Labor Market Participation and the Business Cycle

Christian Haefke and Michael Reiter

Labor Market Fluctuations:

- Standard RBC models: only variations in employment; Either match variability in employment *or* consistent with microeconometric evidence.
  Problem: Employment Variability

Labor Market Fluctuations:

- Standard RBC models: only variations in employment;

- Unemployment:
  - ✔ Indivisible Labor
  - ✔ MP-style matching models

  Critized for getting either the short run fluctuations or the long run response to benefit reforms wrong.
  Problem: previous & Unemployment Variability;

Labor Market Fluctuations:

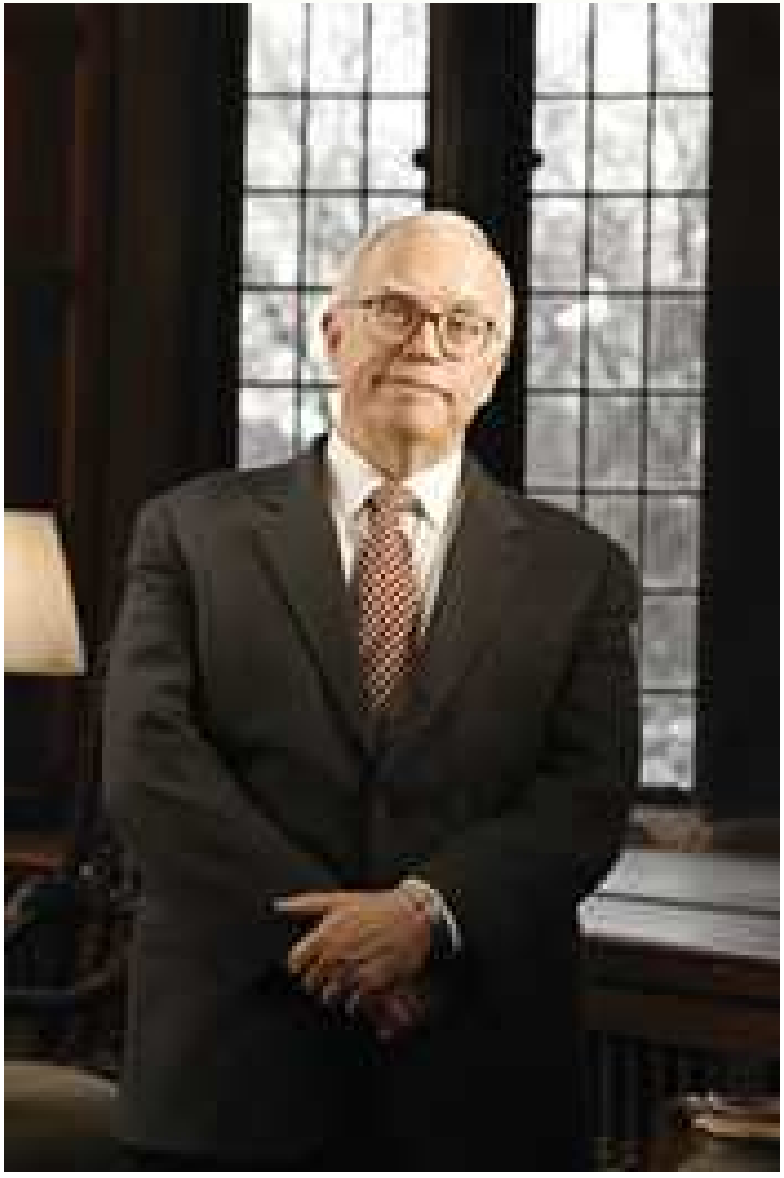
- Standard RBC models: only variations in employment;
- Unemployment:
  - ✔ Indivisible Labor
  - ✔ MP-style matching models
- Labor Market Participation:
  - ✔ Endogenous search intensity;
  - ✔ Endogenous participation decision

  Problem: previous & Unemployment procyclical;

The Extensive Margin:

"[. . .] any serious model of business-cycle labor market fluctuations must account for manhour variation at the extensive margin (employment or labor-force entry decisions) as well as manhour variations at the intensive margin (hours per employee)."

James Heckman:"Comments on the Ashenfelter and Kydland Papers" *Carnegie Rochester Series on Public Policy, 21*, 1984, 209–224.



Why Labor Market Participation?

- *Unemployment Variability*: Transitions to inactivity quantitatively as important as transitions to unemployment;
- *Employment Variability*: Transitions from inactivity second most important determinant (after job separations);

Shimer, R (2005): “Assessing the Ins and Outs . . . ”

Why Labor Market Participation?

- *Unemployment Variability*:
- *Employment Variability*:
- A large part of the population is out of the labor force:
  - US, total population: participation rate 65%
  - stdev log participation: 0.4-0.5%, i.e. one quarter of GDP's.
  - corr (participation,GDP): 0.6
  - Sample Period: 1/1976 – 12/2001
  - Data is HP-filtered ($\lambda = 100000$) and seasonally adjusted.

$$\text{Participation rate} = \frac{\text{No. Employed + No. Unemployed}}{\text{Population} > 16}$$

What we know so far:

- The slope of the reservation wage distribution affects the labor supply elasticity (Ben-Porath 1973);
- Unemployment benefits affect the participation decision (Garibaldi, Wasmer, 2005);
- A basic matching model with participation cannot replicate core stylized facts (Shimer, 2004; Veracierto 2004), in particular unemployment rates are procyclical.

Our Key Results

- we get variability of the participation rate right (cross sectional density of home productivity)
- Implied elasticity of labor supply on extensive margin consistent with micro evidence.
- Employment variability substantially improved compared to the model without participation.
- Strongly **counter**cyclical unemployment rate!
  - ✔ Labor supply elasticity
  - ✔ Time aggregation
- Additional mechanism is necessary to match unemployment variability.

The Model

	Per Period Payoff
at home	h

- Per period payoff h is:
  - idiosyncratic;
  - with cross-sectional distribution $F(h)$;

The Model

	Per Period Payoff
at home	h
search actively	$b(h)$+Chance of finding job

- Per period payoff h is:
  - ✔ idiosyncratic;
  - ✔ with cross-sectional distribution $F(h)$;
- Only active searchers receive job offers;

The Model

Flow Values:

at home:	$rV^h =$	h
searching:	$rV^u =$	$b(h) + \lambda \left(V^e - V^u\right)$

not employed: $rV^n = \max_{\{H,U\}} \left\{rV^h; rV^u\right\}$

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Reservation Strategy with critical value h_c:

stay at home $h > h_c$

participate $h \leq h_c$

The Model

The flow value of non-employment becomes:

$$rV^n(h) = \begin{cases} h & \text{for } h > h_c \\ b(h) + \lambda^w \left(V^e(h) - V^n(h)\right) & \text{for } h \leq h_c \end{cases}$$

The Model

The flow value of non-employment becomes:

$$rV^n(h) = \eta\left(\bar{\mathbf{V}}^{\mathbf{n}} - \mathbf{V}^{\mathbf{n}}(\mathbf{h})\right) + \begin{cases} h & \text{for } h > h_c \\ b(h) + \lambda^w \left(V^e(h) - V^n(h)\right) & \text{for } h \leq h_c \end{cases}$$

When *not employed*, agents receive a

new draw of home productivity with probability η:

- life cycle considerations;
- events in family;
- helps rationalize large gross flows.

The Employment Relationship

Value of being employed:

$$rV^e(h) = w(h) + \chi\left(\bar{V}^n - V^e(h)\right)$$

Value of a filled job:

$$rJ(h) = z - w(h) + \chi\left(0 - J(h)\right)$$

Free entry condition:

$$\frac{1}{q(\theta)}\phi = \int_{\underline{h}}^{h_c} J(h)dF(h)\frac{1}{F(h_c)}$$

Wages

- Generalized Nash bargaining to split match surplus; Worker's bargaining share, α.

$$\alpha J(h) = (1-\alpha)\left(V^e(h) - V^n(h)\right)$$

- By assumption all workers are equal *on* the job.
- Threatpoints:
  - ✔ Heterogeneous; (tractable in steady state);
  - ✔ Homogeneous: Trick: Reset home productivity
    - when bargain breaks down (counterfactual implications);
    - when matched (ResetH).

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- but workers redraw anyway upon separation.

Two Useful Assumptions

ConstB All agents receive the same amount of flow utility, i.e. $b(h) \equiv b_0$.

- ✔ Makes steady state wages independent of *current* home productivity.
- ✔ Simplifies steady state job creation condition to $J = \frac{\phi}{q(\theta)}$.

Two Useful Assumptions

ConstB All agents receive the same amount of flow utility, i.e. $b(h) \equiv b_0$.

EtaChi The probability, η, of a new draw of home-productivity is equal to the separation probability, χ.

- ✔ employed and non-employed receive new home-productivity with equal probability;
- ✔ Together with **ConstB** this effectively separates the participation decision from wage determination.

Equilibrium

- Wage curve and Job creation condition
  $\Rightarrow$ wage, labor market tightness;
- Flow conditions (Beveridge Curve)
  $\Rightarrow$ unemployment;
- Indifference between staying at home and participating $V^h(h_c) = V^u(h_c) \Rightarrow h_c$
  $\Rightarrow$ Participation Rate

Wages and Tightness

Under assumption *ConstB* job creation condition and wage curve are given by

$$\text{JCC: } w = z - (r+\chi)\frac{\phi}{q(\theta)}$$

$$\text{WC: } w = \frac{r+\chi}{r+\chi+\alpha\lambda}(1-\alpha)b + \frac{r+\chi+\lambda}{r+\chi+\alpha\lambda}\alpha z$$

$$+ \quad (\eta-\chi)\,\frac{1}{r+\chi+\alpha\lambda}\int_{h_c}^{\infty}(h-h_c)dF(h)$$

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$$+ \quad (\eta-\chi)\frac{1}{r+\chi+\alpha\lambda}\int_{h_c}^{\infty}(h-h_c)dF(h)$$

Furthermore, under assumption *EtaChi* the wage curve is also independent of the home-sector, i.e. the reservation home productivity h_c.

Participation and (Un)employment

In the textbook model without participation:

Participation and (Un)employment

Assume *EtaChi*, *then*

$$u = \frac{\chi}{\chi + \lambda}\pi \qquad \pi : \text{Participation Rate}$$

$$e = \frac{\lambda}{\chi + \lambda}\pi \qquad \pi = F(h_c)$$

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- $\text{Ela}_{e,z} = \text{Ela}_{es,z} + \text{Ela}_{\pi,z}$
  Participation magnifies employment fluctuations;
- $\text{Ela}_{u,z} = \text{Ela}_{us,z} + \text{Ela}_{\pi,z}$
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  Participaton dampens unemployment fluctuations;
  If $f(h_c)$ too large, unemployment procyclical.

Standard Steady State Results

Comparative Statics (for *EtaChi* and *ConstB*):

$$\frac{d\theta}{\theta} = \frac{r + \chi + \alpha\lambda^w}{\vartheta(r + \chi) + \alpha\lambda^w} \frac{dz - db_0}{z - b_0}$$

- The variability of labor market tightness, θ, depends on the match surplus $z - b_0$.
- Endogenous participation does not affect the response of labor market tightness to variations in productivity.
- The wage, labor market tightness, and the threshold value of homeproductivity are independent of the redraw distribution, $F(h)$.

Participation and Productivity

Proposition 2: In steady state the general equilibrium response of the participation threshold satisfies:

$$\frac{dh^c}{dz} = \frac{\alpha\lambda^w}{\vartheta(r+\chi)+\alpha\lambda^w} > 0$$

Proposition 3: The change in the participation rate is proportional to the cross sectional density of home productivities at the participation threshold:

$$\frac{dP}{dz} = f(h^c)\frac{dh^c}{dz} > 0$$

Some Limiting Cases

- *Frictionless limit*: $\phi \to 0 \Rightarrow$
  - ✔ $\lambda \to \infty$
  - ✔ $w \to z$
- *Constant Participation*
  if no mass around the participation threshold.
  (Recall h_c independent of $F(h)$.)

Summary: Theoretical Findings

- Standard Pissarides model and standard (frictionless) RBC model are limiting cases of our model.
- The participation threshold varies approximately 1:1 with aggregate productivity $\Rightarrow$ variation in participation is largely determined by the cross-sectional distribution of home productivity.
- Endogenous participation has little (or no) effect on labor market tightness and its dynamics.

Calibration

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- Unemployment flow utility $b = 0.615$ to match semi-elasticity of 1.3;
- Median home productivity $\bar{h}$: steady state participation rate of 65.35%.
- Spread of cross sectional density of home productivity (σ): Match U.S. wage distribution;

The Wage - Homeproductivity Calibration

kommt noch

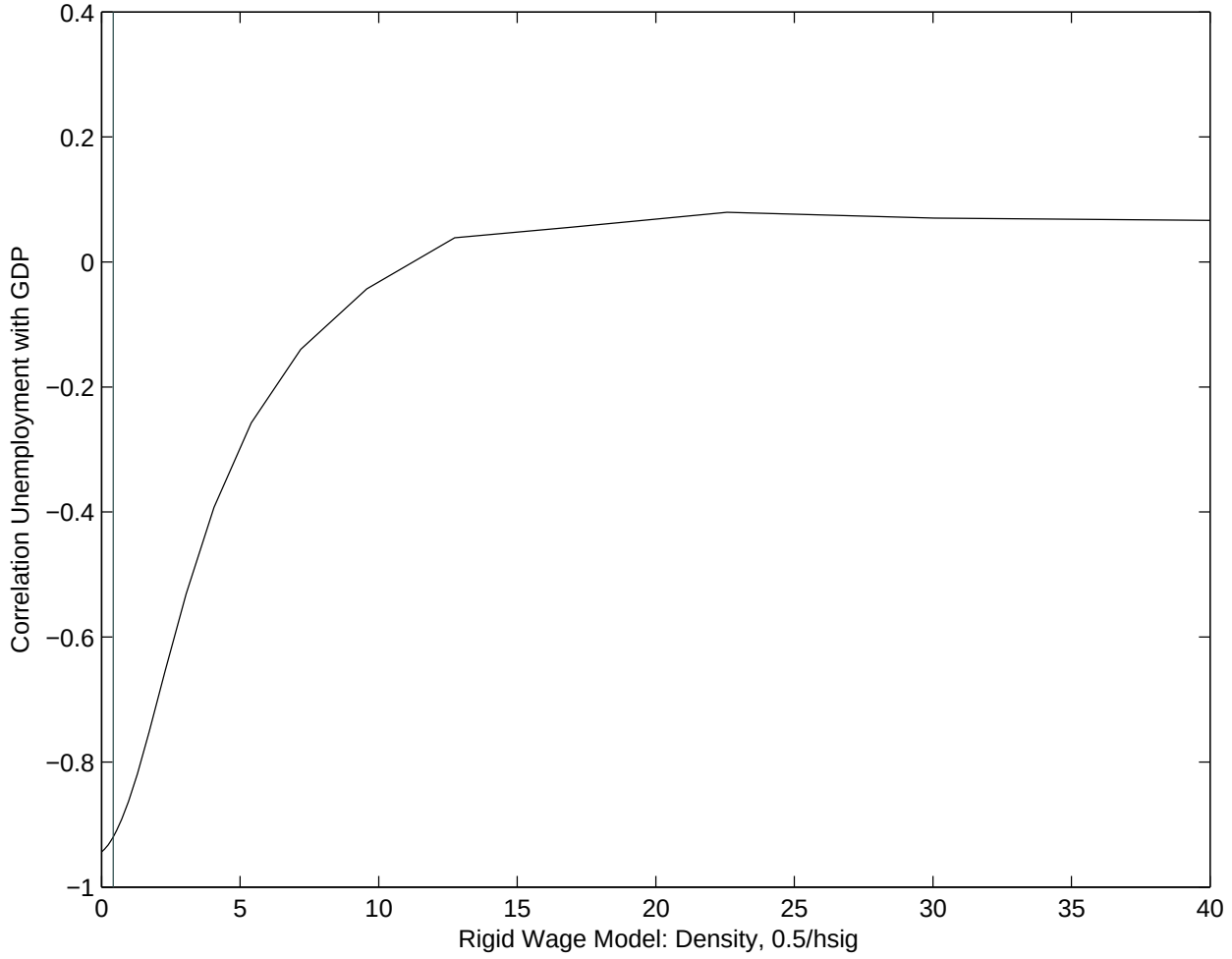
Micro Studies: LS Elasticities

Name (Year)	Dataset (Years)	Sample	Dependent Variable	Model Approach	Labor Supply Elasticity
Ashenfelter (1978)	NC-Iowa R.I.M.				husband: 0.2 wife: 0.9
van Soest et al (JoEMX, 2002)	Dutch SEP (1995)	mar f	positive desired hours worked	structural	Own Wage: 0.6–0.75
Kimmel & Kniesner (JME, 1998)	SIPP (1984)	sin/mar m/f	Employment vs Nonemployment	FE probit	men: 0.65 – 1.08 women: 1.85–2.41
Chang & Kim (mimeo, 2005)	PSID 79-92 CPS 68-01	mar HH	reservation wage distribution	Calibrate model	men: 0.84–0.96 women: 1.36–1.71

Estimated labor supply elasticities range from 0.2 – 2.4.

Our calibration implies 0.6.

Cyclicality of Unemployment rate



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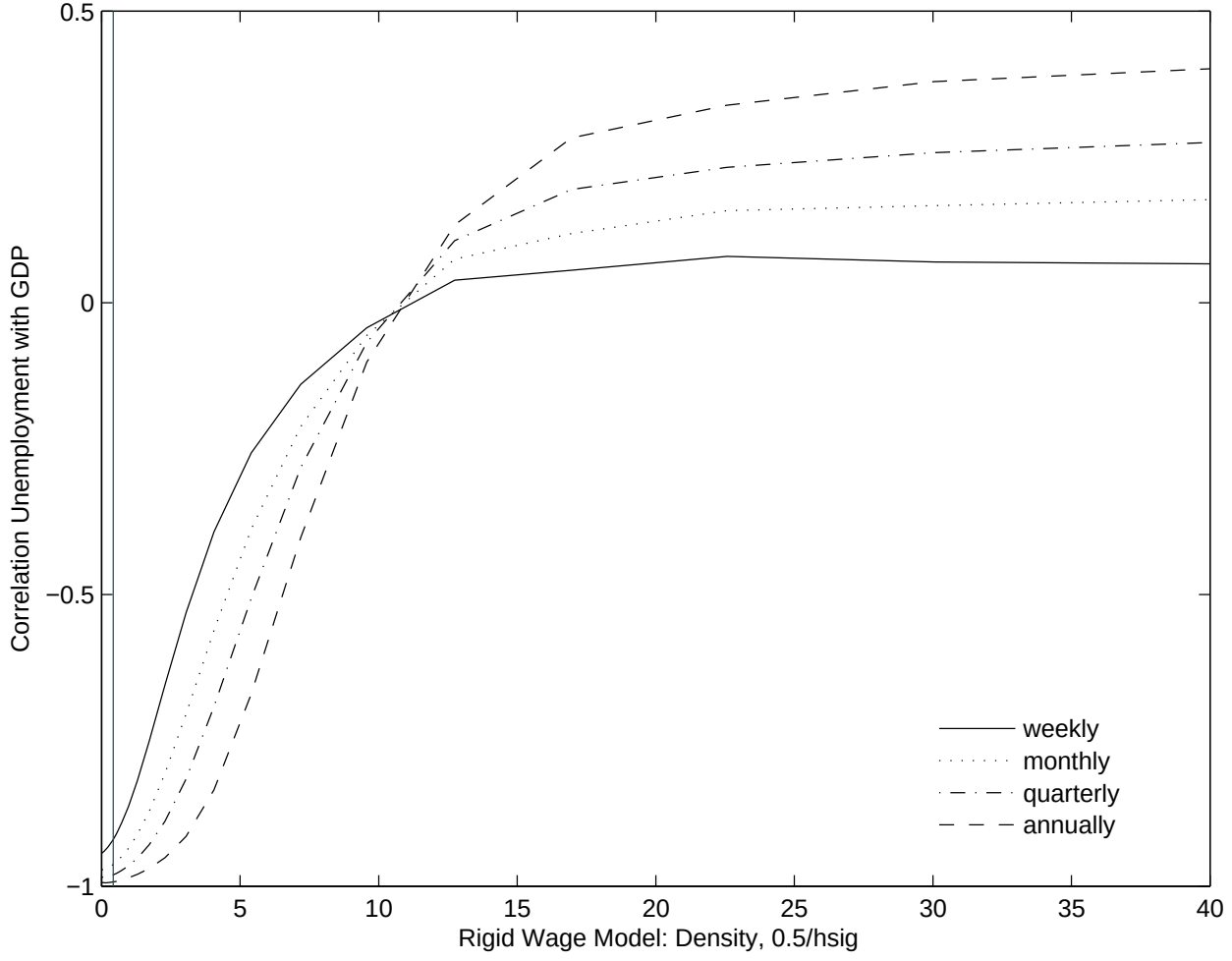

Data and Benchmark

Data	Mean	σ_x	$\frac{\sigma_x}{\sigma_{GDP}}$	ρ_{-1}	$\rho^q_{x,GDP}$	$\rho^m_{x,GDP}$
Participation rate	65.354	0.50	0.231	0.877	0.549	
Employment rate	61.205	1.43	0.660	0.955	0.896	
Unemployment	4.150	14.26	6.566	0.947	-0.918	
Real GDP	6888.580	2.17	1.000	0.932	1.000	
Benchmark Model						
Participation rate	65.365	0.358	0.227	0.953	0.911	0.887
Employment rate	61.188	0.428	0.271	0.959	0.896	0.855
Unemployment	4.177	1.084	0.703	0.611	-0.498	-0.286
Real GDP	61.210	1.569	1.000	0.913	1.000	1.000

Employment Variability

	Mean	$\sigma_{\mathbf{x}}$	$\frac{\sigma_{\mathbf{x}}}{\sigma_{\mathbf{GDP}}}$	$\rho_{-\mathbf{1}}$	$\rho^{\mathbf{q}}_{\mathbf{x,GDP}}$
Data	61.205	1.43	**0.660**	0.955	0.896
No Participation	61.145	0.085	**0.066**	0.924	0.965
Flexible, EW	61.188	0.428	**0.271**	0.959	0.896
Flexible, DW					
$b(h) = b_0$	61.218	0.447	**0.279**	0.958	0.904
$b(h) = h - 0.2$	61.153	0.407	**0.263**	0.965	0.848

Employment Variability

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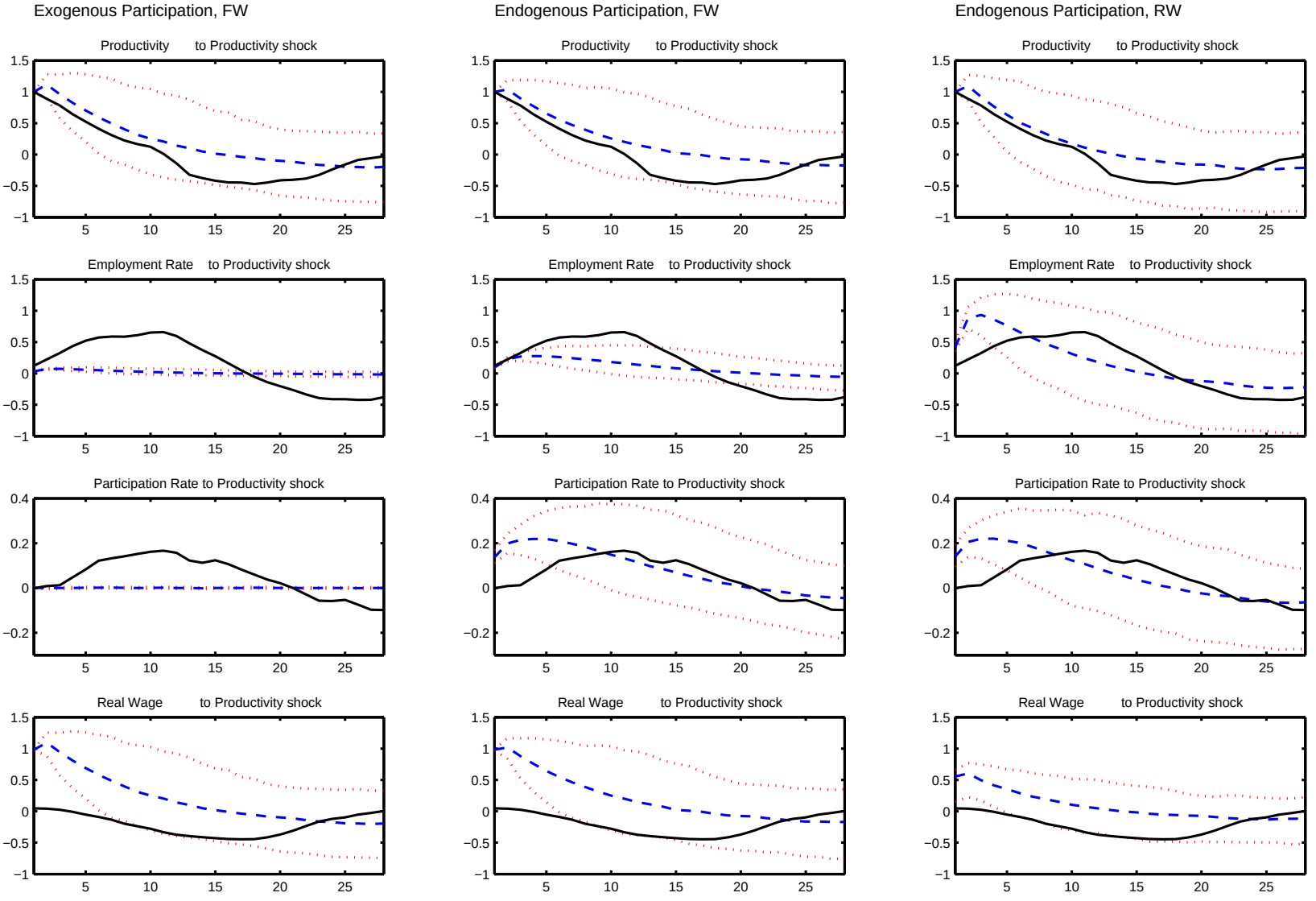
No Participation	61.145	0.085	**0.066**	0.924	0.965
Flexible, EW	61.188	0.428	**0.271**	0.959	0.896
Rigid, EW	61.063	1.227	**0.513**	0.936	0.981
Rigid, DW: $b(h) = h - 0.2$	61.089	1.148	**0.496**	0.936	0.980

Impulse Responses



Unemployment Variability

	Mean	$\sigma_{\mathbf{x}}$	$\frac{\sigma_{\mathbf{x}}}{\sigma_{\mathbf{GDP}}}$	$\rho_{-\mathbf{1}}$	$\rho^{\mathbf{q}}_{\mathbf{x,GDP}}$
Data	4.150	14.26	**6.566**	0.947	-0.918
No Participation	4.173	1.239	**0.968**	0.924	-0.965
Flexible, EW	4.177	1.084	**0.703**	0.611	-0.498
Flexible, DW					
$b(h) = b_0$	4.135	1.159	**0.736**	0.692	-0.636
$b(h) = h - 0.2$	4.155	1.085	**0.724**	0.591	0.359

Unemployment Variability

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No Participation	4.173	1.239	**0.968**	0.924	-0.965
Flexible, EW	4.177	1.084	**0.703**	0.611	-0.498
Rigid, EW	4.262	12.393	**5.234**	0.920	-0.981
Rigid, DW $b(h) = h - 0.2$	4.213	11.174	**4.868**	0.918	-0.982

Key Findings

- Countercylical Unemployment Rate:
  Time Aggregation, Labor Supply Elasticity;
- Employment Fluctuations:
  Participation Margin
- Unemployment Fluctuations:
  Wage Rigidity

Summary: Numerical Results

- Implied elasticity of labor supply consistent with micro evidence;
- Improve employment variability;
- Strongly counter-cyclical unemployment rate;
- Some wage rigidity: $\longrightarrow$ unemployment fluctuates much more than output.
- Results are robust to relaxing assumptions *EtaChi*, *ConstB*.

Conclusions

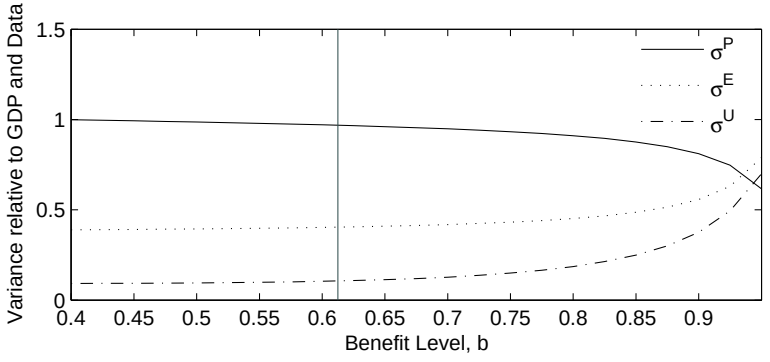
Two ingredients . . .

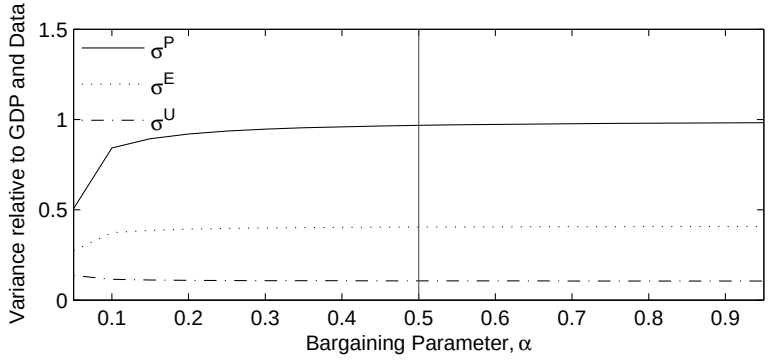
- Right degree of heterogeneity
- Continuous time rather than quarterly simulations

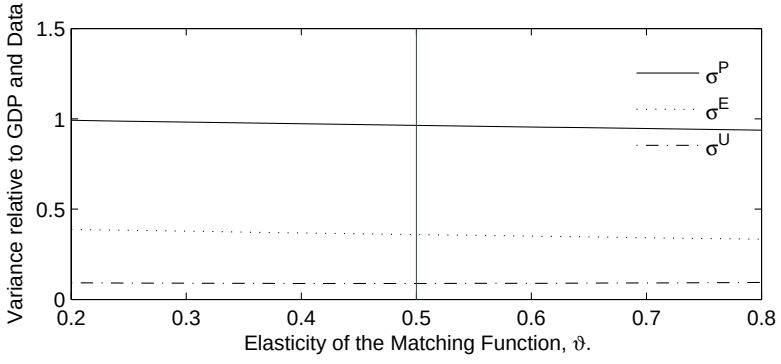
. . . help improving

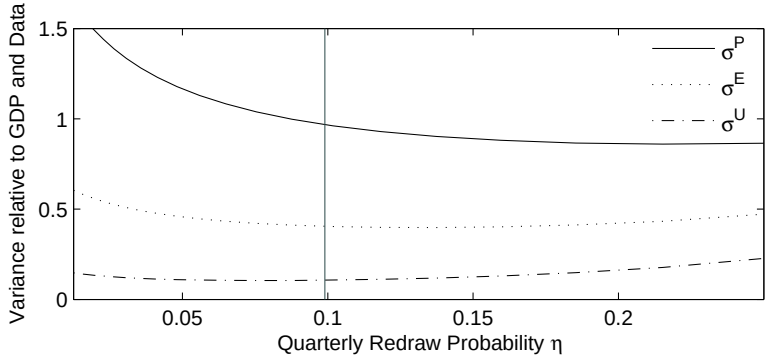
- on the matching literature in terms of variability of macro aggregates
- on the RBC literature by making the labor supply elasticity consistent with micro evidence.

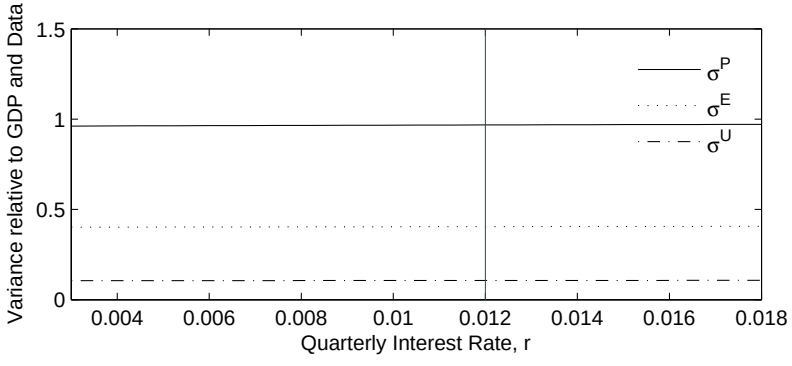
Robustness

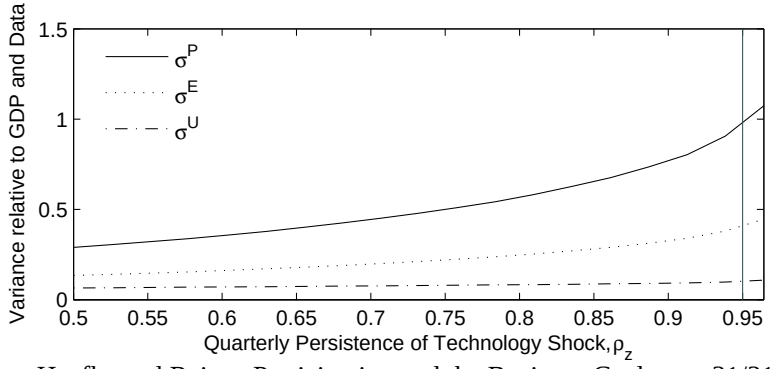

Variance relative to GDP and Data
Benefit Level, b
σP
σE
σU


Variance relative to GDP and Data
Bargaining Parameter, α
σP
σE
σU


Variance relative to GDP and Data
Elasticity of the Matching Function, ϑ.
σP
σE
σU


Variance relative to GDP and Data
Quarterly Redraw Probability η
σP
σE
σU


Variance relative to GDP and Data
Quarterly Interest Rate, r
σP
σE
σU


Variance relative to GDP and Data
Quarterly Persistence of Technology Shock, ρz
σP
σE
σU