

# A Model of Hysteresis: Endogenous Wage Rigidity and Labor Force Participation Discussion

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# Outline

- 1 Motivation
- 2 Models
  - Simple Game
  - Macro Model
- 3 Quantitative Analysis: Sec. 6

# Outline

## 1 Motivation

## 2 Models

Simple Game

Macro Model

## 3 Quantitative Analysis: Sec. 6

# Questions

- Observe persistent movements in labor market outcomes.
- Why?
  - Driven by shocks?
  - Combined with equilibrium selection?

## Approach

- search/matching in labor markets
- emphasize **labor market participation**
- *ex ante* wage setting
- goal is to match facts
  - Beveridge curve shifts
  - wage sensitivity
  - persistent effects of shocks

## Answers

- coordination failure in labor markets: multiplicity
- creates persistent effects from transitory shocks
- inefficient outcomes

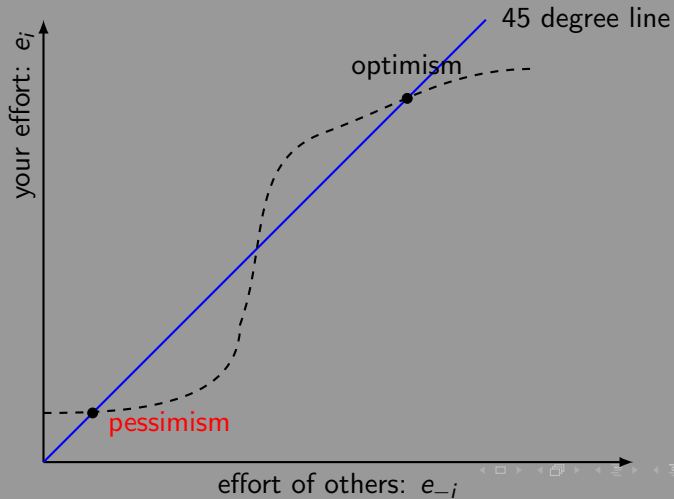
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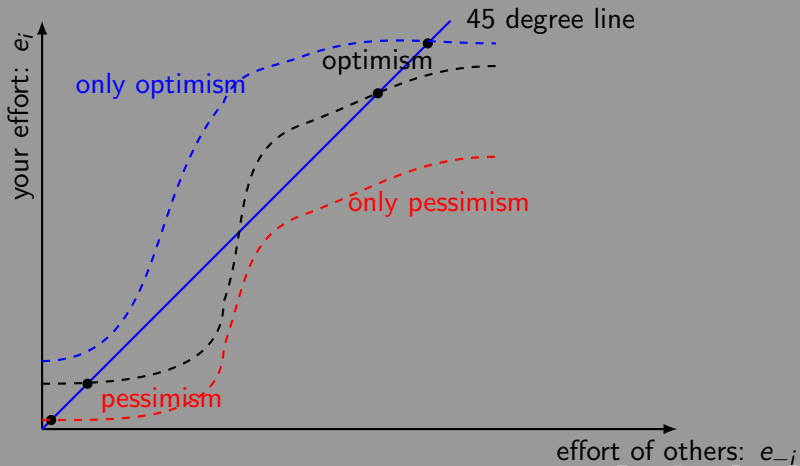
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# My View of Multiplicity





## and Local Selection



## Critique

- impressive and challenging to put this together.
- distinction between participation and unemployment is important and needs to be made clearer
- many pieces, focus on a few issues:
  - the Game: is the strategic complementarity compelling?
  - the Equilibrium: what does the set of equilibrium look like?
  - Quantitative Analysis: what features are being convincingly matched?

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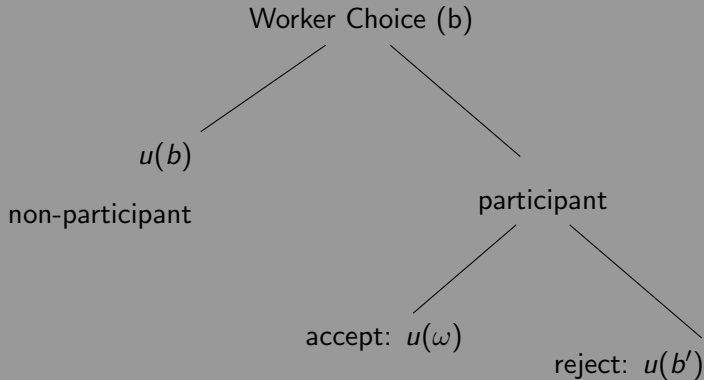
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## Alternative Game: Workers

- variation on their age
- Draw  $b$  from  $H(\cdot)$
- if choose non-participant get  $u(b)$
- if participate, match with a firm and get a wage offer  $\omega$
- decision depends on  $b$  relative to reservation of  $r$ .
- accept and get  $u(\omega)$
- reject and get  $u(b')$
- important:  $b'$  correlated with  $b$ .
- so in this way you can participate but in the end not accept
- there is an opportunity cost of participating

# Cooper Version

Figure : Worker Choice



## Alternative Game: Firms

- draw profitability  $p$
- if enter, pay a cost  $c$  to post a vacancy
- set a wage  $\omega$  that solves

$$\max(p - \omega)G(\omega|r) \quad (1)$$

- $G(\omega|r) = Pr(\omega \geq b' | b \leq r)$
- this dependence of the acceptance probability on  $r$  **potentially** links the reservation  $b$  of the worker to the firm's choice

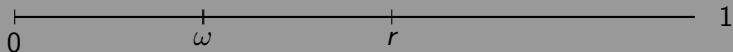
## Alternative Game: Firms

- FOC (as they study)

$$(p - \omega)G_{\omega}(\omega|r) = G(\omega|r) \quad (2)$$

- $G_{\omega}(\omega|r) > 0$  is the marginal increase in the likelihood of a trade and  $G(\omega|r)$  captures the infra-marginal cost of the higher wage
- key is  $\tilde{G}(\omega|r) \equiv \frac{G(\omega|r)}{G_{\omega}(\omega|r)}$
- conjecture:  $\tilde{G}(\omega|r)$  is independent of  $r$ .
- easy to see in uniform case



Figure : Uniform Distribution of  $b$ 

- uniform:  $G(\omega|r) = \frac{\omega}{r}$  for  $\omega \leq r$
- general:  $G(\omega|r) = \frac{G(\omega)}{G(r)}$  for  $\omega \leq r$

## Truncated Distribution Implies

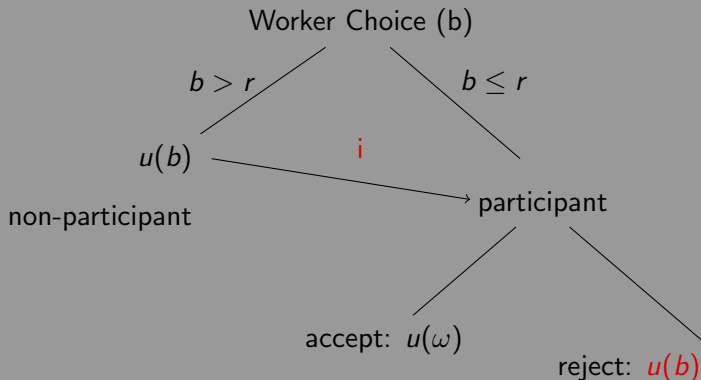
- only a subset of workers may choose to participate
- $\omega = \frac{p}{2}$  is independent of  $r$  in uniform case
- no strategic complements vs their Prop 2.
- no multiplicity
- like auction literature with reserve price set optimally

## Alternative Game: Productivity and Types

Assume  $b$  and  $p$  are positively correlated:  $p(b)$

- $\omega(r)$  increases: selection matters for productivity
- strategic complementarity present
- can we get multiple equilibria depends on shape of  $p(b)$
- need some IRS or perhaps induced by  $H(b)$
- model could create correlation between participation rate, wage and average productivity of labor
- what do changes in match efficiency due to the participation decision in this model?

## Their Version



## Differences in Game

- role of  $i$ 
  - $i = 1$  in my case: no accidental participation
  - if  $i = 1$ , then  $r_0$  is irrelevant as in my case
  - what does  $i \in (0, 1)$  capture? “explained” in 5.4 (???)
- no cost of participating in their model; distinction depends on  $i$
- key seems to be  $(i) \in [0, 1)$  as exogenous participation rate, appears in  $V^F(\omega, r_0)$ .

# Worker's Problem

Payoff:

$$\begin{aligned} V^W(r, w_0) = & \underbrace{u \int_{\underline{b}}^r bdH(b)db + (1-u)\mathbb{I}_{\{w_0 \leq r\}} \int_{w_0}^r bdH(b)db + i \int_r^{\bar{b}} bdH(b)db}_{unemployed} \\ & + \underbrace{(1-u)w_0 H(\min\{r, w_0\})}_{employed} + \underbrace{(1-i) \int_r^{\bar{b}} bdH(b)db}_{nonparticipant} \end{aligned}$$

Best response:

$$b^*(w_0) = \begin{cases} \underline{b} & \text{if } w_0 < \underline{b} \\ w_0 & \text{if } w_0 \in [\underline{b}, \bar{b}] \\ \bar{b} & \text{if } w_0 > \bar{b} \end{cases}$$

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## Firm's Problem

Payoff:

$$V^F(w, r_0) = (1 - \nu) \left[ \mathbb{I}_{\{w \leq r_0\}} \frac{uH(w)}{uH(r_0) + i(1 - H(r_0))} + (1 - \mathbb{I}_{\{w \leq r_0\}}) \frac{uH(r_0) + i[H(w) - H(r_0)]}{uH(r_0) + i(1 - H(r_0))} \right] (p - w).$$

Best response:

$$w^*(w_0) = \begin{cases} \hat{w} & \text{if } r_0 < w^L \\ r_0 & \text{if } r_0 \in [w^L, w^C] \\ w^C & \text{if } r_0 > w^C \end{cases}$$

Prop. 2 For  $r_0$  in  $[w^L, w^C]$ , there are *positive spillovers* and *strategic complementarities* for the firm (the worker's strategy imposes a thick market externality).



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**Prop. 2** For  $r_0$  in  $[w^L, w^C]$ , there are *positive spillovers* and *strategic complementarities* for the firm (the worker's strategy imposes a thick market externality).

## Other points

- why posted price? mechanism design approach
- makes you think what about participation actually means!  
Exactly what options are lost by participating?
- perhaps need to add a search cost on both sides to induce sorting

## “Macro Model” Equilibrium

- simple bilateral game fits nicely into aggregate model
- job filling rate reflects  $i$ ; how much does this matter? (eq.4)
- does this mean that usual matching function is not specified correctly due to  $i$  flows?
- response to shocks through the local selection argument
- nonlinearity and persistence arise
- robustness:
  - alternative wage setting mechanisms
  - directed search
  - multi-worker firms

## Hall AER

- Prop. 3 about a continuum of equilibria is like Hall's result
- standard search and matching model
- BUT: wage is indeterminate, within the bargaining set
- **small** change in fundamentals does not change the wage
- deals with Shimer puzzle
- other implications?

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## Blanchard - Summers

- sources of hysteresis
  - human capital accumulation
  - insider-outsider model of wages
  - did not mention participation, but focus on effects of employment rules on unemployment
  - hysteresis induced by state variables (membership), not selection
- what was their evidence: high serial correlation of unemployment
- does the argument hold now? extend to participation decision?
- interesting differences in participation between the US and Europe?



## Explaining the Facts: Hall Petrosky-Nadeau

- Participation Rate falling due to:
  - aging
  - welfare programs
  - **prime age higher-income workers**
- LFP: 83.8% in 2004 to 81.2% in 2014 for prime age
- find that fall in LFP small for poor and largest for third quartile
- decline is large too for young workers

## Shifting Beverage Curve: Beauchemin and Tasci

- TFP + Match Efficiency Shocks + Separation Shocks
- trying to match: U, vacancies, real output
- Match Efficiency Falling, as in Veracierto
- participation rate is absent
- great to put all of this together

## Explaining the Facts: Alternative View

- on non-participants
  - where do np come from? U or E?
  - could the dynamics of np come from that of U? [Table 1]
  - who are they in terms of age? education?
  - what do the dynamics of non-participation look like?
- what about time series and alternative to AR process
- separating trend from business cycle is difficult, particularly in models with multiplicity

## Final Thoughts

- awesome topic
- work on model to better distinguish participation and acceptance/rejection
- more to do on the quantitative side