# A NEW MEASURE

# OF THE UNEMPLOYMENT GAP

Pascal Michaillat (Brown)

Emmanuel Saez (Berkeley)

# UNEMPLOYMENT GAP: KEY FOR STABILIZATION POLICIES

- in practice
  - US Humphrey–Hawkins Full Employment Act of 1978: government must achieve “full employment”
  - unemployment gap = distance from “full employment”
- in theory
  - optimal stabilization policies depend on distance from efficiency: monetary policy, fiscal policy, etc.
  - unemployment gap = distance from efficiency

# CHALLENGES IN MEASURING UNEMPLOYMENT GAP

1. statistical approach (CBO): trend unemployment not efficient
2. Phillips-curve approach: imprecise
3. structural approach: neoclassical shocks not observable
4. Hosios approach: issues with Nash bargaining

- this paper: sufficient-statistic formula based on matching model
  - any wage setting & labor demand
  - statistics measurable in real time
  - direct policy implications

# LABOR-MARKET MODEL

# NOTATION

- labor force: $h(t)$
- employed workers: $l(t) < h(t)$
- unemployed workers: $U(t) = h(t) - l(t)$
- production workers: $n(t) < l(t)$
- unemployment rate: $u(t) = U(t)/h(t)$
- recruiting wedge: $\tau(t) = l(t)/n(t) - 1$
- vacancies: $v(t)$
- labor market tightness: $\theta(t) = v(t)/U(t)$

# MATCHING FUNCTION

- matching function: $m(t) = m_t(U(t), v(t))$
  - constant returns to scale
- job-finding rate: $f_t(\theta(t)) = m(t)/U(t) = m_t(1, \theta(t))$
- vacancy-filling rate: $q_t(\theta(t)) = m(t)/v(t) = m_t(1/\theta(t), 1)$
- 1st sufficient statistic: matching elasticity

$$\eta(t) \equiv \frac{\partial \ln(m_t)}{\partial \ln(U)} = -\frac{d \ln(q_t)}{d \ln(\theta)} = 1 - \frac{d \ln(f_t)}{d \ln(\theta)}$$

# WORKER FLOWS

- job-separation rate: $s(t)$
- given $f(\theta)$ and $s$, unemployment rate converges to

$$u(\theta) = \frac{s}{s + f(\theta)}$$

- in practice convergence is very fast, so

$$u(t) = u_t(\theta(t)) = \frac{s(t)}{s(t) + f_t(\theta(t))}$$

- 2nd sufficient statistic: unemployment rate $u(t)$

# RECRUITING PROCESS

- $\rho(t)$ recruiters devoted to each vacancy
- employment ($l$) = producers ($n$) + recruiters

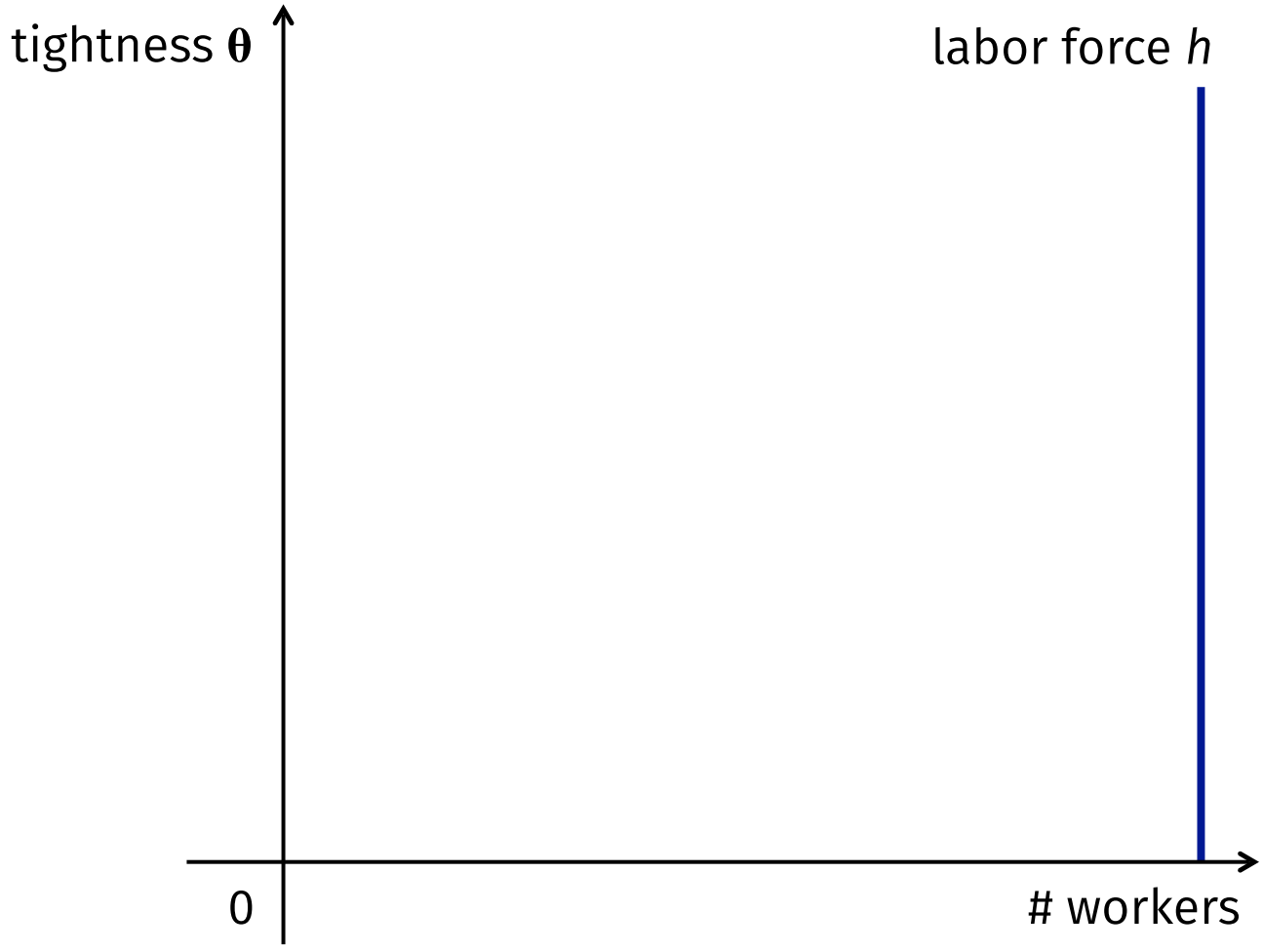
$$l(t) = n(t) + \rho(t) \cdot v(t)$$

$$l(t) = n(t) + \rho(t) \cdot \frac{s(t)l(t)}{q_t(\theta(t))}$$

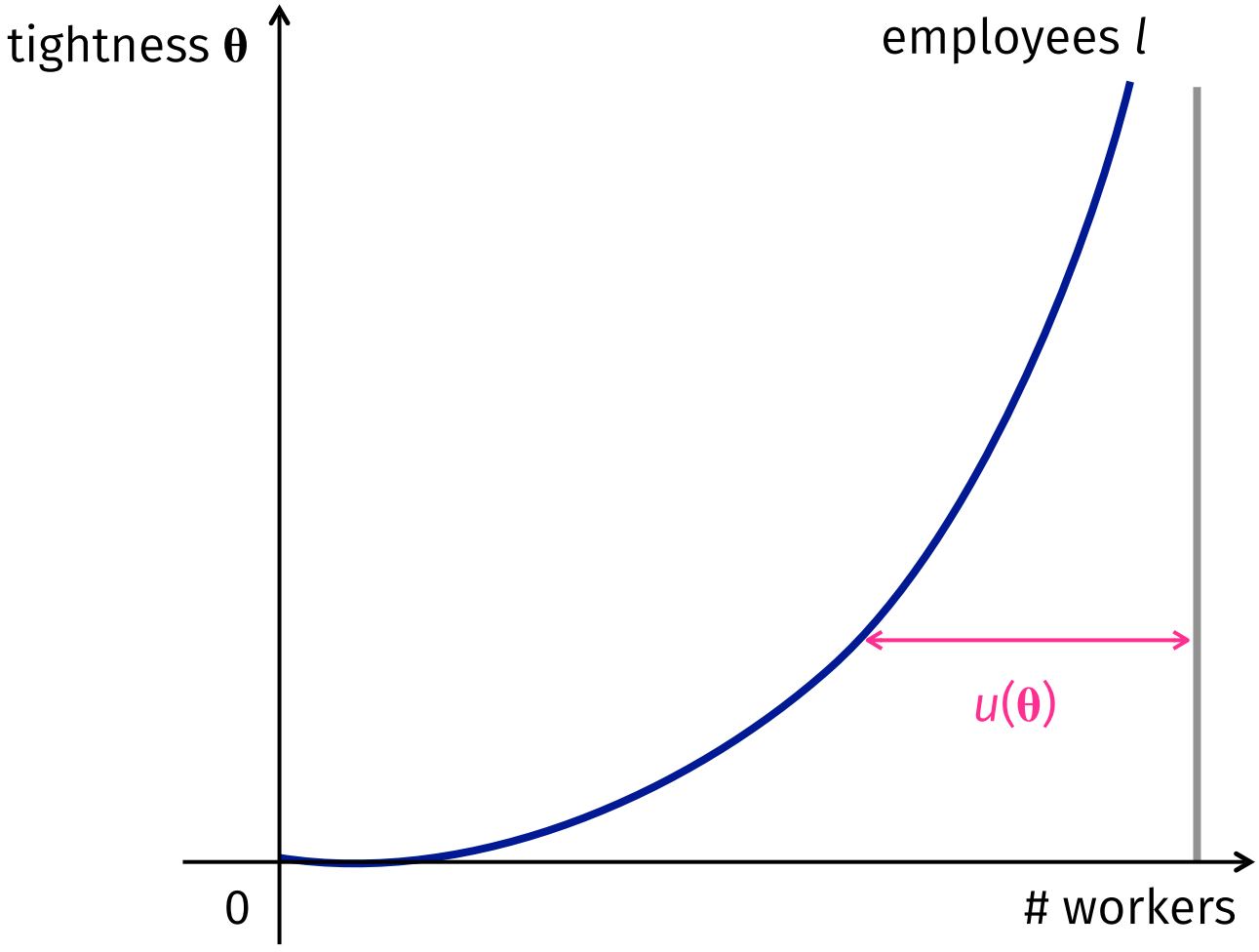
$$l(t) = [1 + \tau(t)]\, n(t) \quad \text{with} \quad \tau(t) = \tau_t(\theta(t)) = \frac{s(t)\rho(t)}{q_t(\theta(t)) - s(t)\rho(t)}$$

- 3rd sufficient statistic: recruiting wedge $\tau(t)$

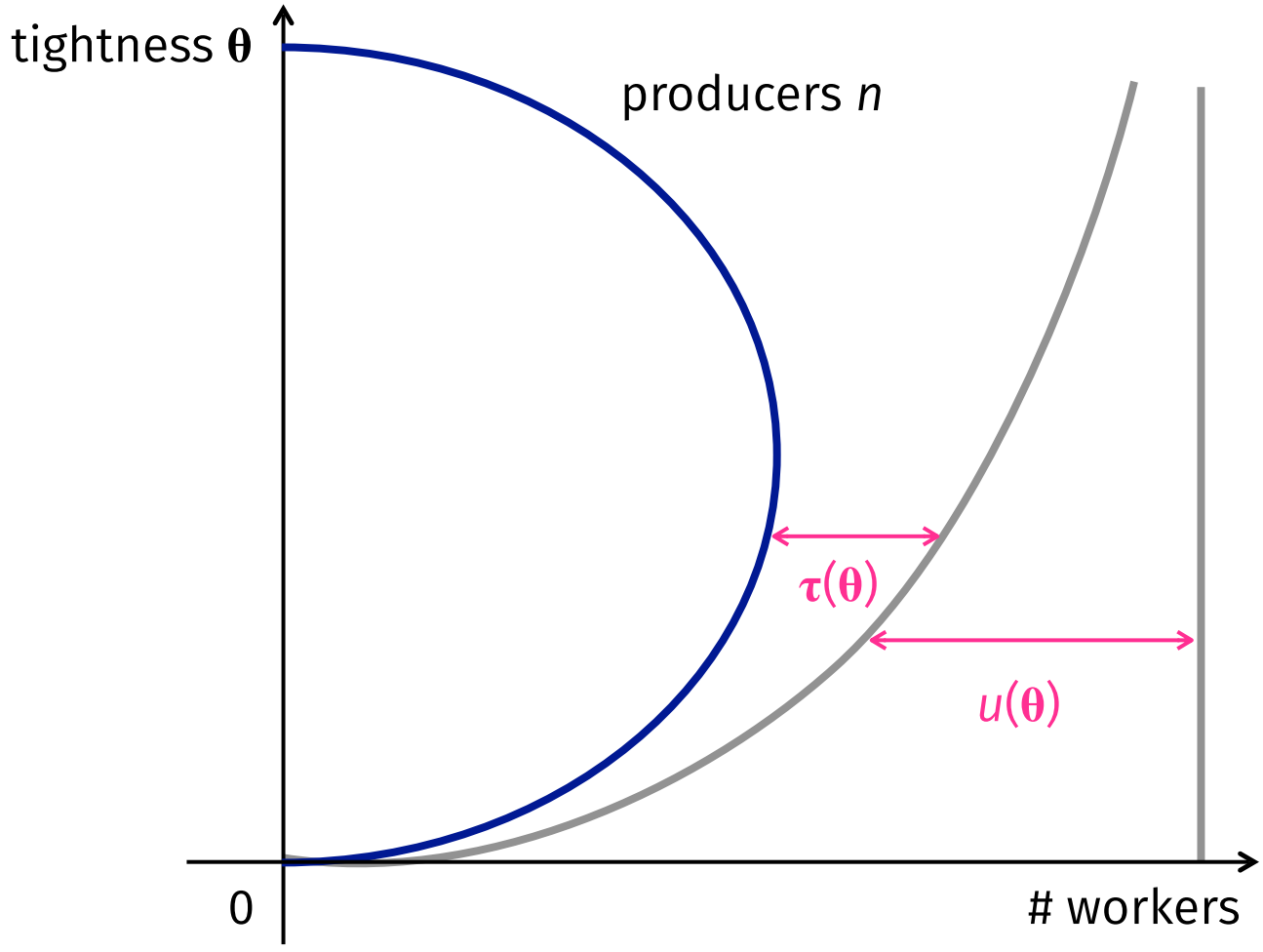
# LABOR-MARKET STRUCTURE



# LABOR-MARKET STRUCTURE



# LABOR-MARKET STRUCTURE



# MEASURING THE UNEMPLOYMENT GAP

# EFFICIENT TIGHTNESS

- efficient tightness $\theta^*(t)$ maximizes # of producers $n_t(\theta)$
- first-order condition implicitly defines $\theta^*(t)$:

$$\frac{u_t(\theta^*(t))}{\tau_t(\theta^*(t))} = \frac{\eta(t)}{1-\eta(t)}$$

- $\theta^*(t)$ depends on
  - matching process: $\eta(t)$, $m_t(\cdot)$
  - recruiting process: $\rho(t)$
  - job-separation rate: $s(t)$
  - but not on labor force participation: $h(t)$

# EFFICIENT UNEMPLOYMENT

- first-order expansion of $\tau_t(u)$ around $u(t)$:

$$\ln(\tau^*(t)) - \ln(\tau(t)) = \frac{d\ln(\tau_t)}{d\ln(u)} \cdot [\ln(u^*(t)) - \ln(u(t))]$$

- where

$$\frac{d\ln(\tau_t)}{d\ln(u)} = -\frac{\eta(t)}{1-\eta(t)} \cdot \frac{1+\tau(t)}{1-u(t)}$$

$$\tau^*(t) = \frac{1-\eta(t)}{\eta(t)} \cdot u^*(t)$$

- given $\eta(t)$, $u(t)$, $\tau(t)$, solve for $u^*(t)$ in first-order expansion

# EFFICIENT UNEMPLOYMENT

- first-order expansion of $\tau_t(u)$ around $u(t)$:

$$\ln(\tau^*(t)) - \ln(\tau(t)) = \frac{d\ln(\tau_t)}{d\ln(u)} \cdot [\ln(u^*(t)) - \ln(u(t))]$$

- where

$$\frac{d\ln(\tau_t)}{d\ln(u)} = -\frac{\eta(t)}{1-\eta(t)} \cdot \frac{1+\tau(t)}{1-u(t)}$$

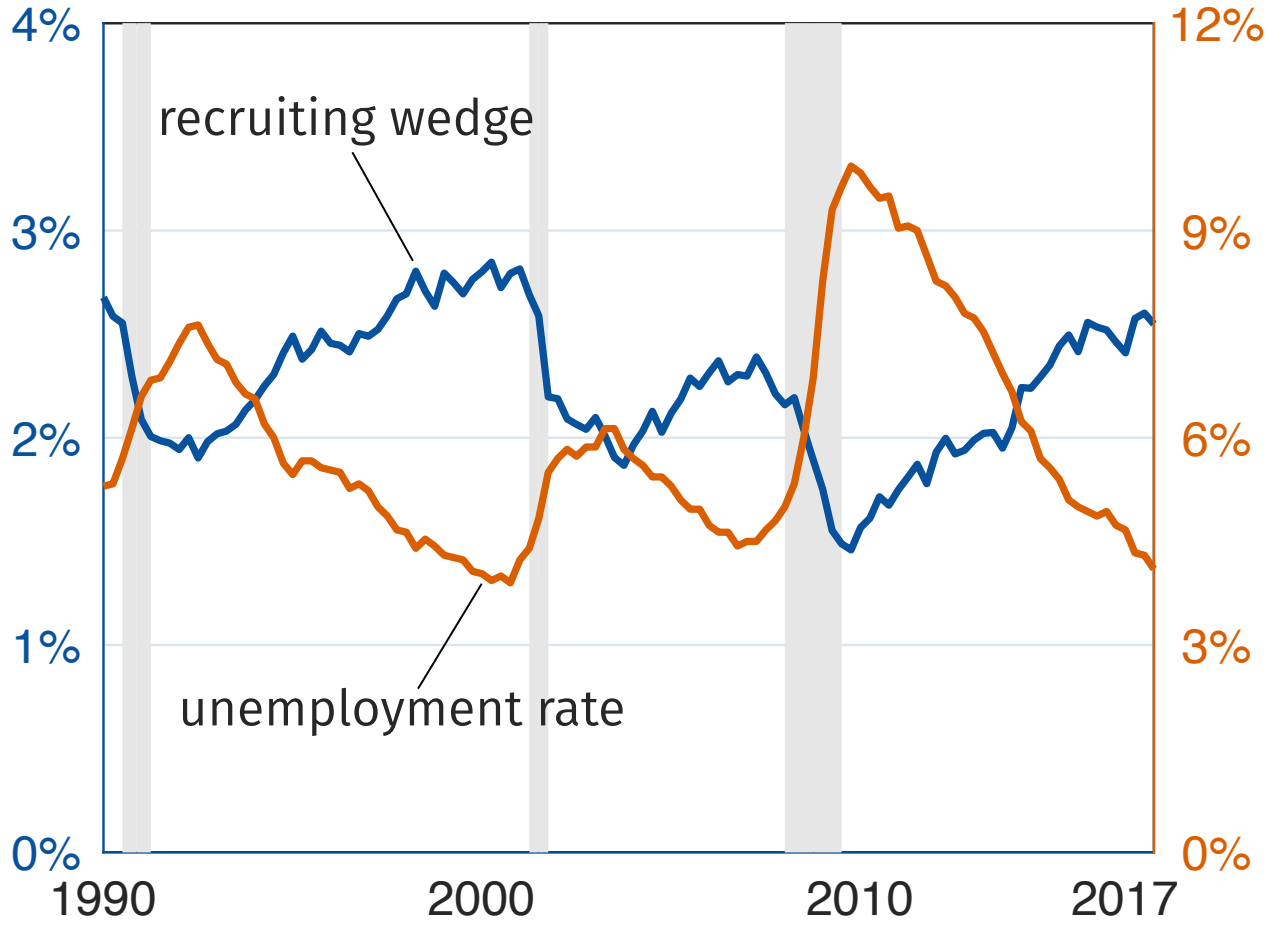
$$\tau^*(t) = \frac{1-\eta(t)}{\eta(t)} \cdot u^*(t)$$

- given $\eta(t)$, $u(t)$, $\tau(t)$, solve for $u^*(t)$ in first-order expansion

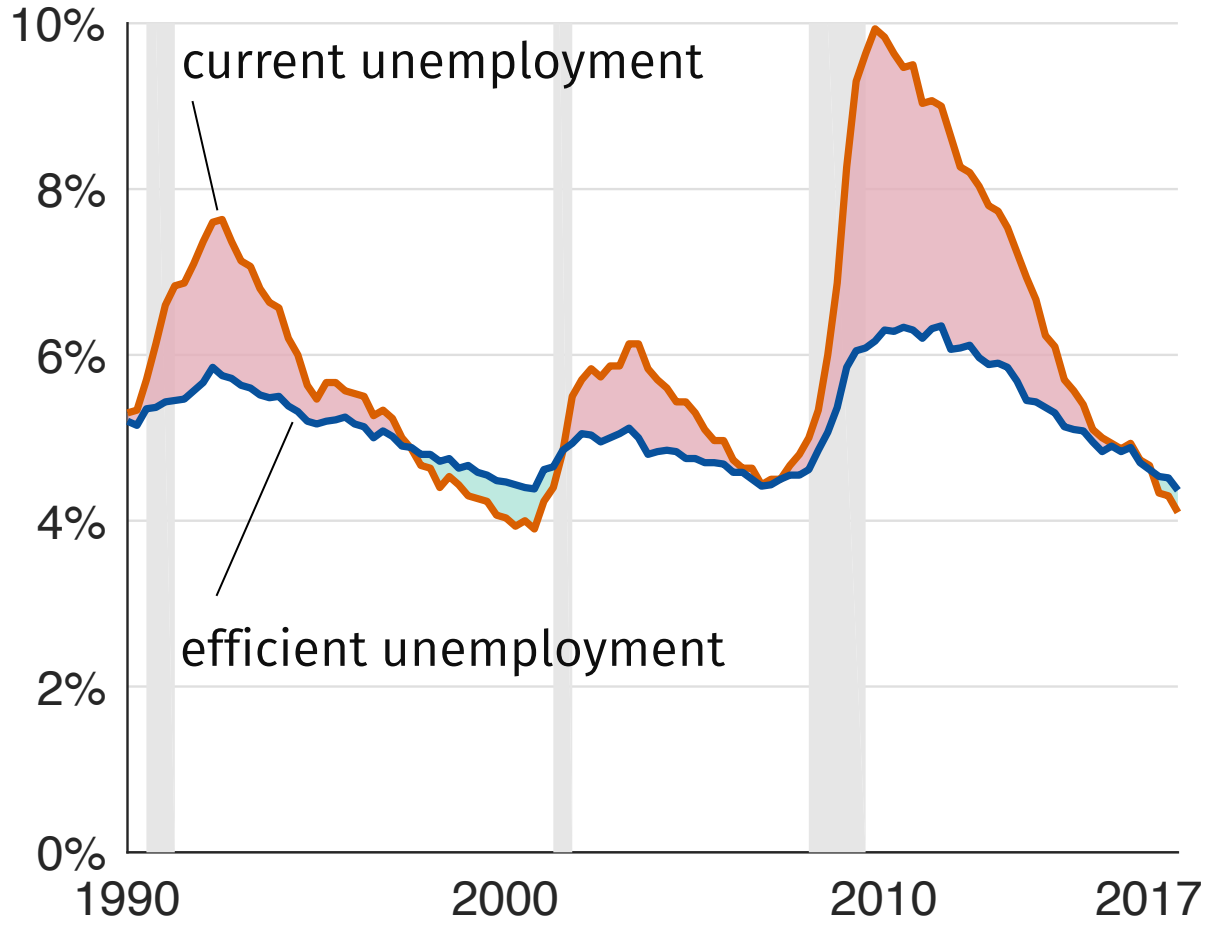
# MATCHING ELASTICITY: $\eta = 0.6$

| | $\eta$ | source |
|---|---|---|
| Petrongolo, Pissarides [2001] | 0.5–0.7 | metastudy |
| Shimer [2005] | 0.7 | CPS |
| Rogerson, Shimer [2011] | 0.6 | JOLTS |
| Borowczyk-Martins, Jolivet, Postel-Vinay [2013] | 0.3 | JOLTS |

# RECRUITING WEDGE: LANDAIS, MICHAILLAT, SAEZ [2018]



# EFFICIENT UNEMPLOYMENT & UNEMPLOYMENT GAP



# VALUE/COST OF UNEMPLOYMENT

# SOCIAL WELFARE

$$sw(t) = sw_t(n_t(\theta(t)), U_t(\theta(t)))$$

- $n_t(\theta)$: producers in firms
- $U_t(\theta) = u_t(\theta)h(t)$: unemployed workers, which contribute to welfare through
  - home production (+)
  - leisure (+)
  - loss of mental health (−)
  - loss of human capital (−)

# WELFARE RATE OF SUBSTITUTION

- efficient tightness satisfies $dsw_t/d\theta^* = 0$ so

$$\frac{dn_t}{d\theta} + \frac{\partial sw_t/\partial U}{\partial sw_t/\partial n} \cdot \frac{dU_t}{d\theta} = 0$$

- 4th sufficient statistic: welfare rate of substitution between production and unemployment at $\theta^*$

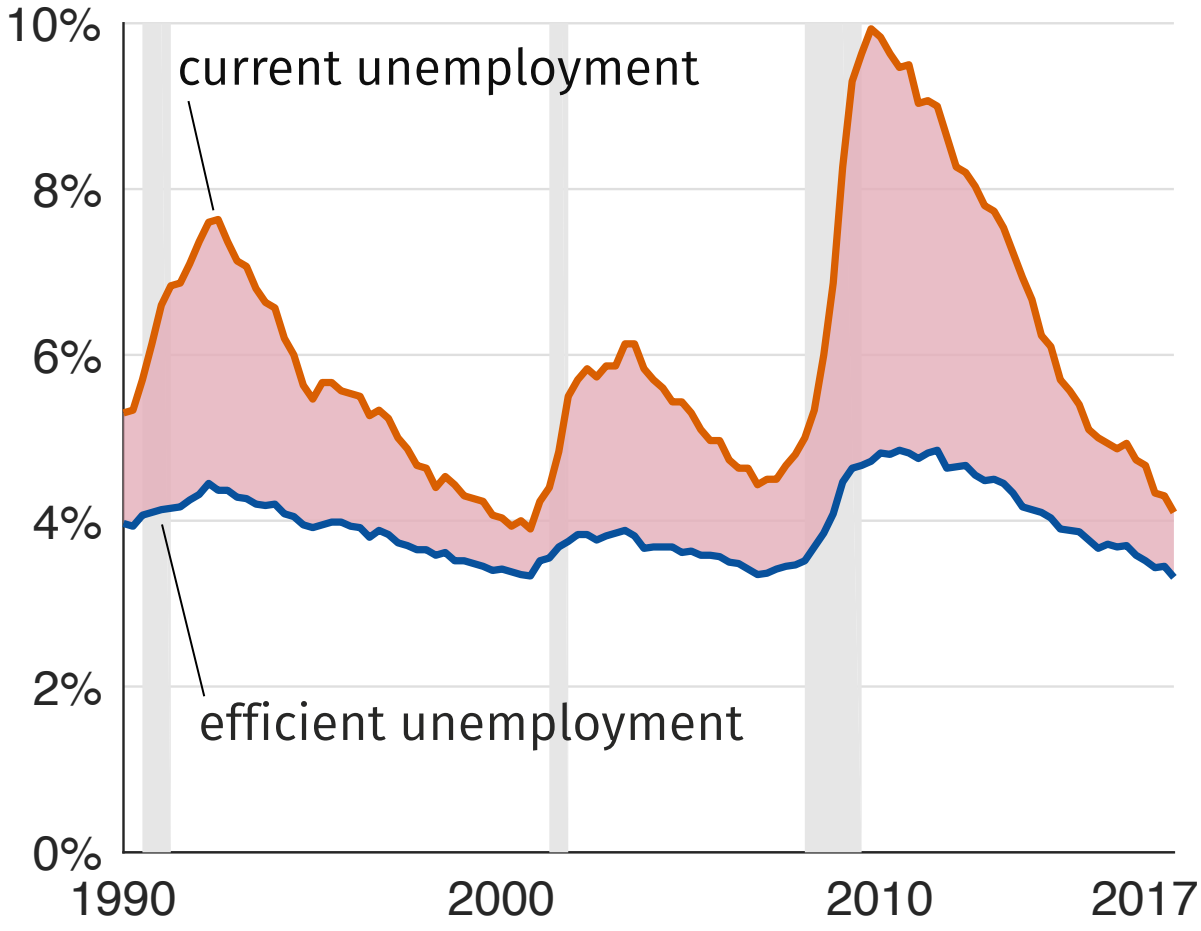
$$z(t) \equiv \frac{\partial sw_t/\partial U}{\partial sw_t/\partial n}$$

- previous case: $z = 0$; in reality: $z > 0$ or $z < 0$

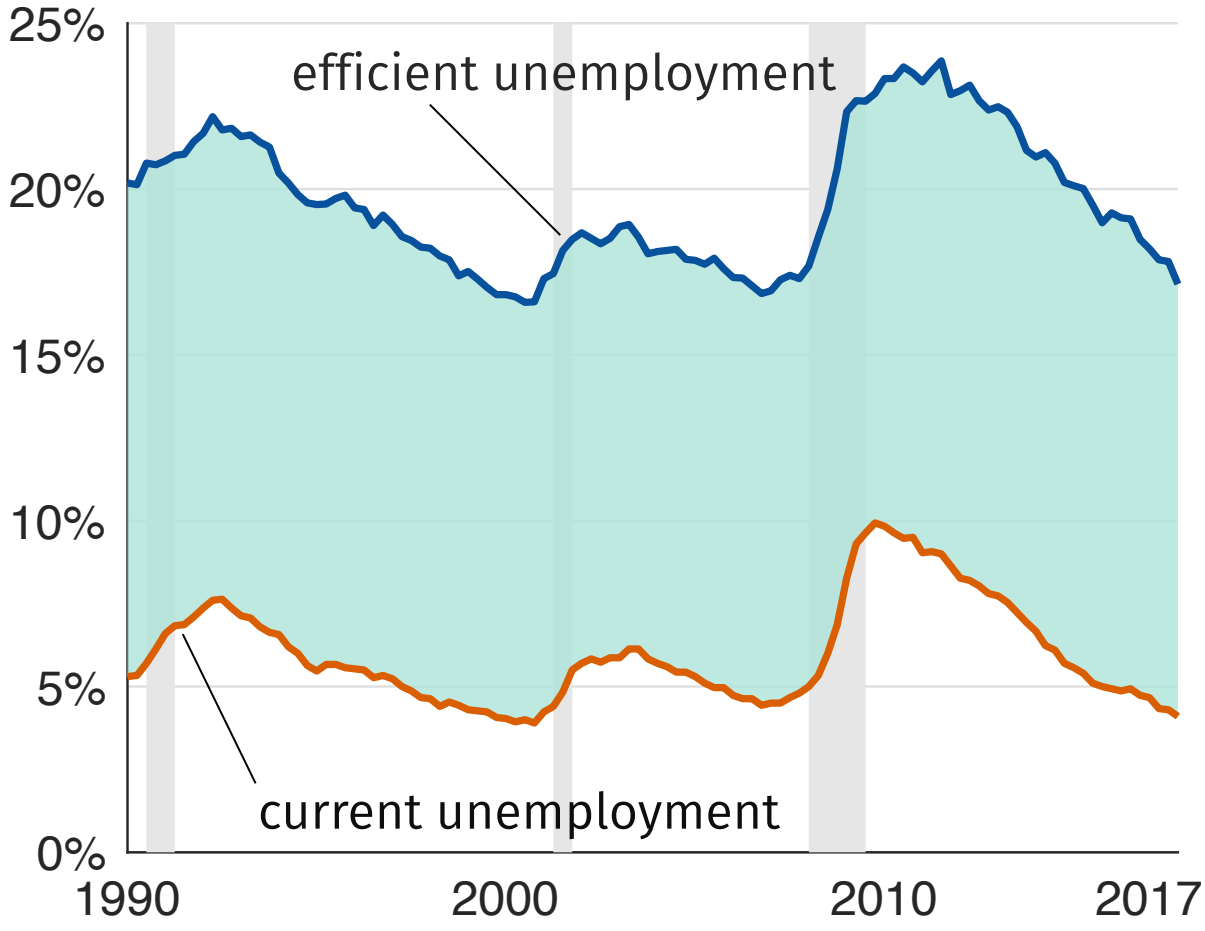
# WELFARE RATE OF SUBSTITUTION: MACRO & MICRO

| | $z$ | source |
|---|---|---|
| Shimer [2005] | 0.4 | – |
| Hall, Milgrom [2008] | 0.4 | calibration |
| Hagedorn, Manovskii [2008] | 0.96 | calibration |
| Hagedorn, Manovskii [2008] | 0.7 | calibration with taxes |
| Di Tella, MacCulloch, Oswald [2003] | –0.6 | Eurobarometer |
| Blanchflower, Oswald [2004] | –3 | GSS |
| Borgschulte, Martorell [2016] | –1 | veterans |

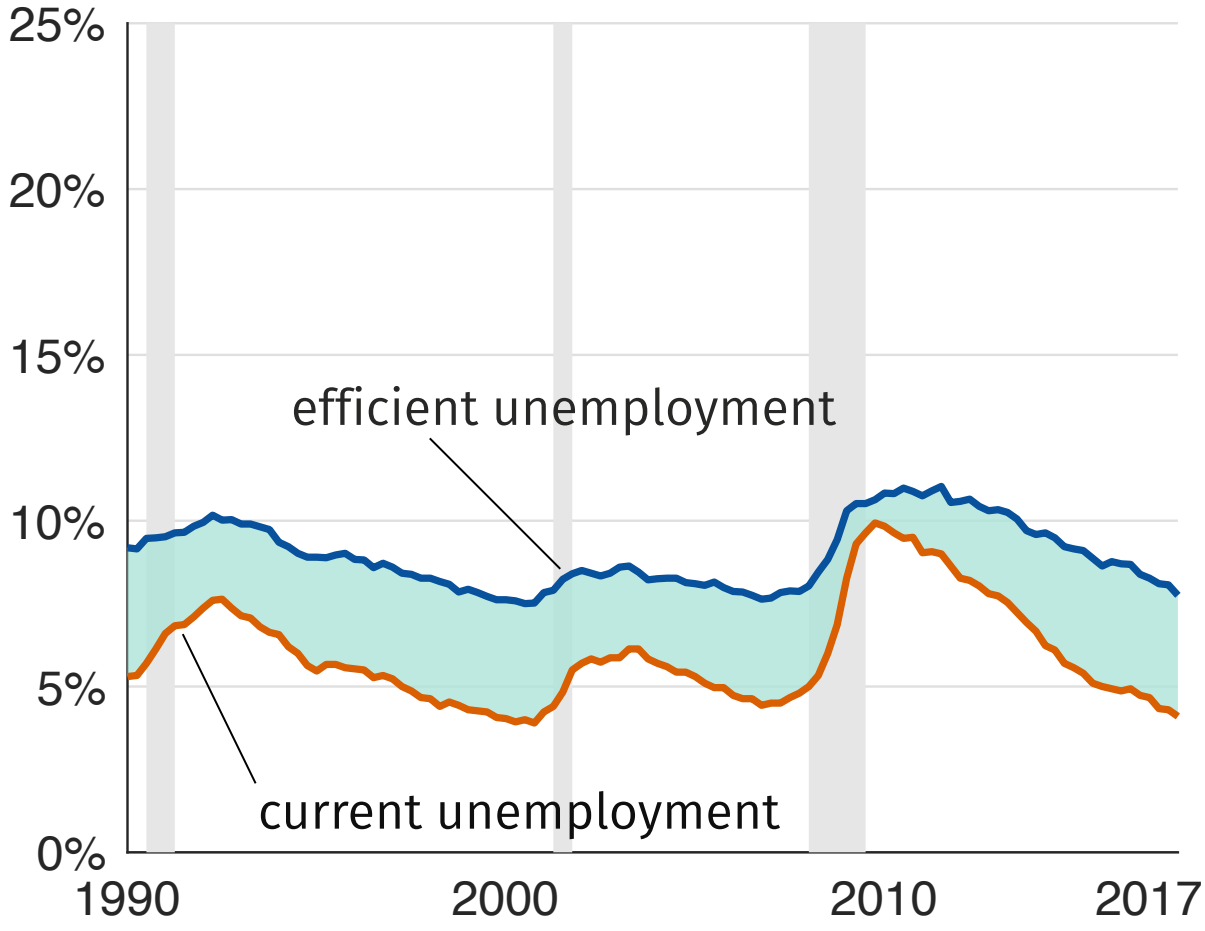
# MICROEVIDENCE: $z = -0.6$



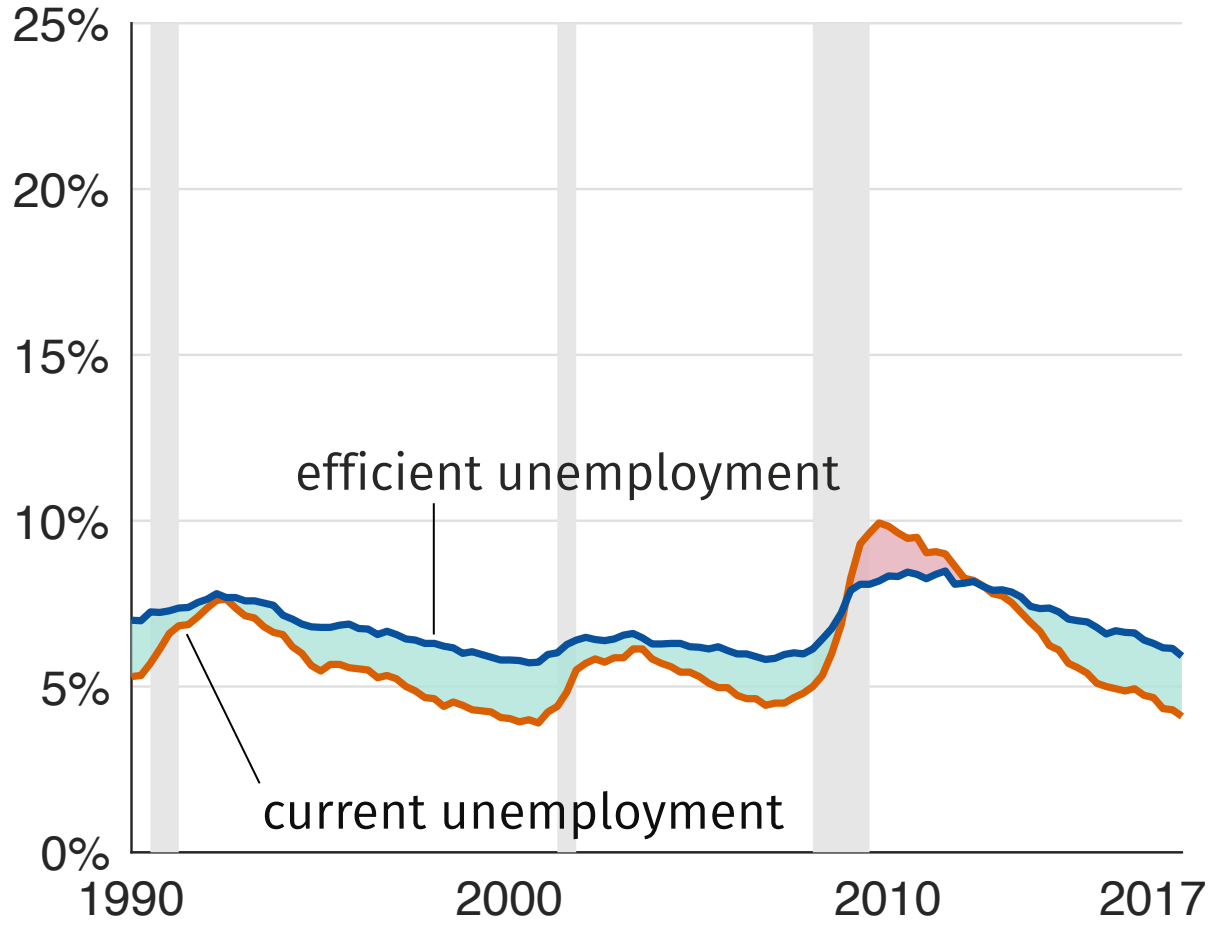
# HAGEDORN & MANOVSKII: $z = 0.96$



# HAGEDORN & MANOVSKII (TAX): $z = 0.7$



# SHIMER + HALL & MILGROM: $z = 0.4$



# MONETARY POLICY

# NEO-WICKSELLIAN FRAMEWORK

1. unemployment determined by interest rate: $u = u(i)$
2. productive efficiency at $u^*$
3. divine coincidence: desirable inflation at $u^*$

- optimal policy: set interest rate at $i^*$ to obtain $u^*$
- Taylor expansion from suboptimal $[i_0, u_0]$:

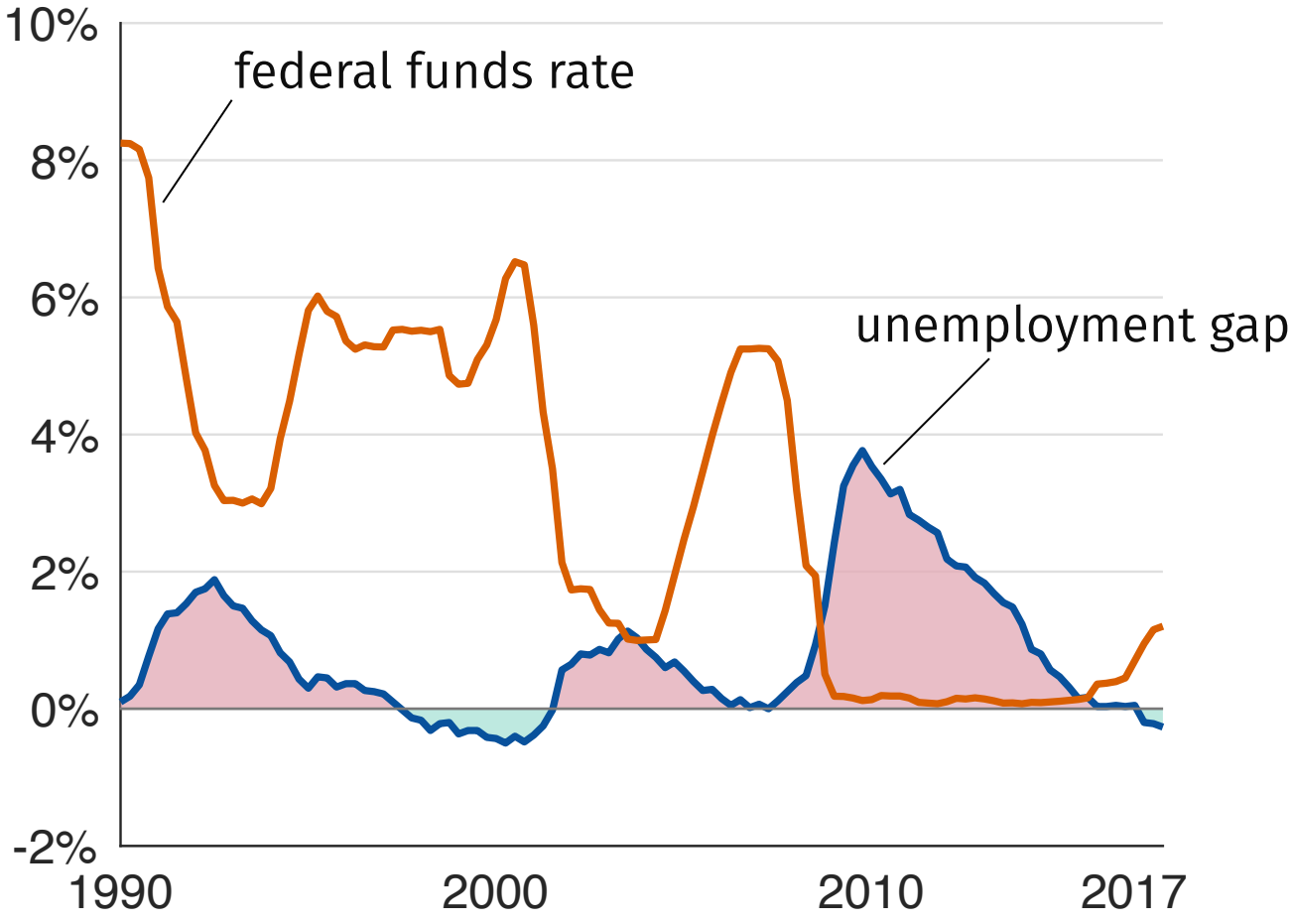
$$u^* \approx u_0 + \frac{du}{di} \cdot (i^* - i_0) \quad \text{so} \quad i^* - i_0 \approx -\frac{u_0 - u^*}{du/di}$$

- optimal interest-rate change $=$ $-$ unemployment gap $/(du/di)$

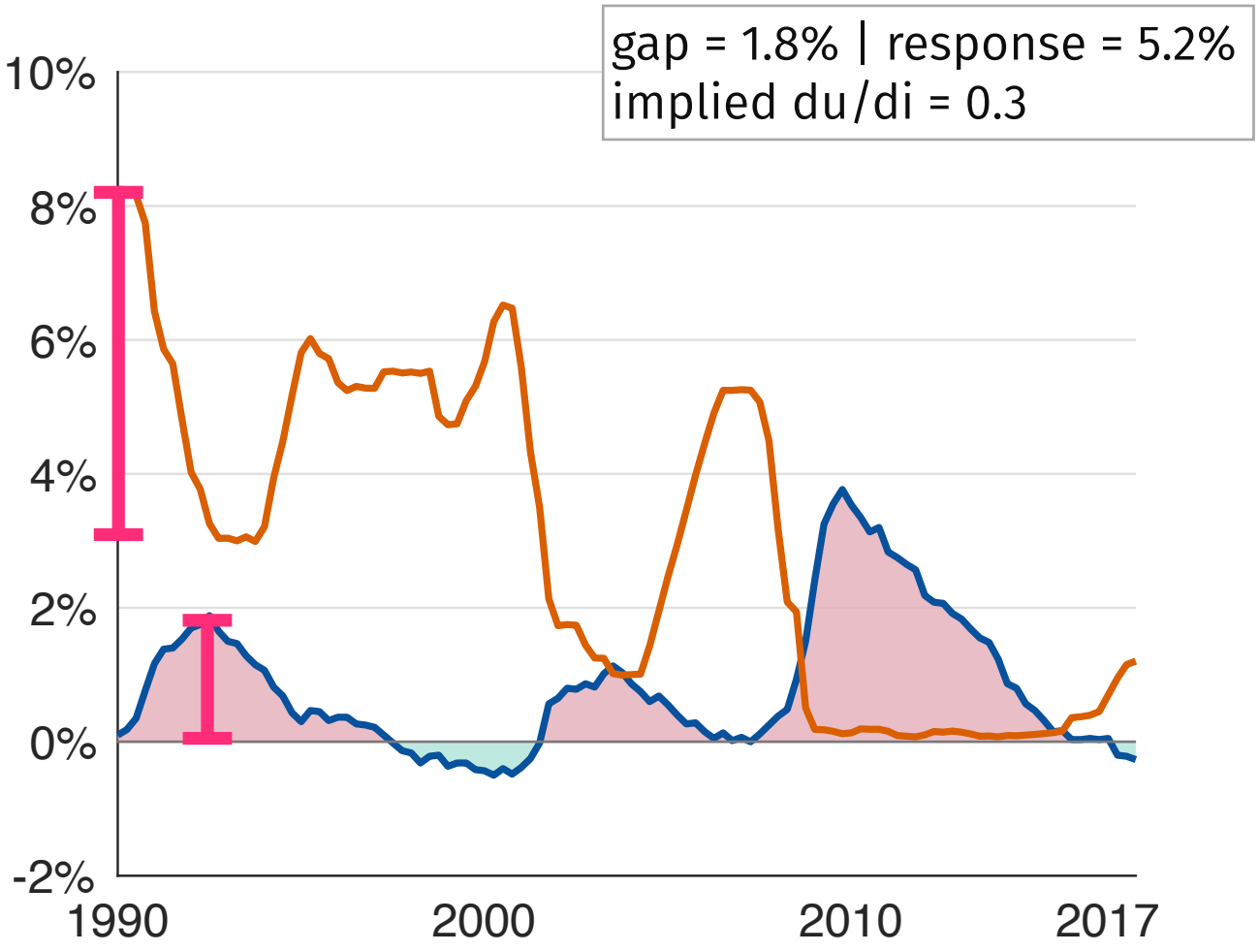
# MONETARY MULTIPLIER: $du/di = 0.5$

| | $du/di$ | method |
|---|---|---|
| Bernanke, Blinder [1992] | 0.6 | VAR |
| Leeper, Sims, Zha [1996] | 0.1 | VAR |
| Christiano, Eichenbaum, Evans [1996] | 0.1 | VAR |
| Bernanke, Boivin, Eliasz [2005] | 0.2 | FAVAR |
| Romer, Romer [2003] | 0.9 | narrative |
| Coibion [2012] | 0.5 | narrative |

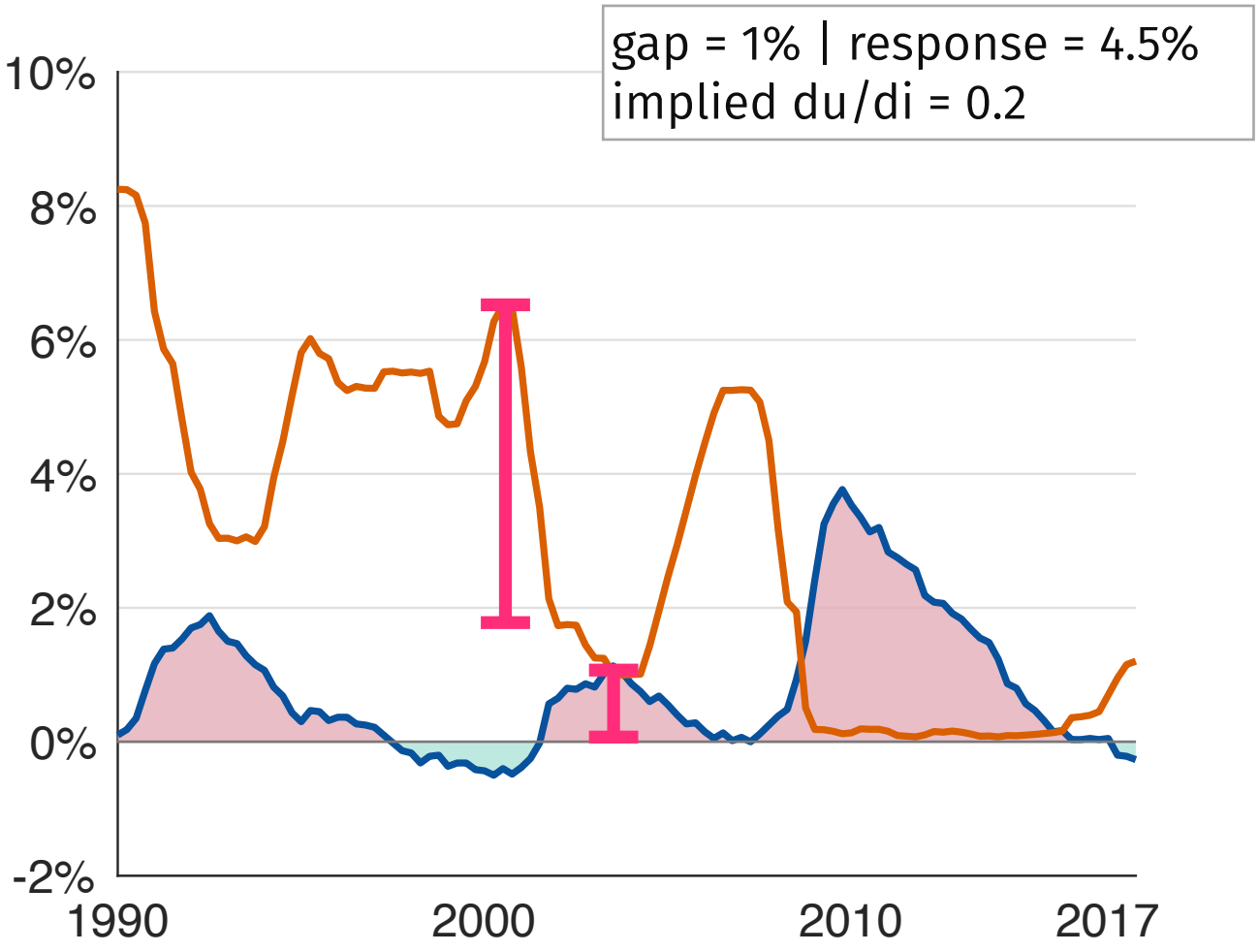
# INFORMAL ASSESSMENT OF FED'S BEHAVIOR



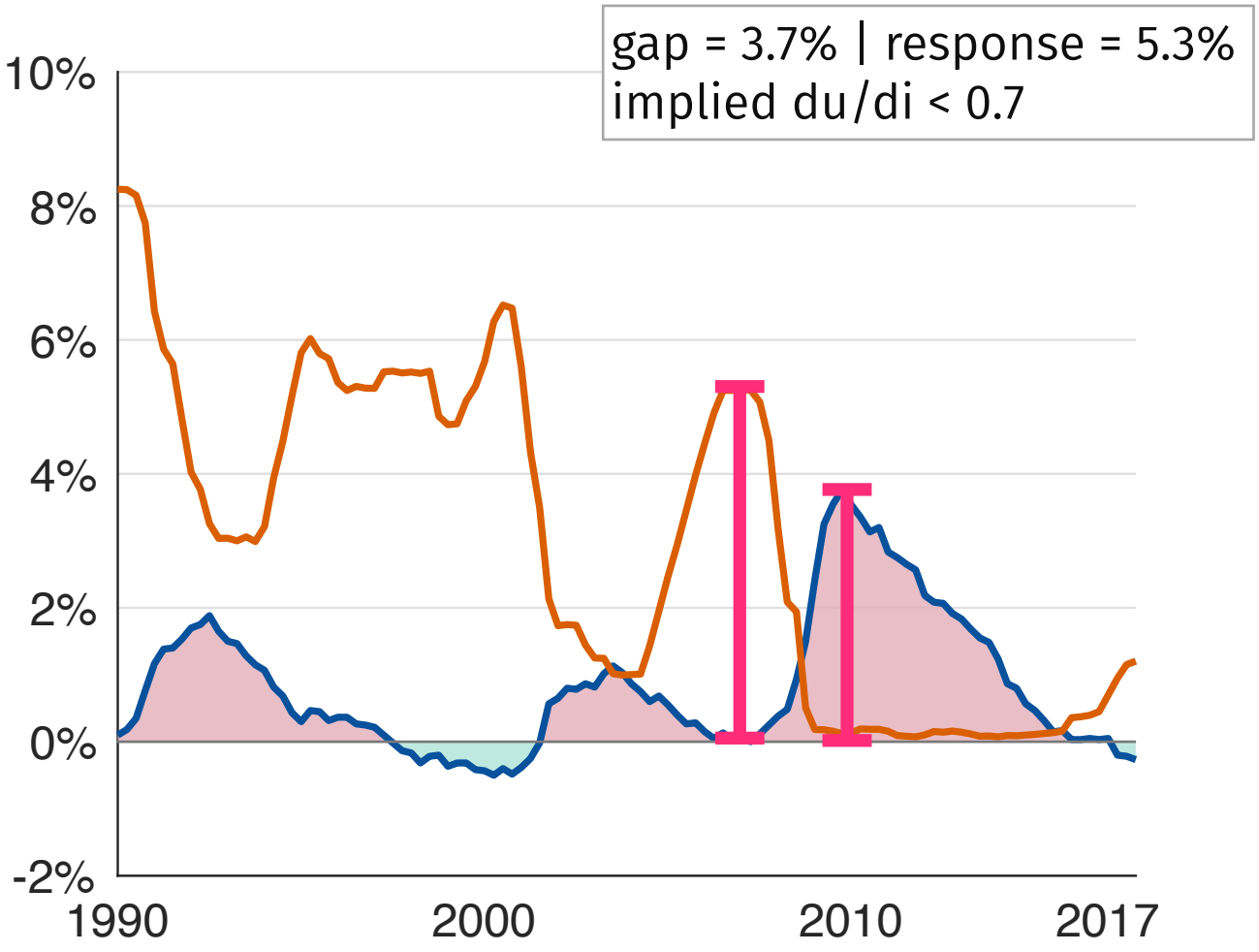
# INFORMAL ASSESSMENT OF FED'S BEHAVIOR



# INFORMAL ASSESSMENT OF FED'S BEHAVIOR



# INFORMAL ASSESSMENT OF FED'S BEHAVIOR

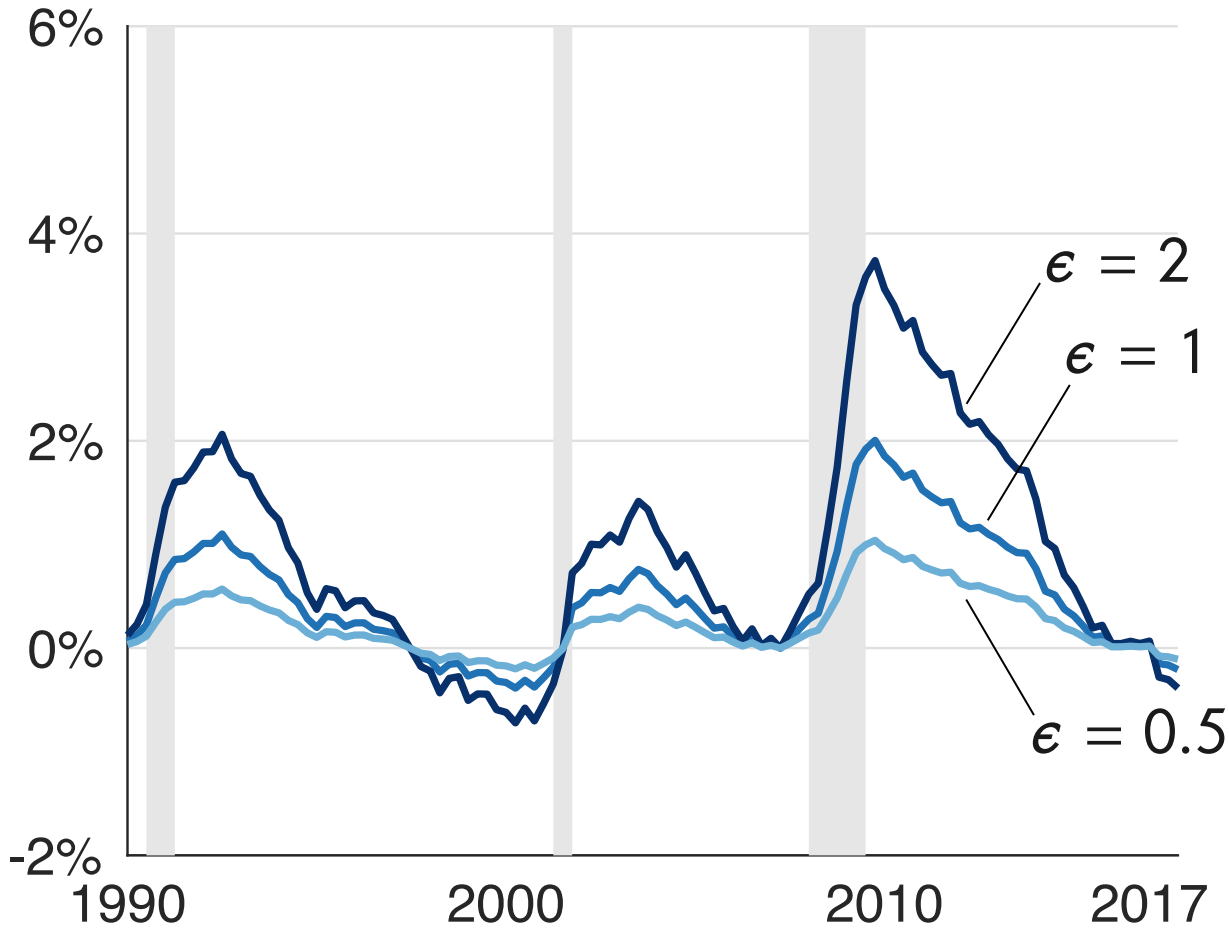


# FISCAL POLICY

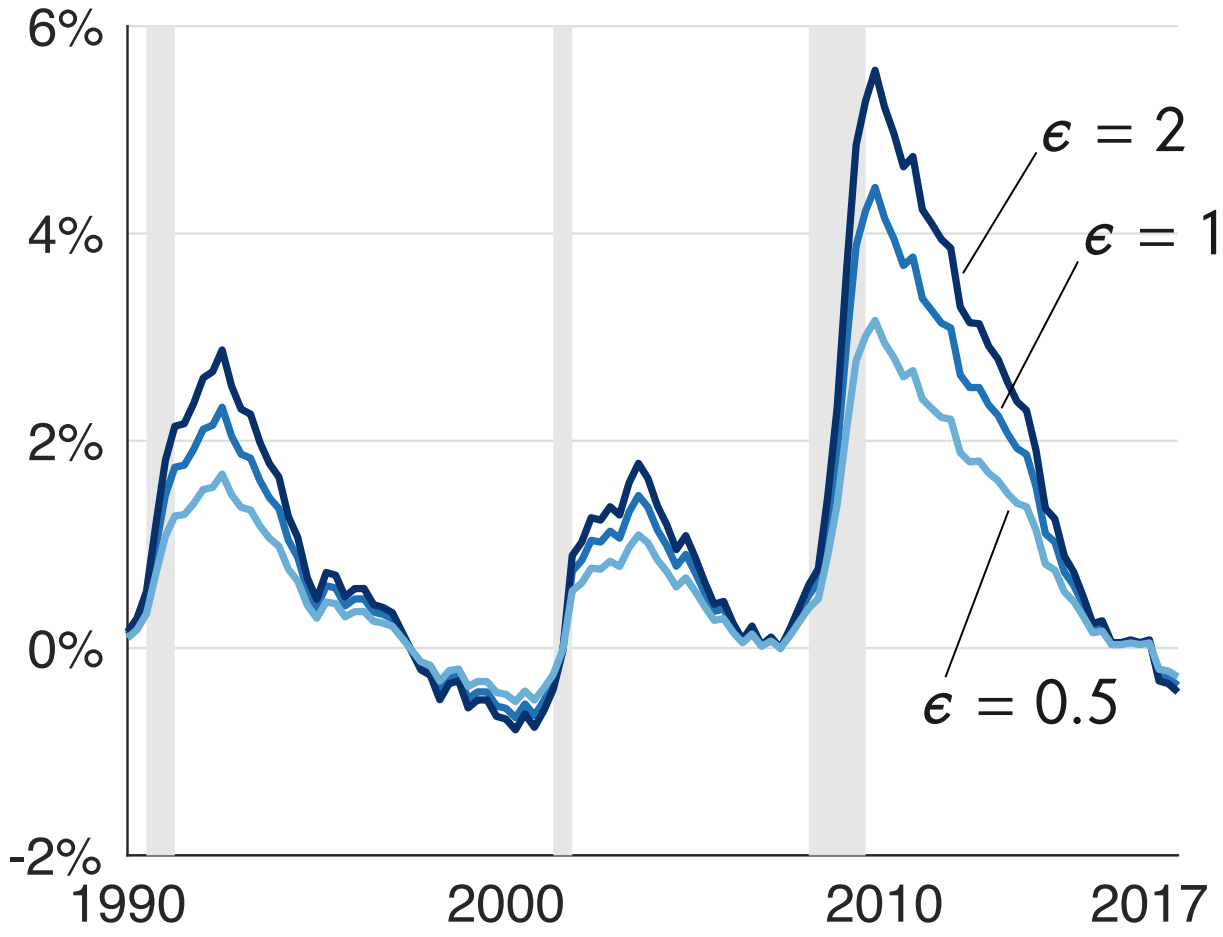
# OPTIMAL STIMULUS SPENDING

- stimulus spending ≡ public spending − Samuelson spending
- optimal stimulus $= G(\epsilon, \text{multiplier}) \times$ unemployment gap
  - $\epsilon > 0$: elasticity of substitution between public & private consumption
  - multiplier: decrease in unemployment rate when public spending increases by 1% of GDP
  - see Michaillat, Saez [2019]

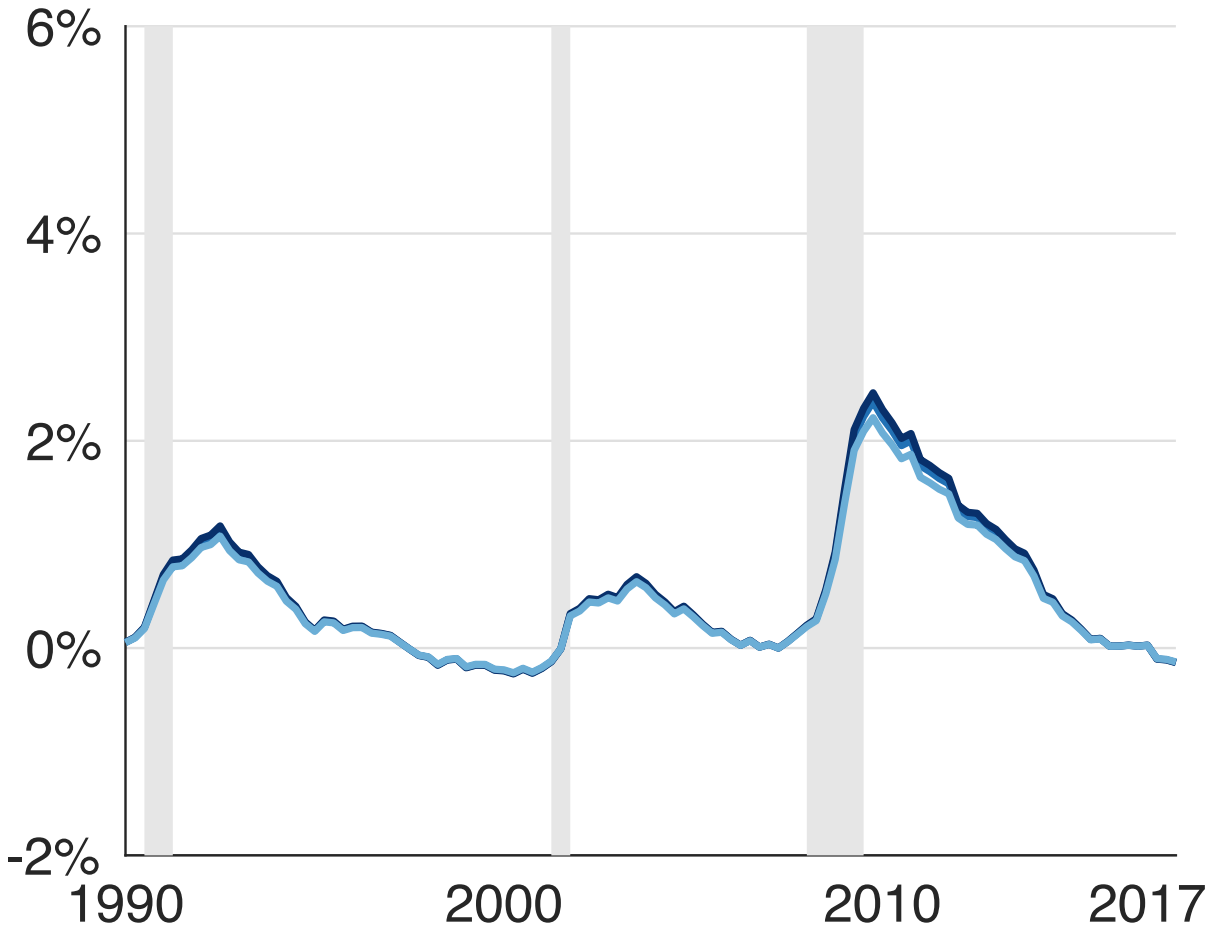
# OPTIMAL STIMULUS SPENDING | MULTIPLIER = 0.1



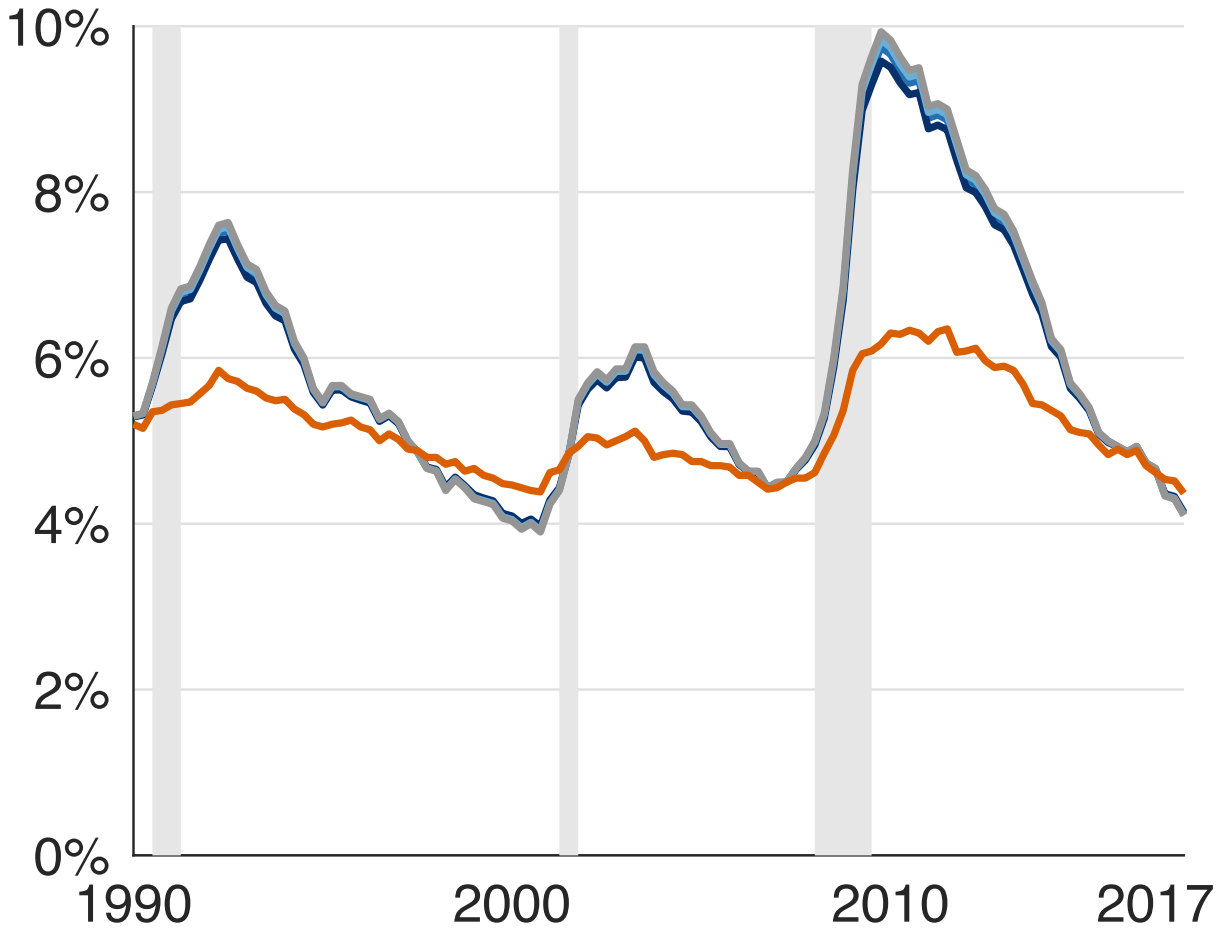
# OPTIMAL STIMULUS SPENDING | MULTIPLIER = 0.5



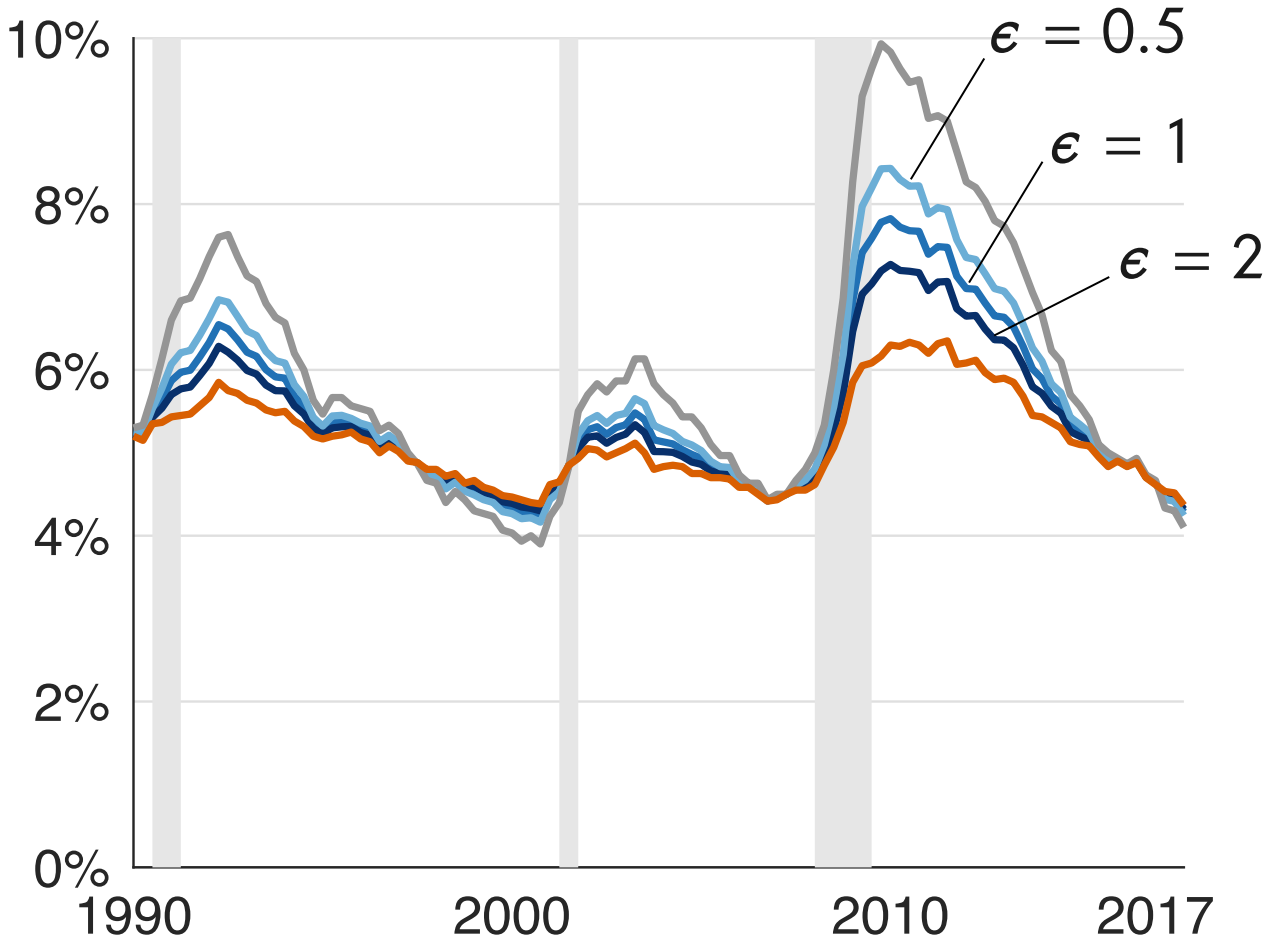
# OPTIMAL STIMULUS SPENDING | MULTIPLIER = 1.5



# RESULTING UNEMPLOYMENT | MULTIPLIER = 0.1



# RESULTING UNEMPLOYMENT | MULTIPLIER = 0.5



# RESULTING UNEMPLOYMENT | MULTIPLIER = 1.5