Session 6: Endogenous separations and labor force participation

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Recap last lecture

- DMP model
  - Efficiency
  - Dynamics: Moments and IRFs
  - Key limitation: Not enough V/U volatility

Today's lecture

- Modelling endogenous job separations
- Modelling labor force participation

Endogenous job separations - the fight

- Shimer (2012) found that cyclical variation in separation rates unimportant
- This claim contradicted in later work:
  - Fujita and Ramey (2009)
  - Barnichon (2012)
    - Incorrect to assume contribution to employment volatility from job creation and destruction is independent
- What's the fuss about?
  - Matters for a bunch of results
  - Simplicity

Endogenous job separations

- Model separations along the lines of Den Haan, Ramey and Watson (AER, 2000) and Christiano, Trabandt and Walentin (2011)
- Need heterogeneity in productivity for some fraction $(0 < x < 1)$ of matches to fulfill criteria to be dissolved
  - Standard criteria: negative total surplus of match
  - **Alternative criteria**: negative surplus of match to employer
- Timing within a period:
  1. Wage is bargained
  2. Employer decides cut-off:
     $\Rightarrow$Worker with shock $a_{jt} < \bar{a}_t$ fired
  3. The idiosyncratic productivity shock is realized: $a_{jt} \sim \zeta$
     - ζ is lognormal and $E(a_{jt}) = 1$

Firm's value

- η_t is the unconditional expected (idiosyncratic) productivity

$$\eta_t = \int_{\bar{a}_t}^{\infty} v d\zeta(v)$$

- ζ_t is the endogenous separation probability

$$\zeta_t = \int_{0}^{\bar{a}_t} d\zeta(v)$$

- $\Rightarrow$expected value to firm of a match conditional on $\bar{a}_t$: $\frac{\eta_t}{1-\zeta_t} J_t$

$$J_t = Z_t \frac{\eta_t}{1-\zeta_t} - W_t + E_t \left\{ \beta (1-\sigma) (1-\zeta_{t+1}) J_{t+1} \right\}$$

- **Assumption ("right to manage"):** Firm chooses $\bar{a}_t$ to maximize profits per beginning of period match$=(1-\zeta_t)\,J_t$
  - Yields following expression for the cut-off:

$$\bar{a}_t = \frac{\eta_t}{1-\zeta_t} - \frac{J_t}{Z_t}$$

- Intuition: trade off profit-per-worker vs. profits forfeited by firing a fraction ζ_t of workers

JCC, worker's value and bargaining

Job creation condition becomes

$$c = q_t \beta E_t \left\{ (1-\sigma)\left(1-\zeta_{t+1}\right) J_{t+1} \right\}$$

Worker value:

$$H_t = W_t - b + \beta E_t \left\{ \left[(1-\sigma)\left(1-\zeta_{t+1}\right) - f_t \right] H_{t+1} \right\}$$

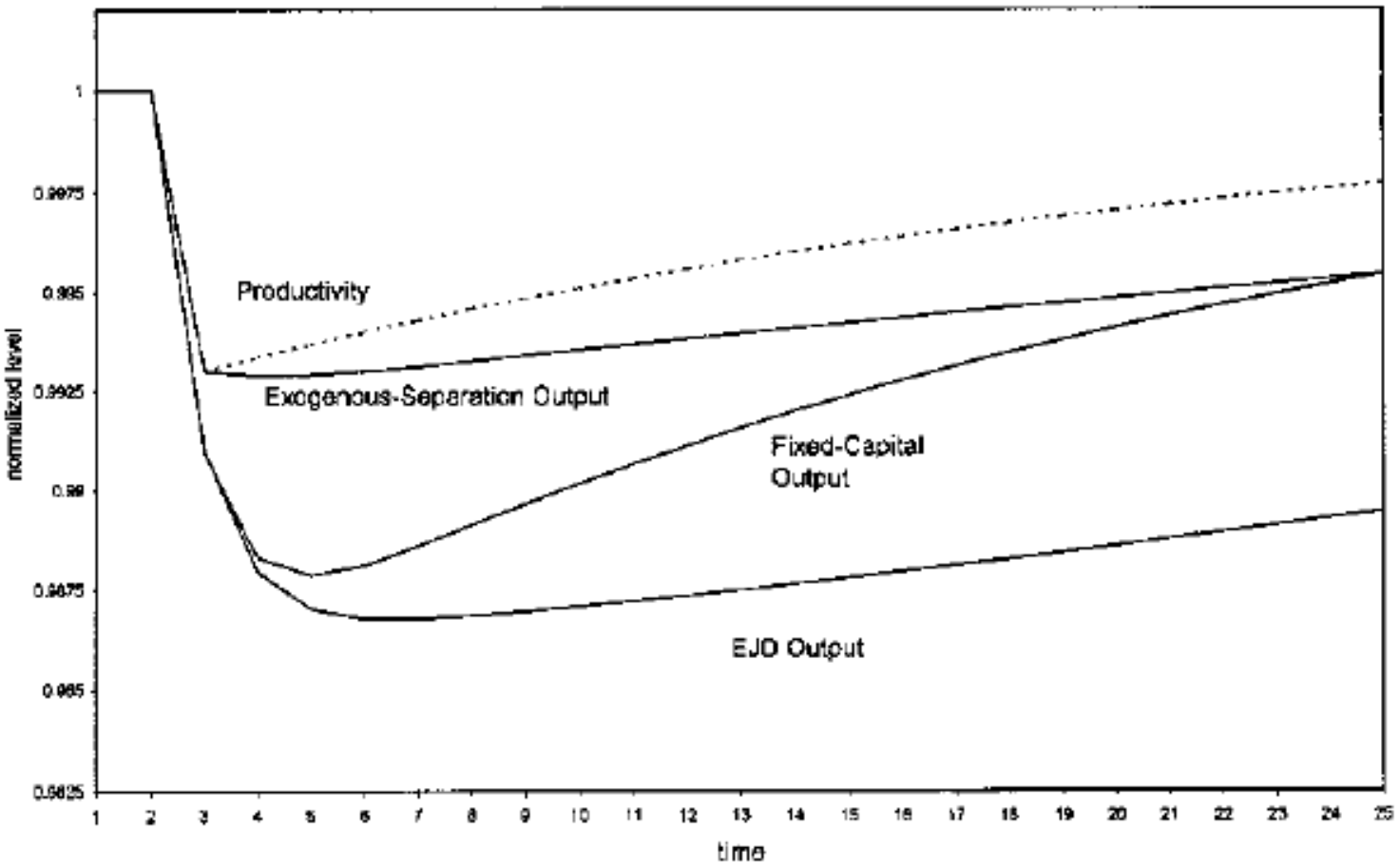
Nash bargaining over wages:

$$\max_{W_t} \left(\left(1-\zeta_t\right) H_t \right)^{\varphi} \left(\left(1-\zeta_t\right) J_t \right)^{1-\varphi}$$

Amplification from endogenous separations

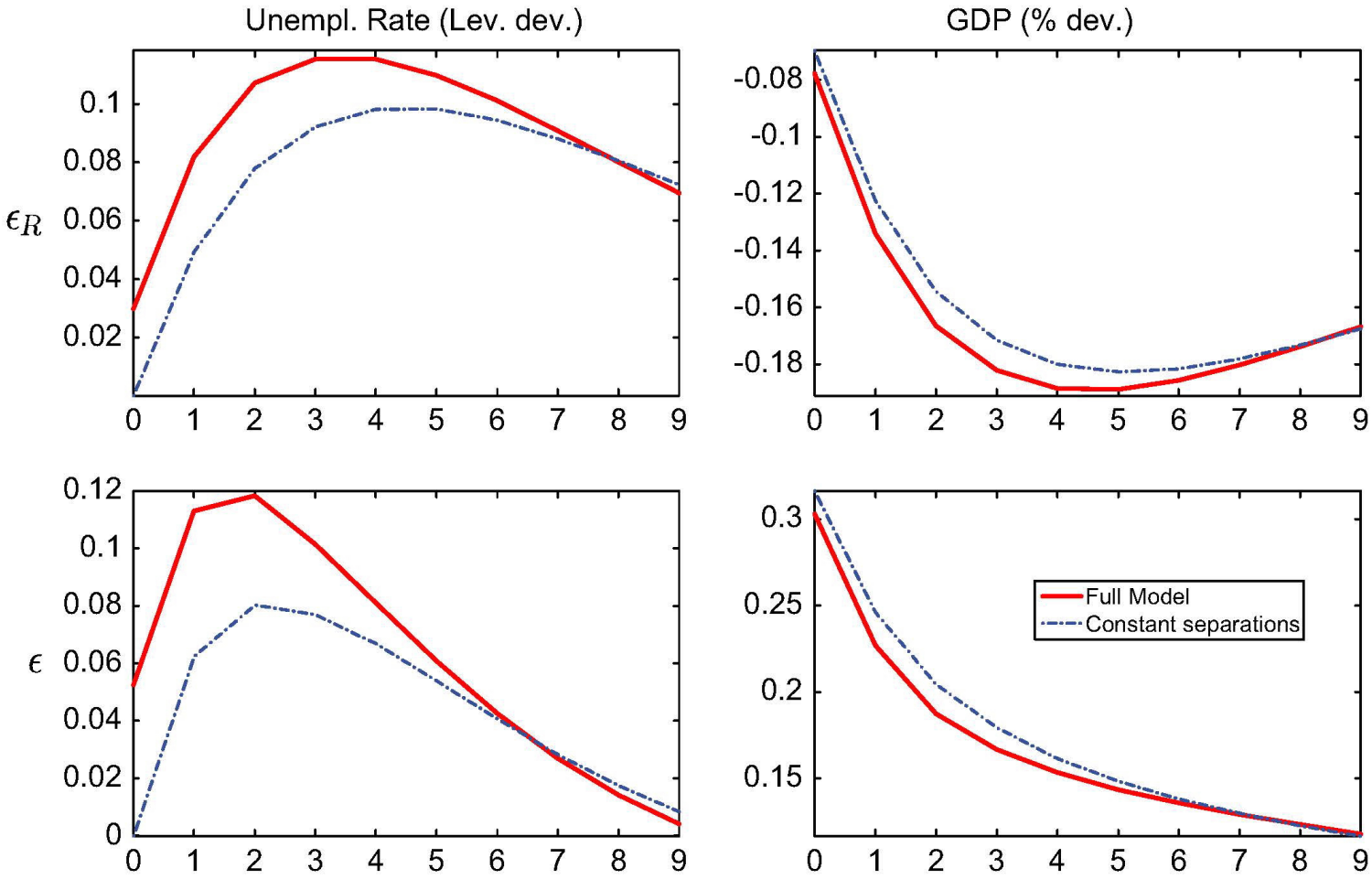
Results from Den Haan et al

Impulse response to a TFP shock



Amplification from endogenous separations (part II)

Results from Christiano et al - richer model with nominal rigidities

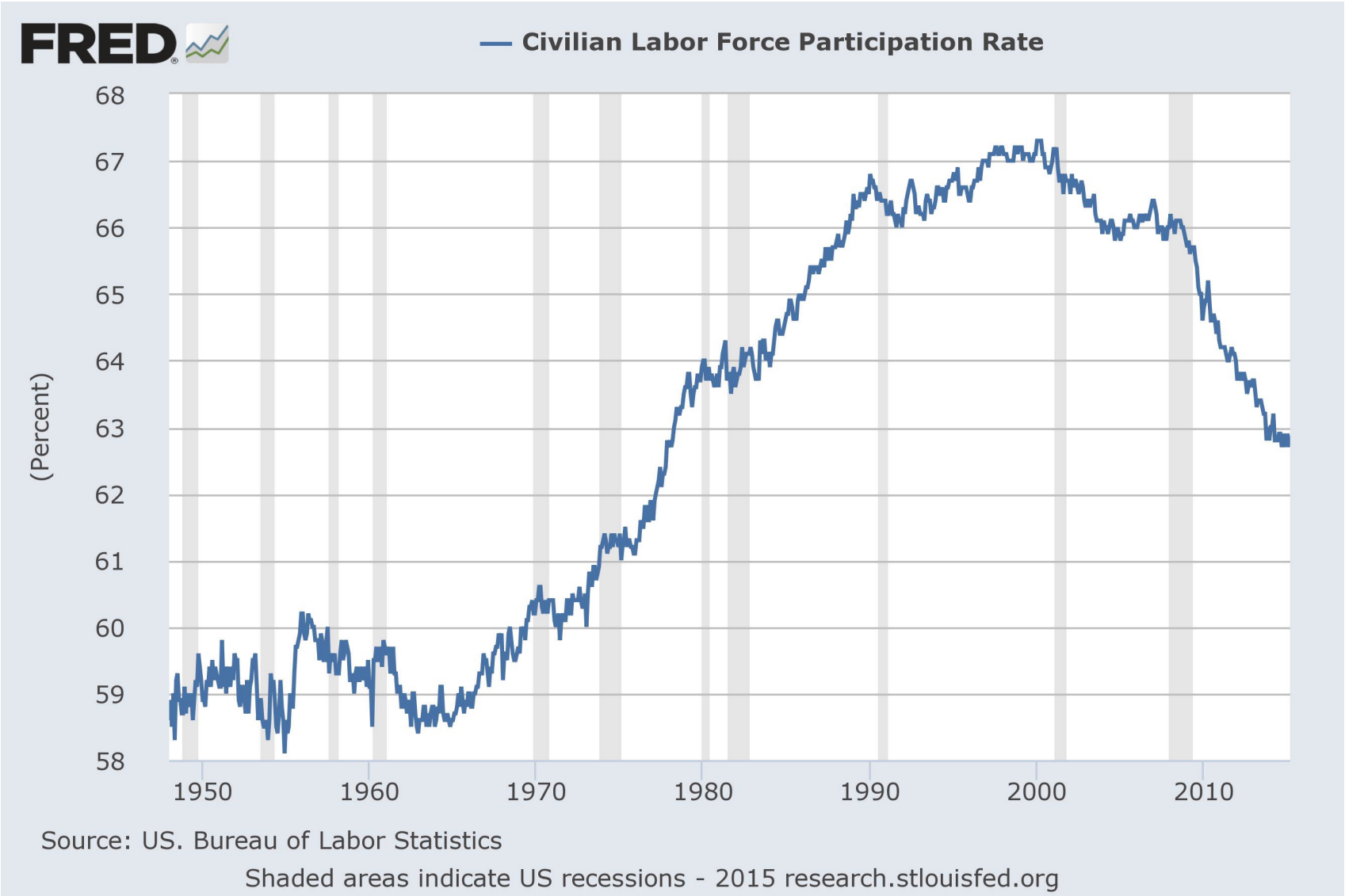


Add'l reason endogenous separation matters

- If separations are exogenous, then wages of existing workers are not allocative
- With endogenous separations, wages of existing workers matter, so wage rigidities for already employed workers matter
  - Carlsson and Westermark (2015) - partial solution to Shimer puzzle
- (Same technical method used for default rates in financial friction literature: Bernanke, Gertler and Gilchrist (1999))

Labor force participation

Labor force participation



LFP-modelling over the business cycle: Overview

1. Veracierto (2008)
   - Full unemployment insurance
2. Krusell, Mukoyama, Rogerson and Sahin (2012)
   - No unemployment insurance (only lump-sum)
3. [*Christiano, Trabandt and Walentin (2011)*]
   - Optimal unemployment insurance

Veracierto: Models must be consistent with LFP choice

- Claims that key reason agents stop working in Merz' model is to enjoy leisure (RBC story)
- But, can obtain more leisure by leaving labor force
  $\Rightarrow$this would dampen or even reverse countercyclicality of unemployment
- Should match LFP facts:
  1. 20% as volatile as GDP
  2. Weakly procyclical

Veracierto: Sets up RBC-DMP model with LFP

Key new margin:
Value of "home production" lost when searching=
job finding probability $\times$ expected discounted value of being employed

Veracierto

With endogenous LFP, RBC-DMP fails in several dimensions:

1. Unemployment volatility too low
   - $\approx$GDP, but in data $6 * GDP$
2. U weakly procyclical
   - U countercyclical in data
3. LFP fluctuates too much and is too procyclical
   - Model corr=0.97$\gg$Data corr=0.39

Failure due to high IES in home goods

- Veracierto's main point is that standard RBC mechanism - employment decreases because agents substitute to home production - can not yield unemployment (just non-employment in the form of out-of-labor force)
- He suggests a way forward:
  - Explore importance of firms' and workers' search decisions varying with the cycle

Krusell et al "Gross Worker Flows over the Business Cycle"

- Research question: What shocks are needed to match gross flows between the three possible states of a worker: employment, unemployment and out-of-the-labor force?
  - Quantify contribution to key variables of:
    - TFP shock, Z
    - Job finding rate shock, λ
    - Separation rate shock, σ
- Trading off some richness against some simplifications:
  - Flows!
  - Capture heterogeneity in return to market work/disutility of working
  - **Capture heterogeneity in wealth**
    BUT
  - Exogenus job finding rates (λ) and separation rates (σ)
  - A bit mechanical - only labor market choice is participation (actually job acceptance)

Model prelims

$c \geqq 0, k' \geqq 0$
$U = \log(c) - \alpha e$
$Y_t = Z_t K_t^{\theta} L_t^{1-\theta}$
Heterogeneity in return to market work:
$\log z_{i,t+1} = \rho_z \log z_{i,t} + \varepsilon_{i,t+1}$
$V(k, z, \Omega) = \max\{W(k, z, \Omega), N(k, z, \Omega)\}$
where $\Omega = [Z, \lambda, \sigma;$ joint distr. of wealth and labor market status$]$

Value functions of workers

Working

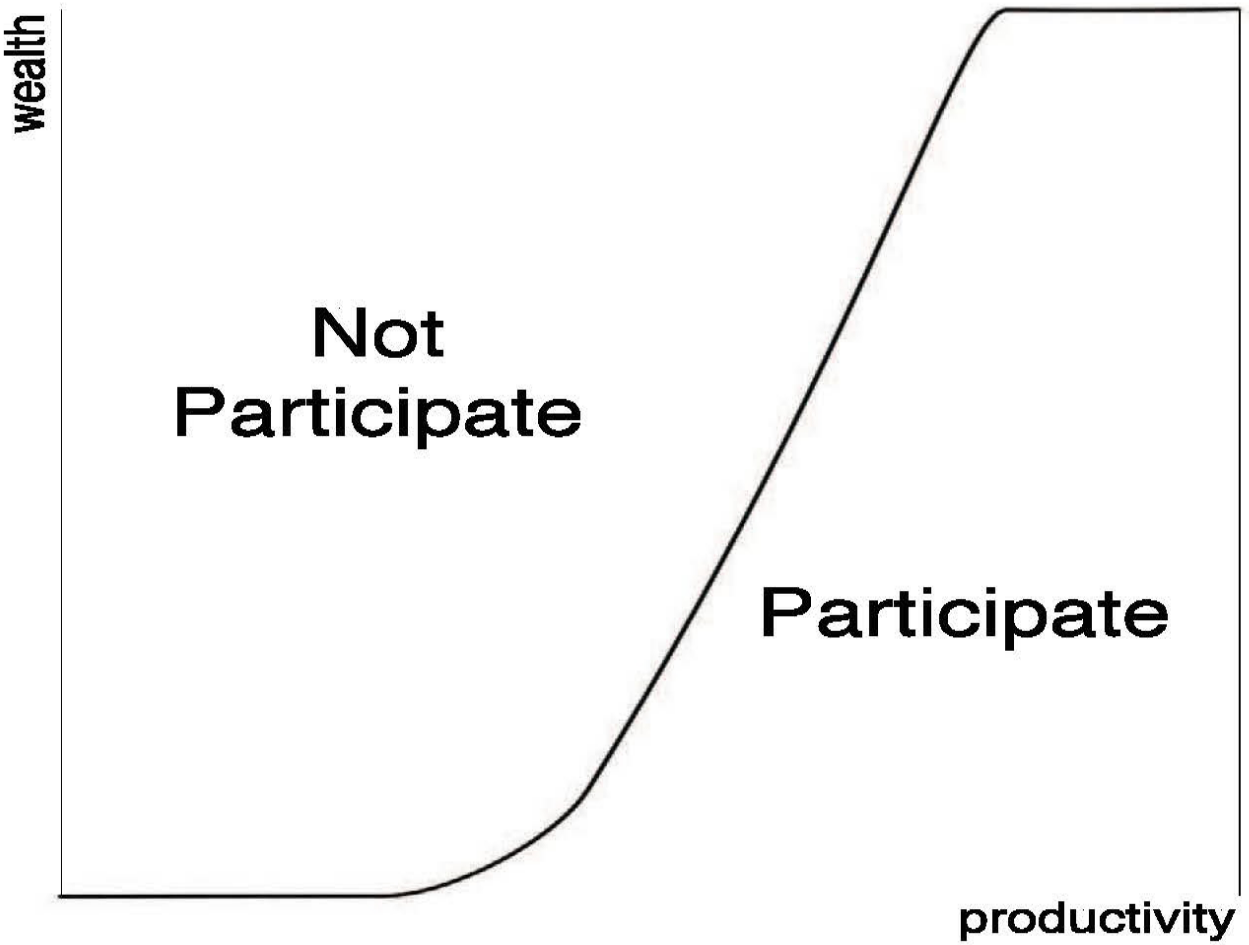
$$
\begin{aligned}
W(k,z,\Omega) &= \max_{c,k'} \left\{ \log(c) - \alpha + \beta E \left[\begin{array}{c} (1-\sigma(1-\lambda))\, V(k',z',\Omega') + \\ \sigma(1-\lambda)\, N(k',z',\Omega') \end{array} \right] \right. \\
s.t.\quad c+k' &= [1+r(\Omega)]\,k + \mathbf{w}(\Omega)\,\mathbf{z}
\end{aligned}
$$

Non-working

$$
\begin{aligned}
N(k,z,\Omega) &= \max_{c,k'} \left\{ \log(c) + \beta E \left[\begin{array}{c} \lambda V(k',z',\Omega') + \\ (1-\lambda)\, N(k',z',\Omega') \end{array} \right] \right\} \\
s.t.\quad c+k' &= [1+r(\Omega)]\,k
\end{aligned}
$$

Participation decision

Basic result/intuition



Calibrate to fit average values of stock and flows

Flows in the Data and the Model							
US 1968-2009				Model			
FROM	TO			FROM	TO		
	E	U	N		E	U	N
E	0.954	0.016	0.030	E	0.954	0.007	0.039
U	0.270	0.508	0.222	U	0.396	0.505	0.099
N	0.048	0.027	0.925	N	0.035	0.044	0.921

Note: Monthly frequency

Business cycle results - shocks

Behavior of Stocks to Price and Job Availability Shocks									
	Volatilities $std(x)$			Correlations $corrcoef(x, Y)$			Autocorrelations $corr(x, x_{-1})$		
	u	$lfpr$	E	u	$lfpr$	E	u	$lfpr$	E
Data	.12	.003	.011	−.87	.46	.84	.92	.72	.95
Price shocks only	.03	.010	.011	−.55	.94	.96	.37	.71	.75
Friction shocks only	.11	.007	.002	−.90	−.80	.45	.79	.72	.52

Business cycle results - shocks (in words)

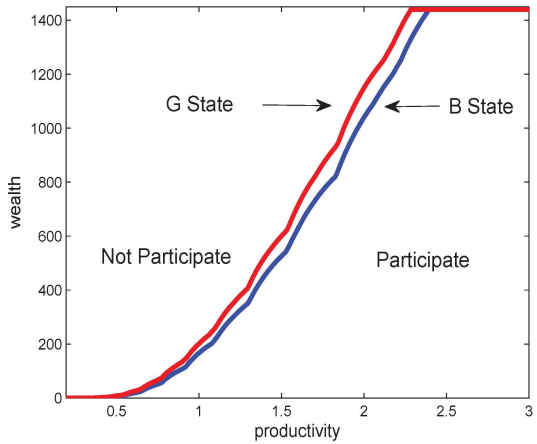
- With only friction shocks:
  - Match unemployment volatility and most transition rates
  - LFP countercyclical ($\neq$ *data*)
- With only TFP shock
  - Match employment volatility
  - LFP procyclical ($=$ *data*)

Combining the two types of shock (perfectly correlated)

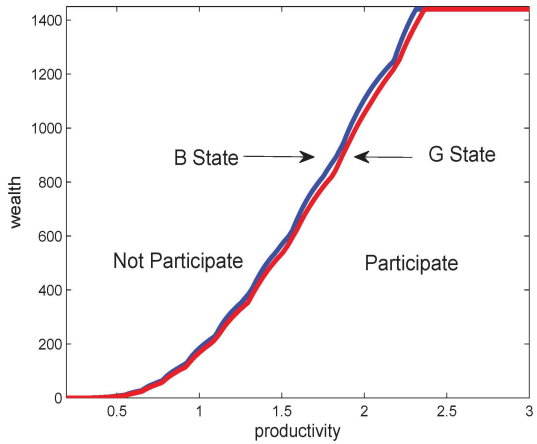
Behavior of Stocks in Benchmark Model									
	Volatilities $std(x)$			Correlations $corrcoef(x,Y)$			Autocorrelations $corr(x,x_{-1})$		
	u	$lfpr$	E	u	$lfpr$	E	u	$lfpr$	E
Data	.12	.003	.011	−.87	.46	.84	.92	.72	.95
Model	.13	.004	.011	−.98	.56	.97	.80	.68	.78

Aggregate shocks and participation choice

TFP shocks:



Job finding rate and separation rate shocks:



Flow implications (with both types of shock)

Gross Worker Flows in the Benchmark Model						
A. Data						
	f_{EU}	f_{EN}	f_{UE}	f_{UN}	f_{NE}	f_{NU}
$std(x)$	.085	.032	.077	.060	.043	.064
$corrcoef(x, Y)$	$-.82$	.33	.78	.78	.64	$-.70$
$corrcoef(x, x_{-1})$	.73	.20	.84	.73	.41	.75
B. Model						
	f_{EU}	f_{EN}	f_{UE}	f_{UN}	f_{NE}	f_{NU}
$std(x)$	.085	.031	.077	.051	.080	.066
$corr(x, Y)$	$-.90$	.35	.92	.56	.89	$-.92$
$corr(x, x_{-1})$	.68	.09	.72	.30	.70	.68

Take-away from Krusell et al

1. Model can capture cyclicality of flows
2. Employment and LFP appear to be driven by different shocks over cycle
3. Technically impressive: captures individual transitions between E,U and N over cycle
4. Are these job finding rates and separation rates consistent with optimizing behavior?
5. (separations margin unimportant - timing assumption such that finding rate affects separated workers)

Wrapping up

- Modelling endogenous job separations
- Modelling labor force participation
  - To be continued
- Next lecture also covers non-search theories of unemployment