A MACROECONOMIC APPROACH TO OPTIMAL UNEMPLOYMENT INSURANCE

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BAILY-CHETTY THEORY OF OPTIMAL UI

- insurance-incentive tradeoff:
  - UI provides consumption insurance
  - but UI reduces job search
- two aspects of the debate are missing:
  - sometimes jobs may be unavailable
  - UI may affect job creation
- because the Baily-Chetty model is partial equilibrium:
  - endogenous labor supply
  - but fixed labor market tightness

THIS PAPER

- general-equilibrium model of optimal UI
  - endogenous labor supply
  - endogenous labor demand
  - equilibrium labor market tightness
- model captures 3 effects of UI:
  - UI may reduce job search
  - UI may alleviate rat race for jobs
  - UI may raise wages and deter job creation
- application: optimal UI over the business cycle

A MATCHING MODEL OF UI

UI PROGRAM

- moral hazard: search effort is unobservable
- employed workers receive c^e
- unemployed workers receive c^u
- replacement rate R measures generosity of UI:
  - $R \equiv 1 - (c^e - c^u)/w$
  - R = benefit rate + tax rate
  - workers keep fraction $1 - R$ of earnings

LABOR MARKET

- measure 1 of identical workers, initially unemployed
  - search for jobs with effort e
- measure 1 of identical firms
  - post v vacancies to hire workers
- CRS matching function: $l = m(\underset{+}{e}, \underset{+}{v})$
- labor market tightness: $\theta \equiv v/e$

MATCHING PROBABILITIES

- vacancy-filling probability:

$$q(\underset{-}{\theta}) \equiv \frac{l}{v} = m\left(\frac{1}{\theta}, 1\right)$$

- job-finding rate per unit of effort:

$$f(\underset{+}{\theta}) \equiv \frac{l}{e} = m(1, \theta)$$

- job-finding probability: $e \cdot f(\theta) < 1$

MATCHING COST: ρ RECRUITERS PER VACANCY

- employees = $\left[1 + \underset{+}{\tau(\theta)}\right] \cdot$ producers
- <u>proof:</u>

$$\underbrace{l}_{\text{employees}} = \underbrace{n}_{\text{producers}} + \underbrace{\rho \cdot v}_{\text{recruiters}}$$

$$l = n + \rho \cdot \frac{l}{q(\theta)}$$

$$l = \underbrace{\left[1 + \frac{\rho}{q(\theta) - \rho}\right]}_{\equiv 1+\tau(\theta)} \cdot n$$

REPRESENTATIVE WORKER

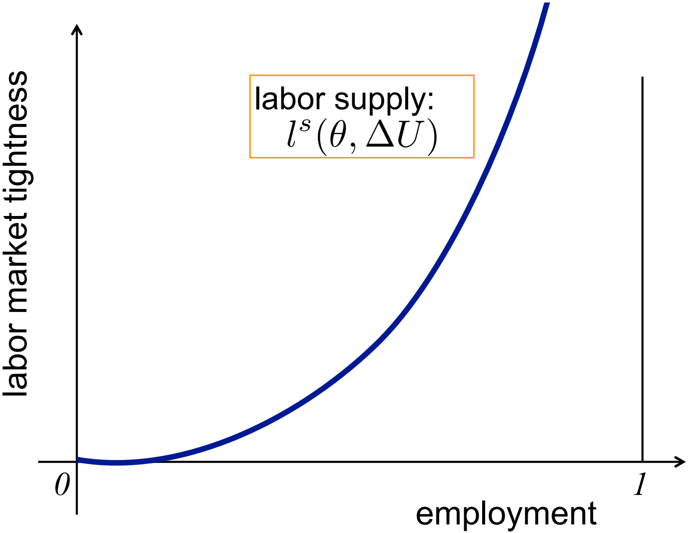
- consumption utility $U(c)$, search disutility $\psi(e)$
- utility gain from work: $\Delta U \equiv U(c^e) - U(c^u)$
- solves $\max_e \left\{U(c^u) + e \cdot f(\theta) \cdot \Delta U - \psi(e)\right\}$
- effort supply $e^s(\underset{+}{\theta}, \underset{+}{\Delta U})$ gives optimal effort:

$$\psi'(e^s(\theta, \Delta U)) = f(\theta) \cdot \Delta U$$

- labor supply $l^s(\underset{+}{\theta}, \underset{+}{\Delta U})$ gives employment rate:

$$l^s(\theta, \Delta U) = e^s(\theta, \Delta U) \cdot f(\theta)$$

LABOR SUPPLY

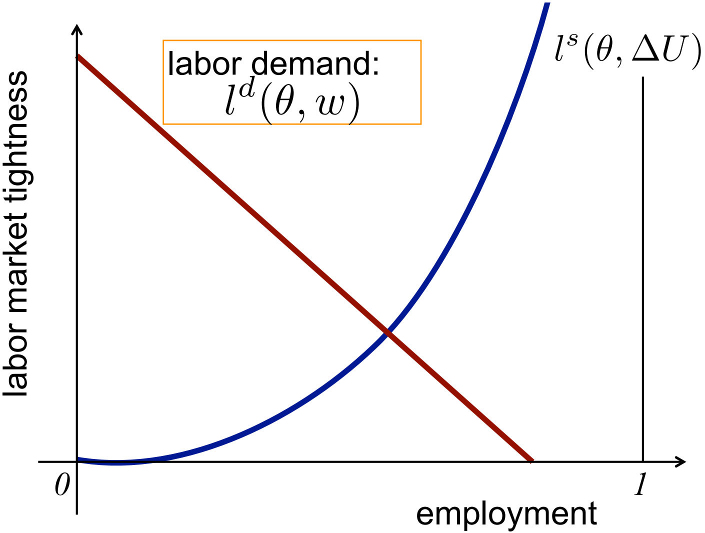


REPRESENTATIVE FIRM

- hires l employees
  - $n = l/[1 + \tau(\theta)]$ producers
  - $l - n$ recruiters
- production function: $y(n)$
- solves $\max_l \left\{ y(l/[1 + \tau(\theta)]) - w \cdot l \right\}$
- labor demand $l^d(\underline{\theta}, \underline{w})$ gives optimal employment:

$$y'\left(\frac{l^d}{1 + \tau(\theta)}\right) = \left[1 + \tau(\theta)\right] \cdot w$$

LABOR DEMAND



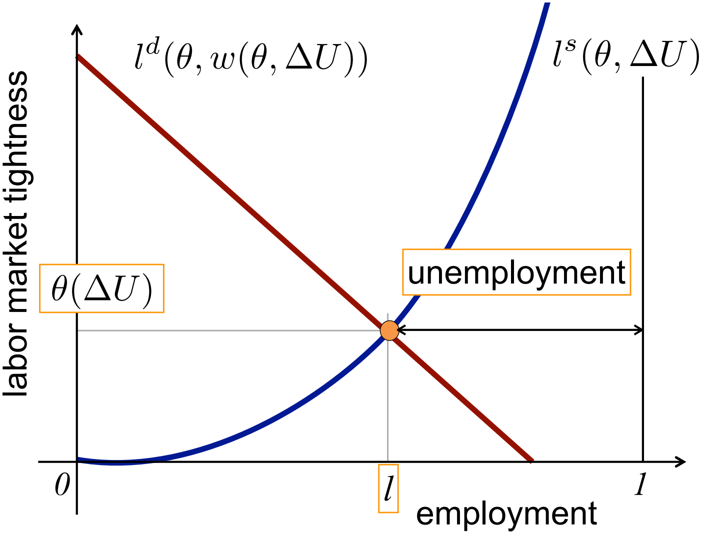
LABOR-MARKET EQUILIBRIUM

- as in any matching model, need a price mechanism
  - general wage schedule: $w = w(\theta, \Delta U)$
- tightness equilibrates supply & demand:

$$l^s(\theta, \Delta U) = l^d(\theta, w(\theta, \Delta U))$$

- equilibrium tightness: $\theta(\Delta U)$

LABOR-MARKET EQUILIBRIUM



SUFFICIENT-STATISTIC FORMULA FOR OPTIMAL UI

GOVERNMENT'S PROBLEM

- choose ΔU to maximize welfare:

$$SW = l \cdot U(c^e) + (1 - l) \cdot U(c^u) - \psi(e)$$

- subject to budget constraint:

$$y\left(\frac{l}{1 + \tau(\theta)}\right) = l \cdot c^e + (1 - l) \cdot c^u$$

- to workers' response: $e = e^s(\theta, \Delta U)$ & $l = l^s(\theta, \Delta U)$
- and to equilibrium constraint: $\theta = \theta(\Delta U)$

CONDITION FOR OPTIMAL UI

- express all the variables as a function of $(\theta, \Delta U)$
- government solves $\max_{\Delta U} SW(\theta(\Delta U), \Delta U)$
- first-order condition:

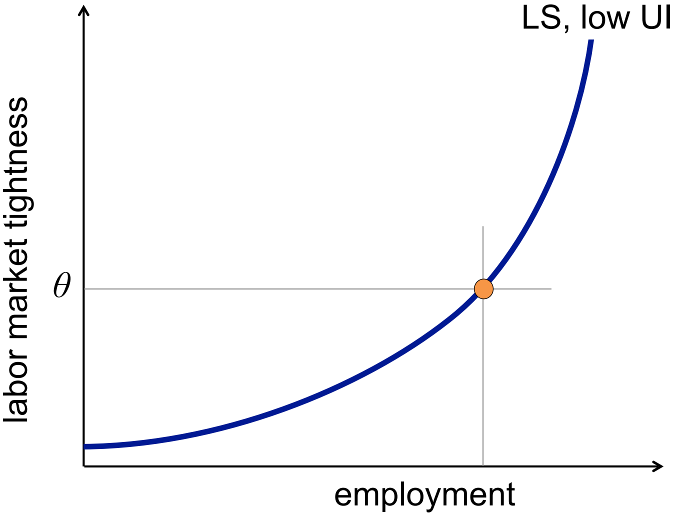
$$0 = \underbrace{\left.\frac{\partial SW}{\partial \Delta U}\right|_{\theta}}_{\text{Baily-Chetty formula}} + \underbrace{\left.\frac{\partial SW}{\partial \theta}\right|_{\Delta U} \cdot \frac{d\theta}{d\Delta U}}_{\text{correction}}$$

BAILY-CHETTY FORMULA

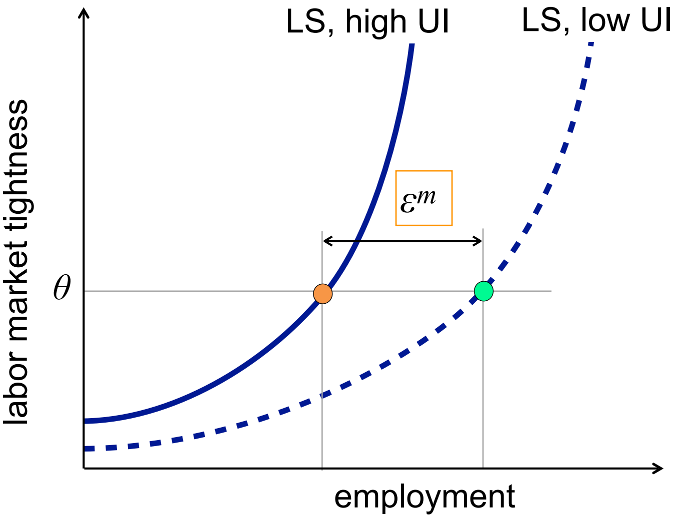
$$R = R^* \left(\epsilon^m, \frac{U'(c^u)}{U'(c^e)} \right)$$

- $\epsilon^m > 0$: microelasticity of unemployment wrt UI
  - measures disincentive from search
  - R^* is decreasing in ϵ^m
- $U'(c^u)/U'(c^e) > 1$: ratio of marginal utilities
  - measures need for insurance
  - R^* is increasing in $U'(c^u)/U'(c^e)$

MICROELASTICITY OF UNEMPLOYMENT



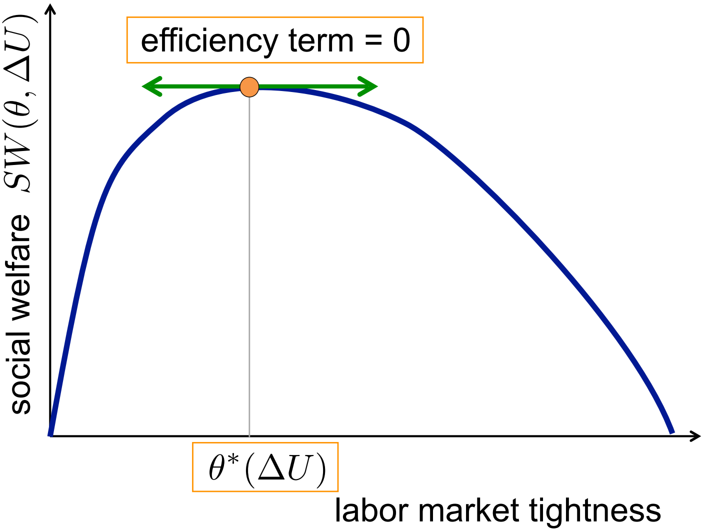
MICROELASTICITY OF UNEMPLOYMENT



$\partial SW/\partial\theta|_{\Delta U}$ MEASURED BY EFFICIENCY TERM

- efficiency term depends on several sufficient statistics:
  - $\tau(\theta)$: recruiter-producer ratio
  - u: unemployment rate
  - $1-\eta$: elasticity of the job-finding rate $f(\theta)$
  - ΔU: the utility gain from work

EFFICIENCY TERM AND EFFICIENT TIGHTNESS



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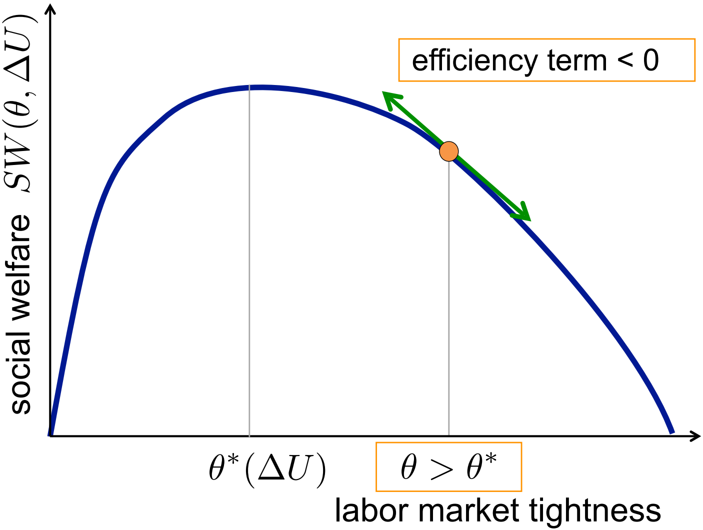

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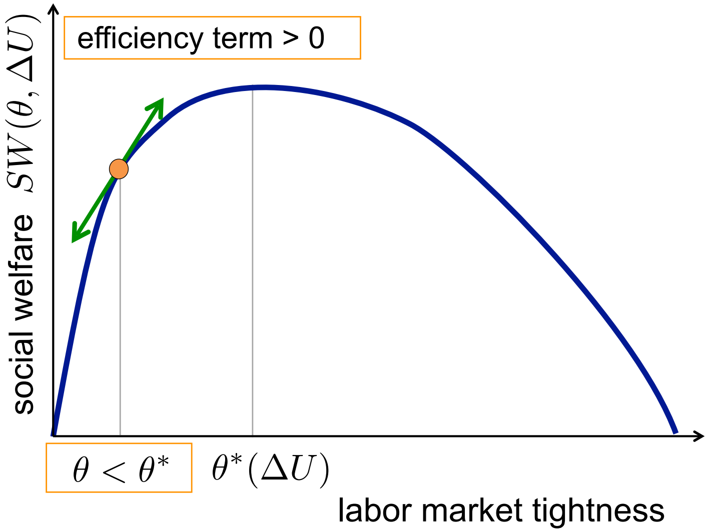

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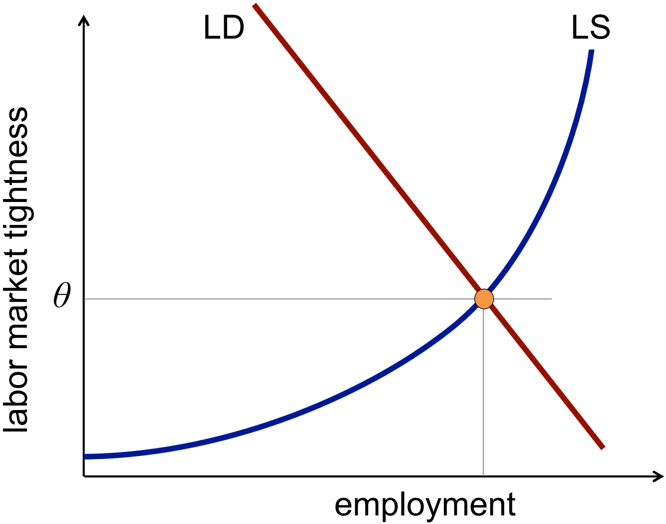

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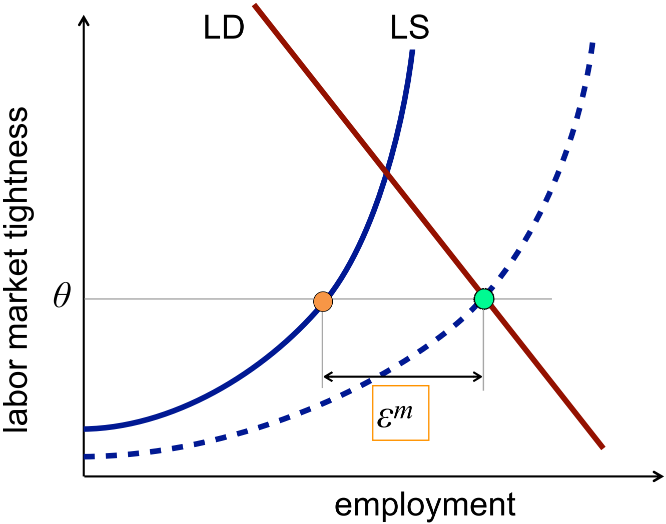

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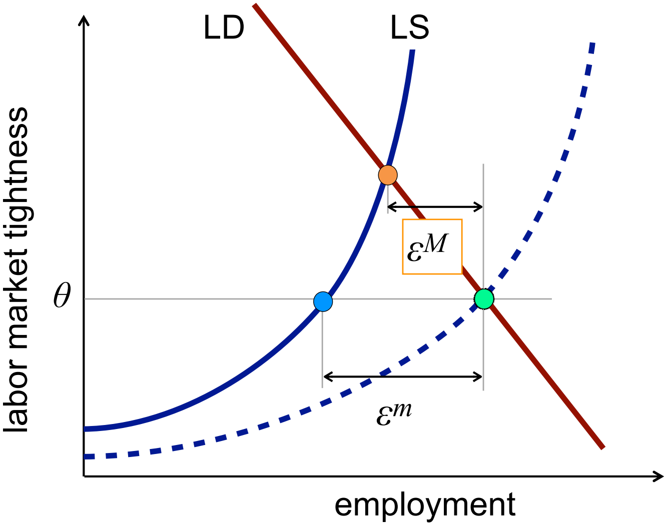
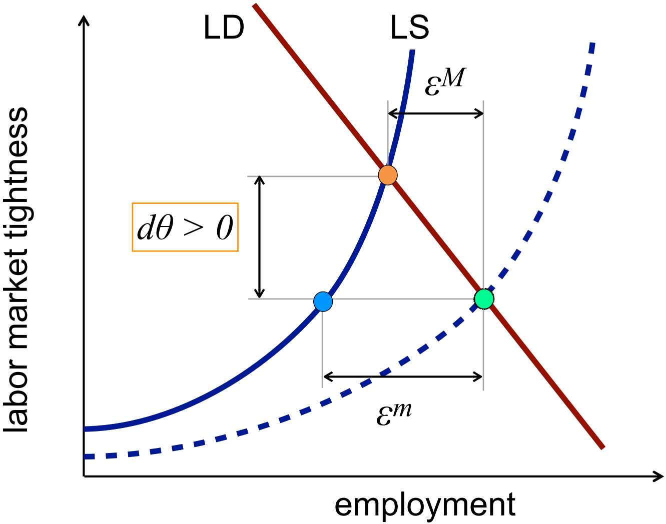


$1 - \epsilon^M/\epsilon^m$ GIVES EFFECT OF UI ON θ



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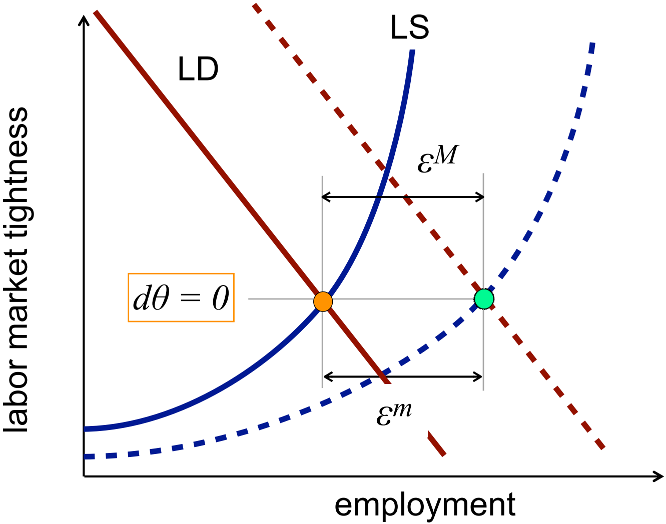

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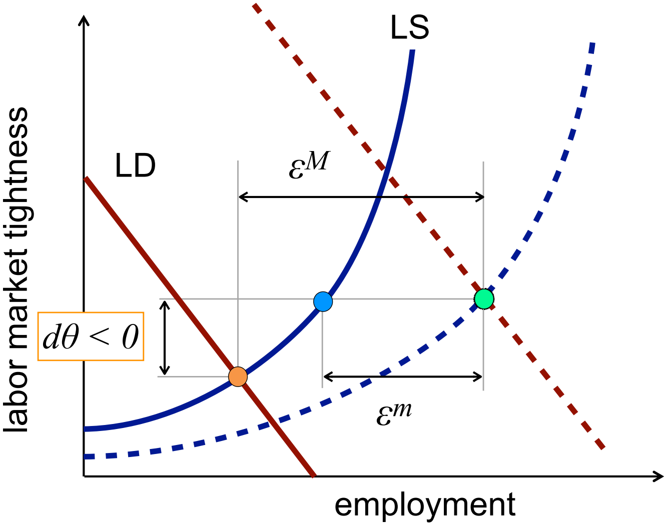


OPTIMAL UI FORMULA IN SUFFICIENT STATISTICS

$$R = \underbrace{R^*\left(\epsilon^m, \frac{U'(c^u)}{U'(c^e)}\right)}_{\text{Baily-Chetty formula}} + \underbrace{\left(1 - \frac{\epsilon^M}{\epsilon^m}\right) \cdot \text{efficiency term}}_{\text{correction}}$$

OPTIMAL UI VERSUS BAILY-CHETTY LEVEL

- optimal UI = Baily-Chetty if
  - UI has no effect on tightness: $\epsilon^M = \epsilon^m$
  - or tightness is efficient: efficiency term = 0
- optimal UI ≠ Baily-Chetty if
  - UI affects tightness: $\epsilon^M \neq \epsilon^m$
  - and tightness is inefficient: efficiency term ≠ 0

⇝ optimal UI > Baily-Chetty if UI pushes tightness toward efficiency

OPTIMAL UI OVER THE BUSINESS CYCLE: THEORY

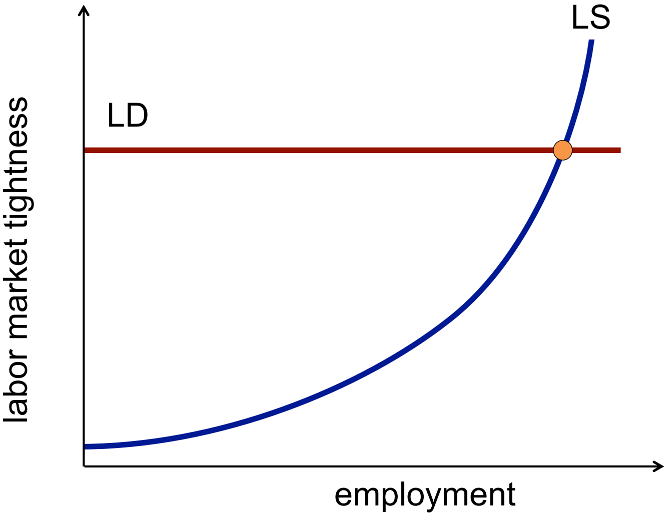
THREE MATCHING MODELS

	model		
	standard	rigid-wage	job-rationing
prod. function	linear	linear	concave
wage	bargaining	rigid	rigid
reference	Pissarides [2000]	Hall [2005]	Michaillat [2012]

BUSINESS CYCLES IN THE MODELS

- Baily-Chetty level is broadly constant
- $1 - \epsilon^M/\epsilon^m$ has constant sign
- efficiency term changes sign over business cycle
  - under labor demand shocks
  - > 0 in slumps and < 0 in booms
  - generates cyclicality of optimal UI

STANDARD MODEL: $1 - \epsilon^M / \epsilon^m < 0$



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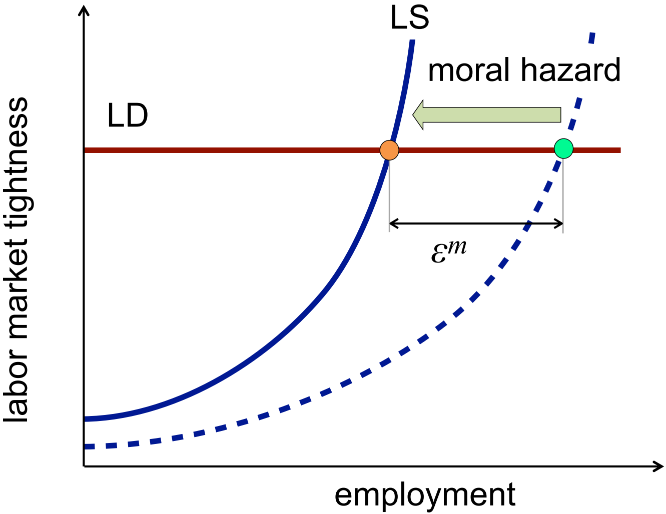

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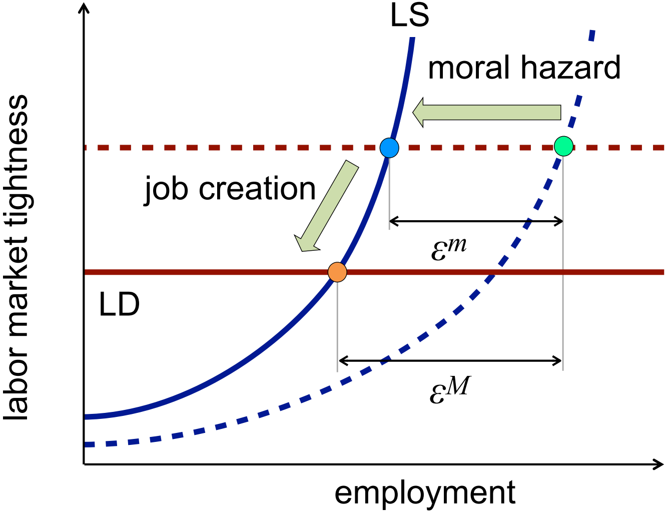
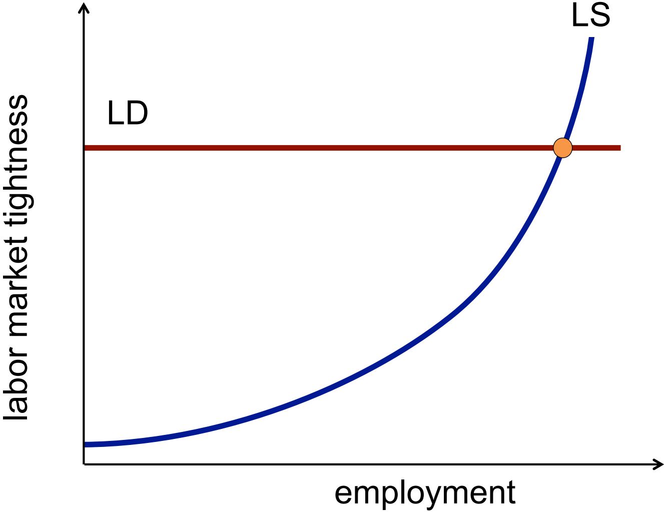


RIGID-WAGE MODEL: $1 - \epsilon^M/\epsilon^m = 0$



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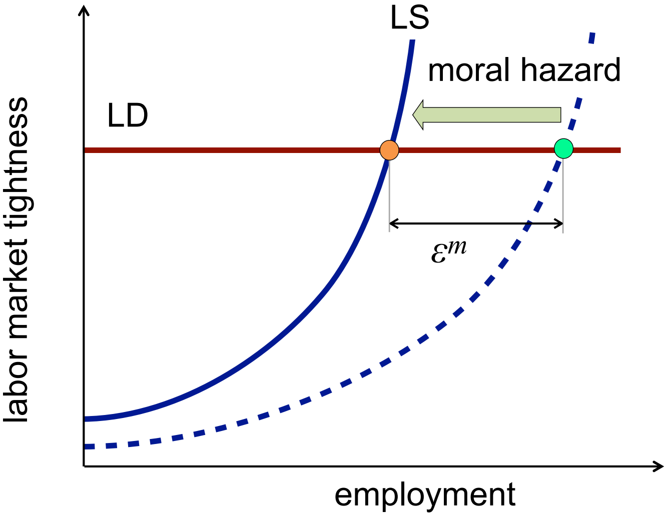

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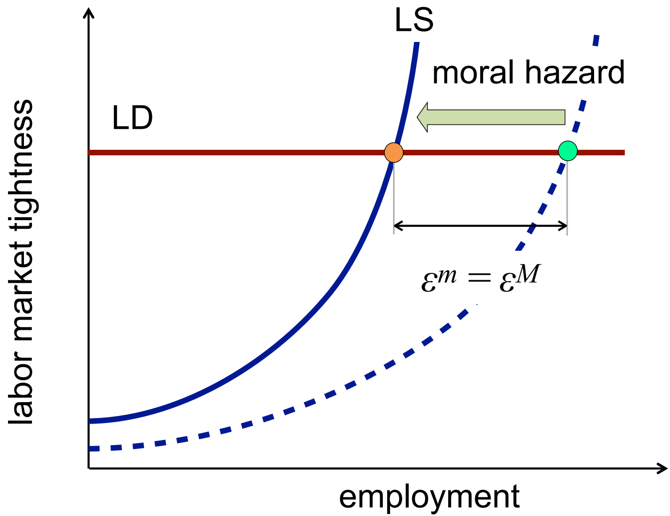
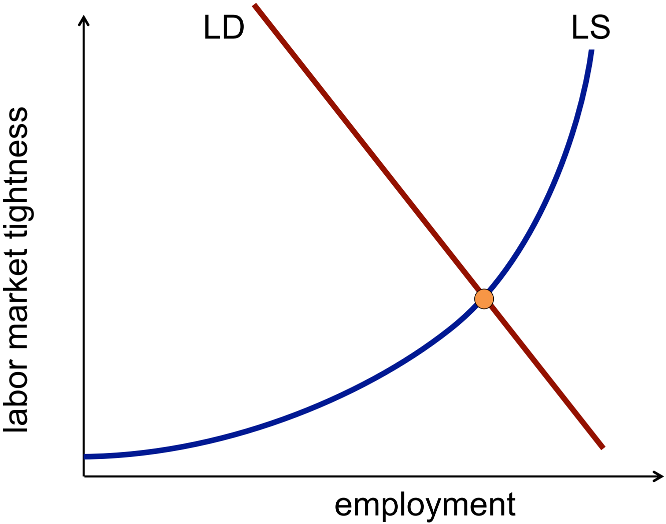


JOB-RATIONING MODEL: $1 - \epsilon^M/\epsilon^m > 0$



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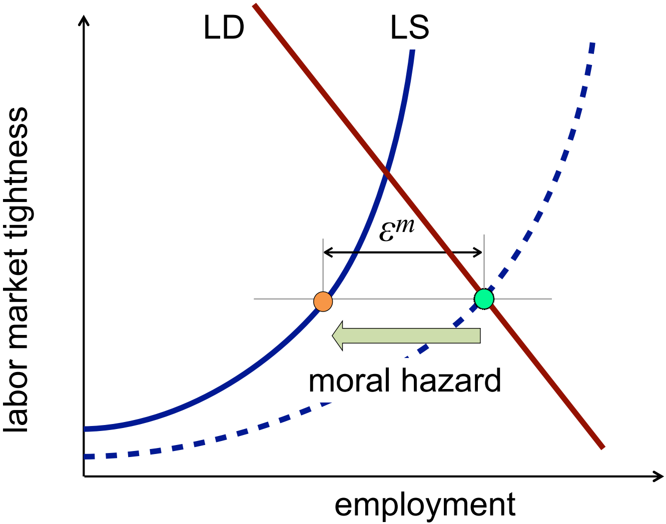
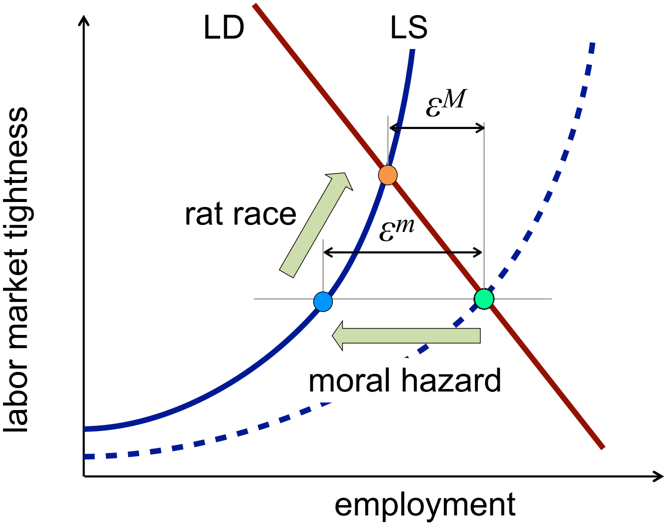


JOB-RATIONING MODEL: $1 - \epsilon^M/\epsilon^m > 0$



CYCLICALITY OF OPTIMAL UI

- tightness is too low in slumps & too high in booms
- standard model: procyclical UI
  - moral hazard & job creation: $1 - \epsilon^M/\epsilon^m < 0$
  - UI should be reduced in slumps to stimulate tightness
- rigid-wage model: acyclical UI
  - only moral hazard: $1 - \epsilon^M/\epsilon^m = 0$
  - UI has no effect on tightness
- job-rationing model: countercyclical UI
  - moral hazard & rat race: $1 - \epsilon^M/\epsilon^m > 0$
  - UI should be raised in slumps to stimulate tightness

OPTIMAL UI OVER THE BUSINESS CYCLE: APPLICATION TO THE US

MICROELASTICITY OF UNEMPLOYMENT WRT UI

- many estimates of the microelasticity
- obtained by comparing identical jobseekers receiving different UI benefits in the same market
- plausible range of estimates: $0.4 \leq \epsilon^m \leq 0.8$
  - estimates of the microelasticity of unemployment duration wrt potential duration of UI benefits
- key references:
  - Katz, Meyer [1990]
  - Landais [2015]

MACROELASTICITY OF UNEMPLOYMENT WRT UI

- few estimates of the macroelasticity
- obtained by comparing identical labor markets receiving different UI benefits
- plausible range of estimates: $0 \leq \epsilon^M \leq 0.3$
- key references:
  - Card, Levine [2000]
  - Hagedorn et al [2016]
  - Chodorow-Reich, Coglianese, Karabarbounis [2019]
  - Dieterle, Bartalotti, Brummet [2020]
  - Boone et al [2021]

COMPARING MICROELASTICITY & MACROELASTICITY

- estimates obtained separately suggest $1 - \epsilon^M/\epsilon^m > 0$:

$$0 < \epsilon^M < 0.3 < 0.4 < \epsilon^m < 0.8$$

- implied range for the elasticity wedge: 0.25–1
  - lower bound: $1 - \epsilon^M/\epsilon^m = 1 - 0.3/0.4 = 0.25$
  - upper bound: $1 - \epsilon^M/\epsilon^m = 1 - 0/0.8 = 1$
- one exception: Johnston, Mas [2018] find $1 - \epsilon^M/\epsilon^m = 0$ when they estimate ϵ^m and ϵ^M in MO data

RESPONSE OF TIGHTNESS TO UI

- Marinescu [2017] finds that an increase in UI raises tightness
  - corresponding elasticity wedge: : $1 - \epsilon^M/\epsilon^m = 0.4$
- Levine [1993] & Farber, Valletta [2015] find that an increase in UI leads uninsured jobseekers to find jobs faster
  - ⇝ an increase in UI raises tightness
  - ⇝ $1 - \epsilon^M/\epsilon^m > 0$
- evidence from Austria: Lalive et al [2015] find that an increase in UI raises tightness
  - corresponding elasticity wedge: $1 - \epsilon^M/\epsilon^m = 0.2$

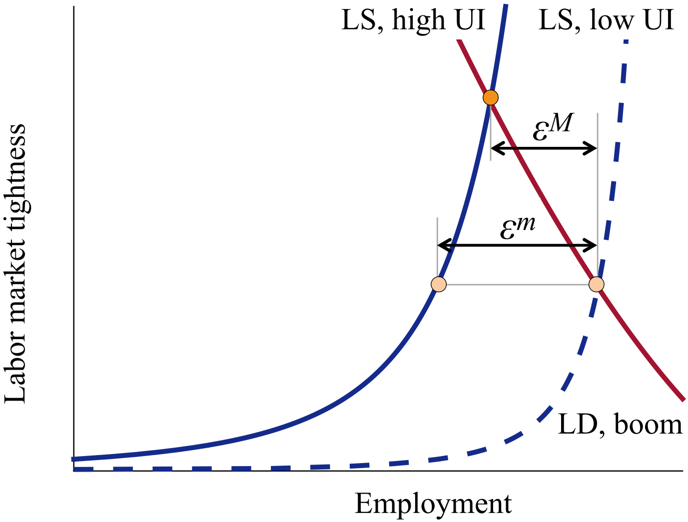
RAT-RACE & JOB-CREATION CHANNELS

- RCT evidence of rat-race mechanism:
  - negative spillover of more intense job search
  - Crepon et al [2013] in France
  - Gautier et al [2012] in Denmark
- no evidence of job-creation mechanism:
  - re-employment wages unaffected by UI
  - Krueger, Mueller [2016]
  - Marinescu [2017]
  - Johnston, Mas [2018]
  - also true in Austria: Card et al [2007]

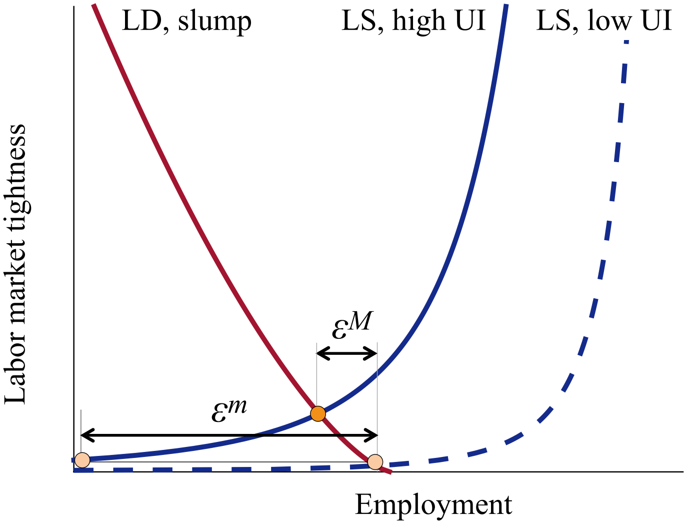
SUMMARY OF THE EVIDENCE: $1 - \epsilon^M/\epsilon^m \approx 0.4$

- the evidence shows that $1 - \epsilon^M/\epsilon^m \geq 0$
  - reasonable median estimate: $1 - \epsilon^M/\epsilon^m = 0.4$
- the evidence supports the rat-race mechanism but not the job-creation mechanism
  - further support for $1 - \epsilon^M/\epsilon^m > 0$
- additional evidence suggests that the elasticity wedge may be larger in bad times
  - Valletta [2014]
  - Toohey [2017]

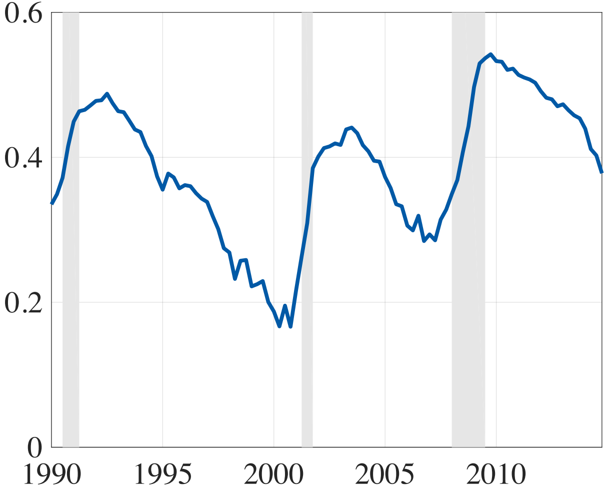
ELASTICITY WEDGE IN GOOD TIMES



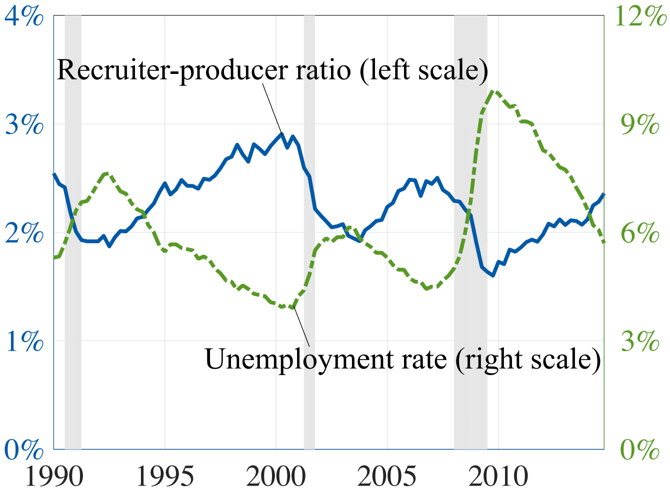
ELASTICITY WEDGE IN BAD TIMES



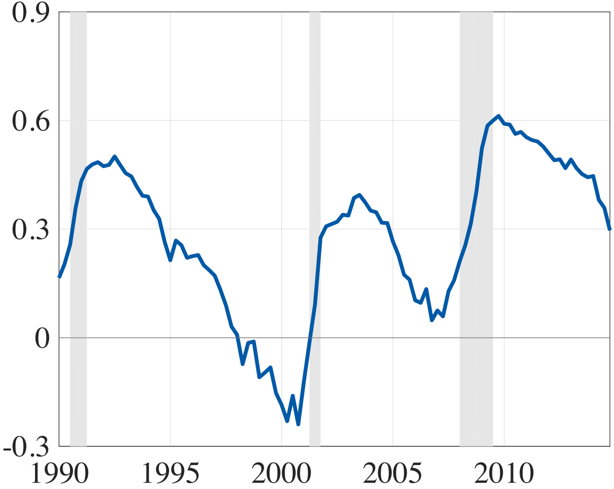
ELASTICITY WEDGE IN THE US



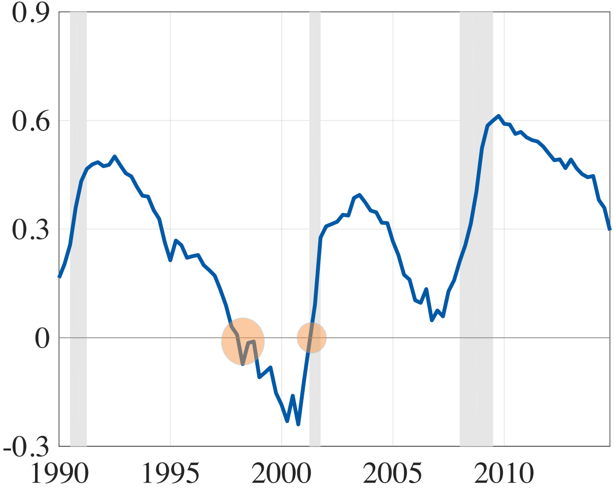
JOBSEEKING & RECRUITING IN THE US



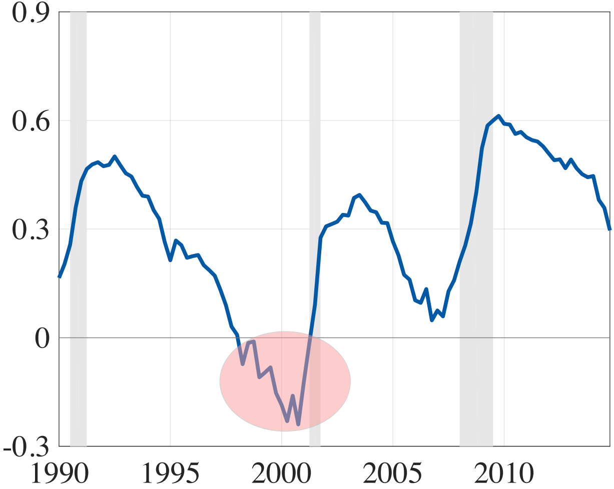
EFFICIENCY TERM IN THE US



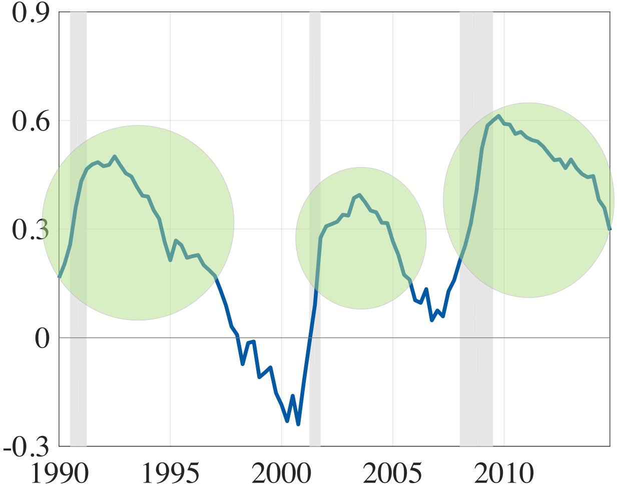
EFFICIENCY TERM = 0 ⇒ UI = BAILY-CHETTY



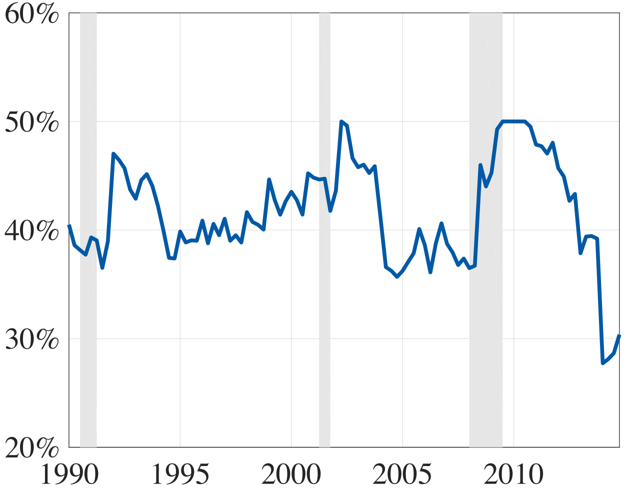
EFFICIENCY TERM < 0 ⇒ UI < BAILY-CHETTY



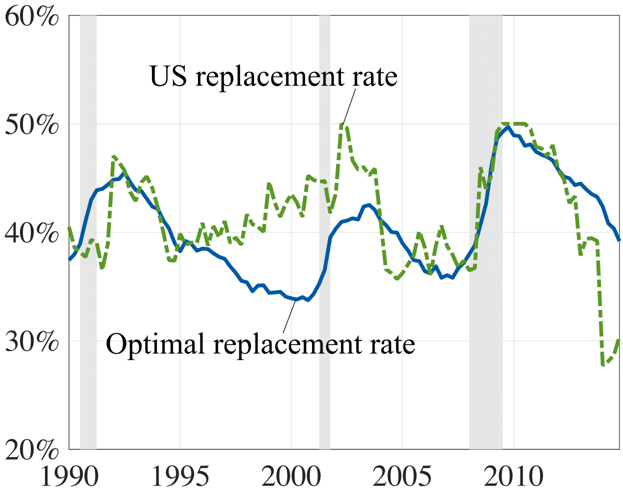
EFFICIENCY TERM > 0 $\Rightarrow$ UI > BAILY-CHETTY



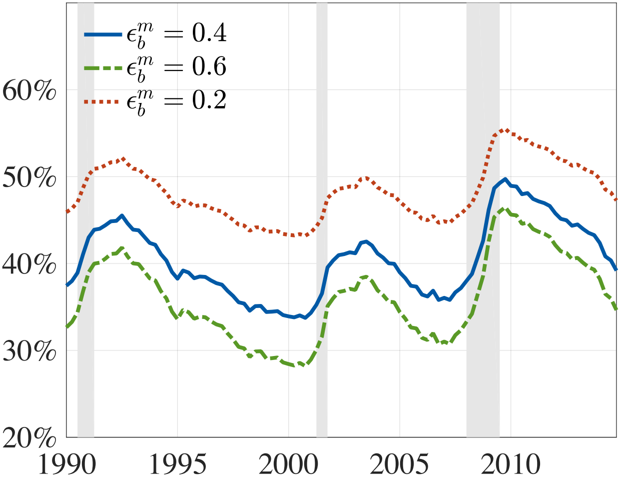
EFFECTIVE REPLACEMENT RATE IN THE US



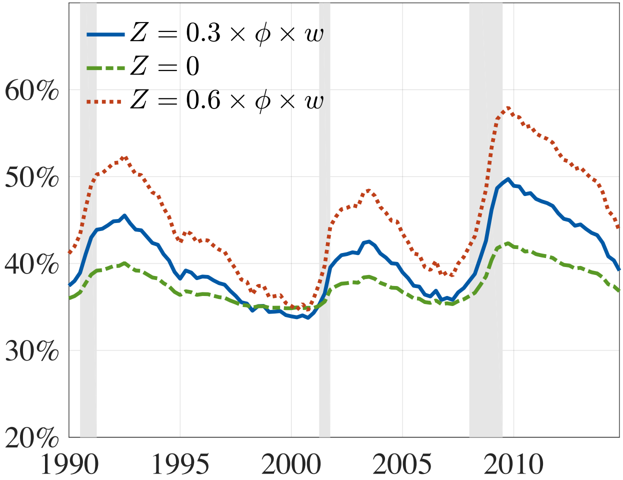
OPTIMAL REPLACEMENT RATE IN THE US



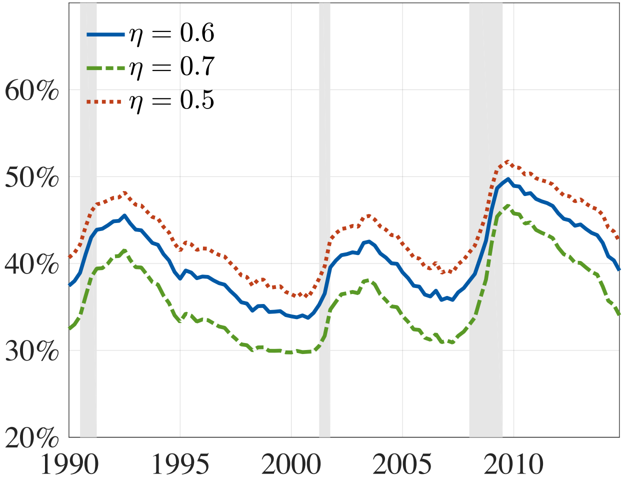
SENSITIVITY ANALYSIS: MICROELASTICITY



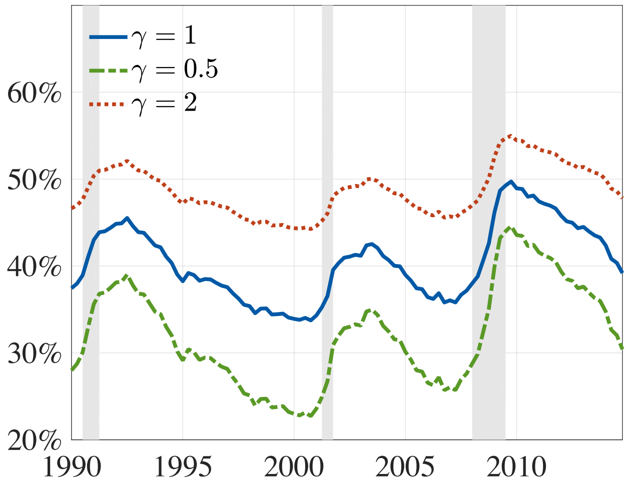
SENSITIVITY ANALYSIS: COST OF UNEMPLOYMENT



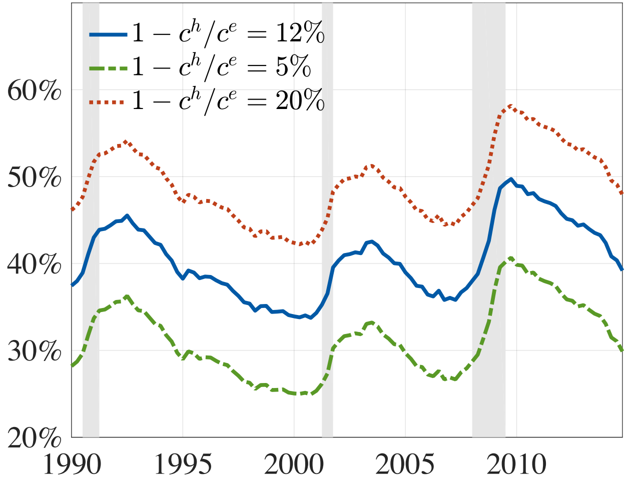
SENSITIVITY ANALYSIS: MATCHING ELASTICITY



SENSITIVITY ANALYSIS: RISK AVERSION



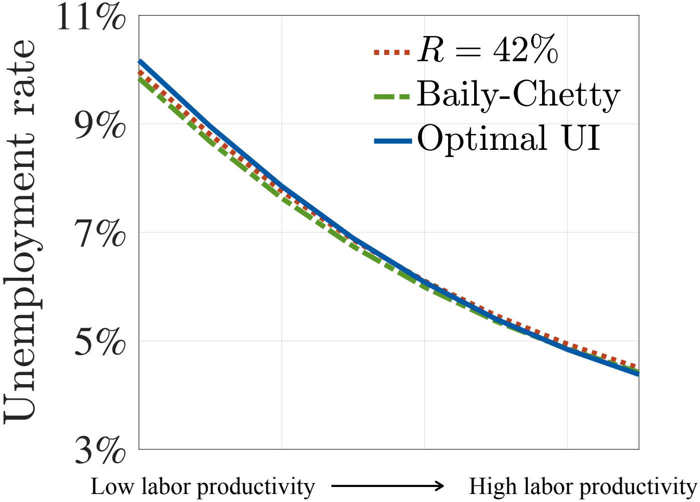
SENSITIVITY ANALYSIS: CONSUMPTION DROP



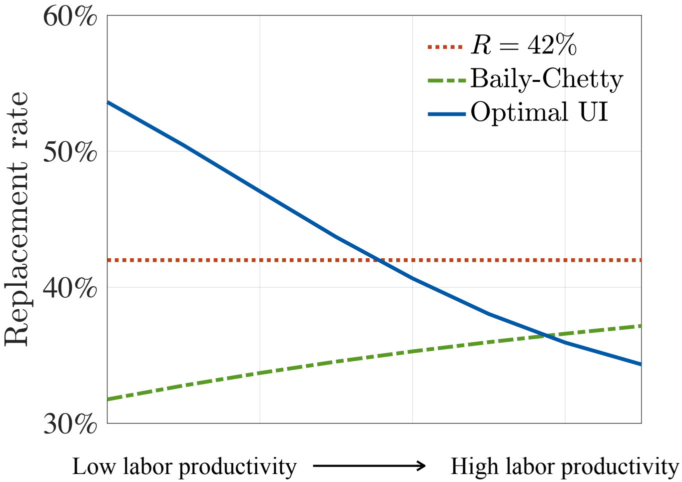
OPTIMAL UI OVER THE BUSINESS CYCLE: SIMULATIONS OF JOB-RATIONING MODEL

Parameter	Description	Source
$\alpha = 0.73$	Production function: concavity	$1 - \frac{\epsilon^M}{\epsilon^m} = 0.4$
$\gamma = 1$	Relative risk aversion	Chetty [2006]
$s = 2.8\%$	Monthly job-separation rate	CPS, 1990–2014
$\eta = 0.6$	Matching elasticity	Petrongolo, Pissarides [2001]
$\mu = 0.60$	Matching efficacy	$\theta = 0.43$
$\rho = 0.80$	Matching cost	$\tau = 2.3\%$
$\zeta = 0.5$	Real wage: rigidity	Michaillat [2014]
$\omega = 0.73$	Real wage: level	$u = 6.1\%$
$\sigma = 0.17$	Disutility from home production: convexity	$\frac{d\ln(c^h)}{d\ln(c^u)} = 0.2$
$\xi = 1.43$	Disutility from home production: level	$1 - \frac{c^h}{c^e} = 12\%$
$\kappa = 0.22$	Disutility from job search: convexity	$\epsilon^m_b = 0.4$
$\delta = 0.33$	Disutility from job search: level	$e = 1$
$z = -0.14$	Disutility from unemployment	$Z = 0.3 \times \phi \times w$

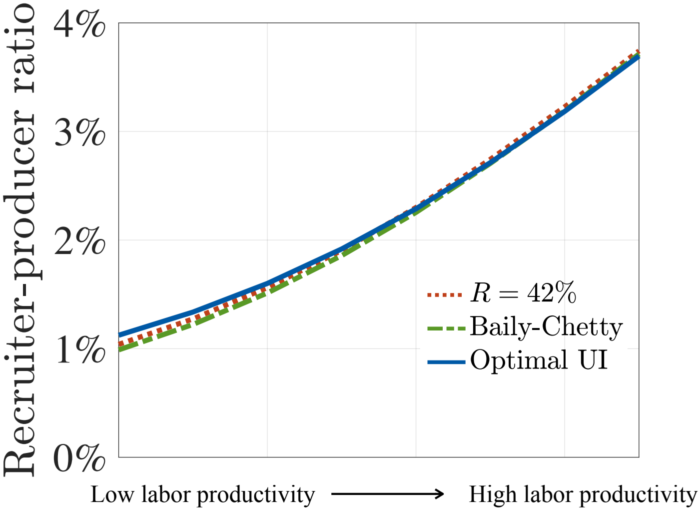
UNEMPLOYMENT RATE OVER THE CYCLE



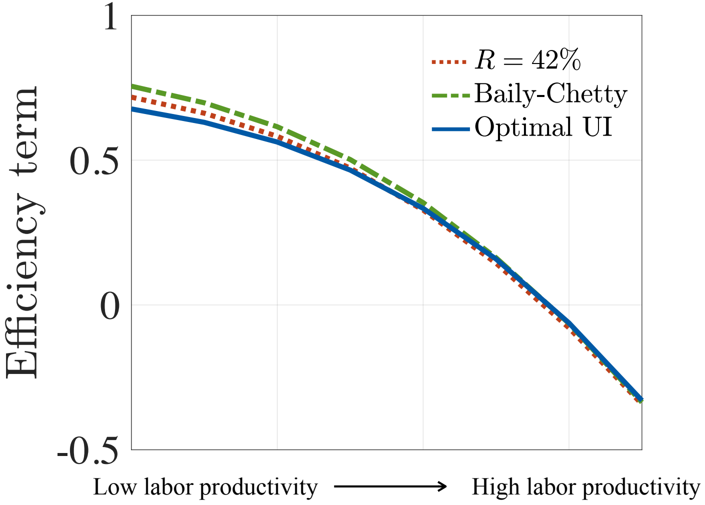
REPLACEMENT RATE OVER THE CYCLE



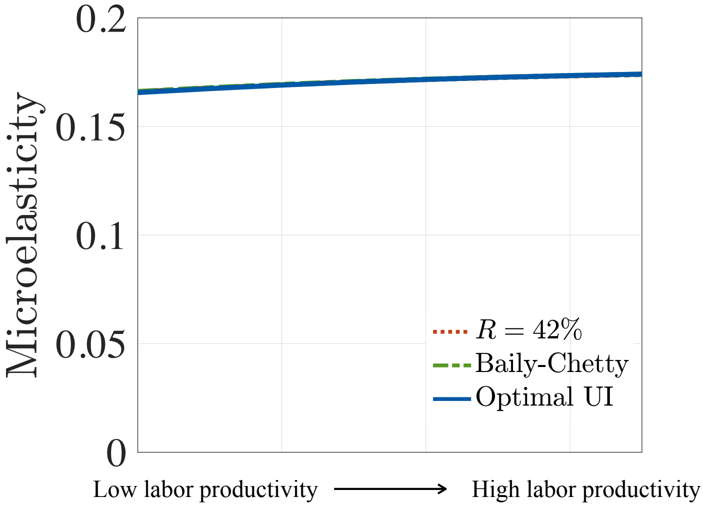
RECRUITERS/PRODUCERS OVER THE CYCLE



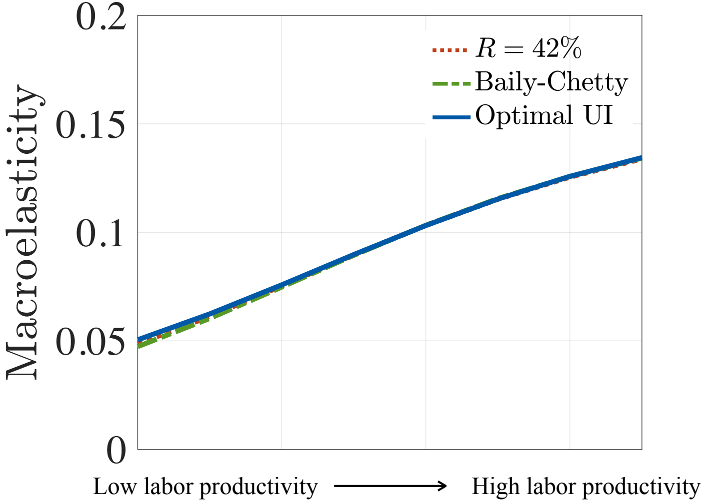
EFFICIENCY TERM OVER THE CYCLE



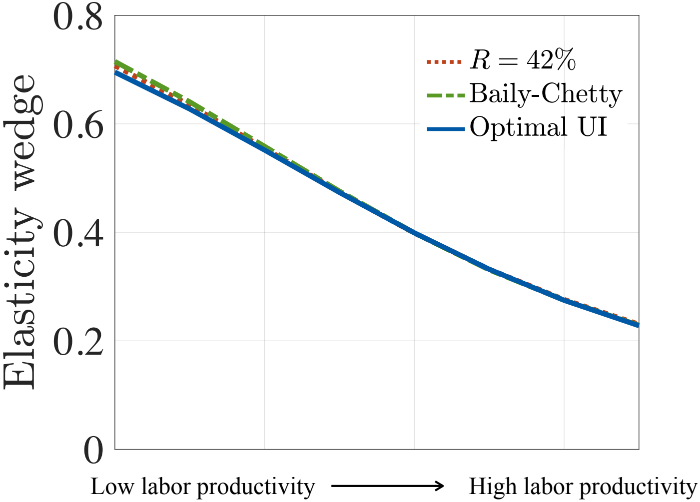
MICROELASTICITY OVER THE CYCLE



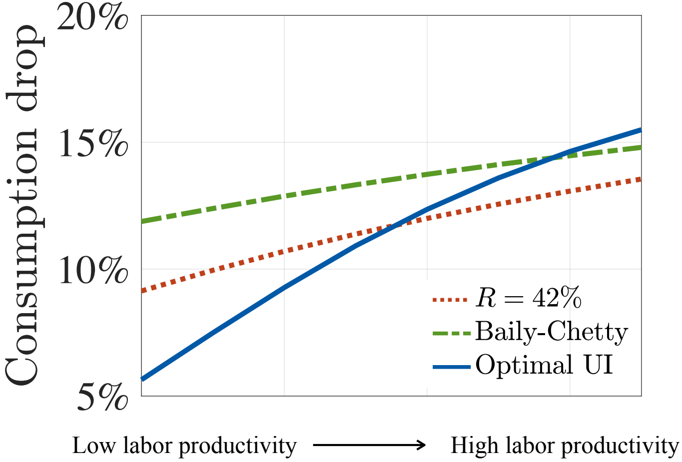
MACROELASTICITY OVER THE CYCLE



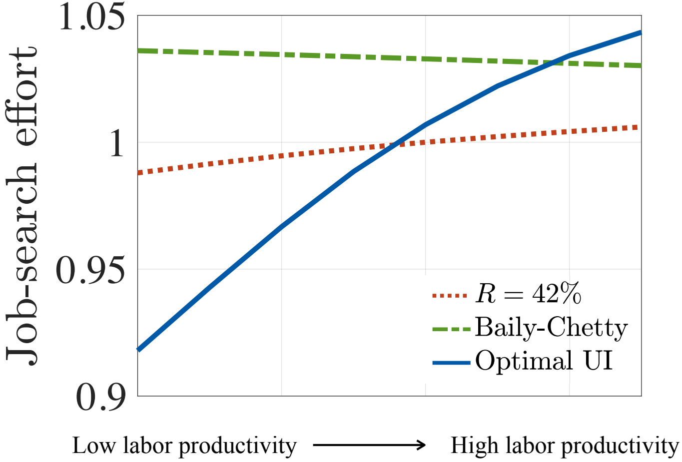
ELASTICITY WEDGE OVER THE CYCLE



CONSUMPTION DROP OVER THE CYCLE



JOB SEARCH OVER THE CYCLE



HOME PRODUCTION OVER THE CYCLE