Sovereign Default and Labor Market Dynamics

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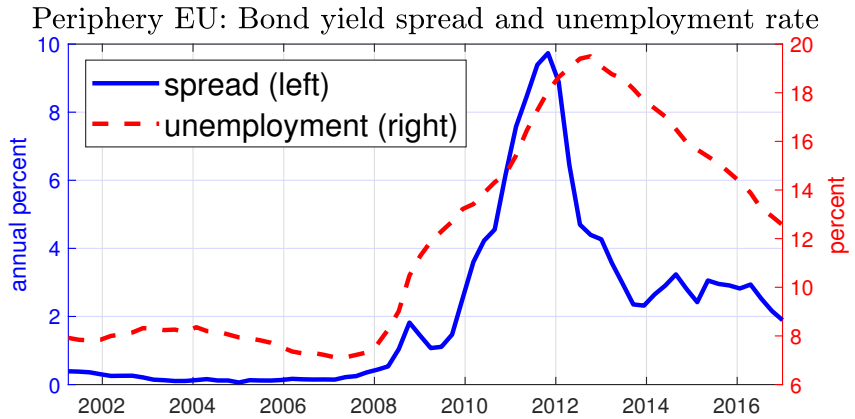
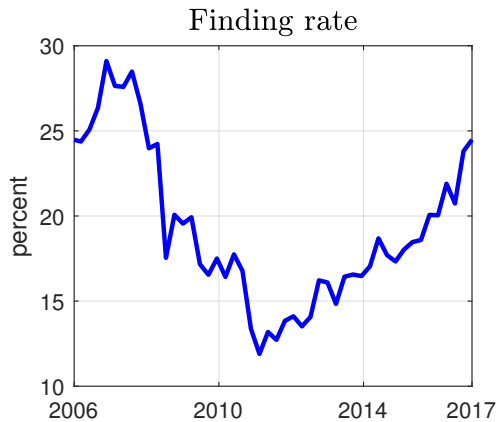
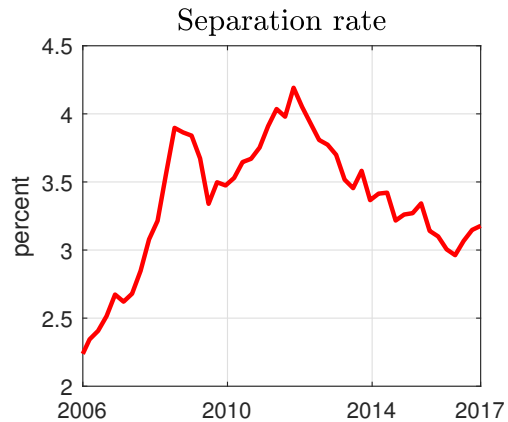
European debt crisis

- Prolonged recessions and sluggish recovery in the aftermath of crisis:
  - By 2015, unemployment rates were: Spain (23.1), Greece (25.8), Italy (12.2), Portugal (13.4), Ireland (10.6).

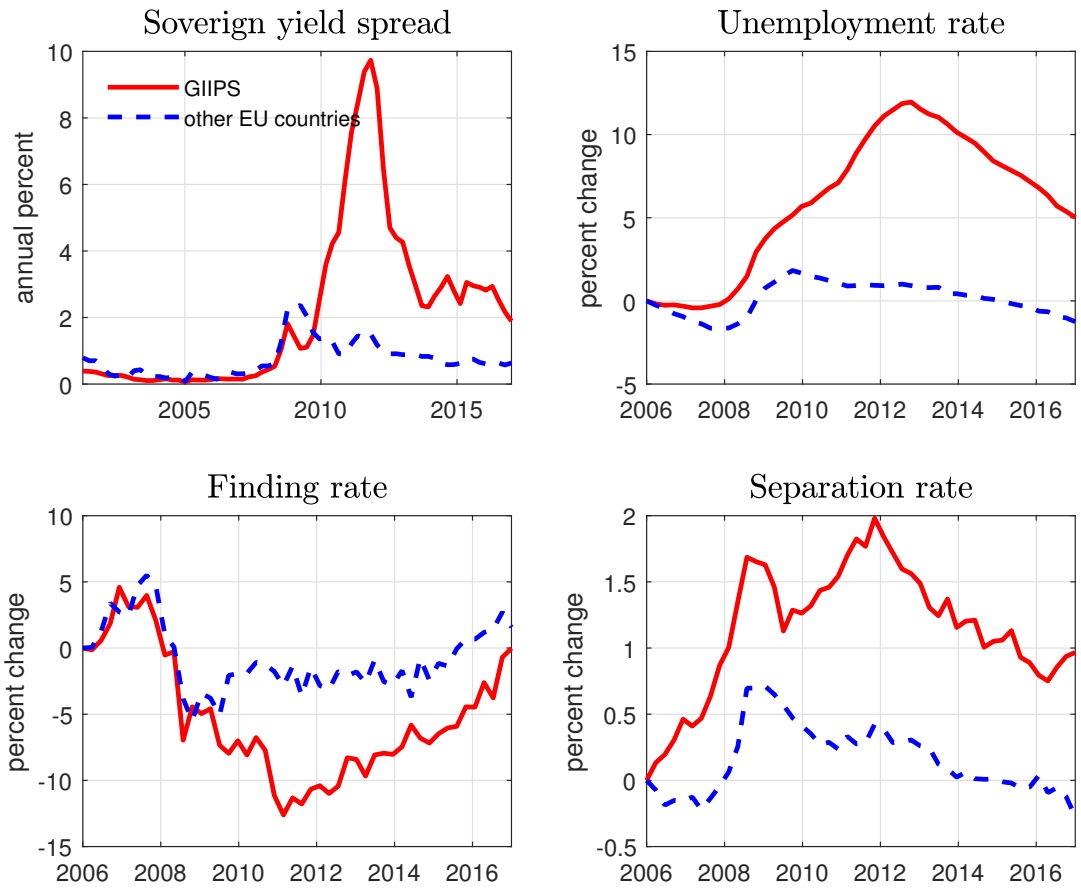






Different experience in the core and periphery economies

Individual countries



Questions:

1. What mechanism can help explain the connection between sovereign bond fragility and labor market slack?
2. Are there any policies to improve debt sustainability and labor market outcomes?

What we do in this paper

- Use a quantitative framework to address these questions:
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- We embed the labor market search and matching frictions into a quantitative default model.
  - **Households:** choose the efforts to search for jobs.
  - **Firms:** produce and post vacancies.
  - **Government:** collects taxes, provide public consumption, borrows on international financial markets, and may default.

- A **procyclical** fiscal policy is key to understanding the transmission of sovereign risk in the labor market.

Main results

- The sovereign default risk induces a **procyclical** fiscal policy:
  - During economic downturns: government spending $\downarrow$ and tax rate $\uparrow$
  - Used to be an emerging market phenomenon (Cuadra, Sanchez & Sapriza 2010, Vegh & Vuletin 2015).
  - Applies to advanced economies now (Bianchi, Ottonello & Presno 2023)

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- When default risk emerges, higher tax rate:
  1. **Contemporaneous effect:** firm's surplus $\downarrow \Rightarrow$ job destruction rate $\uparrow \Rightarrow$ unemployment rate $\uparrow \Rightarrow$ tax base $\downarrow \Rightarrow$ default risk $\uparrow$
  2. **Dynamic effect:** expectation of high tax rate in the future
     $\Rightarrow$ current job posting and search efforts $\downarrow$
     $\Rightarrow$ unemployment in the long run $\uparrow$
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- A **Markov** government does not internalize the dynamic effect.
  - ignores the effects of its fiscal policies in t on job creation in past periods $(t-1, t-2, ...) \Rightarrow$ Time inconsistency problem!
  - Creates a role for **fiscal commitment**.

Main results

- Committing to fiscal consolidation (e.g., lower spending) can:
  - stimulate employment
  - increase debt sustainability
  - improve welfare

- Rationalizes the fiscal reforms many countries adopted after the Global Financial Crisis
  - Germany's constitutional amendment in 2009: limit on the structural deficit of no more than 0.35% of GDP
  - Lithuania and Italy: similar balanced budget rules as constitutional amendments in 2012
  - Portugal, Ireland, France, and Greece: balanced budget rules as statutory laws.

Literature

- Unemployment in sovereign default model:
  - Bianchi, Ottonello & Presno 2023, Bianchi & Sosa-Padilla (2020), Na, Schmitt-Grohé, Uribe & Yue (2018).
  - Our paper: dynamic effects on labor market $\Rightarrow$ role for fiscal commitment!

- Domestic consequences of sovereign default:
  - w/ domestic production: Gordon & Guerrón-Quintana (2018), Arellano, Bai & Mihalache (2018).
  - w/ monetary friction: Arellano, Bai & Mihalache (2020)
  - w/ private financing cost: Kaas, Mellert & Scholl (2020), Arellano, Bai & Bocola (2020).
  - w/ financial friction and labor market: Balke (2023) and Balke and Ravn (2016)
  - Our paper: domestic labor market through procyclical fiscal policy!

- Implication on optimal fiscal policy:
  - Procyclical fiscal policy: Cuadra, Sanchez & Sapriza (2010), Bianchi, Ottonello & Presno (2022).
  - Fiscal commitment in sovereign default model: Hatchondo, Martinez & Roch (2022), Liu & Shen (2022).
  - Our paper: Effects of fiscal commitment on domestic labor market!

Motivating Empirical Observations

- Fiscal policy became more procyclical after 2008 in Greece, Italy, Portugal, and Spain.

	Corr(τ, GDP)		Corr(eff. tax rate, GDP)	
	GIPS	Other EU	GIPS	Other EU
before 2008	-0.13	-0.18	0.22	0.13
after 2008	-0.42	-0.11	-0.40	0.09

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Other empirical observations: Details

- Countries with higher sovereign risk are associated with more procyclical fiscal policies.
- Countries with more procyclical fiscal policies are associated with ...
  - higher labor market volatility ($std(\Delta U) \uparrow$).
  - positive correlations between spread and unemployment ($corr(spr_t, U_{t+1}) > 0$).

Model Ingredients

Embed search & matching into a sovereign default model

- Three types of agents: household, firms, the government.
- **Households**: unemployed u_t and employed $N_t = 1 - u_t$.
  - **perfect consumption insurance**
  - chooses search effort s_t^o.
- **Firms**: a continuum of firms with the measure N_t;
  - Rep firm posts a number of vacancies v_t.
  - Firms produce outputs, then bargain a wage w_t^N with the employed workers.
  - Exit if cannot cover idiosyncratic operation cost (job destroyed)
- Markov **government** borrows from international lenders and chooses fiscal policies: $\{d_t, \tau_t, g_t, b_{t+1}\}$
  - May default on its debt
  - Take private sector's response as given.
- **Markov perfect equilibrium.**

Search & Matching

- Matching function à la Den Haan et.al (2000):

$$m_t = \mathcal{M}(u_t s_t^o, v_t) = \frac{\overbrace{\left(u_t s_t^o \right)}^{\text{eff. search effort}} \times \overbrace{v_t}^{\text{vacancies}}}{\left[(u_t s_t^o)^{\sigma_m} + v_t^{\sigma_m} \right]^{\frac{1}{\sigma_m}}},$$

- Job-finding rate and job-filling rate:

$$f(\theta_t) s_t^o = \frac{m_t}{u_t} = \frac{s_t^o}{\left(1 + \theta_t^{-\sigma_m}\right)^{\frac{1}{\sigma_m}}}, \qquad q(\theta_t) = \frac{m_t}{v_t} = \frac{1}{\left(\theta_t^{\sigma_m} + 1\right)^{\frac{1}{\sigma_m}}}.$$

where $\theta_t \equiv \frac{v_t}{u_t s_t^o}$ is the labor market tightness.

Law of Motion for Employment

$$N_{t+1} = N_t - \underbrace{\mathbb{P}_\phi(\phi_{i,t} > \bar{\phi}_t)N_t}_{\text{job destruction}} + \underbrace{\mathcal{M}(u_t s_t^o, v_t)}_{\text{job creation}}$$

- The aggregate production: $y_t = z_t N_t$
- Aggregate productivity shock z_t follows a log AR(1) process.
- Each firm:
  - output = $(z_t \times 1)$ units of consumption good.
  - pays tax rate τ_t on output
  - draw an idiosyncratic operational cost: $\phi_{i,t} \sim F_\phi(x)$
  - dividend is: $div_{i,t} = (1 - \tau_t)z_t - w_t^N - \phi_{i,t} \geq \underline{d}$
- Threshold for job destruction: $\bar{\phi}_t = (1 - \tau_t)z_t - w_t^N - \underline{d}$;
- Probability of destruction: $\mathbb{P}_\phi(\phi_{i,t} > \bar{\phi}_t)$.

Firms' problem

- Firm's Problem:

$$\max_{\{v_{t+k}\}_{k=0}^{\infty}} \mathbb{E}_t \sum_{k=0}^{\infty} \Lambda_{t,t+k} \left(-\kappa v_{t+k} + \mathcal{D}iv_{t+k+1}\right)$$

$$\text{s.t.} \quad J_t : \quad N_{t+k+1} = \mathbb{P}_\phi(\phi < \bar{\phi}_{t+k}) N_{t+k} + q(\theta_{t+k}) v_{t+k}$$

$$\lambda_t : \quad q(\theta_{t+k}) v_{t+k} \geq 0.$$

- HH's SDF: $\Lambda_{t,t+k} = \beta^k u_c(c_{t+k}, g_{t+k}) / u_c(c_t, g_t)$.
- Aggregate dividend: $\mathcal{D}iv_t = (1 - \tau_t) z_t N_t - w_t^N N_t - N_t \int_0^{\bar{\phi}_t} x dF_\phi(x)$.

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- **Vacancy-posting condition:**

$$\underbrace{\frac{\kappa}{q(\theta_t)} - \lambda_t}_{J_t} = \mathbb{E}_t \Lambda_{t,t+1} \left[(1-\tau_{t+1}) z_{t+1} - w_{t+1}^N - \int_0^{\bar{\phi}_{t+1}} x dF_\phi(x) + \mathbb{P}_\phi(\phi < \bar{\phi}_{t+1}) \underbrace{\left(\frac{\kappa}{q(\theta_{t+1})} - \lambda_{t+1} \right)}_{J_{t+1}} \right]$$

- J_t: the franchise value of one additional hire.

Household's Problem

- Household's Problem:

$$\max_{\{s^o_{t+k}\}_{k=0}^{\infty}} \mathbb{E}_t \sum_{k=0}^{\infty} \beta^k u(c_{t+k}, g_{t+k})$$

$$\text{s.t.} \quad \lambda_t : \quad c_{t+k} = w^N_{t+k} N_{t+k} + u_{t+k} h - u_{t+k} v(s^o_{t+k}) + \widetilde{Div}_{t+k},$$

$$\mu^e_t : \quad N_{t+k+1} = \mathbb{P}_\phi(\phi < \bar{\phi}_{t+k}) N_{t+k} + f(\theta_{t+k}) u_{t+k} s^o_{t+k}.$$

  - h : unemployment benefit.
  - $v(\cdot)$: search effort cost function with $v' > 0$ and $v'' > 0$.
  - $\widetilde{Div}_{t+k} = Div_{t+k} - \kappa v^*_{t+k}$: net dividends from firms.

- **Search-smoothing condition** is

$$\underbrace{\frac{v'(s^o_t)}{f(\theta_t)}}_{\mu^e_t} = \mathbb{E}\Lambda_{t,t+1} \left[w^N_{t+1} - h + v(s^o_{t+1}) + \left(\mathbb{P}_\phi(\phi_{j,t+1} < \bar{\phi}_{t+1}) - f(\theta_{t+1}) s^o_{t+1}\right) \underbrace{\frac{v'(s^o_{t+1})}{f(\theta_{t+1})}}_{\mu^e_{t+1}} \right].$$

  - μ^e_t: the value of an employment position from workers' perspective

Nash Bargaining

Government's Recursive Problem

- Markov Government
  - issues one-period non-contingent bond: b'
  - chooses public consumption (g) and tax rate (τ)
- Decides whether to default on its debt:

$$\mathcal{V}(b,N,z) = \max_{d\in\{0,1\}} \left\{ (1-d)\mathcal{V}^R(b,N,z) + d\mathcal{V}^D(N,z) \right\}.$$

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- Value of repayment:

$$\mathcal{V}^R(b,N,z) = \max_{\{b',\tau,g\}} \left\{ u(c,g) + \beta \mathbb{E}\mathcal{V}(b',N',z') \right\}$$

$$\text{subject to:} \quad c = (1-\tau)zN + uh - \kappa v - uv(s^o) - N\int_0^{\bar{\phi}} x dF_\phi(x),$$

$$g + b = \tau zN - uh + q^b(b',N',z)b',$$

Private equilibrium conditions.

Private eqm conditions

Government's Recursive Problem

- Default has two costs:
  (1) utility cost $U^D(z) = \max\{0, \alpha_0 + \alpha_1 \log(z)\}$,
  (2) temporary financial exclusion w/ reenter prob. of ξ.

- Value of default:

$$\mathcal{V}^D(N,z) = \max_{\{\tau,g\}} \left\{ u(c,g) - U^D(z) + \beta \mathbb{E}\left[(1-\xi)\mathcal{V}^D(N',z') + \xi \mathcal{V}(0,N',z') \right] \right\}$$

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$g = \tau zN - uh$,

Private equilibrium conditions.

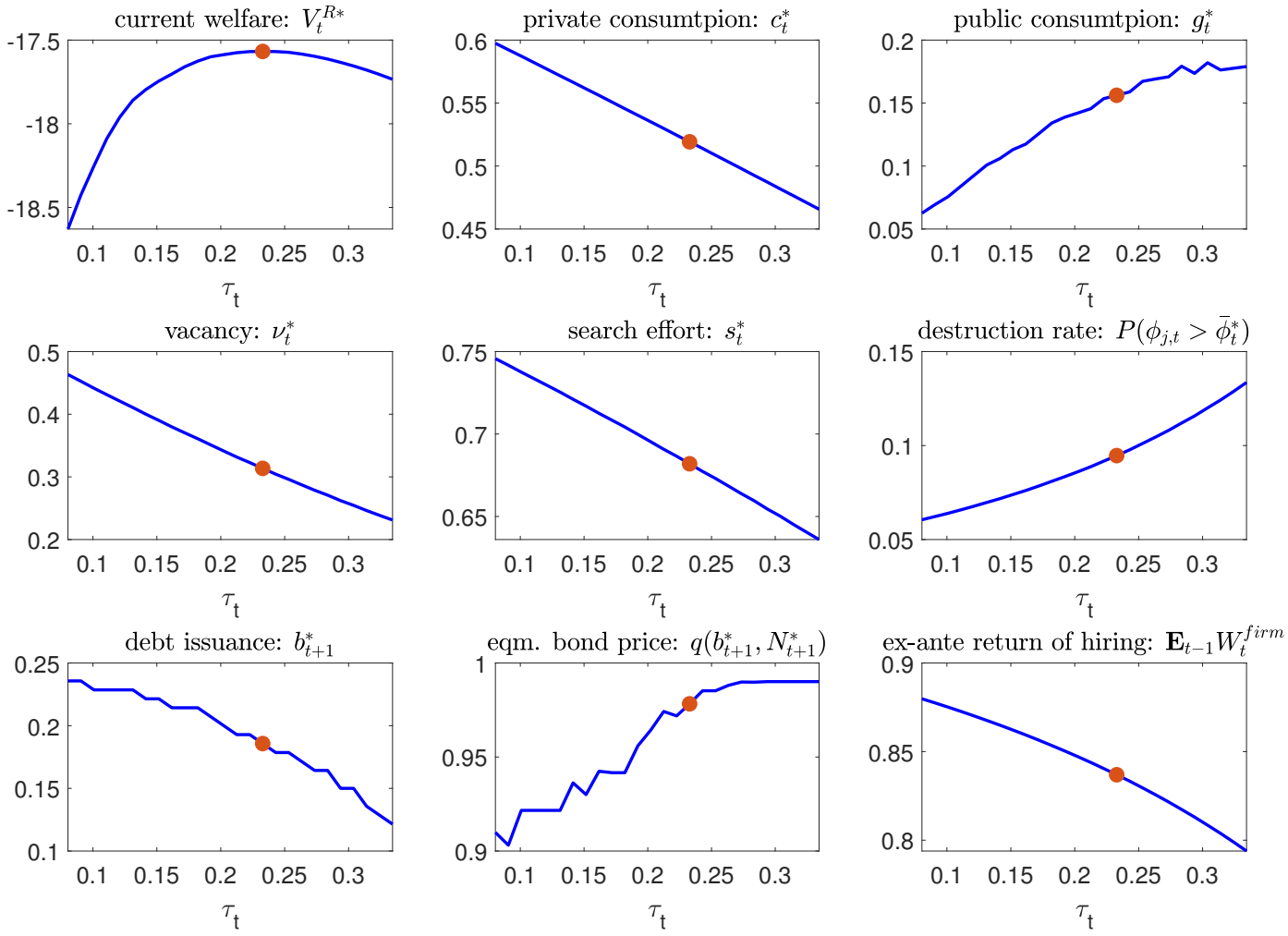
- Bond price determined by competitive risk-neutral lenders:

$$q^b(b',N',z) = \frac{\mathbb{E}_{z'|z}\left[1 - \mathcal{D}\left(b',N',z'\right)\right]}{1+r}.$$

Definition of Markov Perfect Equilibrium Simplified Model

Quantitative Results

Counterfactual: Effects of Varying τ_t



- **Contemporaneous effect:** $\tau_t \uparrow \Rightarrow P(\phi_{j,t} > \bar{\phi}_t^*) \uparrow$
- **Dynamic effect:** $\tau_t \uparrow \Rightarrow$ ex-ante return of hiring (searching) $\downarrow$

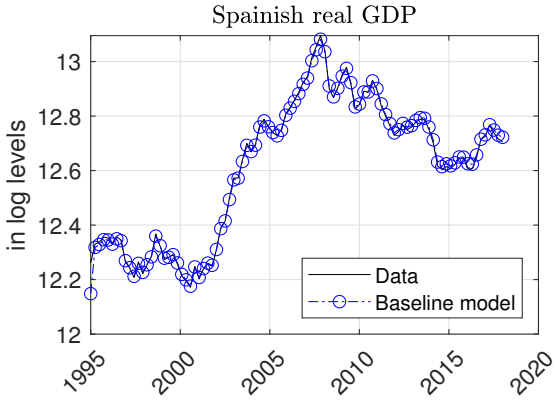
Simulation Results

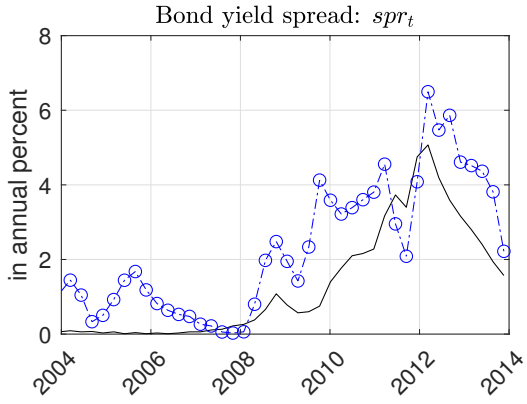
We calibrate our model to the Spanish economy from 1995Q1 to 2019Q4.

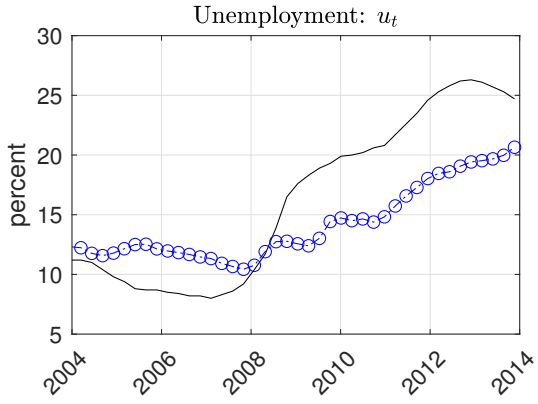
	Spain 1995Q1-2019Q4	Baseline Model		Spain 1995Q1-2019Q4	Baseline Model
Targeted Moments:			***Business Cycle Moments:***		
Mean tax-to-GDP (%)	25.7%	25.6%	std(c)/std(y)	1.17	0.94
Mean unemployment (%)	16.0%	15.8%	std(g)/std(y)	1.06	1.76
Mean job destruction (%)	5.9%	5.8%	std(tb/y)/std(y)	0.52	0.36
Std. of job destruction (%)	0.7%	0.7%	std(u)	5.15	1.93
Debt-to-GDP (%)	5.6%	5.6%	corr(c,y)	0.99	0.96
Mean spread (%)	1.7%	1.7%	corr(g,y)	0.98	0.96
Std. of spread (%)	1.2%	1.1%	corr(tb/y,y)	-0.16	-0.18
std(y) (%)	5.9%	5.8%	corr(θ, y)	0.15	0.93
corr(y, y_{-1})	0.77	0.78	Prob. of Default (%)	3%	1.5%
Fiscal and Labor Market Moments (2008Q1-2019Q4):					
corr(spr,y)	-0.31	-0.03	corr(spr,τ)	0.32	0.12
corr(spr,u)	0.68	0.02	corr(τ, y)	-0.54	-0.20
corr(spr,tb/y)	0.28	0.15	corr(τ, u)	0.43	0.97
corr(spr,θ)	-0.46	-0.11	corr(τ, θ)	-0.25	-0.52
corr(spr, finding)	-0.68	-0.09	corr(finding,y)	0.55	0.94
corr(spr, destruction)	0.29	0.06	corr(destruction,y)	-0.08	-0.69

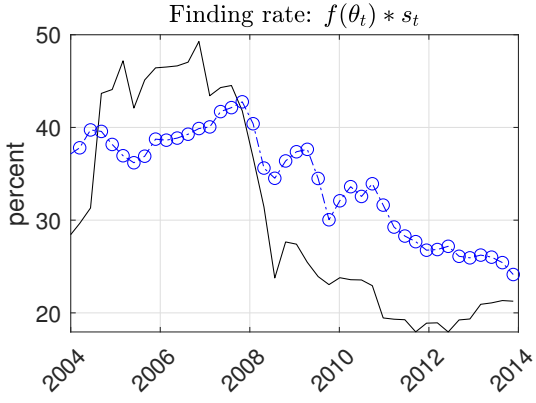
Policy functions Calibration

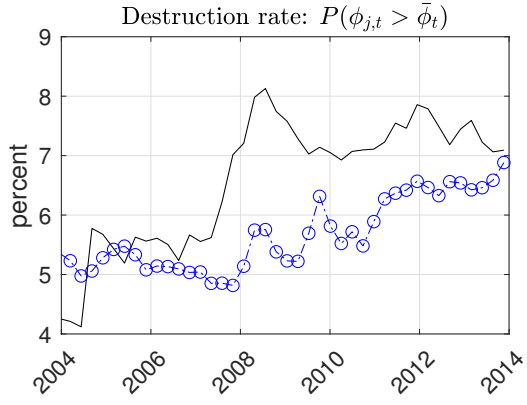
Map the model to the Spanish debt crisis

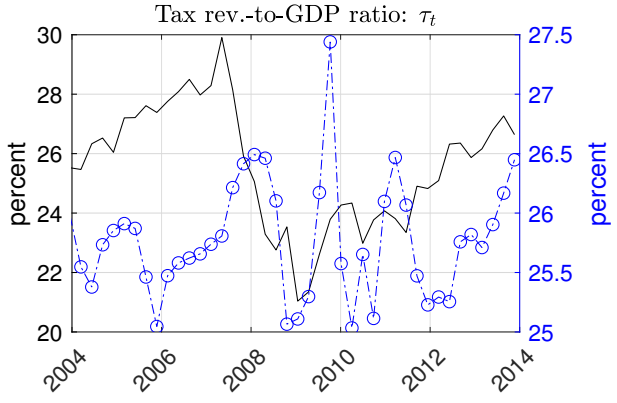


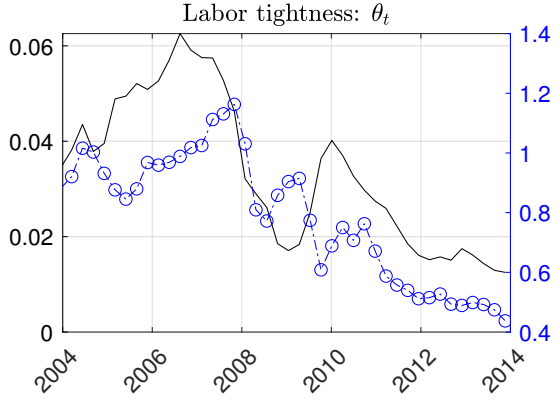


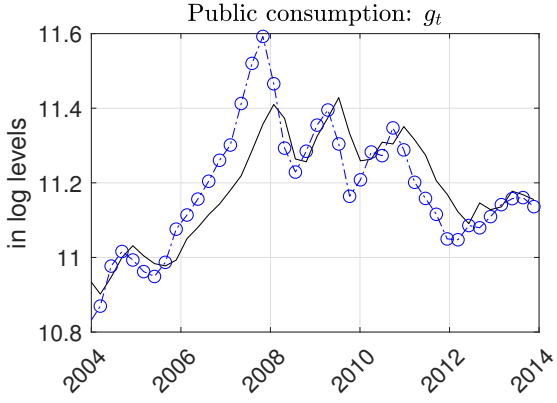






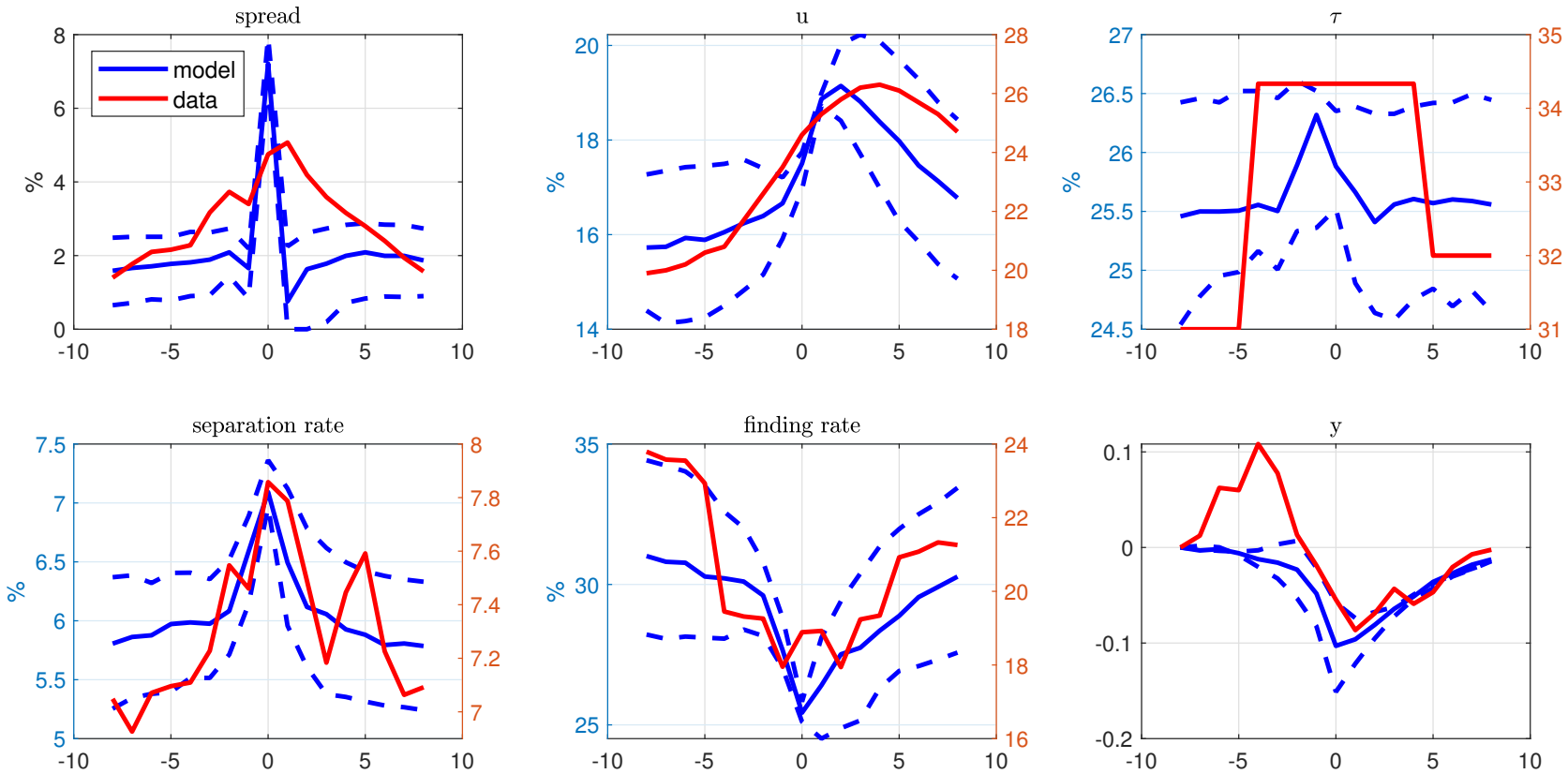






Model dynamics around high-default-risk episodes

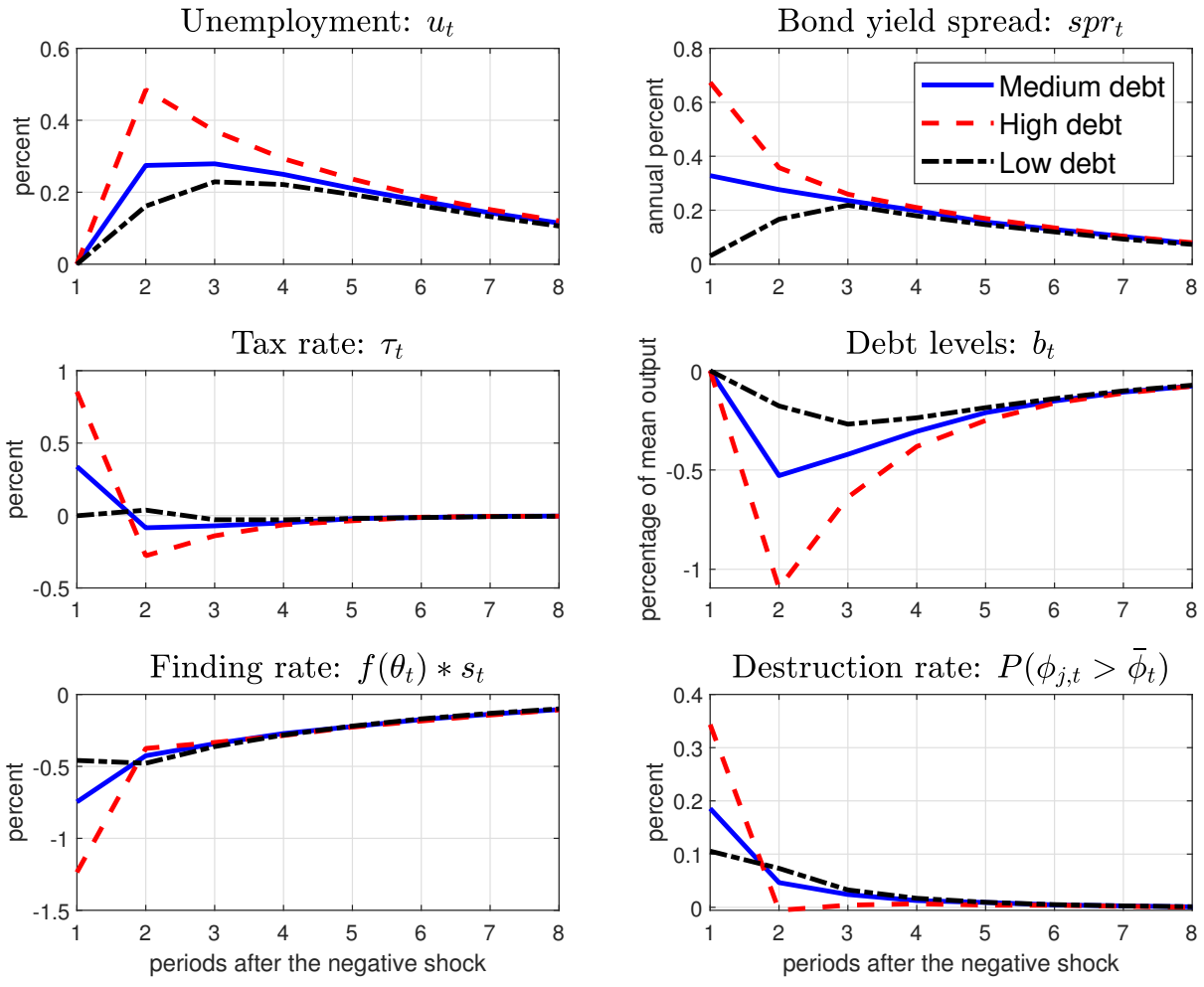
Figure: Event window around high-default-risk episode



- Data: $t = 0$ represents 2012Q2.
- Model: $t = 0$ represents the time when sovereign spread exceeds 5%.

Debt-dependent transmission of shocks

Figure: Conditional impulse response to a negative TFP shock



reference models

Committed Fiscal Consolidation

- In baseline model:
  - government conducts a procyclical fiscal policy when default risk emerges.
  - does not internalize the effects on private decisions in previous periods
  - leads to high unemployment rate and default risk in the long run.

Committed Fiscal Consolidation

- In baseline model:
  - government conducts a procyclical fiscal policy when default risk emerges.
  - does not internalize the effects on private decisions in previous periods
  - leads to high unemployment rate and default risk in the long run.
- Committing to fiscal consolidation can
  - stimulate job creation
  - reduce default risk and improves debt sustainability
  - lead to welfare gains
- Simplistic way to capture the fiscal reforms many countries adopted after the Global Financial Crisis

Committed Fiscal Consolidation

- Consider a fiscal consolidation reform:
  - government maximizes an alternative utility function: $\tilde{u}(c,g) = (1 - \frac{\phi_g}{\tau^c})\frac{c^{1-\sigma}}{1-\sigma} + \frac{\phi_g}{\tau^c}\frac{g^{1-\sigma}}{1-\sigma}$
  - true utility function: $u(c,g) = (1-\phi_g)\frac{c^{1-\sigma}}{1-\sigma} + \phi_g\frac{g^{1-\sigma}}{1-\sigma}$
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  - $\tau^c > 1$: commit to lower public consumption

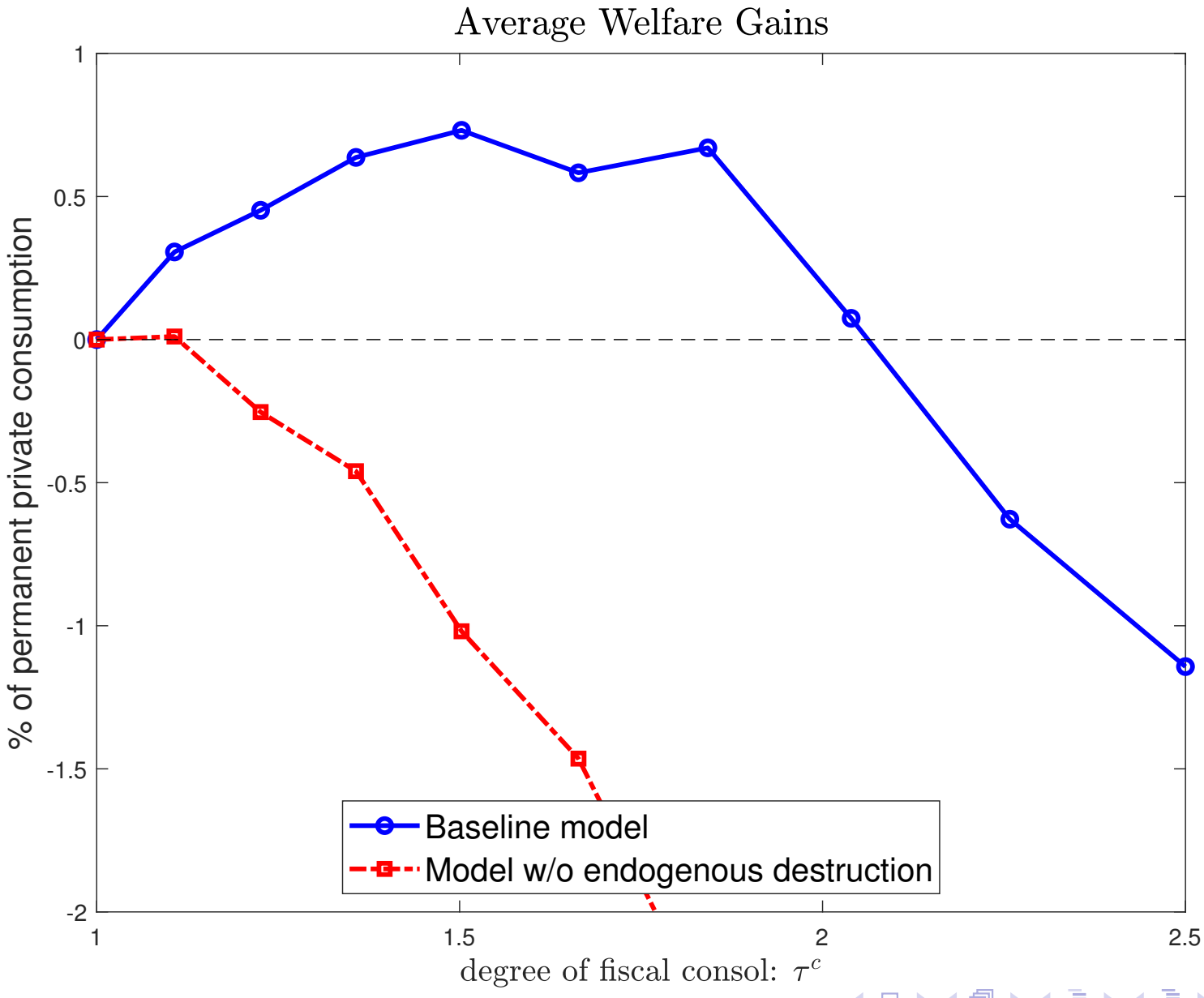
- Two opposite effects:
  1. suboptimal private-public consumption ratio (welfare loss)

$$\frac{c}{g} = \left[\frac{1-\phi_g/\tau^c}{\phi_g/\tau^c}\right]^{-1/\sigma} \neq \left[\frac{1-\phi_g}{\phi_g}\right]^{-1/\sigma} = \frac{c^*}{g^*}$$

  2. $\tau^c \uparrow \Rightarrow$ less procyclical fiscal policy $\Rightarrow$ ameliorate the negative feedback loop between default risk and labor market slack (welfare gain)

Effects of varying τ^c

Varying the degree of fiscal consolidation



The effects of optimal fiscal consolidation ($\tau^c = 1.5$)

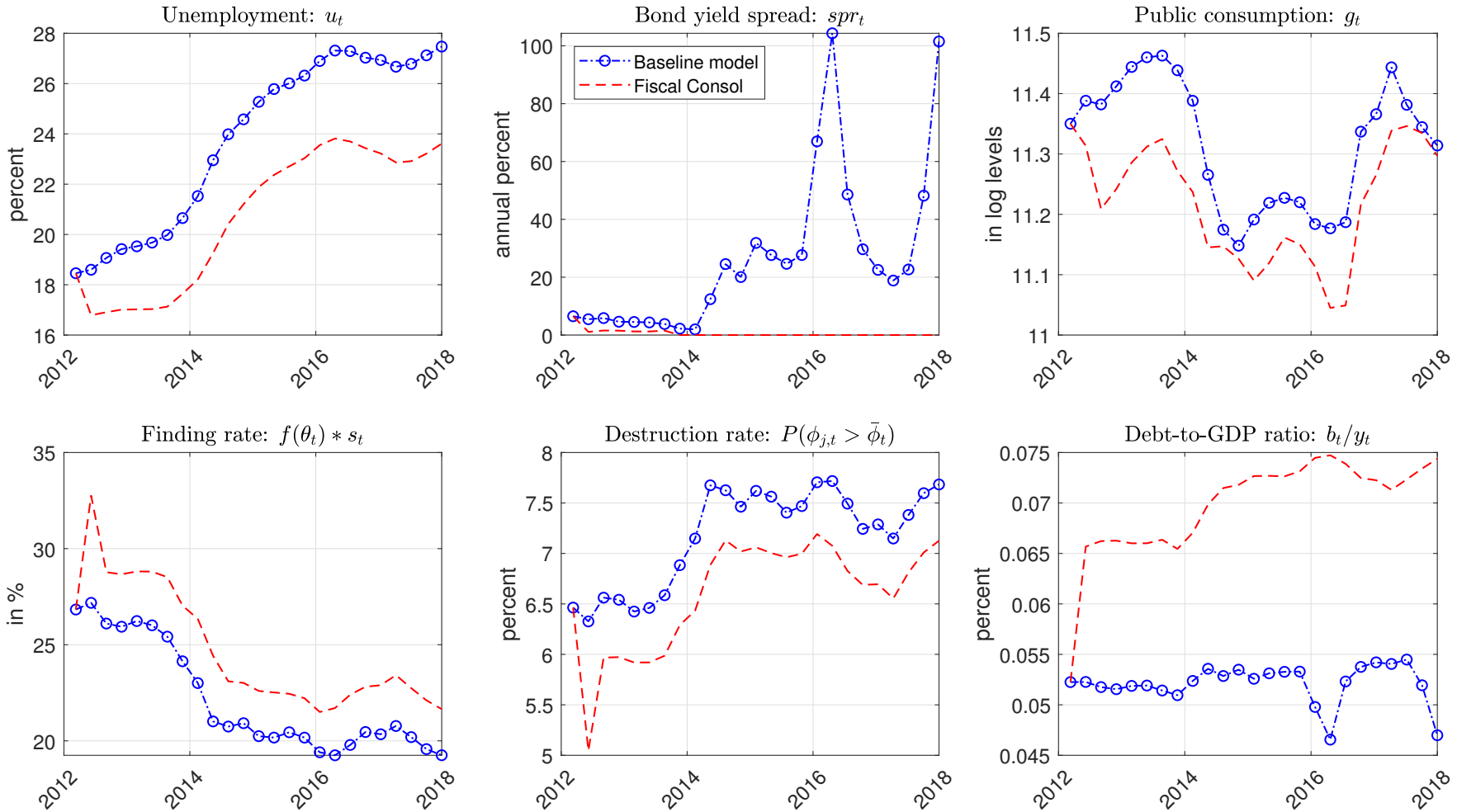
Table: Simulated moments in models w/ and w/o the fiscal consolidation

	Baseline model	Optimal fiscal consolidation
Mean τ (%)	25.6%	21.9%
Mean debt-to-GDP ratio (%)	5.6%	7.3%
Mean spread (%)	1.7%	1.3%
Std. of spread (%)	1.1%	0.7%
Prob. of default (%)	1.5%	0.9%
Mean unemployment (%)	15.8%	13.3%
Std. of unemployment (%)	1.9%	1.7%
Mean finding rate (%)	31.4%	35.1%
Mean destruction rate (%)	5.8%	5.3%
Average wel. gain (%)	-	0.73%

Policy functions

Imposing Fiscal Consolidation on Spain

- If the Spanish government introduced the fiscal consolidation in 2012.



Conclusion

- We embed the labor search and matching friction in a quantitative default model
  - sovereign risk has a dynamic distortion on the labor market;
  - labor market friction amplifies sovereign default risk;
  - the channel lies in the optimal fiscal policy.
- Our model results are consistent with the sluggish unemployment fluctuation and high default risk observed in the recent European debt crisis.
- Committing to a fiscal consolidation reform can stimulate job creation, improve bond sustainability, and improve welfare.

Appendix

Data Sources

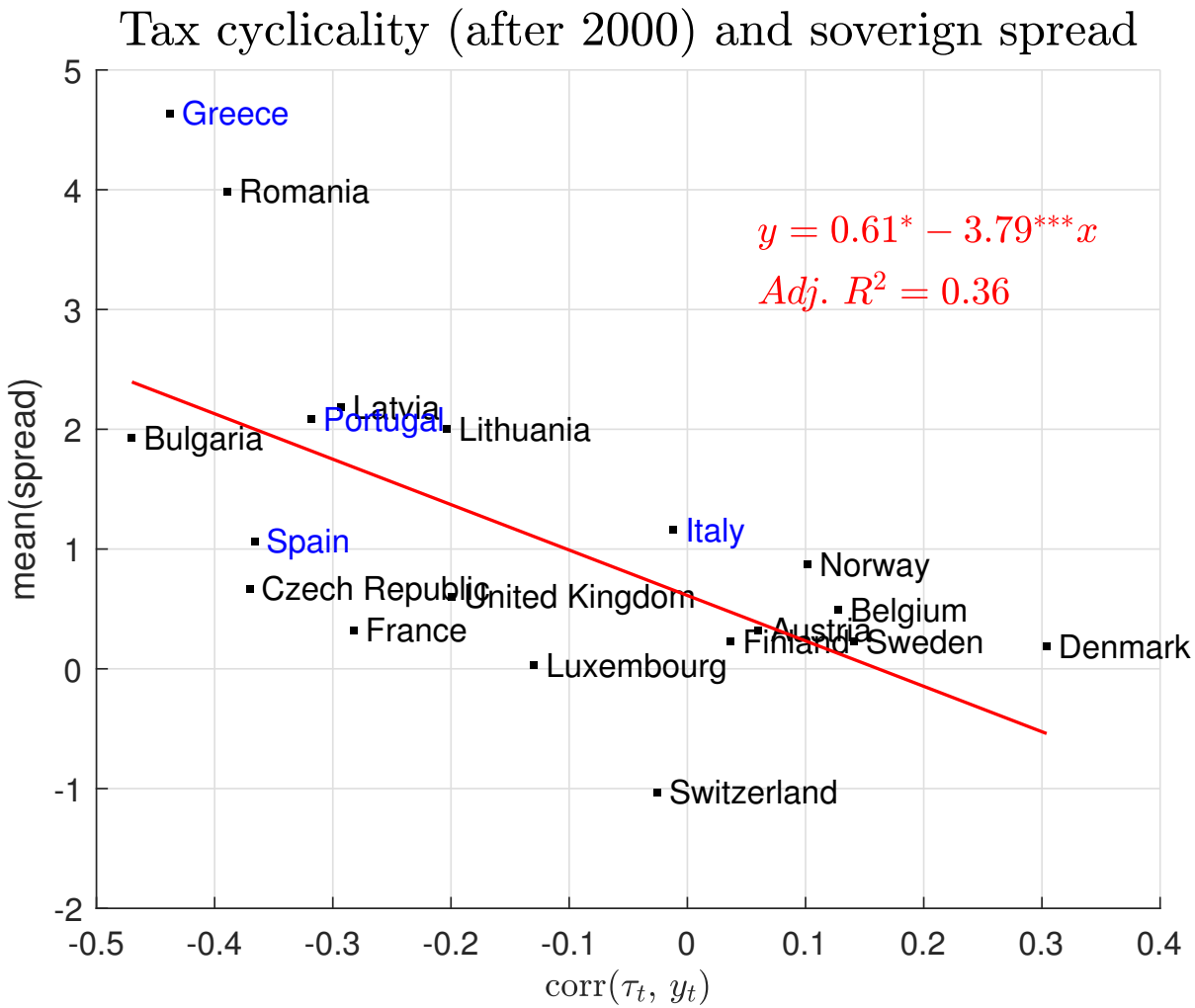
List of Countries: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece*, Italy*, Latvia, Lithuania, Luxembourg, Norway, Portugal*, Sweden, Spain*, Romania, Switzerland, and the United Kingdom. The asterisk mark indicates the EU peripheral countries.

Table: Data source

Name	Data description	Source
Sovereign spread	The Maastricht convergence criteria of long-term interest rate	Eurostat
Real GDP and consumption private and public	Nominal values adjusted by the GDP deflator	Eurostat
Eff. tax rate	Eff. tax rate is the total tax revenue net of transfers in percent of GDP	Eurostat
Primary surplus	Primary surplus is the government's total revenue minus total expenditure	Eurostat
Policy tax rate	VAT tax rate, corporate tax rate, the highest individual income tax rate	Vegh & Vuletin (2015)
Debt ratio	Government's debt security divided by annual GDP	Eurostat
Unemployment rate	Unemployment rate for the population between from 15 to 74 years old	Eurostat
Vacancy rate	Total number of vacancies divided by the number of job positions	Eurostat and OECD
Unemployment pop. (by duration)	Total number of registered unemployment population (unemployment pop. less than 1 month, from 1 to 2 months)	Eurostat
Vacancy number	Total number of newly-posted vacancies	OECD
Labor tightness	Number of vacancies over the number of registered unemployment pop.	Eurostat and OECD

Motivating Empirical Observation

- A higher sovereign risk is associated with a more procyclical fiscal policy, as in Bianchi, Ottonello & Presno (2022).



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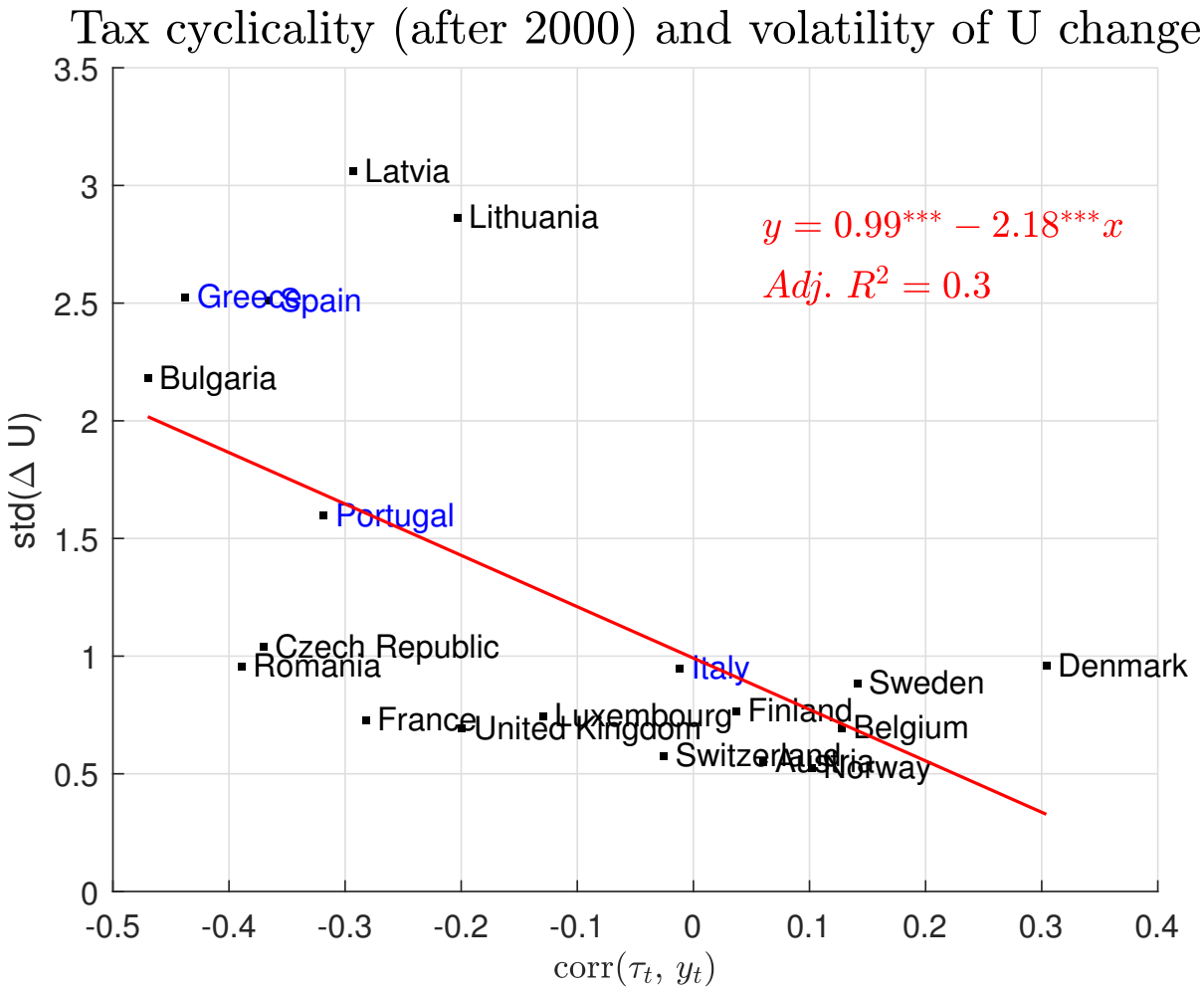
Motivating Empirical Observation

- A procylical fiscal policy is associated with higher labor market volatility.



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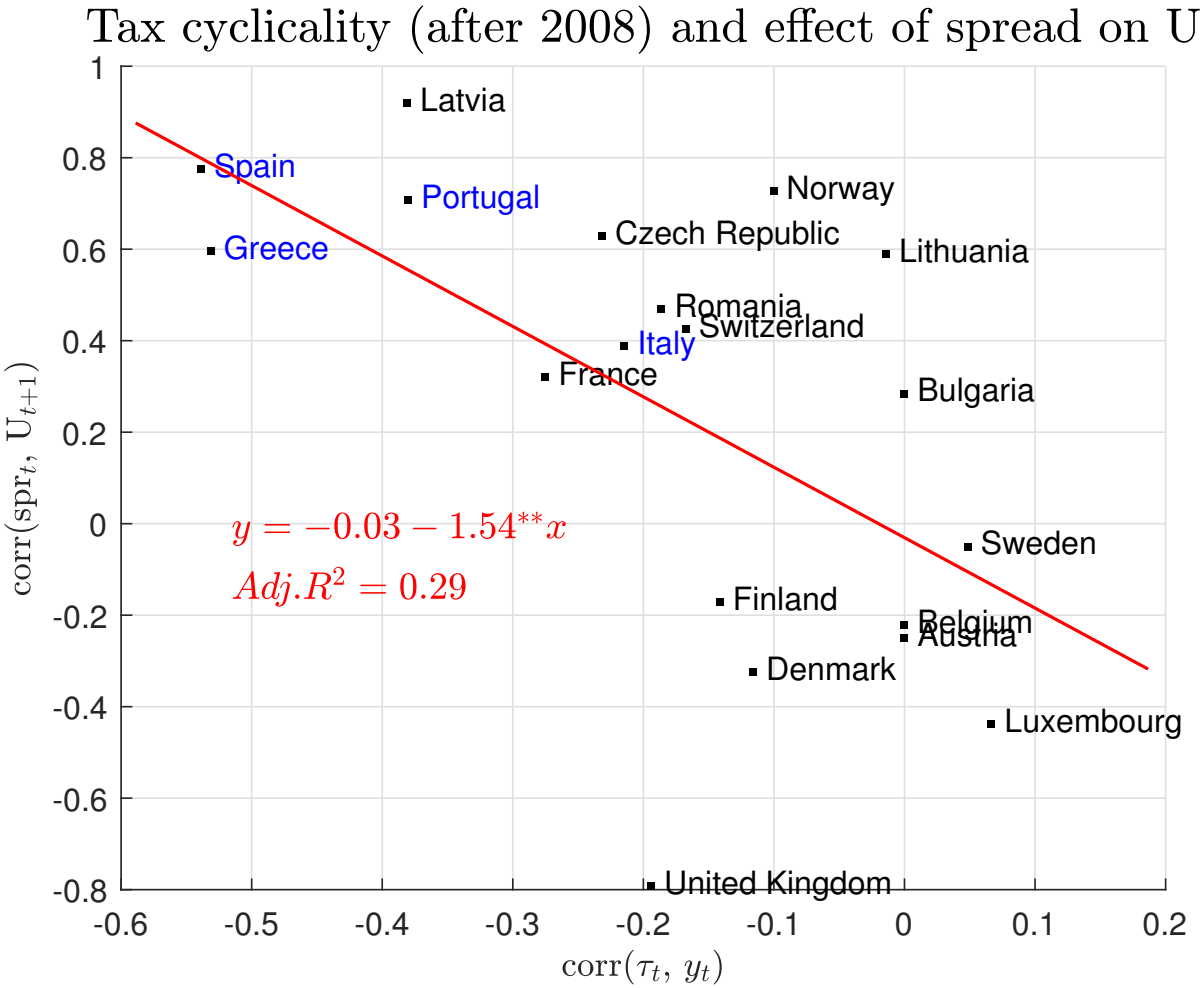
Motivating Empirical Observation

- Positive correlation between spread and unemployment in countries with procylical fiscal policy.



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Sovereign Risk and Labor Market by Country

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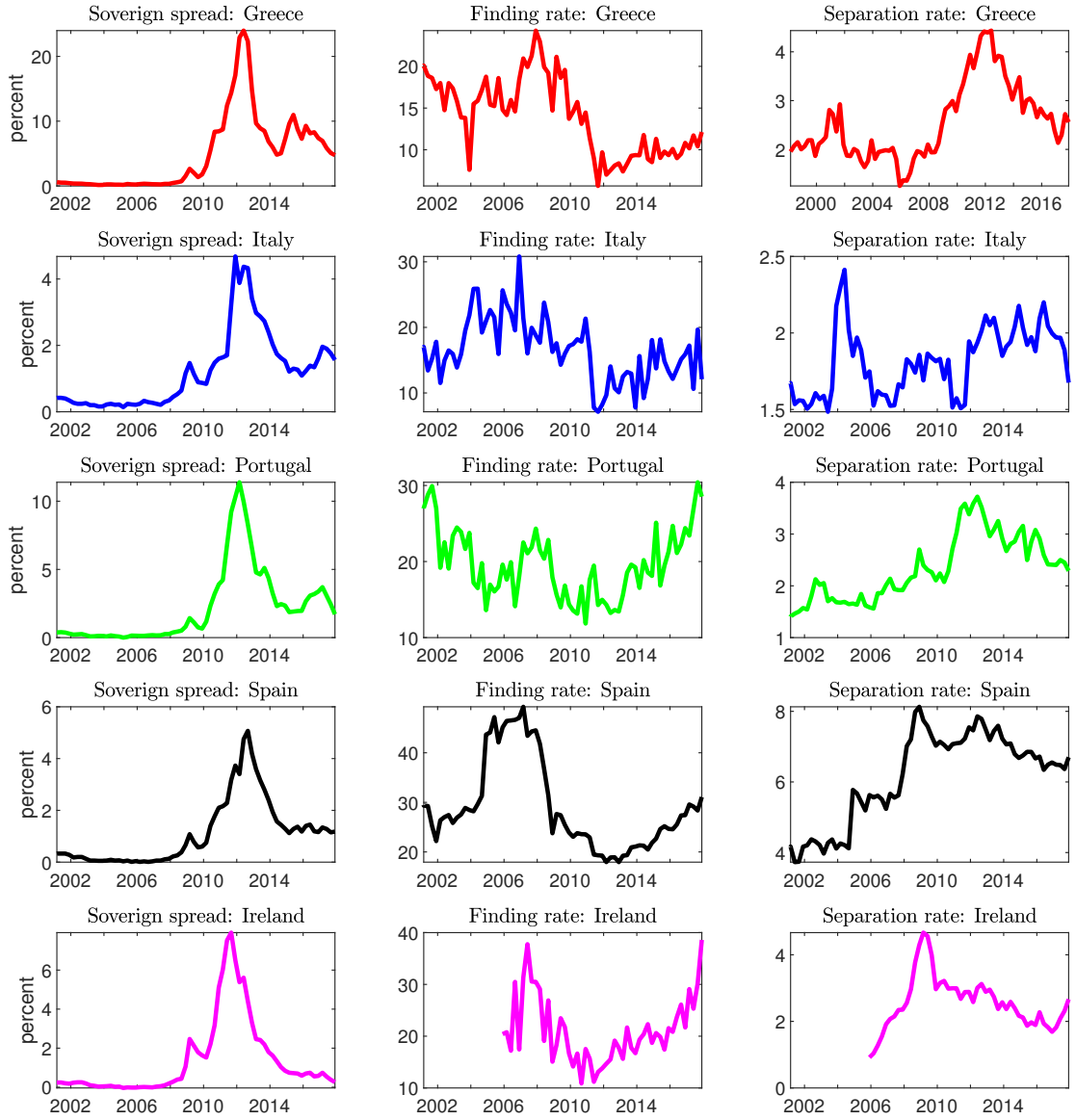

Nash-bargained Wage

Details on Nash

- Wage determined by Nash-bargaining between firms and employed workers.
- η : workers' bargaining power.
- Nash-bargained wage:

$$w_t^N = \eta \left[(1-\tau_t) z_t + \kappa \frac{v_t}{u_t} - \int_0^{\bar{\phi}_t} x dF_\phi(x) \right] + (1-\eta) \left[h - \nu(s_t^o) \right]$$

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Nash-bargaining problem

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- The total surplus is split proportionally between workers and firms:

$$\eta \mathcal{S}_t = (1-\eta)\left(\mathcal{V}_t^e - \mathcal{V}_t^u\right),$$

- The ex-dividend value of job position, and the ex-dividend values of employed and unemployed workers are:

$$\mathcal{S}_t = (1-\tau_t)z_t - w_t^N - \int_0^{\bar{\phi}_t} x dF_\phi(x) + \mathbb{E}_t\left[\Lambda_{t,t+1}\mathbb{P}_\phi(\phi < \bar{\phi}_t)\mathcal{S}_{t+1}\right],$$

$$\mathcal{V}_t^e = w_t^N + \mathbb{E}_t\left\{\Lambda_{t,t+1}\left[\mathbb{P}_\phi(\phi < \bar{\phi}_t)\mathcal{V}_{t+1}^e + \mathbb{P}_\phi(\phi \geq \bar{\phi}_t)\mathcal{V}_{t+1}^u\right]\right\},$$

$$\mathcal{V}_t^u = h - \nu(s_t^o) + \mathbb{E}_t\left\{\Lambda_{t,t+1}\left[f(\theta_t)s_t^o\mathcal{V}_{t+1}^e + (1-f(\theta_t)s_t^o)\mathcal{V}_{t+1}^u\right]\right\}.$$

Private equilibrium conditions back

- State variables: $S_t = \{b_t, N_t, z_t\}$.
- Given government's decisions, $\{\tau_t, g_t, d_t, b_{t+1}\}$, the private equilibrium can be summarized as

$$N_{t+1} = \mathbb{P}_\phi(\phi < \bar{\phi}_t) N_t + q(\theta_t) v_t,$$

$$\frac{\kappa}{q(\theta_t)} - \lambda_t = \mathbb{E}\Lambda_{t,t+1}\left[(1-\tau_{t+1})z_{t+1} - w^N_{t+1} - \int_0^{\bar{\phi}_{t+1}} x dF_\phi(x) + \mathbb{P}_\phi(\phi < \bar{\phi}_{t+1})\left(\frac{\kappa}{q(\theta_{t+1})} - \lambda_{t+1}\right)\right],$$

$$\eta\left(\frac{\kappa}{q(\theta_t)} - \lambda_t\right) = (1-\eta)\frac{v'(s^o_t)}{f(\theta_t)},$$

$$q(\theta_t)v_t \geq 0, \qquad \lambda_t \geq 0, \qquad \lambda_t q(\theta_t) v_t = 0,$$

$$w^N_t = \eta\left[(1-\tau_t)z_t + \kappa\frac{v_t}{u_t} - \int_0^{\bar{\phi}_t} x dF_\phi(x)\right] + (1-\eta)\left[h - v(s^o_t)\right],$$

$$(1-\tau_t)z_t - w^N_t - \bar{\phi}_t = \underline{d},$$

$$c_t = (1-\tau_t)z_t N_t + u_t h - \kappa v_t - u_t v(s^o_t) - N_t \int_0^{\bar{\phi}_t} x dF_\phi(x).$$

Definition 1 (Markov Perfect Equilibrium)

A ***Markov-Perfect Equilibrium*** is defined by value functions $\{\mathcal{V}(S), \mathcal{V}^R(S), \mathcal{V}^D(S)\}$, policy rules $\{\mathcal{T}^R(S), \mathcal{G}^R(S), \mathcal{B}'(S), \mathcal{T}^D(S), \mathcal{G}^D(S), \mathcal{D}(S)\}$, and a bond price schedule $\mathcal{Q}^b(b', N', z)$ such that

(i) under the government's policies, the private sector's decisions of $\{c, N', v, w^N, \bar{\phi}, \lambda\}$ satisfy the private equilibrium conditions;

(ii) given the bond price schedule and the private equilibrium conditions, the government's value functions and policy rules solve its recursive problems;

(iii) the bond price is determined by the competitive risk-neutral lenders.

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Policy Functions

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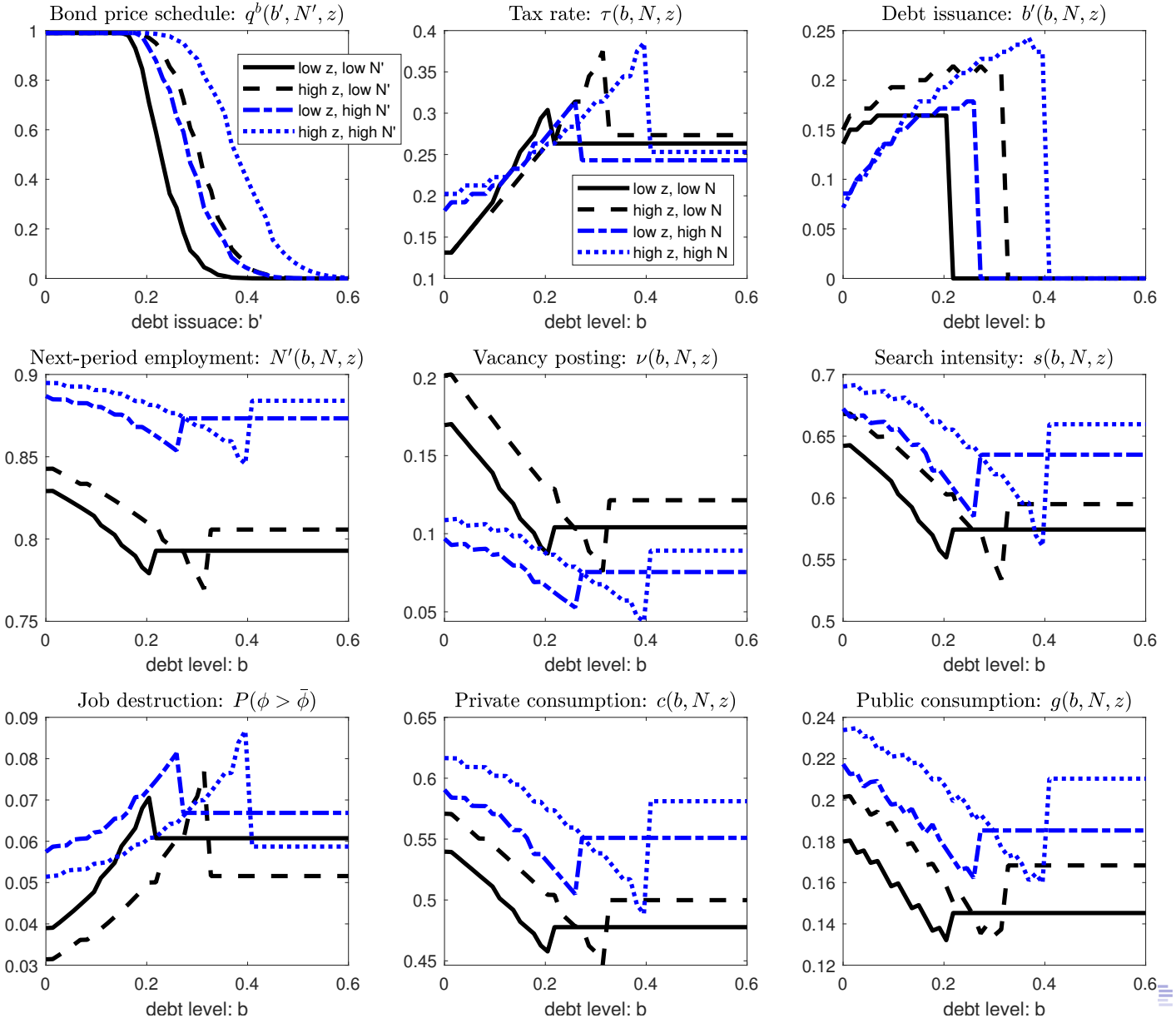

Calibration: Spain 1995Q1-2019Q4

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Functional forms:

- Utility function: $u(c,g) = (1-\phi_g)\frac{c^{1-\sigma}}{1-\sigma} + \phi_g \frac{g^{1-\sigma}}{1-\sigma}$,
- Idiosyncratic operational cost: $\phi_{j,t} \sim \lambda_u exp(-\lambda_u \phi_{j,t})$,
- Search cost function: $\nu(s^o) = \frac{(s^o)^{1+\phi_s}}{1+\phi_s}$,
- Default utility cost: $U^D(z) = \max\{0, \alpha_0 + \alpha_1 \log(z)\}$.

Table: Parameter used to target data moments

Parameters	Description	Values	Target
ϕ_g	Utility weight of g	0.149	Mean tax rate = 25.6%
κ	Vacancy cost	0.426	Mean unemployment = 16.0%
$\underline{d}$	Equity constraint	-0.084	Mean job destruction = 5.9%
λ_u	Hazard rate in destruction func	7.2	Std. of destruction = 0.73%
β	Subjective discount factor	0.857	Mean debt-to-GDP = 5.6%
α_0	Utility cost of default	0.235	Mean spread = 1.67%
α_1	Utility cost of default	3.3	Std. of spread = 1.16%
σ_z	Std. of TFP shock innovation	0.0342	Std. of output = 5.9%
ρ_z	Persistence of shock	0.71	Persistence of output = 0.77

Calibration: Spain 1995Q1-2019Q4

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Table: Parameters borrowed from the literature

Parameters	Description	Value	Source
σ	Risk aversion	2	Standard in the RBC literature
r	Risk-free rate	0.01	German interest rate
ξ	Reenter prob. during exclusion	0.1	Follow Aguiar & Gopinath (2006)
η	Workers' wage bargaining power	0.3	Follow Z. Liu et al. (2016)
σ^m	Matching function curvature	0.97	Steady-state matching elasticity of 0.7
ϕ_s	Search elasticity	3.37	Follow Pei & Xie (2020)
h	Reservation value of unemployed	0.25	Follow Leduc & Liu (2020)

Reference Models back

To showcase the interaction between labor market friction and financial friction, we set-up three reference models:

- **Model w/o default risk:** to close the model, we assume a debt-elastic interest rate schedule: $r_t = r^* + \eta_b[exp(b_{t+1}) - 1]$. (Schmitt-Grohé and Uribe (2003))

- **Model w/o endogenous job destruction:** firms face an exogenous destruction rate set to average job destruction in the baseline environment.

- **Model w/o labor market frictions:** fix the employment level at the steady-state value in the baseline.

Reference models: IRF to negative TFP shock

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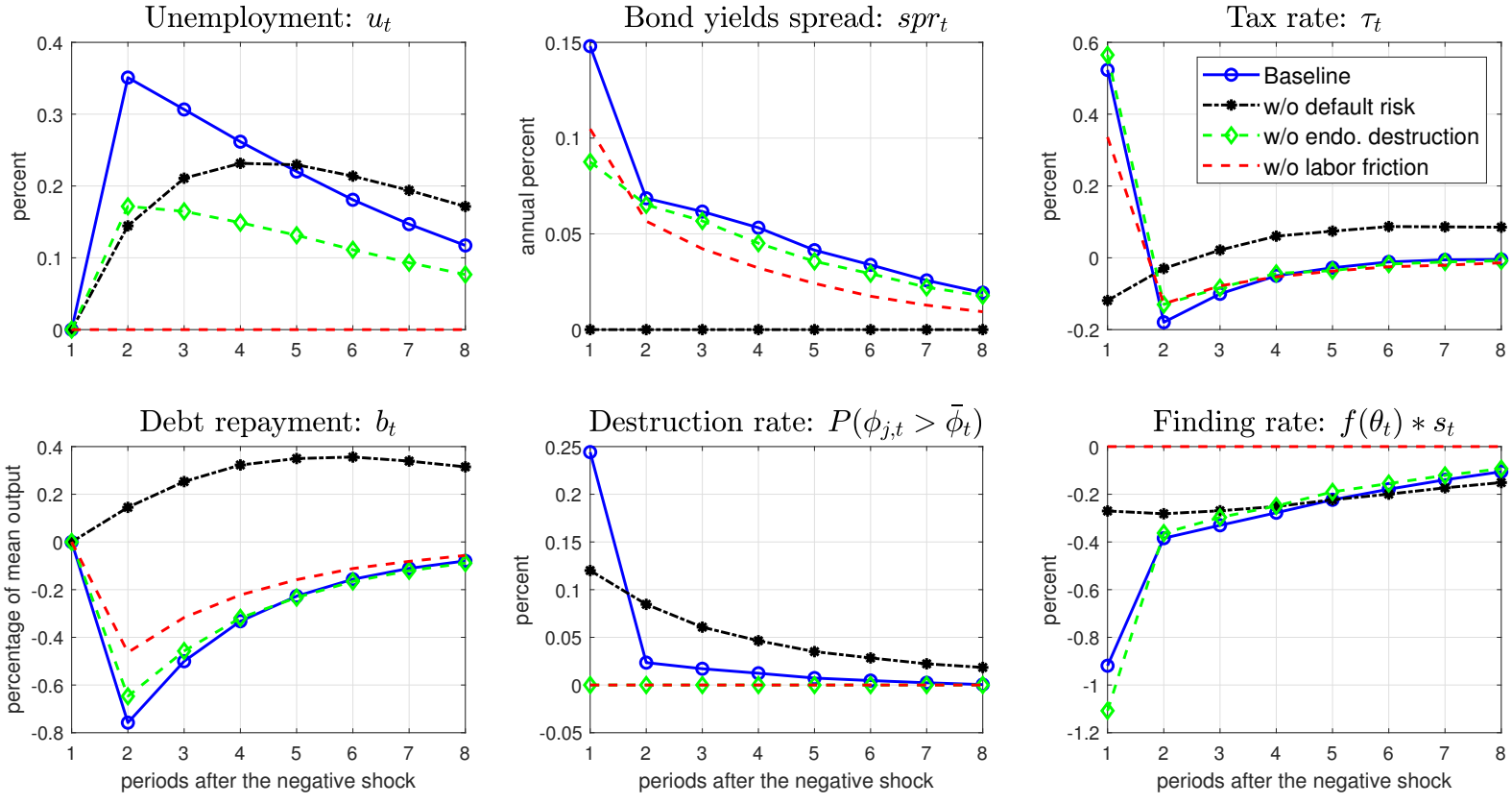
Recalibration:

- Model w/o default risk: ϕ_g, κ, $\underline{d}$, η_b.
- Model w/o endogenous job destruction: ϕ_g, κ, α_0, α_1.
- Model w/o labor market friction: ϕ_g, β, α_0, α_1.



Fiscal Consolidation: Policy Functions

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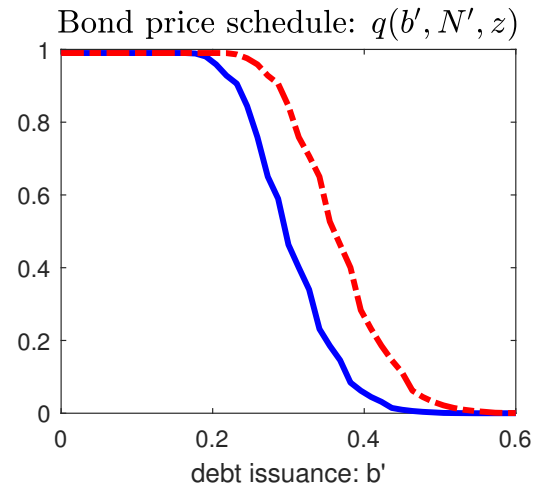
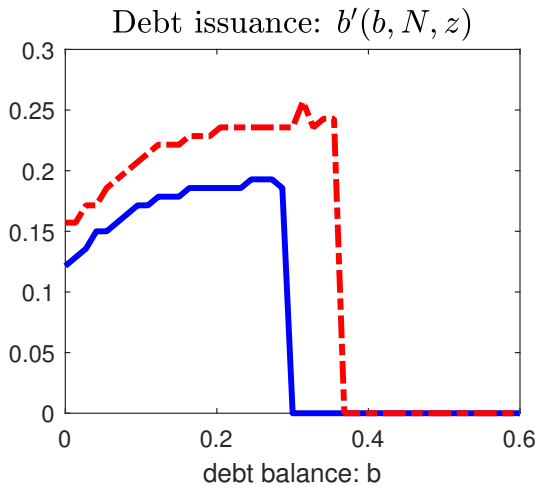
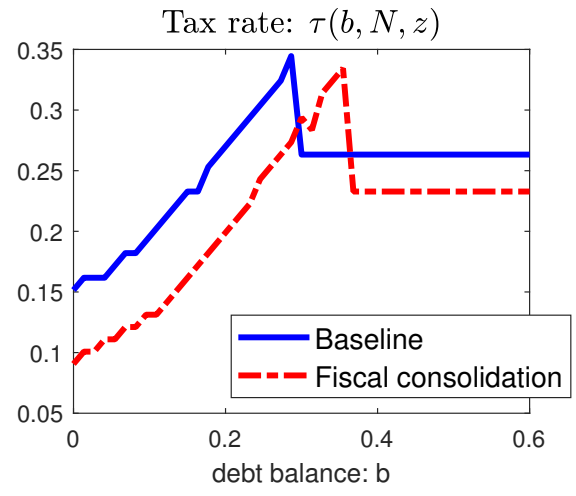
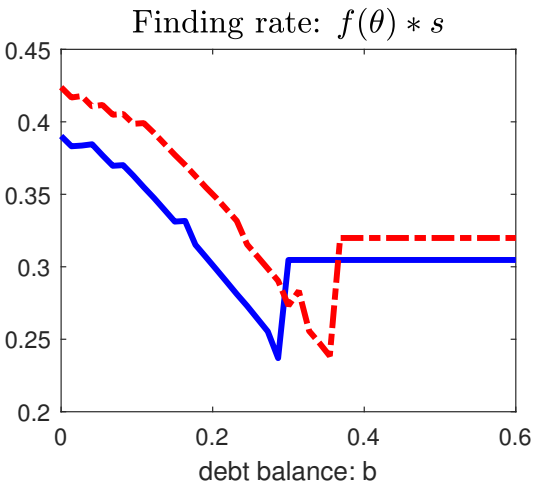
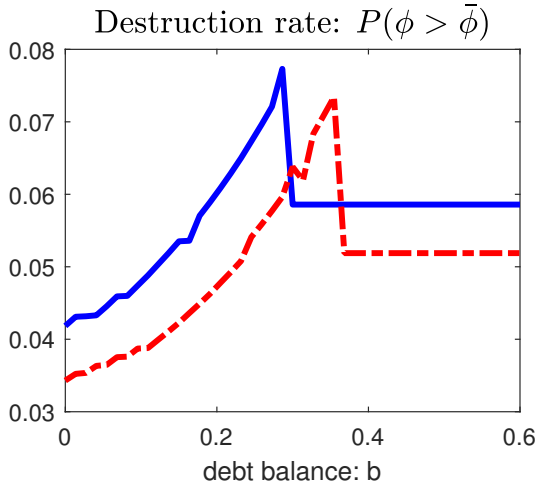
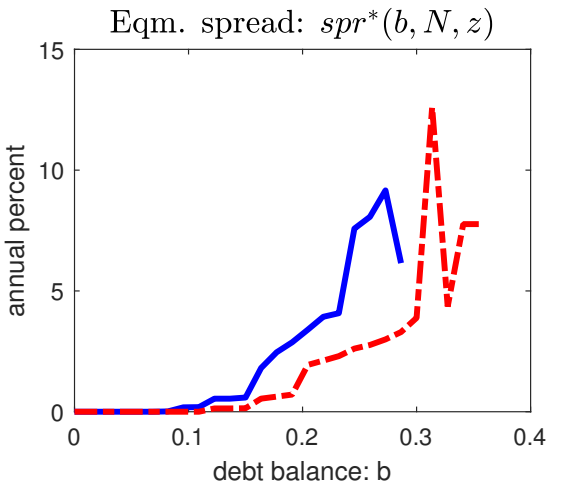




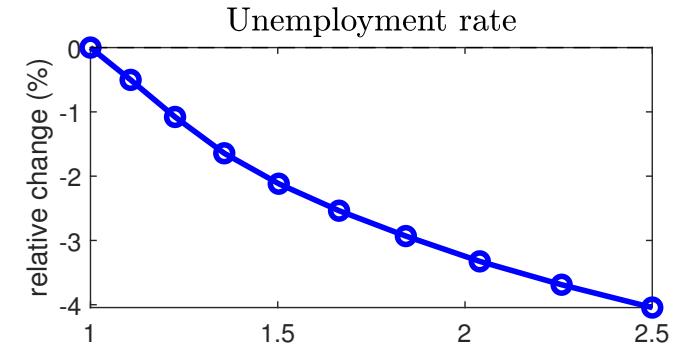


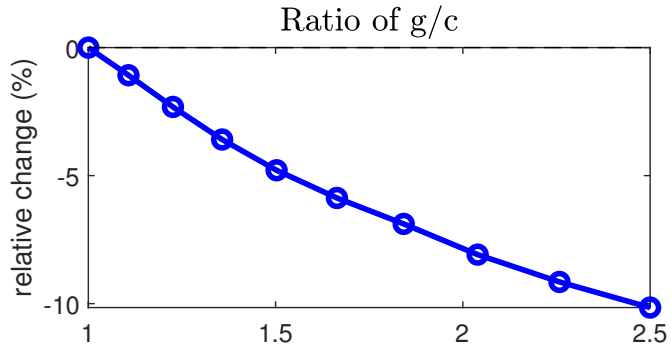


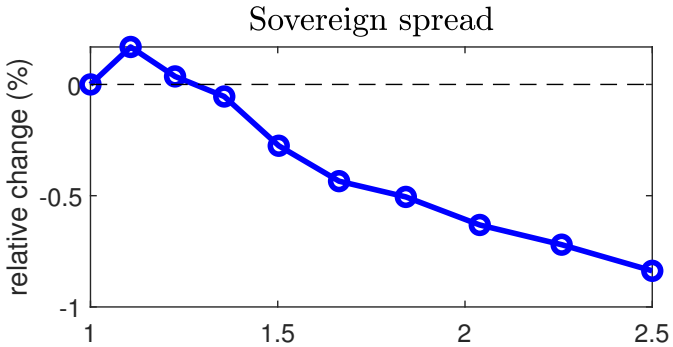


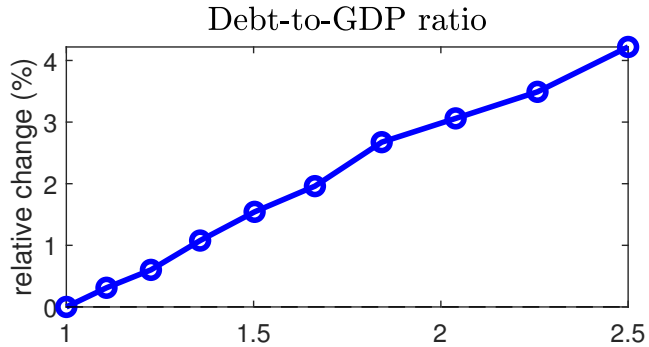


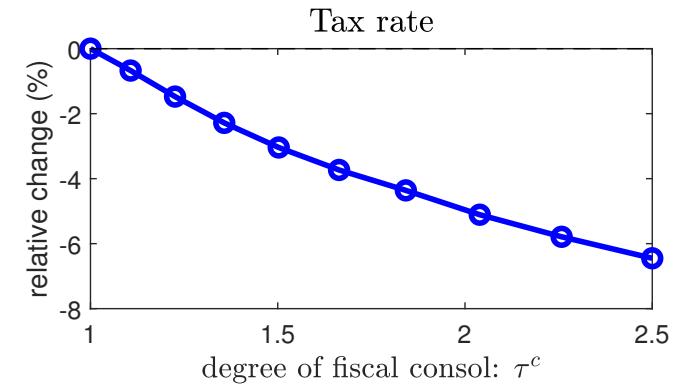
Varying the degree of fiscal consolidation

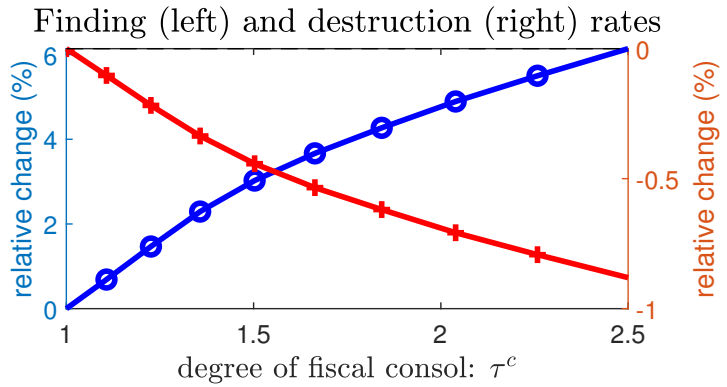












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