Labor market institutions and the business cycle: the role of aggregate demand

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Motivation

- Market incompleteness & borrowing constraints $\rightarrow$ precautionary saving motive
- Precautionary savings depend on labor market flow probabilities
- Cyclical volatility of unemployment risk generates shifts in aggregate demand
- With price & wage rigidities shifts in AD translate to shifts in real output
- Giving rise to a feedback loop between output and unemployment risk
- We investigate stabilizing role of labor market institutions

Unemployment risk and consumption

Adapted from Table 4 in Krueger et al. (2016): Decomposing changes in expenditure growth in Great Recession

	Change C growth	Change Y growth	Change C/Y growth
All	-6.9	-2.9 (42%)	-3.8 (55%)
Net Worth Q1	-6.5	-0.7 (11%)	-4.5 (69%)
Net Worth Q5	-6.2	-3.0 (42%)	-3.4 (55%)

Adapted from Tables 4 & 9 in Coibion et al. (2021): Effect of 2nd moment for expected growth rate of EA GDP on nondurable consumption

	One month after treatment	Four months after treatment	High Risk Sectors	Low Risk Sectors
Posterior: uncertainty	-4.61**	-4.51**	-8.85**	2.48
	(2.23)	(2.25)	(3.71)	(3.13)

Labor market institutions

We examine the effects of the following

- Unemployment benefits μ
- Firing costs Δ
- Wage subsidies τ^w

Compare & contrast the behavior of labor markets in the US and EA

Literature

- **Labor market institutions in RANK:** Christoffel et al. (2009), Thomas and Zanetti (2009), Zanetti (2011)
- **Labor market institutions in HANK:** Krusell et al. (2010), McKay and Reis (2016), Den Haan et al. (2018), Kekre (2019), Graves (2020), Dengler and Gehrke (2021)
- **USA vs. European labor markets:** Ljungqvist and Sargent (1998), Blanchard and Wolfers (2000), Haan et al. (2001), Ljungqvist and Sargent (2007), Rogerson (2008), Abbritti and Mueller (2013), Kitao et al. (2017), Kolasa et al. (2021)

Model

- Ex-ante identical worker households subject to uninsurable idiosyncratic iid labor productivity shocks drawn from log-normal distribution
- Endogenous separations: firms learn about the workers' productivities and lay off those below a certain threshold like in Krause and Lubik (2007)
- Job finding and separation rates react to aggregate shocks
  $\rightarrow$ labor market risk changes over the business cycle
  $\rightarrow$ demand for precautionary savings fluctuates
  $\rightarrow$ aggregate demand feedback loop
- Single-worker intermediate goods producers, monopolistically competitive wholesalers subject to Rotemberg price friction and perfectly competitive final goods producers
- Monetary & fiscal authorities, government debt (only asset) in positive net supply

Timing convention

1. Aggregate shocks revealed
2. Vacancy posting & hiring takes place
3. Idiosyncratic shocks revealed, separations (exogenous & endogenous)
4. Production & consumption

Employment dynamics

Total separations

$$s_t = \hat{s} + (1 - \hat{s})\, s_t^n$$

Endogenous separations depend on firing threshold $\tilde{a}_t$

$$s_t^n = \int_0^{\tilde{a}_t} h(a)\, \mathrm{d}a = H(\tilde{a}_t)$$

Employment dynamics

$$N_t = (1 - s_t)\,(N_{t-1} + M_t)$$

Search & matching

$$M_t = \bar{M}\,(1 - N_{t-1})^{\alpha}\, V_t^{1-\alpha}$$

Job finding and vacancy filling probabilities

$$f_t = M_t / (1 - N_{t-1}) \quad \text{and} \quad q_t = M_t / V_t$$

Intermediate good firms

Output per worker $= Z_t a_t$, real price of intermediate good $= \Psi_t$

Value of a worker with wage subsidy $\boldsymbol{\tau_t^w}$

$$\mathcal{J}_t(a_t) = \Psi_t Z_t a_t - \left(1 - \boldsymbol{\tau_t^w}\right) w_t + (1 - \hat{s})\, \mathrm{E}_t\left(\Pi_{t+1}/R_t\right) \bar{\mathcal{J}}_{t+1}$$

Endogenous separation under firing cost $\boldsymbol{\Delta_t}$

$$\tilde{a}_t = \frac{\left(1 - \boldsymbol{\tau_t^w}\right) w_t - (1 - \hat{s})\, \mathrm{E}_t\left(\Pi_{t+1}/R_t\right) \bar{\mathcal{J}}_{t+1} - \boldsymbol{\Delta_t}}{\Psi_t Z_t}$$

Expected ex-ante worker value where $A_t = \int_{\tilde{a}_t}^{\infty} \frac{a h(a)}{1 - H(\tilde{a}_t)}\, \mathrm{d}a$

$$\bar{\mathcal{J}}_t = -s_t^n \boldsymbol{\Delta_t} + (1 - s_t^n)\left[\Psi_t Z_t A_t - \left(1 - \boldsymbol{\tau_t^w}\right) w_t + (1 - \hat{s})\, \mathrm{E}_t\left(\Pi_{t+1}/R_t\right) \bar{\mathcal{J}}_{t+1}\right]$$

Vacancy creation condition

$$\kappa/q_t = (1 - \hat{s})\, \bar{\mathcal{J}}_t$$

Wage setting

Homogenous real wage, regardless of workers' idiosyncratic shocks

Steady state real wage satisfies

$$(1-\boldsymbol{\tau^w})\,w = \Psi A - \frac{\left[1-(\Pi/R)\,(1-s)\right]\bar{\mathcal{J}} + s^n\boldsymbol{\Delta}}{1-s^n}$$

Supported by a Nash bargaining solution for a certain bargaining power

Outside steady state wages follow an indexation rule (see, e.g., Den Haan et al. (2018))

$$w_t = \left(w_{ss}Z_t^{\omega_z}\right)^{1-\omega_w}\left(\frac{w_{t-1}}{\Pi_t}\right)^{\omega_w}$$

Households

Employed household

$$V_t^E(b_t) = \max_{c_t,\, b_{t+1}} \left\{ \frac{c_t^{1-\sigma}}{1-\sigma} + \beta \mathrm{E}_t \left[(1 - s_{t+1}) V_{t+1}^E(b_{t+1}) + s_{t+1} V_{t+1}^U(b_{t+1}) \right] \right\}$$

$$\text{subject to} \quad c_t + b_{t+1} = \frac{R_{t-1}}{\Pi_t} b_t + (1 - \tau_t) w_t$$

$$b_{t+1} \geq -\bar{b}$$

Unemployed household where $\boldsymbol{\mu_t}$ is the unemployment benefit replacement rate

$$V_t^U(b_t) = \max_{c_t,\, b_{t+1}} \left\{ \frac{c_t^{1-\sigma}}{1-\sigma} + \beta \mathrm{E}_t \left[f_{t+1}(1 - s_{t+1}) V_{t+1}^E(b_{t+1}) + (1 - f_{t+1}(1 - s_{t+1})) V_{t+1}^U(b_{t+1}) \right] \right\}$$

$$\text{subject to} \quad c_t + b_{t+1} = \frac{R_{t-1}}{\Pi_t} b_t + \boldsymbol{\mu_t} w_t$$

$$b_{t+1} \geq -\bar{b}$$

Policymakers & market clearing

Monetary policy rule

$$R_t = R_{ss} + \phi_\Pi \left(\Pi_t - \Pi_{ss}\right) + \phi_Y \left(Y_t - Y_{ss}\right)/Y_{ss}$$

Fiscal policy

$$D_t + \left(\tau_t - \boldsymbol{\tau_t^w}\right) w_t N_t + \frac{B_t}{P_t} + T_t = R_{t-1}\frac{B_{t-1}}{P_t} + \boldsymbol{\mu_t} w_t \left(1 - N_t\right)$$

Wage subsidies s_t financed via lump-sum taxes T_t on intermediate good firms

Government debt fixed & labor tax closes the constraint, but can entertain other rules

Final good output

$$Y_t = Z_t N_t A_t$$

Goods market clearing

$$Y_t = C_t + \frac{\phi}{2}\left(\Pi_t - \Pi_{ss}\right)^2 Y_t + \kappa V_t + \frac{s_t^n}{1 - s_t} N_t \boldsymbol{\Delta_t}$$

Calibration: parameters

Parameter	Description	Value	Source
σ	Relative risk aversion	2	Standard
γ	Elasticity of substitution between intermediate goods	11	Standard
ϕ	Price adjustment cost	115	Hagedorn et al. (2019)
ϕ_Π	Taylor rule inflation coefficient	1.5	Standard
ϕ_Y	Taylor rule output coefficient	0.125	Standard
μ	Unemployment replacement rate	0.4	Shimer (2005)
$\bar{b}$	Liquidity constraint	0	McKay and Reis (2016)
$\mu(a)$	Mean workers' log productivity	0	den Haan et al. (2000)
$\hat{s}$	Exogenous separations	0.066	den Haan et al. (2000)
α	Matching function elasticity	0.5	Standard
ω_z	Wage indexation to productivity	0.1	Own estimates
ω_w	Real wage rigidity	0.5	Own estimates

Calibration: US targets

United States

Parameter	Description	Value	Target	Target value
β	Discount factor	0.993	Real interest rate	0.025
w	Mean wage	0.903	Broad unemployment rate	0.12
$\bar{M}$	Match efficiency parameter	0.755	Vacancy filling rate	0.7
κ	Vacancy cost	0.082	Vacancy cost to real wage	0.13
B_{ss}/Y_{ss}	Public debt in the steady state	4	Debt to GDP ratio	100%
$\sigma(a)$	Workers' productivity dispersion	0.08	Endogenous firing rate	0.032

Calibration: EA labor market targets and institutions

Variable	Description	EA value	US value
$1-N$	Broad unemployment rate	0.2	0.12
s	Overall separation rate	0.05	0.1
f	Job finding probability	0.2	0.81
q	Vacancy filling probability	0.7	0.7

Parameter	Description	EA value	US value
Δ	Firing cost	0.0225	0
μ	Replacement rate	0.5	0.4
$\bar{M}$	Match efficiency parameter	0.384	0.755
$\hat{s}$	Exogenous separations	0.033	0.066

Solution method

Steady state:

- collocation & endogenous gridpoint method

Stochastic solution:

- modified algorithm of Reiter (2009)
- linear approximation of the transition dynamics around the nonlinear steady state

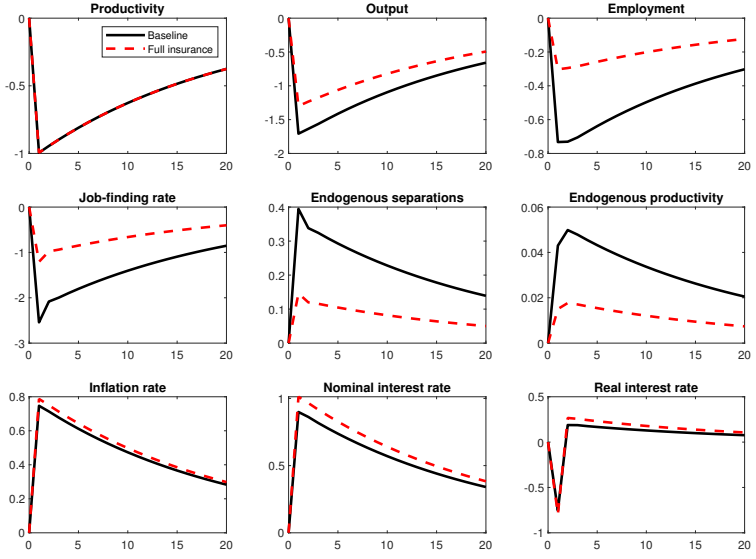
Impact of labor market institutions

Full insurance exercise: unemployment benefit equal to after-tax wage (but we keep the original steady state distribution of assets)

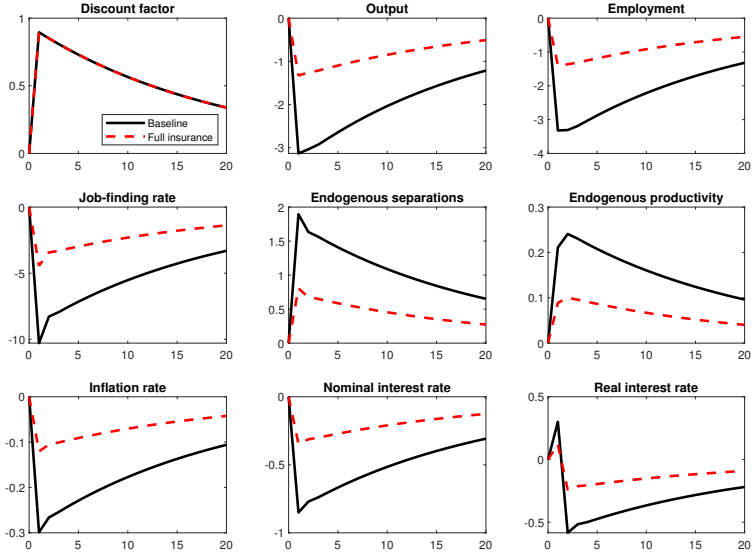
Implement cyclical policies aligning US labor market institutions to EA

Examine impact of countercyclical wage subsidies

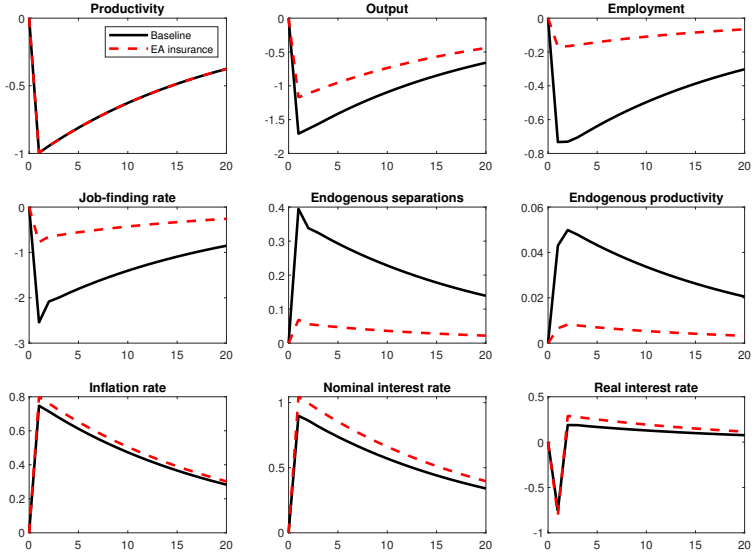
Full insurance: productivity shock (US)



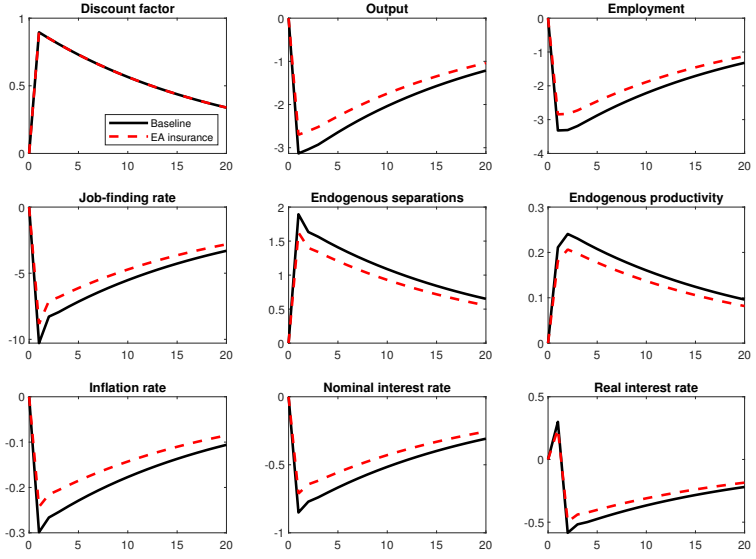
Full insurance: discount factor shock (US)



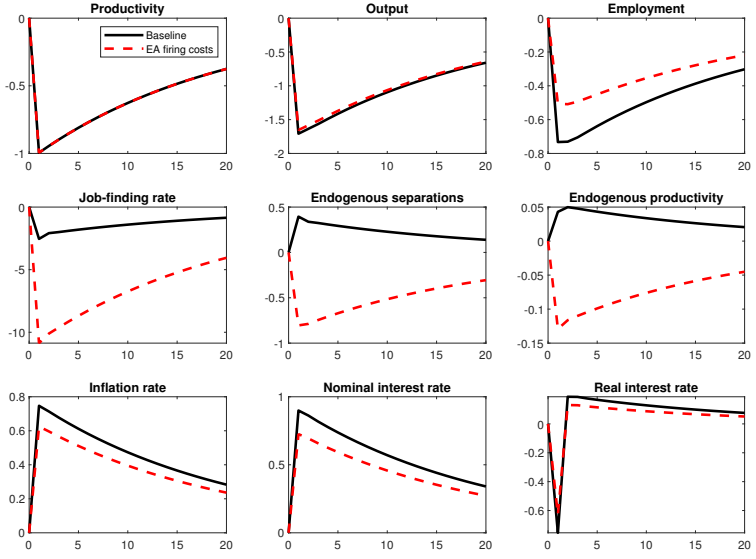
EA unemployment benefits in US: productivity shock



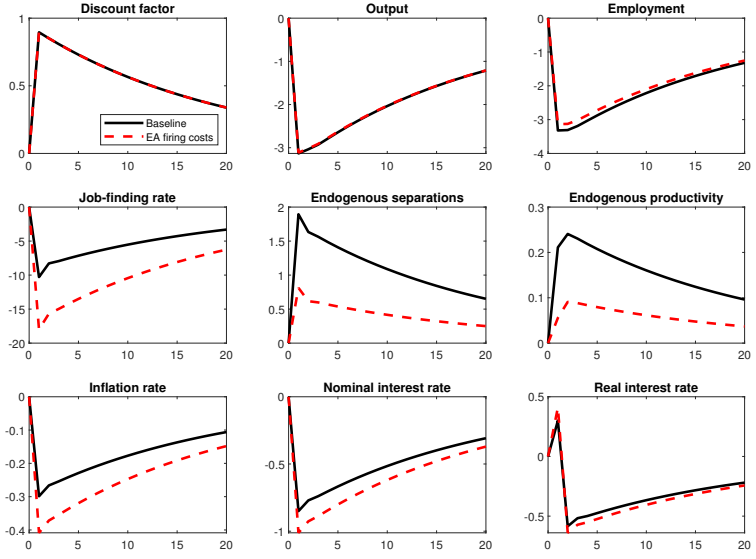
EA unemployment benefits in US: discount factor shock



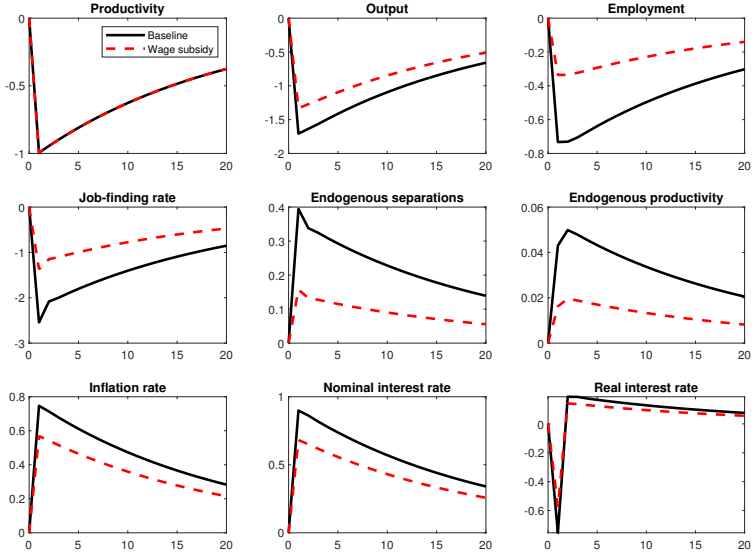
EA firing cost in US: productivity shock



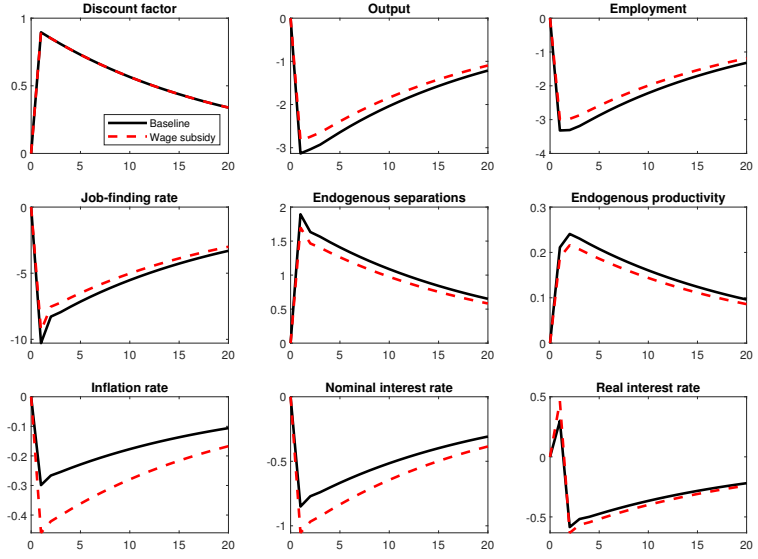
EA firing cost in US: discount factor shock



25% peak wage subsidy in US: productivity shock



25% peak wage subsidy in US: discount factor shock



Conclusions

- Aggregate demand channel due to precautionary savings important in accounting for cyclical volatility of both economies
- Presence of labor market institutions affects aggregate dynamics
- Countercyclical unemployment benefits and wage subsidies effective in containing labor market risk, esp. in face of “supply” shocks

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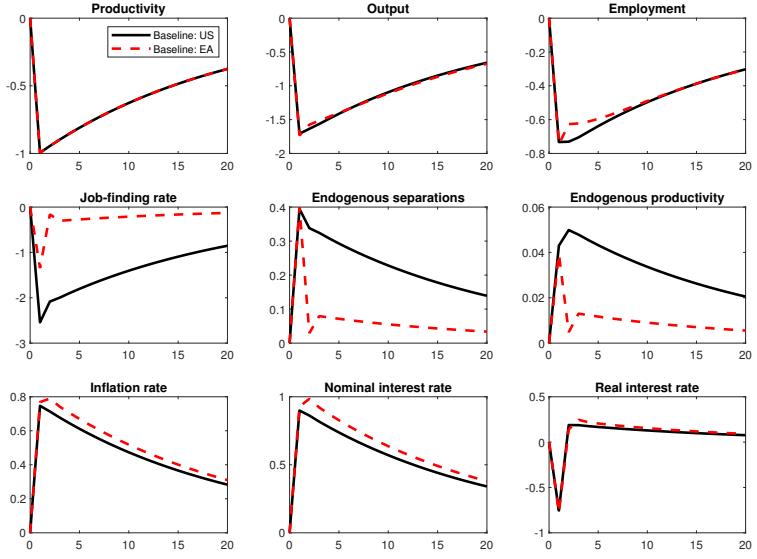
Transmission of shocks: productivity (US vs EA)



Transmission of shocks: discount factor (US vs EA)