



**LABOR SEARCH MODELS:
CYCLICAL DYNAMICS**

JANUARY 22, 2020

LABOR-MARKET EQUILIBRIUM

- **Aggregate law of motion of employment**

$$n_{t+1} = (1 - \rho_x)n_t + m(u_t, v_t)$$

- **Matching-market equilibrium**

$$m(u_t, v_t) = u_t \cdot k^h(\theta_t) = v_t \cdot k^f(\theta_t)$$

- **Vacancy-posting (aka job-creation) condition**

$$\gamma = k^f(\theta_t) E_t \left\{ \mathbb{E}_{t+1|t} \left(z_{t+1} - w_{t+1} + \frac{(1 - \rho_x)\gamma}{k^f(\theta_{t+1})} \right) \right\}$$

- **Wage model**

$$w_t = \eta [z_t + \gamma \theta_t] + (1 - \eta)b$$

- **Shimer (2005) and Hall (2005): analyze the stochastic dynamics of the labor market equilibrium**

Does a good job explaining long-run (steady-state) phenomena

BASIC ISSUES AND RESULTS

- ❑ **Shouldn't a model that does well at explaining long-run phenomena also be expected to do reasonably well at explaining cyclical phenomena? (should it?....)**

- ❑ **Labor search model's key endogenous variables**
 - ❑ **Unemployment u_t (equivalently, $n_t = 1 - u_t$)**
 - ❑ **Vacancies v_t**
 - ❑ **Labor-market tightness θ_t**

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- ❑ Labor search model's key endogenous variables
 - ❑ Unemployment u_t (equivalently, $n_t = 1 - u_t$)
 - ❑ Vacancies v_t
 - ❑ Labor-market tightness θ_t
- ❑ **Main Conclusion:** model's predicted volatility in (u_t, v_t, θ_t) far lower than empirically-observed volatility
- ❑ **Main Model Shortcoming:** the wage-setting process (i.e., assumption of Nash bargaining at a particular parameterization)
 - ❑ Exogenous rise in productivity is nearly-fully absorbed by a rise in the wage \rightarrow virtually no change in firms' incentives to post vacancies
 - ❑ Vacancy-posting key economic margin of basic labor search model

Recall $z_{t+1} - w_{t+1}$ the (future) payoff governing vacancy-posting decision

EMPIRICAL FACTS

□ Basic cyclical labor-market facts

Data Sources:

CPS, JOLTS,
and
Conference
Board

TABLE 1—SUMMARY STATISTICS, QUARTERLY U.S. DATA, 1951–2003

	u	v	v/u	f	s	p	
Standard deviation	0.190	0.202	0.382	0.118	0.075	0.020	
Quarterly autocorrelation	0.936	0.940	0.941	0.908	0.733	0.878	
Correlation matrix	u	1	-0.894	-0.971	-0.949	0.709	-0.408
	v	—	1	0.975	0.897	-0.684	0.364
	v/u	—	—	1	0.948	-0.715	0.396
	f	—	—	—	1	-0.574	0.396
	s	—	—	—	—	1	-0.524
	p	—	—	—	—	—	1

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Data displays a cyclical
Beveridge Curve

Labor-market
tightness θ Worker matching
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Extremely high
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Estimated matching function elasticity $m(u_t, v_t) = u_t^\alpha v_t^{1-\alpha}$: $\alpha = 0.72$

Question: How well can dynamic stochastic labor-search model match key labor-market business cycle facts?

MODEL DETAILS

- **Exogenous processes**
 - **Labor productivity, z**
 - **Separation rate, ρ_x**
 - **(Markov processes, continuous time \rightarrow can re-cast as AR(1)'s in discrete time)**

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Calibration

- Mean productivity $z = 1$ (normalization)

Accounting
profit $z - w$
each period

Question: Why is $z - w > 0$?

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□ Calibration

Accounting
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- Mean productivity $z = 1$ (normalization)
 - **Implies real wage $< z$ because of posting costs**
- Worker Nash bargaining power $\eta = 0.72 (= \alpha)$
 - Satisfies Hosios (1990 *ReStud*) condition for search efficiency
- Mean quarterly separation rate $\rho_x = 0.1$
- "Unemployment benefit" $b = 0.4$
 - **Replacement rate about 40 percent of labor income**
 - **But also measures flow value of leisure/home production**
 - **A critical parameter (Hagedorn and Manovskii (2008))**

MODEL SIMULATION RESULTS

□ Productivity shocks

Model displays a cyclical
Beveridge Curve

All much lower than the data

TABLE 3—LABOR PRODUCTIVITY SHOCKS

		u	v	v/u	f	p
Standard deviation		0.009 (0.001)	0.027 (0.004)	0.035 (0.005)	0.010 (0.001)	0.020 (0.003)
Quarterly autocorrelation		0.939 (0.018)	0.835 (0.045)	0.878 (0.035)	0.878 (0.035)	0.878 (0.035)
Correlation matrix	u	1	-0.927 (0.020)	-0.958 (0.012)	-0.958 (0.012)	-0.958 (0.012)
	v	—	1	0.996 (0.001)	0.996 (0.001)	0.995 (0.001)
	v/u	—	—	1	1.000 (0.000)	0.999 (0.001)
	f	—	—	—	1	0.999 (0.001)
	p	—	—	—	—	1

MODEL MECHANISM

- Consider a single firm's vacancy-posting decision

$$\gamma = k^f(\theta_t) E_t \left\{ \mathbb{E}_{t+1|t} \left(\underbrace{z_{t+1} - w_{t+1}}_{\text{Flow profits, } = pr_{t+1}} + \frac{(1 - \rho_x)\gamma}{k^f(\theta_{t+1})} \right) \right\}$$

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- Interpretation of Shimer (2005) result

- **Wages absorb too much of any change in productivity**
 - → not much change in firms' vacancy posting incentives
 - → (in equilibrium) not much change in θ
 - → (in equilibrium) not much change in u (because $k^h(\theta)$ governs transitions into/out of jobs)

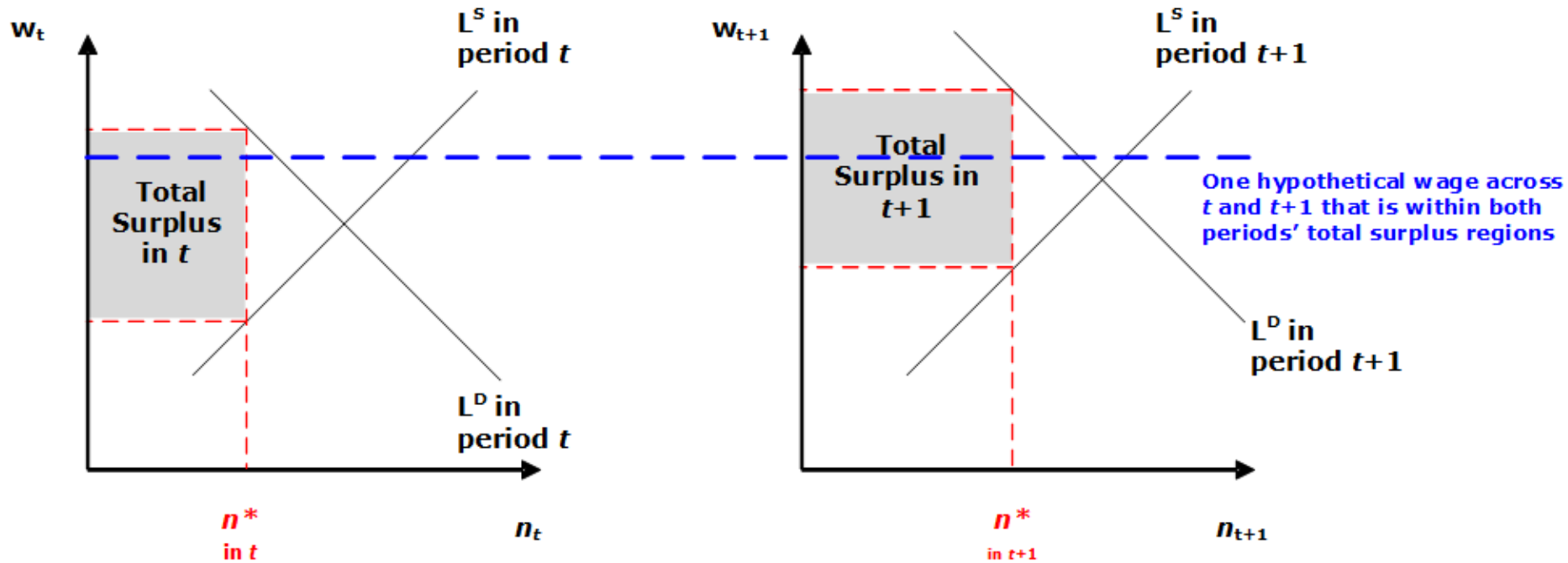
- Unemployment – volatility puzzle

- How to address the model shortcoming?
- Not a criticism of the labor search structure per se...
- ...a criticism of flexible wage-setting model (Nash-Hosios)

BEYOND THE BASIC MODEL

- **Hall (2005): a “social norm” under which w doesn’t change in response to cyclical fluctuations**
 - **Permissible as an equilibrium DUE TO the bargaining interval between z and b**
 - **NOT something rationalizable in a standard Walrasian view of labor market**

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Walrasian Labor Market Perspective

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- **DSGE macro models that take on the Shimer Puzzle**
 - Krause and Lubik (2005): job-to-job transitions
 - Gertler and Trigari (2009): “staggered (Calvo) Nash bargaining”
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 - **Krusell et al (2010 *ReStud*), Nakajima (2012 *IER*): heterogenous risk-averse households (hence no consumption insurance)**
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 - ...

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- ❑ **Pissarides (2009 *Econometrica*)**
 - ❑ **Wage stickiness **NOT** the answer**
 - ❑ **Empirically**
 - ❑ **Wages in new hires are very volatile over the business cycle**
 - ❑ **Wages in ongoing jobs much less volatile (i.e., “sticky”)...**
 - ❑ **...but irrelevant for the dynamics of the vacancy-creation condition of a matching model**

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- ❑ **Proposes model of decreasing average costs of posting vacancies**
 - ❑ **(Technically, a model of fixed hiring costs and constant MC of posting)**
 - ❑ **Rather than typical constant marginal cost of posting vacancies**
 - ❑ **i.e., increasing returns recruiting/posting technology**
 - ❑ **A type of amplification mechanism**

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- ❑ **Micro-level evidence on finer levels of “hiring costs”**
 - ❑ **Barron, Berger, and Black (1997) survey**
 - ❑ **More evidence on “hiring standards” by Davis, Faberman, and Haltiwanger (2013 *QJE*)**
 - ❑ **Some ex-ante of a match, some ex-post of a match**

MODEL MECHANISM

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- **Flow equilibrium conditions (an accounting identity...)**

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- **Wage model**

$$w_t = \eta [z_t + \gamma \theta_t] + (1 - \eta)b$$

- **HM's key insight: in basic RBC model, "gap" between social value of market work (z) and value of non-market activity (b) equals ZERO**

- **Hence ought to be the heart of the issue in a matching model, too...**
- **...not wage-determination mechanism *per se***

MODEL MECHANISM

- To gain intuition, solve analytically for steady state of labor market (i.e., Pissarides Chapter 1)
- Can show (HM 2008, p. 1695) steady state elasticity of labor market tightness to labor productivity is

$$\varepsilon_{\theta,z} = \frac{z}{z-b} \frac{\eta k^h(\theta) + (1 - \beta(1 - \rho_x)) / \beta}{\eta k^h(\theta) + (1 - \xi)(1 - \beta(1 - \rho_x)) / \beta}$$

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- ❑ Depends on many things....
- ❑ ...in particular, depends on the gap between social value of market work (z) and value of non-market activity (b)
- ❑ Shimer calibration of $b = 0.4$ (unemployment “benefit” 40% of the value of labor income) inconsistent with G.E. business cycle models in which **indifference conditions are satisfied in equilibrium**

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- ❑ Steady-state intuition provides intuition for dynamics

BEYOND THE BASIC MODEL

- **Hagedorn and Manovskii (2008)**
 - **Use data on only vacancy posting costs, not broader “hiring costs”**
 - **Consider effects of taxes (which affects the receipt of labor income by households)**

$\eta = 0.05$
(much smaller than typical labor literature)



Back out values of η (worker Nash bargaining weight) and b (flow value of unemployment)

$b = 0.95$
(much larger than typical labor literature)

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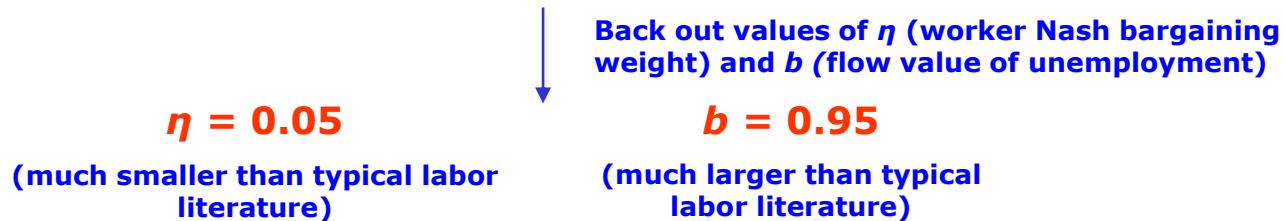


Table 4: Results from the Calibrated Model.

	u	v	v/u	p
Standard Deviation	0.145	0.169	0.292	0.013
Quarterly Autocorrelation	0.830	0.575	0.751	0.765
	u	1	-0.866	-0.966
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Simulations of the Hagedorn and Manovskii calibration: matches data well

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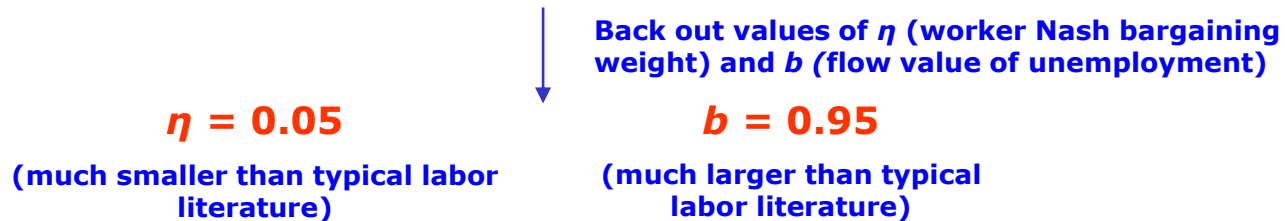


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- **Intuitively, mechanism generates real wage rigidity**
- **All of this raises conceptual question: what are “rigid wages?”**

FULL MACRO MODELS

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 - ❑ ...
 - ❑ **MANY OTHERS!....**