy stock and hires flow during month, both observed, to two unknowns, $\{f_t, \theta_t\}$.

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

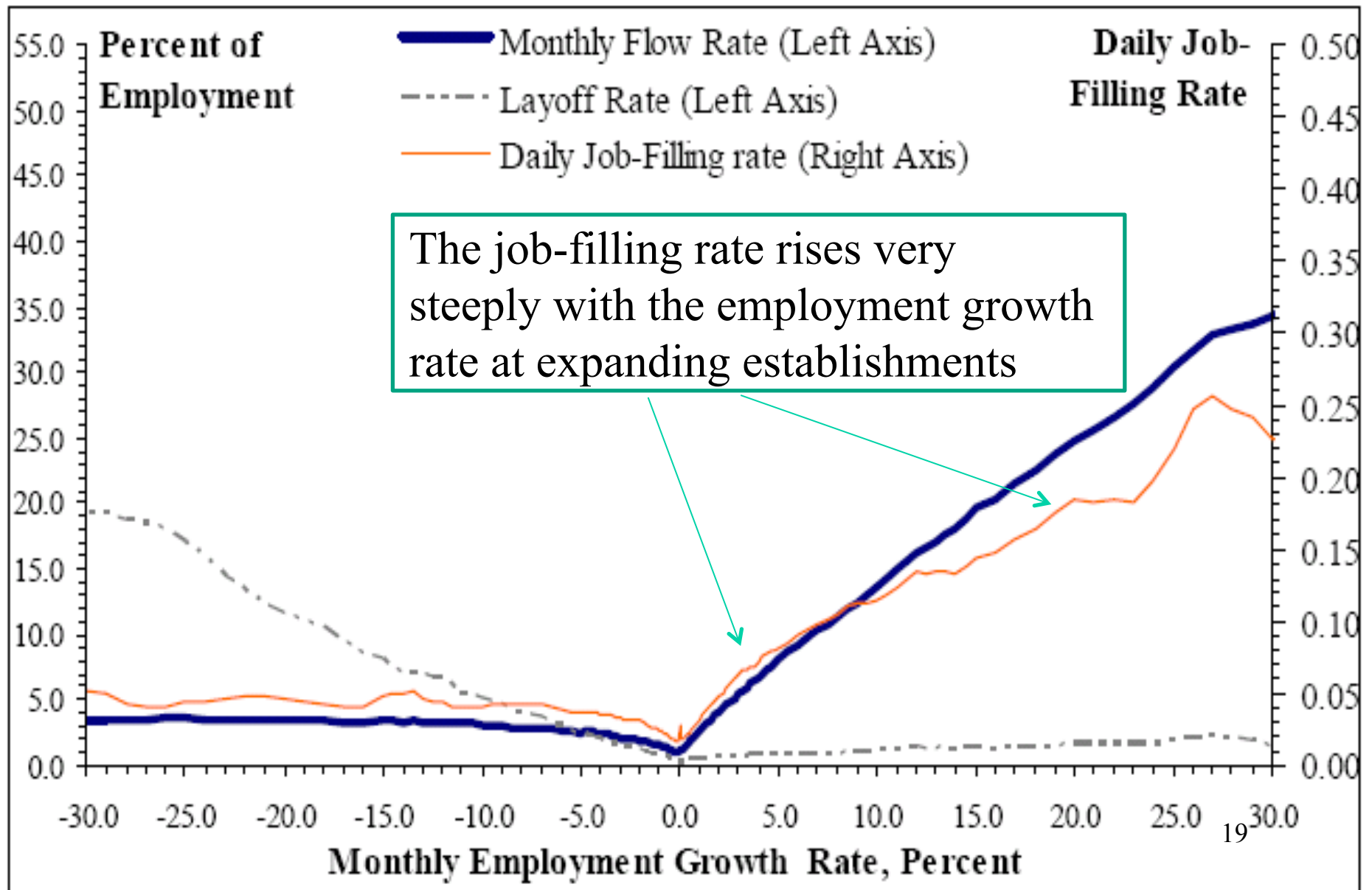
$$H_t = f_t v_{t-1} \sum_{s=1}^{\tau} (1 - f_t - \delta_t + \delta_t f_t)^{s-1} + f_t \theta_t \sum_{s=1}^{\tau} (\tau - s + 1) (1 - f_t - \delta_t + \delta_t f_t)^{s-1}$$

Given data on δ_t , v_t , v_{t-1} , and H_t , solve numerically for f_t (daily job-filling rate) and θ_t (daily flow of new vacancies).

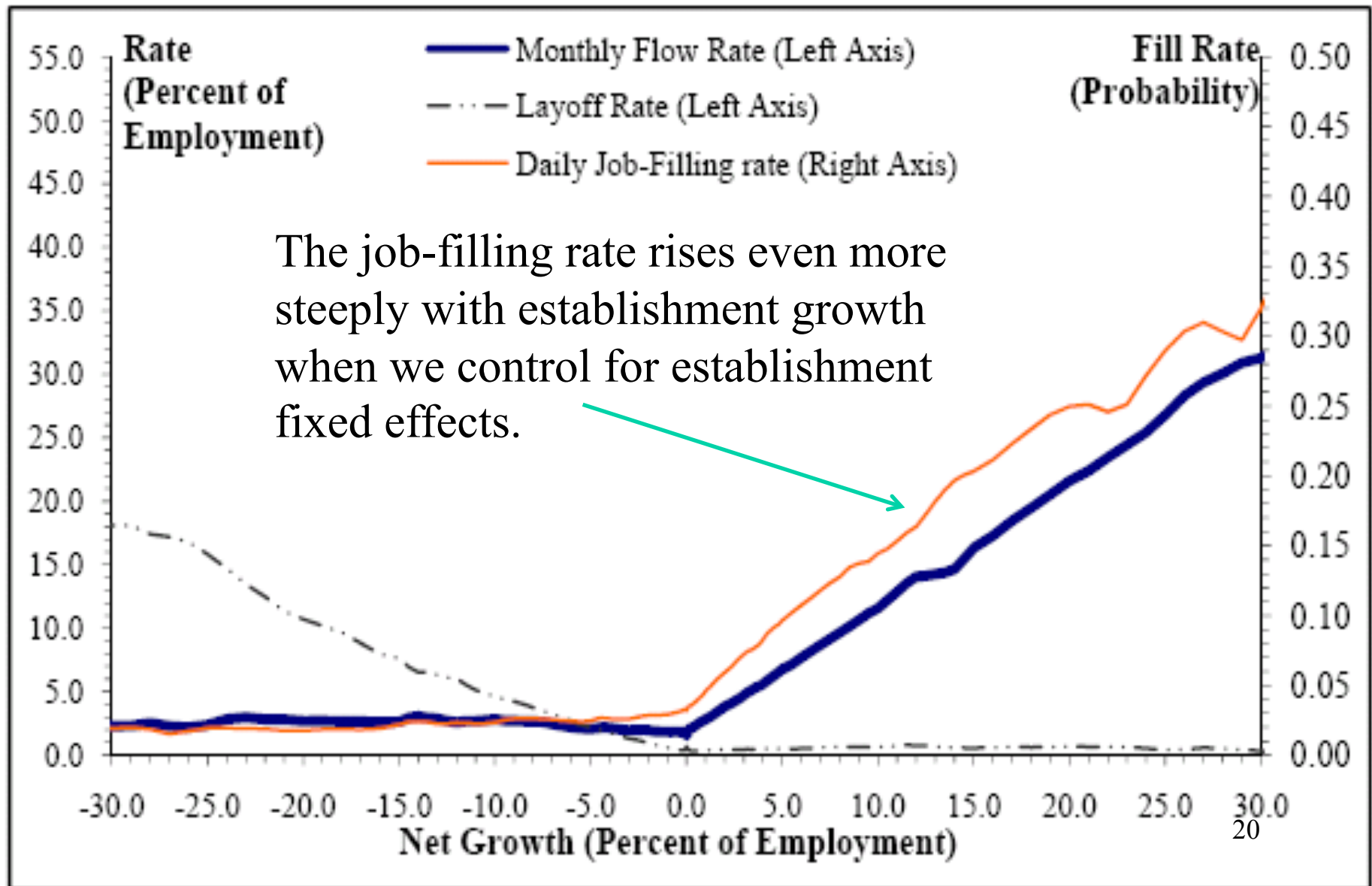
Results by Industry, Size, Turnover

		Daily Job-Filling Rate (%)	Monthly Flow of Vacancies (% of Emp.)	Mean Vacancy Duration (Days)
Nonfarm Employment		5.0	3.4	20.0
<i>Selected Industries</i>	Construction	12.1	5.4	8.3
	Retail Trade	7.3	4.5	13.7
	Government	3.2	1.6	31.4
<i>Number of Employees</i>	10-49	6.6	4.0	15.2
	250-999	4.1	3.1	24.1
	5,000+	2.6	1.7	38.9
<i>Worker Turnover Quintiles (H+S)</i>	Highest	11.4	14.0	8.7
	Middle	3.0	2.4	32.8
	Lowest	1.1	0.4	87.9 ¹⁸

C-S Relations to Employment Growth



Controlling for Establishment FEs

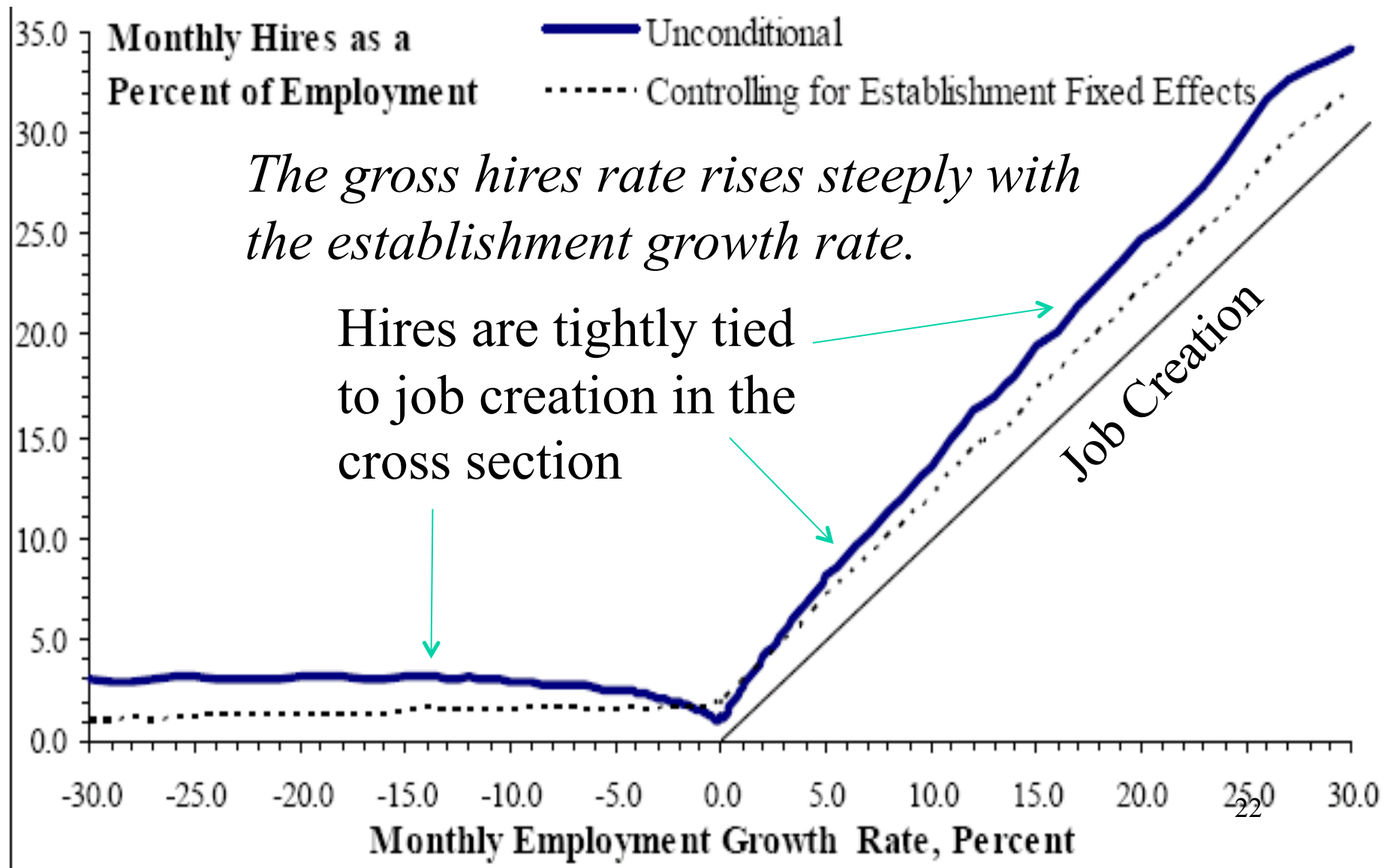


Is It Just Luck?

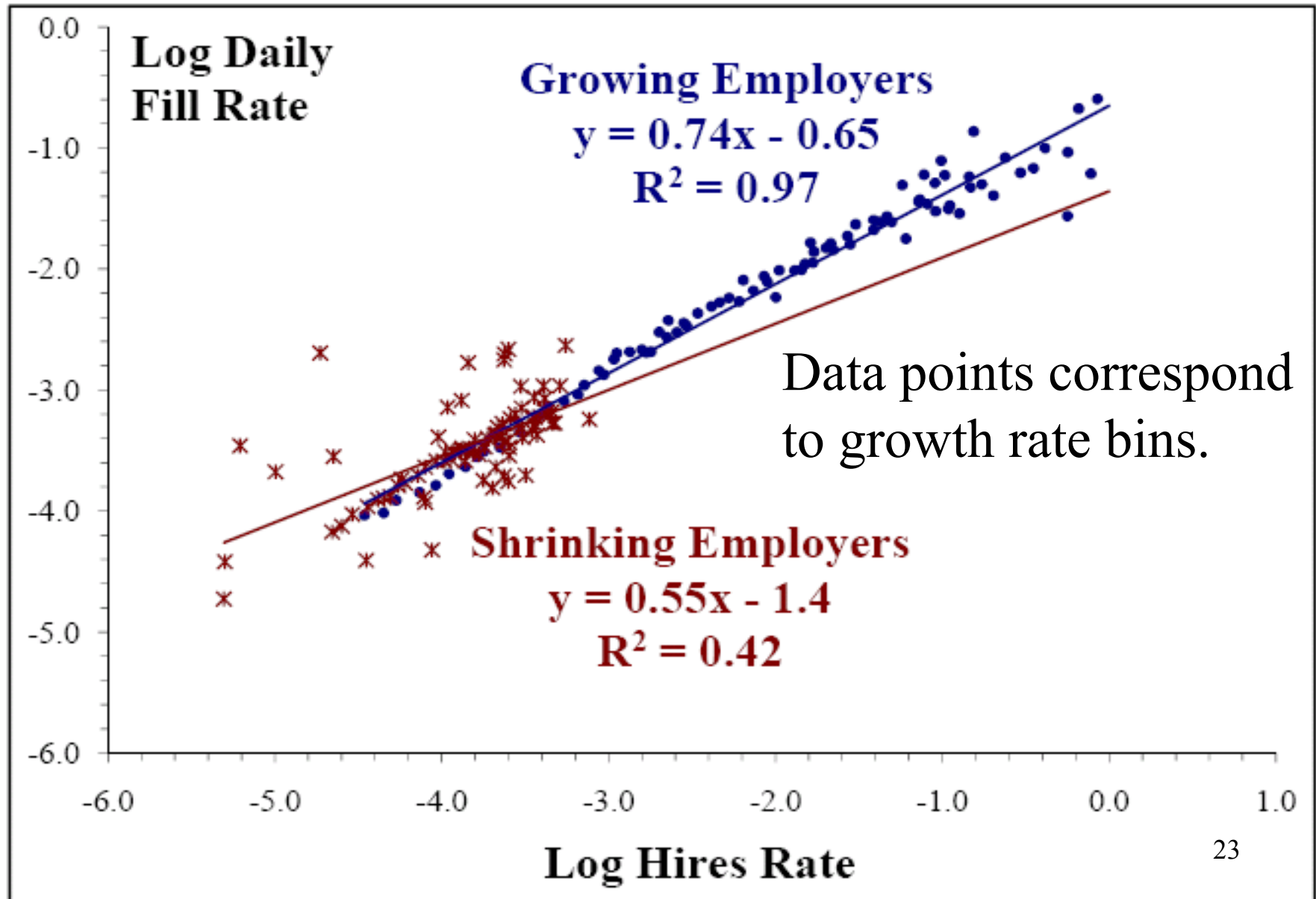
Stochastic nature of job filling induces a spurious positive relationship between employment growth rate and job-filling rate.

- “Lucky” employers fill jobs faster and, as a result, grow faster.
- To quantify this effect, we simulate hires and employment growth at the establishment level for fitted values of f , θ and the distribution of vacancies, allowing parameters and vacancy distributions to vary freely by employer size class.
- Result: Luck effect is much too small to explain the observed C-S relationship between job-filling rate and growth rate:
 - Luck alone \rightarrow job-filling rate rises by 2 percentage points in moving from 0% to 10% monthly growth rate.
 - It rises by another 1 point in moving from 10 to 30%.

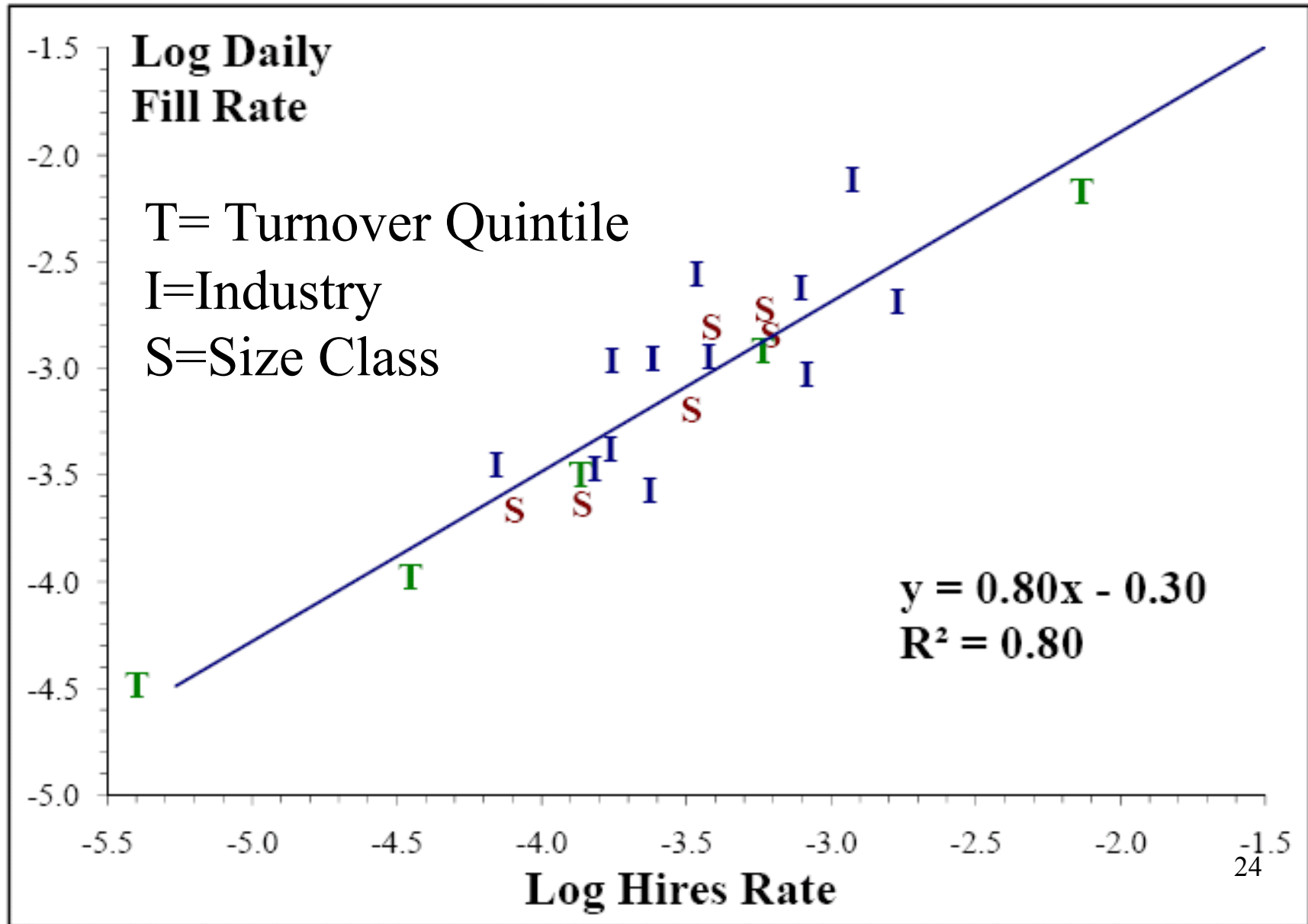
Hires and Establishment Growth Rates in the Cross Section



Job-Filling Rate and Gross Hires Rate



Job-Filling Rate and Gross Hires Rate



Interpreting the C-S Patterns

Employers respond in a major way on at least one other margin, in addition to vacancies, to produce more hires:

Other Potentially Important Response Margins:

1. Higher wages (but hard to square with employer size pattern)
2. Greater search intensity per vacancy by employers
3. Relaxation of hiring standards
4. Scale economies in advertising, screening, recruiting (or scope economies when employer has variety of open positions)
5. Directed job creation in the sense that employers create the types of jobs that fit the location, skills and other characteristics of potential hires.

How Important Are the Other Margins?

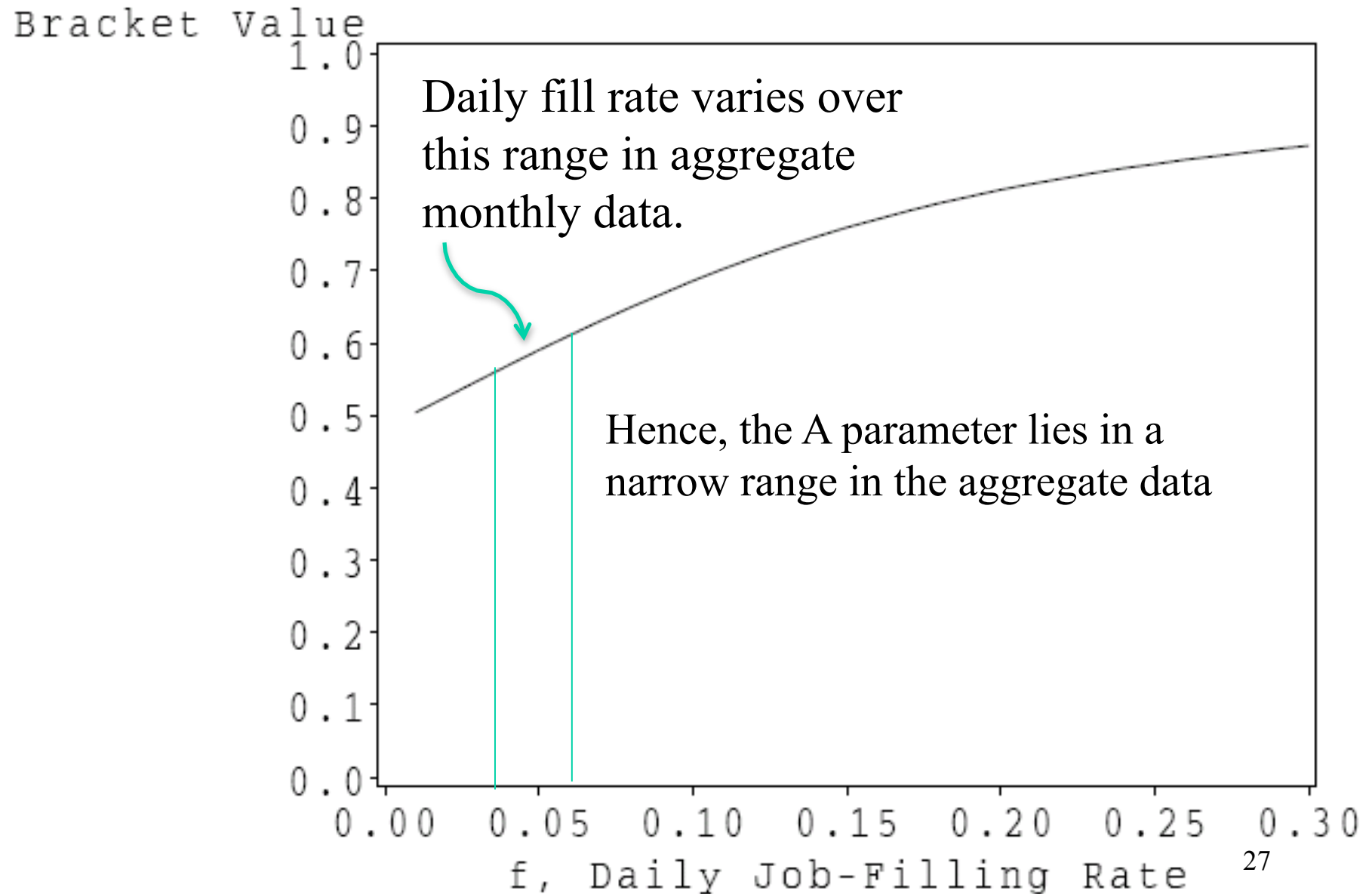
A Quantification

Suppressing the time index, the solution for monthly gross hires can be expressed as

$$H = Bf \left\{ v_{-1} + \left[1 - \frac{1/\tau}{1-x} + \frac{x^\tau}{1-x^\tau} \right] (\tau\theta) \right\}$$
$$\equiv Bf \{ v_{-1} + A(\tau\theta) \}$$

where $x \equiv 1 - f - \delta + f\delta$, and $B \equiv \frac{1-x^\tau}{1-x}$.

Value of Square Bracket Term as a Function of f
Evaluated at Industry Mean for δ and $\tau=26$



How Important Are the Other Margins?

The A term varies modestly in the relevant range. Evaluating at the mean:

$$\begin{aligned}\log H &= \log(Bf) + \log(v + A\tau\theta) \\ &\approx \log(Bf) + \log(v + \bar{A}\tau\theta)\end{aligned}$$

yielding an approx. variance decomposition:

$$\begin{aligned}V(\log H) &= V[\log(Bf)] + V[\log(v + \bar{A}\tau\theta)] \\ &\quad + 2Cov[\log(Bf), \log(v + \bar{A}\tau\theta)] + \text{error}\end{aligned}$$

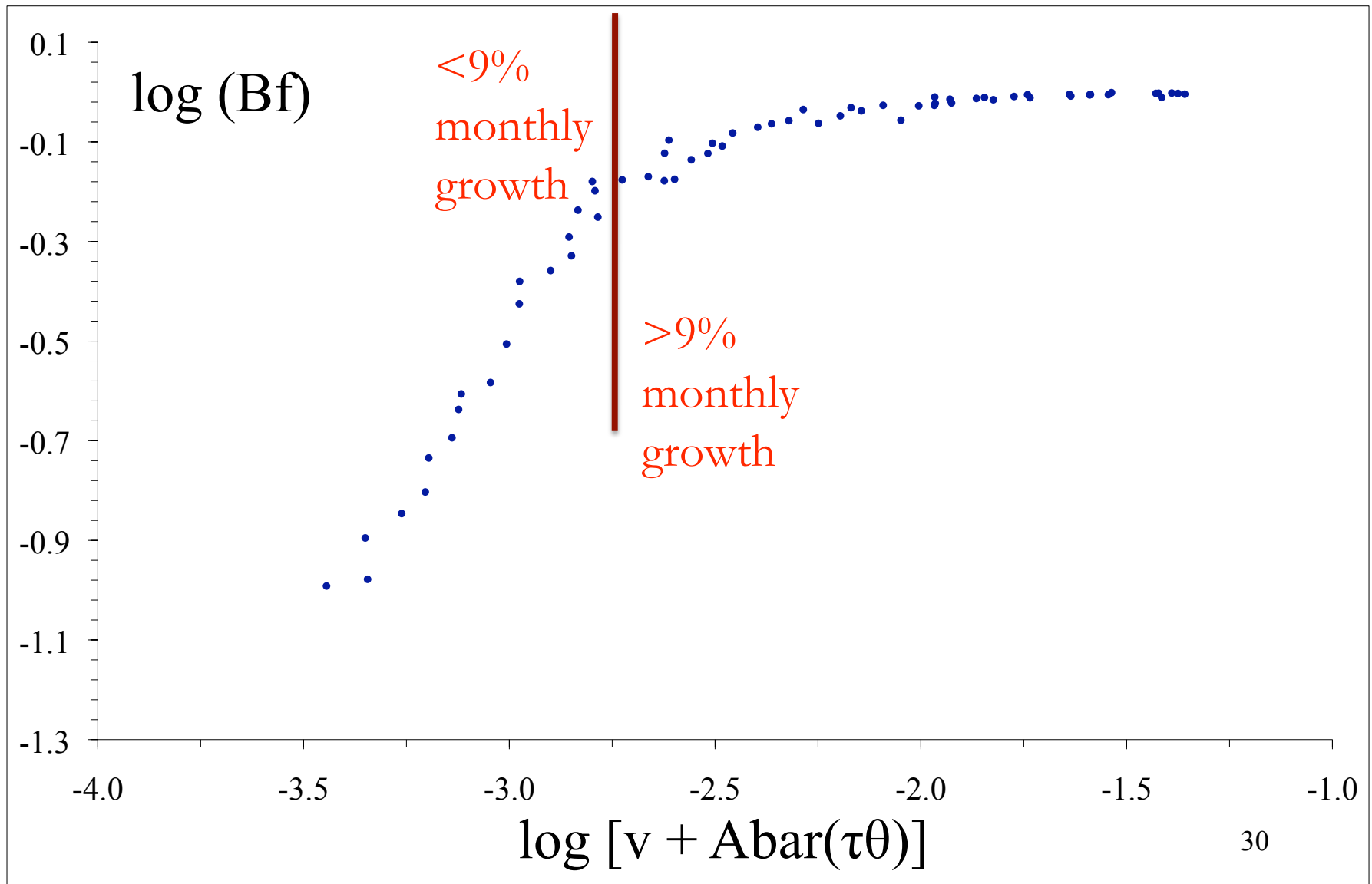
Decomposing the Variance of Log Gross Hires Rate (Unweighted)

EXACT	Variance of $\log(H)$	% Due to Bf Term	% Due to Vacancies	% Due to Covariance	Approx. Error (%)
<i>Industry</i>	0.16	23.3	51.7	25.0	---
<i>Size Class</i>	0.11	44.6	16.7	38.7	---
<i>Turnover</i>	1.22	17.8	34.9	47.3	---
<i>Growth Bin</i>	0.95	10.6	50.7	38.7	---
APPROXIMATE VARIANCE DECOMPOSITION					
<i>Industry</i>	0.16	23.3	47.0	16.1	13.6
<i>Size Class</i>	0.11	44.6	13.9	30.5	11.0
<i>Turnover</i>	1.22	17.8	29.8	44.1	8.3
<i>Growth Bin</i>	0.95	10.6	37.9	33.4	8.1

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Employment-weighted variance decompositions are very similar.

Log(Bf) Plotted Against Vacancy Term in Solution for $\log(H)$ for Growth Rate Bins in (0,.30]



A Specification Test

- Number of hires in month t accounted for by the flow of new vacancies in t :

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

- So, according to the model, the percent of hires in t accounted for by establishments with no vacancies at start of month is:

$$E_t^{NoVac} H_t^{NEW} / H_t$$

where the first variable is the employment share at establishments with no vacancies at months' start.

- This model-implied quantity for hires at establishments with no vacancies at month's start is 19.7% of all hires.
- In the data, 41.6% of hires were at establishments with no vacancies at month's start.

The percentage of hires at establishments that start the month with no vacancies is much higher in the data than is predicted by the model.

Interpreting the Specification Test

- We interpret the specification test result as evidence that a large percentage of hires are not mediated through vacancies.
- The test result could also reflect other forms of model misspecification or systematic reporting errors in the JOLTS data.
- However, the cross-sectional pattern of specification test results supports our interpretation. See next slide.

Data-Generated Minus Model-Implied Percent of Hires at Establishments that Start Month with No Vacancies

Industry		Employer Size	
Construction	36.3	0-9 Employees	32.0
Manufacturing	15.4	10-49 Employees	22.3
Retail	30.5	50-249 Employees	15.6
FIRE	16.9	250-999 Employees	10.1
Professional and Business Services	14.8	1000-4,999 Employees	4.4
Health & Education	8.3	5000+	5.7
Government	7.8		34

Estimating the Percent of Hires Not Mediated through Vacancies

- Consider an extended model of hiring dynamics with some hires not mediated through vacancies.

$$h_{s,t} = (1 + \psi_t) f_t v_{s-1,t}$$

where the parameter ψ governs the number of hires not mediated through vacancies.

- The hires solution in the extended model is very similar in form to that of the basic model:

$$H_t = (1 + \psi_t)(H_t^{OLD} + H_t^{NEW})$$

- To estimate f , θ and ψ , fit 3 moments:

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

$$H_t = (1 + \psi_t) [H_t^{OLD}(f, \theta) + H_t^{NEW}(f, \theta)]$$

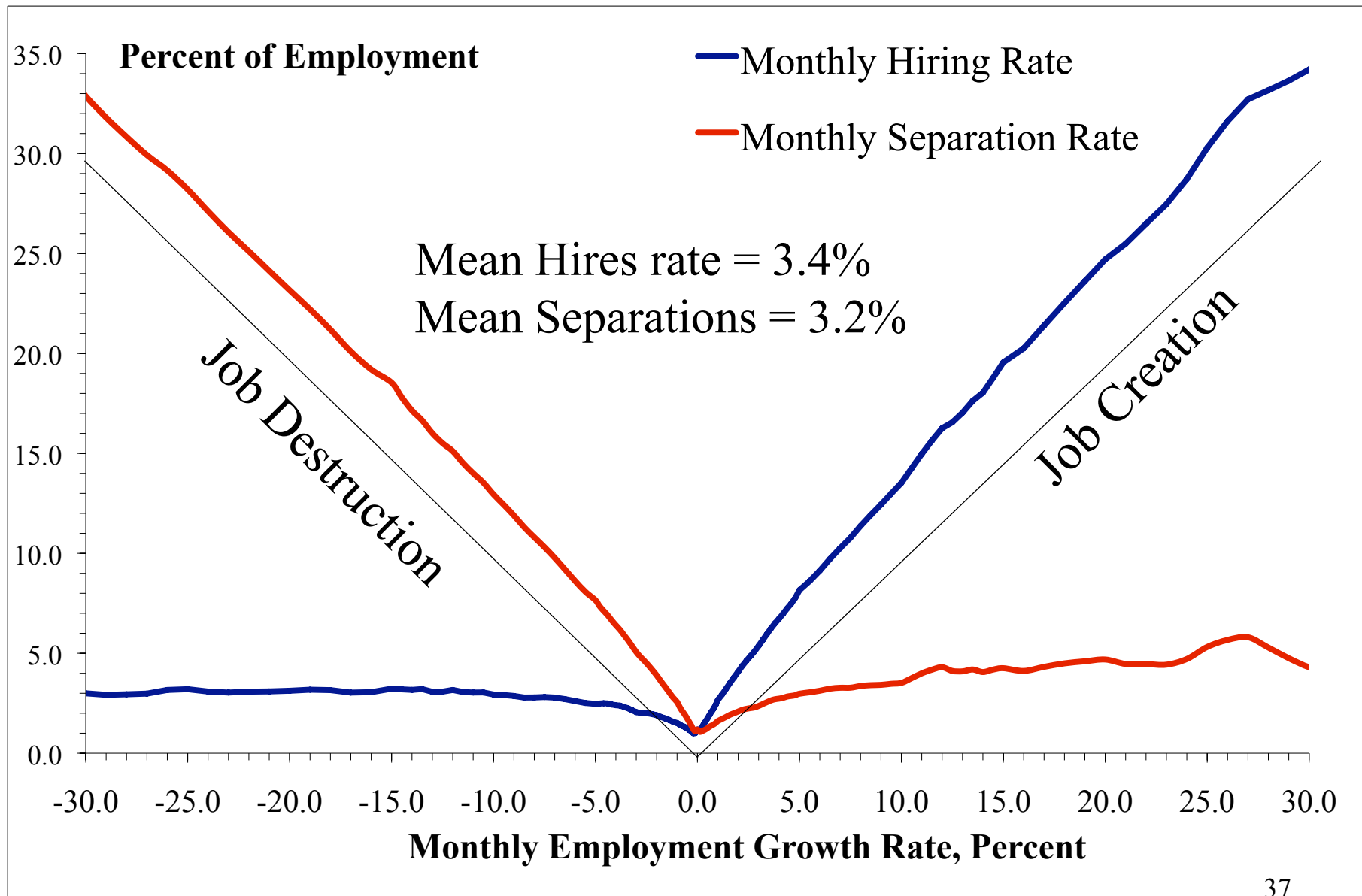
$$(1 + \psi_t) E_t^{NoVac} H_t^{NEW} / H_t =$$

Fraction of Hires at Zero -

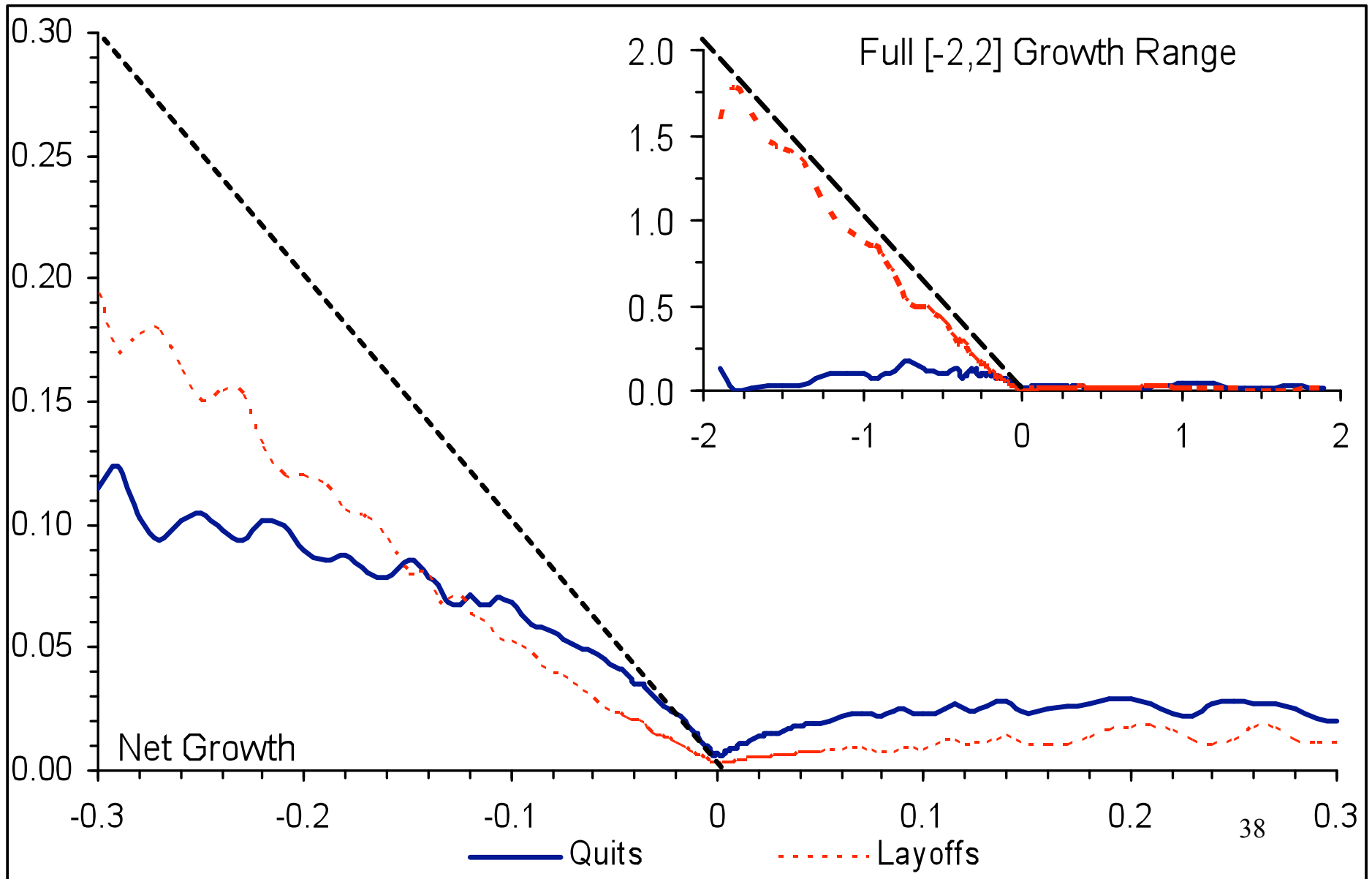
Vacancy Estabs in Data

The percentage of hires not mediated through vacancies is $\psi / (1 + \psi)$

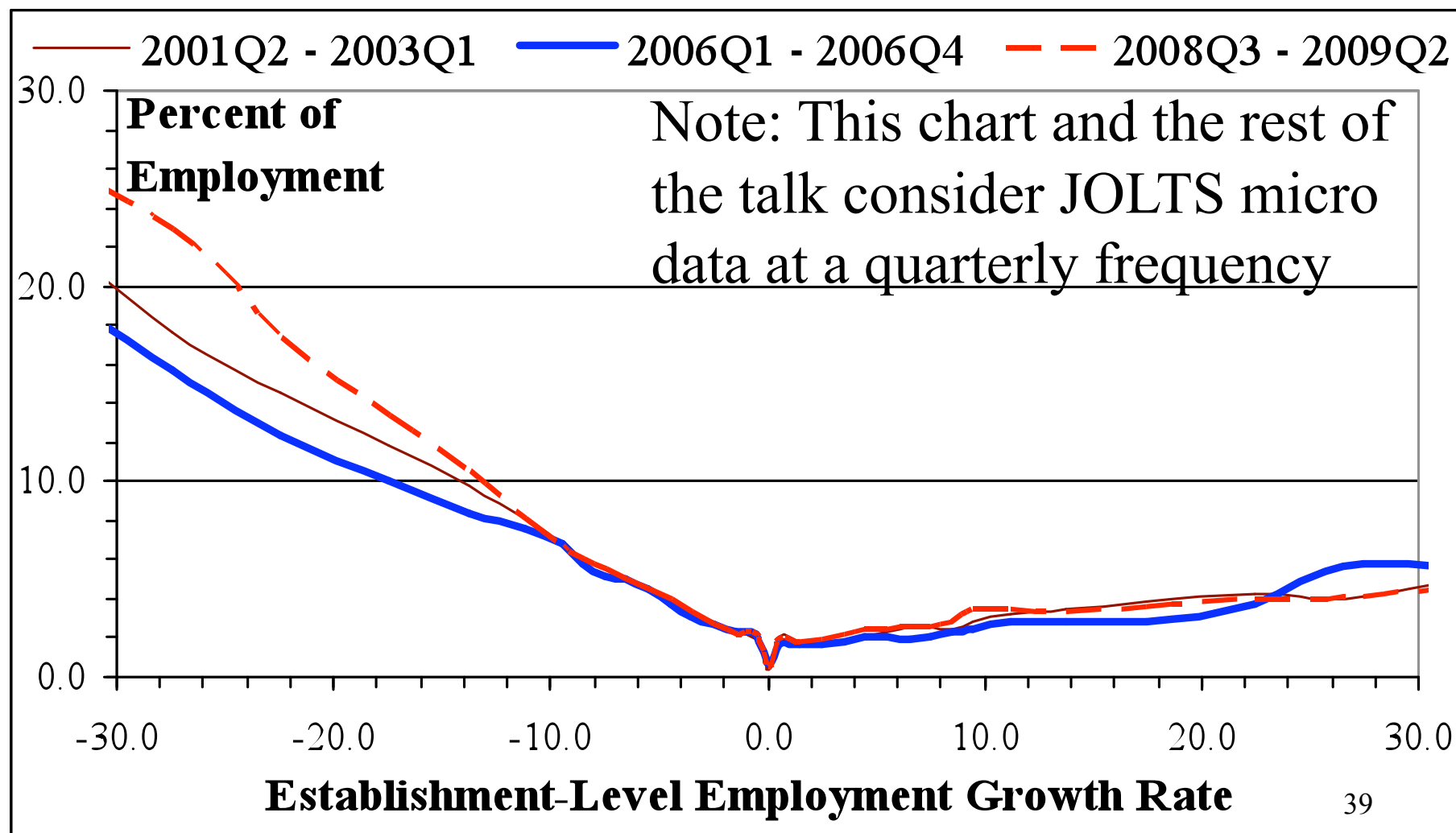
Hires and Separations in the C-S



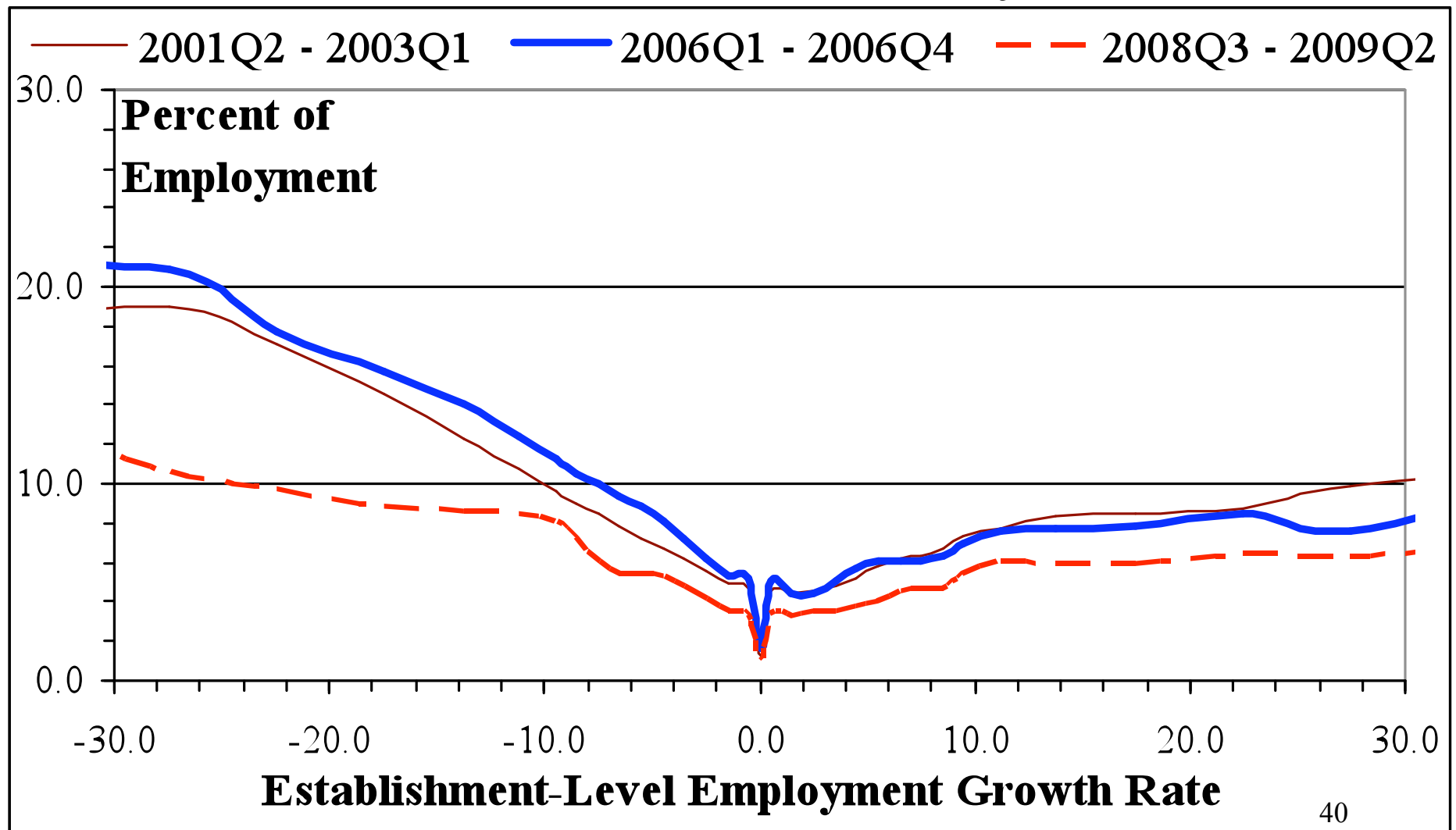
Quits and Layoffs in the C-S



How the C-S Layoff Relation Varies with the Cycle



How the C-S Quit Relation Varies with the Cycle



Relating Micro and Aggregate Outcomes

- Using hires as an example, we can express aggregate rates as:

$$H_t = \sum_b f_t(b) h_t(b)$$

where b indexes growth rate bins, $f(b)$ is the employment mass in bin b , and $h(b)$ is the (conditional) mean hires rate in bin b .

- Changes in the aggregate rates arise from
 1. Shifts over time in the f distribution
 2. Changes over time in the cross-sectional relations – e.g., the conditional hires rates $h(b)$
 3. Interactions between 1 and 2.

- Consider $\tilde{H}_t = \sum_b f_t(b) \bar{h}(b),$

where we fix the C-S relation at the sample mean relation for hires.

- By construction, all movements in \tilde{H} arise from movements in the C-S distribution of employment growth rates.

Question: To what extent do movements in \tilde{H}_t track movements in the actual rate of aggregate hires, H_t ?

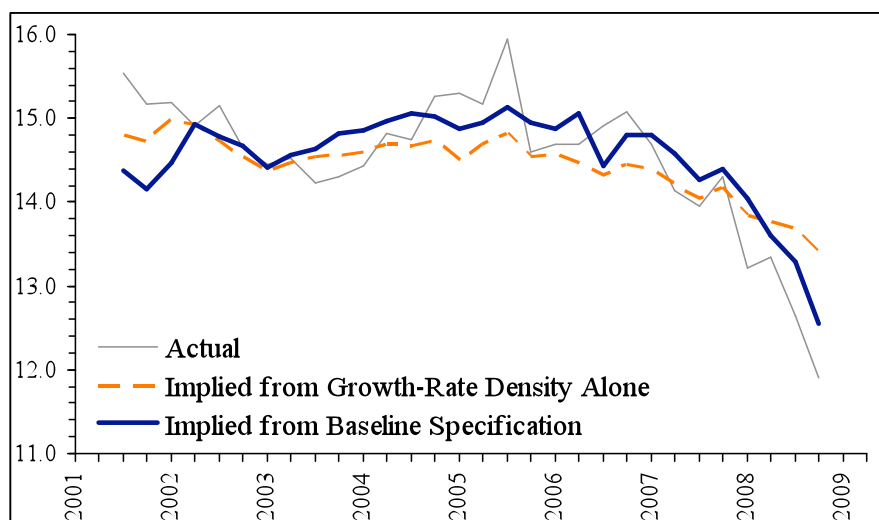
Same question for separations, quits, hires, vacancies

Regressions of Actual Aggregate Rates on Rates Implied by Fixed C-S Relations

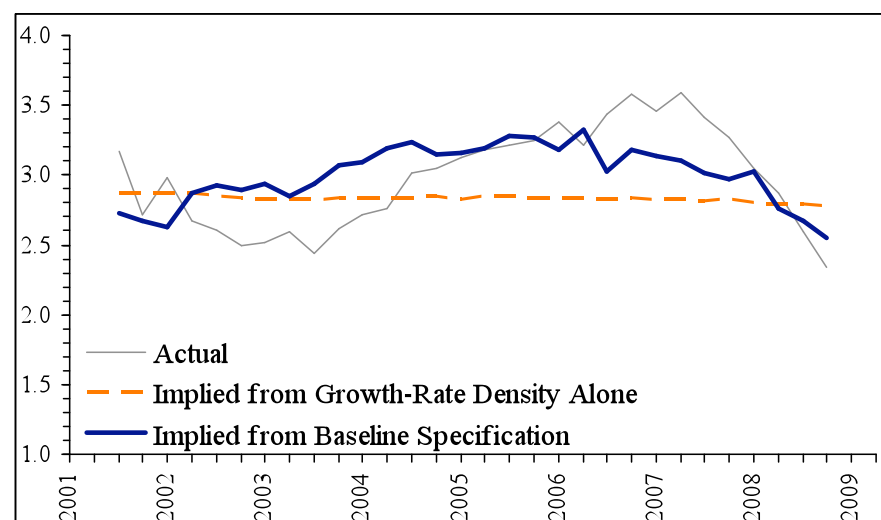
	R-Squared Values
Hiring Rate	.622
Separation Rate	.307
Quit Rate	.001
Layoff Rate	.803
Vacancy Rate	.013

Actual Rates Compared to Rates Implied by Fixed C-S Relations

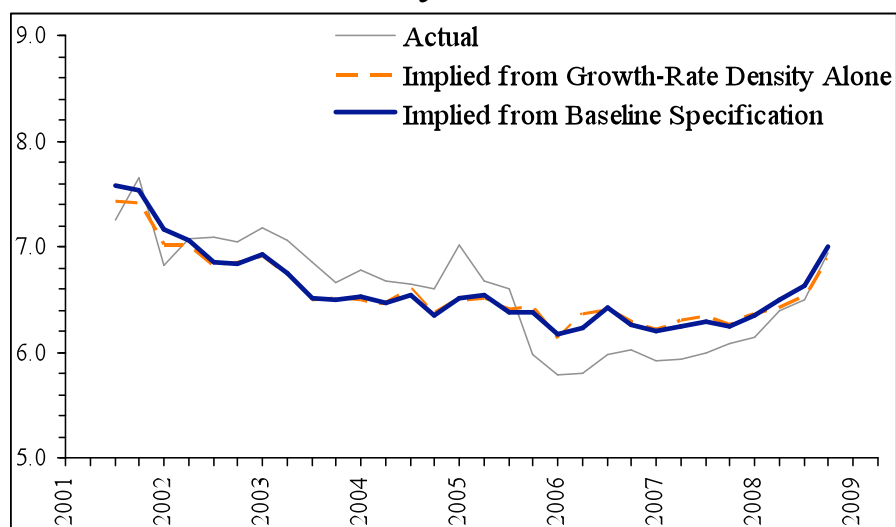
Hires



Vacancies



Layoffs



Quits

