BANCA NAȚIONALĂ A ROMÂNIEI

The interaction between private sector and public sector labor markets

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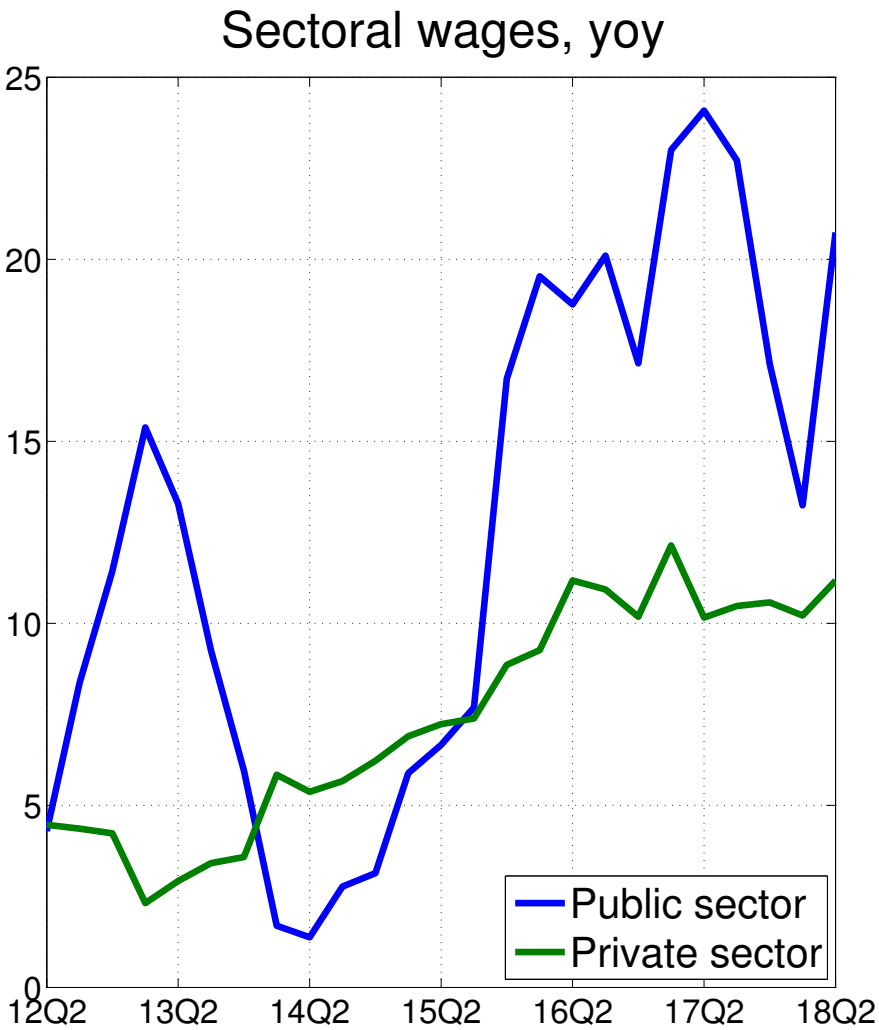
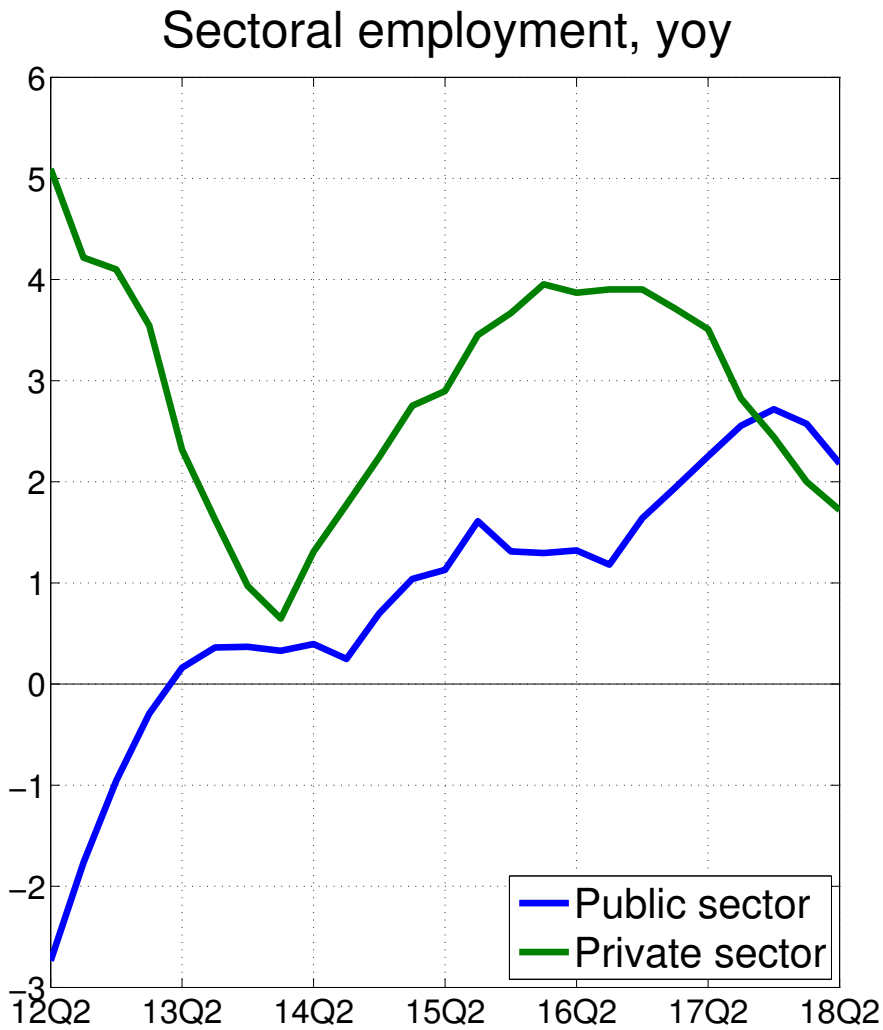
Banca Naţională a României

Tirana, 6–7 December 2018

Economic context





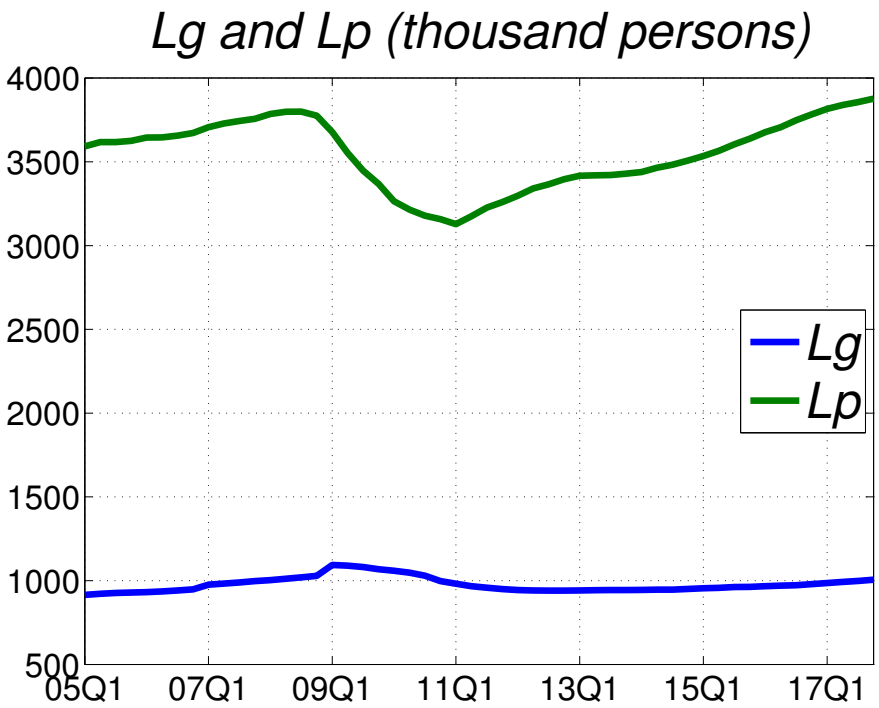
Motivation

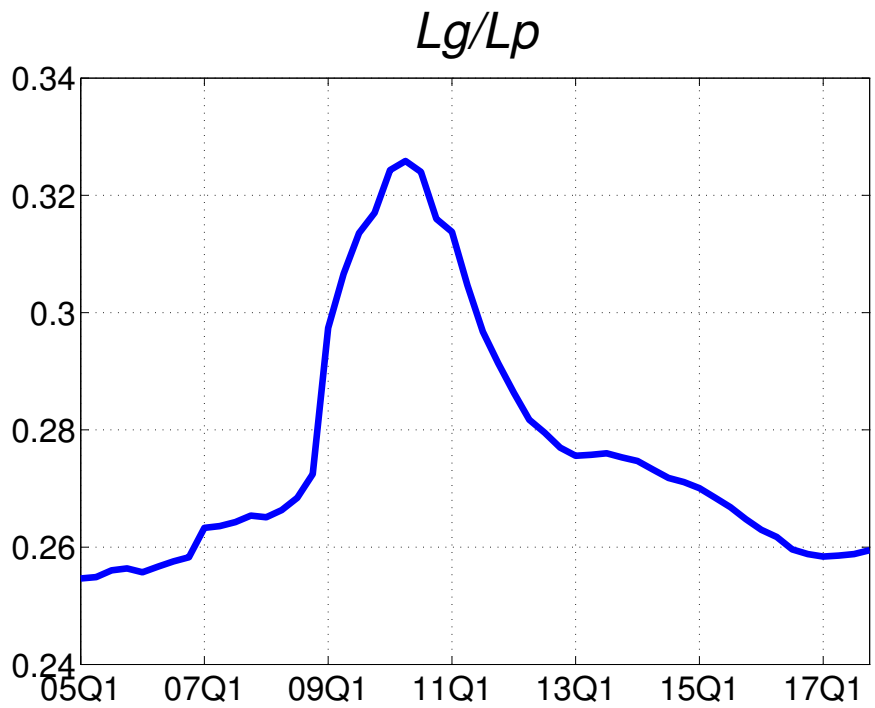
- Public goods have specific features $\rightarrow$ public sector wages and jobs are determined by **different factors** relatively to the private sector
- Quantifying and understanding the interplay between public and private labor markets has important **policy implications**
- Need to introduce **labor market heterogeneity** in typical structural models
- **Takeaways**:
  - data (Bayesian VAR) suggest there are spillover effects for both employment and wage shocks from private sector to public sector, and vice-versa $\rightarrow$ very rich interaction
  - to match these in the model, we consider two types of workers and an active government

Data

- Public sector:
  - NACE sectors O, P, Q, R
  - About 1 mln employees (20% of total)
- Variables for empirical analysis:
  - ΔLg, ΔLp: public, private sector employees, qoq, SA
  - ΔWg, ΔWp: public, private sector real net wages, qoq, SA
  - ΔY: Real GDP, qoq, SA
  - ΔP: CPI at constant VAT rates, qoq, SA
  - R: interbank interest rate ROBOR3M, annual
- Bayesian VAR:
  - 2005Q1:2017Q4 sample
  - 4 lags
  - Normal–inverse-Wishart priors
  - Cholesky identification

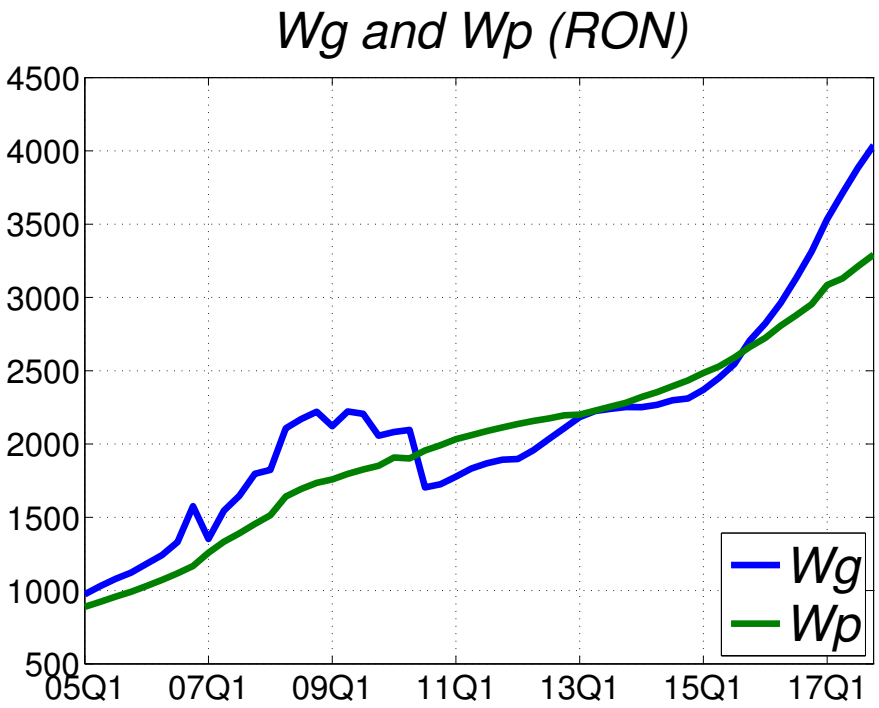
Public and private employees

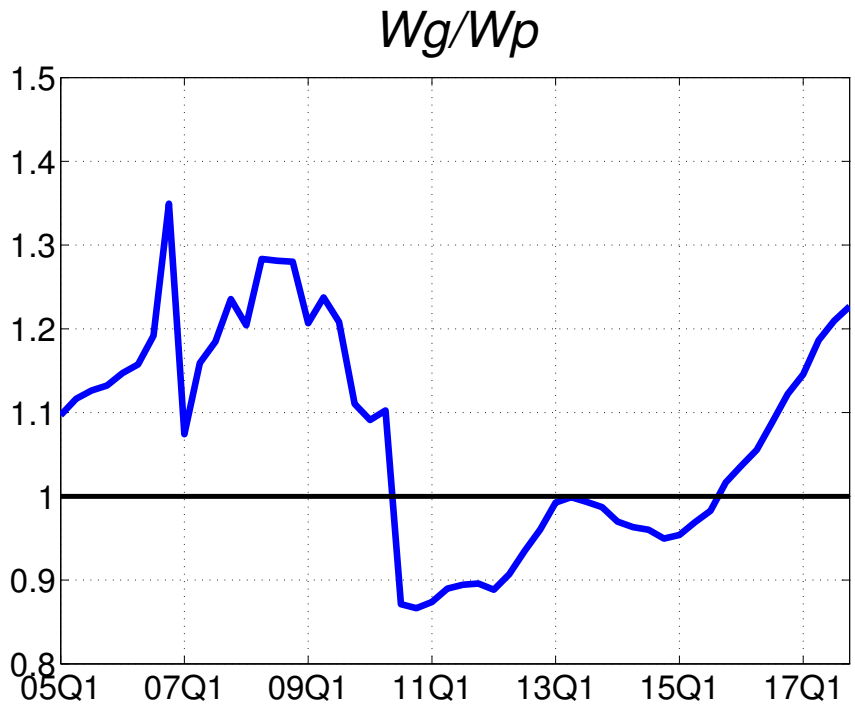




- Public employment: no clear cyclical proprieties
- Lg to Lp ratio is countercyclical and lagging
- Average Lg/Lp: 0.27

Public and private (net) wages

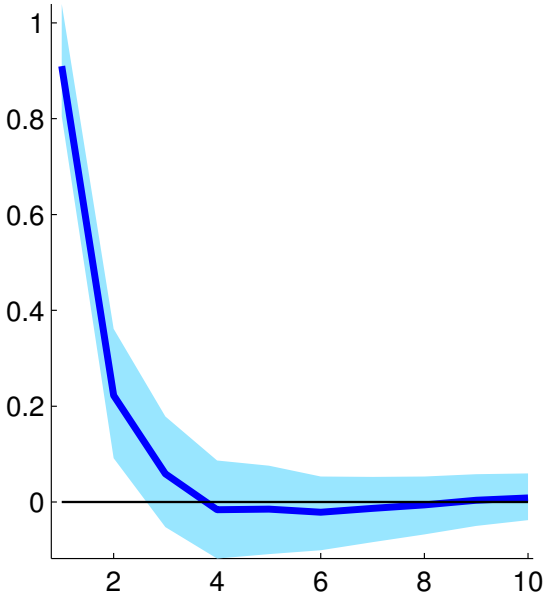




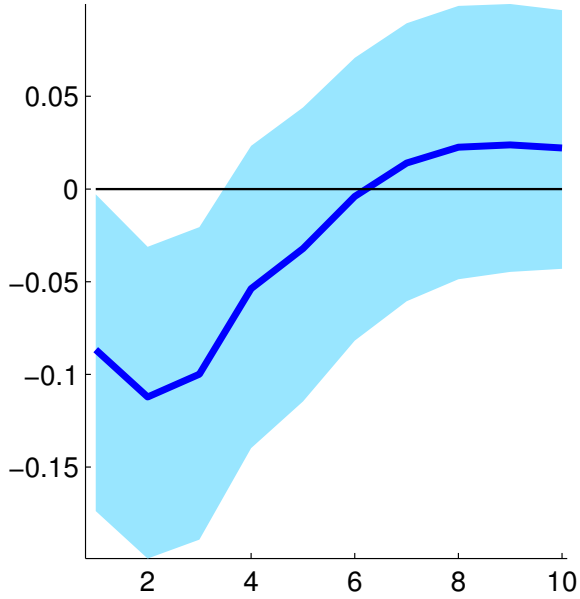
- Public wage more volatile
- Average wage gap Wg/Wp: 8%

Public employement shock

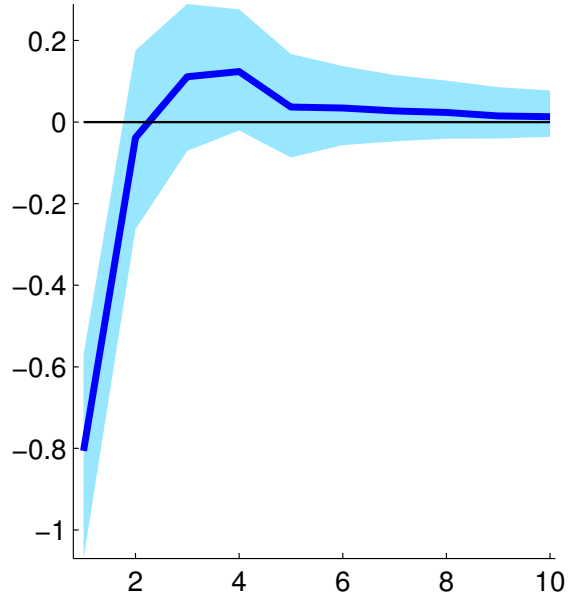
Public labor growth



Private labor growth

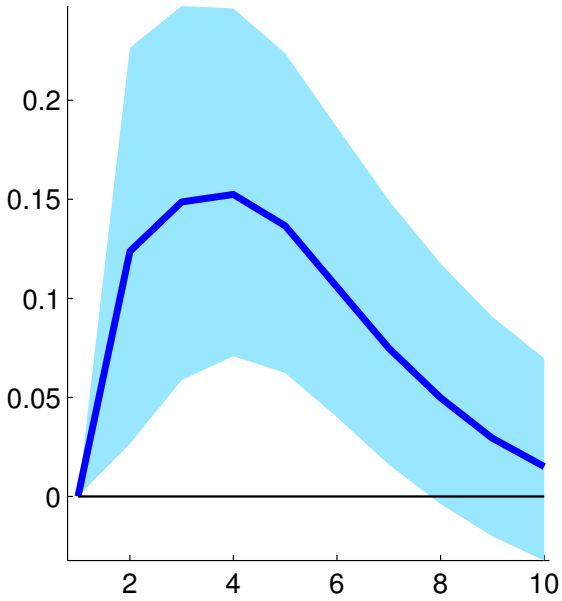


GDP growth

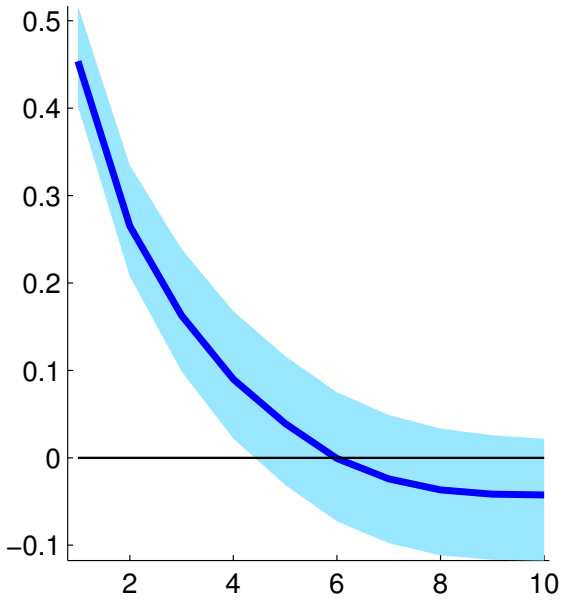


Private employement shock

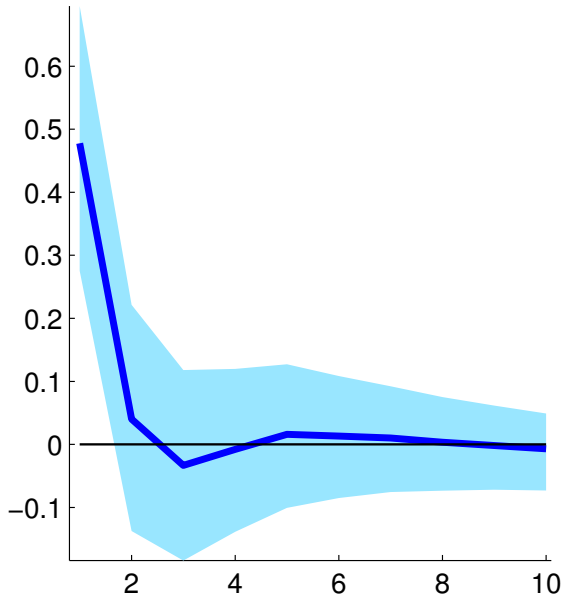
Public labor growth



Private labor growth



GDP growth



Households

- Work in both sectors: $L_t = \mu L_{p,t} + (1-\mu) L_{g,t}$
- Maximize utility

$$U_t = \zeta_t^C \ln(C_t - h\overline{C}_{t-1}) - \zeta_t^L A_L \frac{[\mu L_{p,t} + (1-\mu) L_{g,t}]^{1+\eta}}{1+\eta}$$

- subject to:
$(1+\tau^c) P_t C_t + B_{t+1} \leq$
$\leq [\mu W_{p,t} L_{p,t} + (1-\mu) W_{g,t} L_{g,t}] (1-\tau^w) + R_{t-1} B_t + T_t + \Pi_t$
- Sticky private wages $W_{p,t}$
- Maximize w.r.t. $C_t, B_{t+1}, L_{p,t}$, but not $L_{g,t}$

Firms

- Intermediate goods producers $i \in [0,1]$:

$$Y_t(i) = A_t Z_t \widetilde{L}_t(i) - Z_t \phi$$

$$\widetilde{L}_t(i) = \left[\mu^{\frac{1}{\sigma}} L_{p,t}(i)^{\frac{\sigma-1}{\sigma}} + (1-\mu)^{\frac{1}{\sigma}} L_{g,t}(i)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

- Government pays public wages, so $L_{g,t}$ is "free" for the firm
- Max profits w.r.t. $L_{p,t}$, but not $L_{g,t}$
- Real marginal costs: $mc_t = \lambda_t^P \frac{\mu w_{p,t}}{A_t} \left(\frac{L_{p,t}}{\mu \widetilde{L}_t} \right)^{\frac{1}{\sigma}}$
- Retailers aggregate intermediate goods $Y_t(i)$ into a final good Y_t
  $\rightarrow$ sticky prices

Government

- Wants to maximize *both* public wages and public jobs:

$$\max \left\{ \nu_t^W \omega \left(\frac{W_{g,t}}{P_t Z_t} \right)^{\gamma} + \nu_t^L (1-\omega) \left[(1-\mu) L_{g,t} \right]^{\gamma} \right\}^{1/\gamma}$$

  w.r.t. $W_{g,t}$, $L_{g,t}$ and B_{t+1},

- subject to:

$$P_t G_t + T_t + (1-\mu) W_{g,t} L_{g,t} + R_{t-1} B_t + \frac{\psi}{2} \left(\frac{B_{t+1}}{P_t Y_t} - \frac{B^{SS}}{Y^{SS}} \right)^2 P_t Y_t \leq \tau^c P_t C_t + \tau^w \left[\mu W_{p,t} L_{p,t} + (1-\mu) W_{g,t} L_{g,t} \right] + B_{t+1}$$

- Divide FOCs w.r.t. $W_{g,t}$ and $L_{g,t}$, log-linearize:

$$\widehat{\nu_t^W} + \gamma \widehat{w_{g,t}} = \widehat{\nu_t^L} + \gamma \widehat{L_{g,t}}$$

- Parameters: ω calibrated s.t. 8% SS wage gap, γ estimated
- Central bank: Taylor rule

Estimation ▸ Calibrated ▸ Estimated

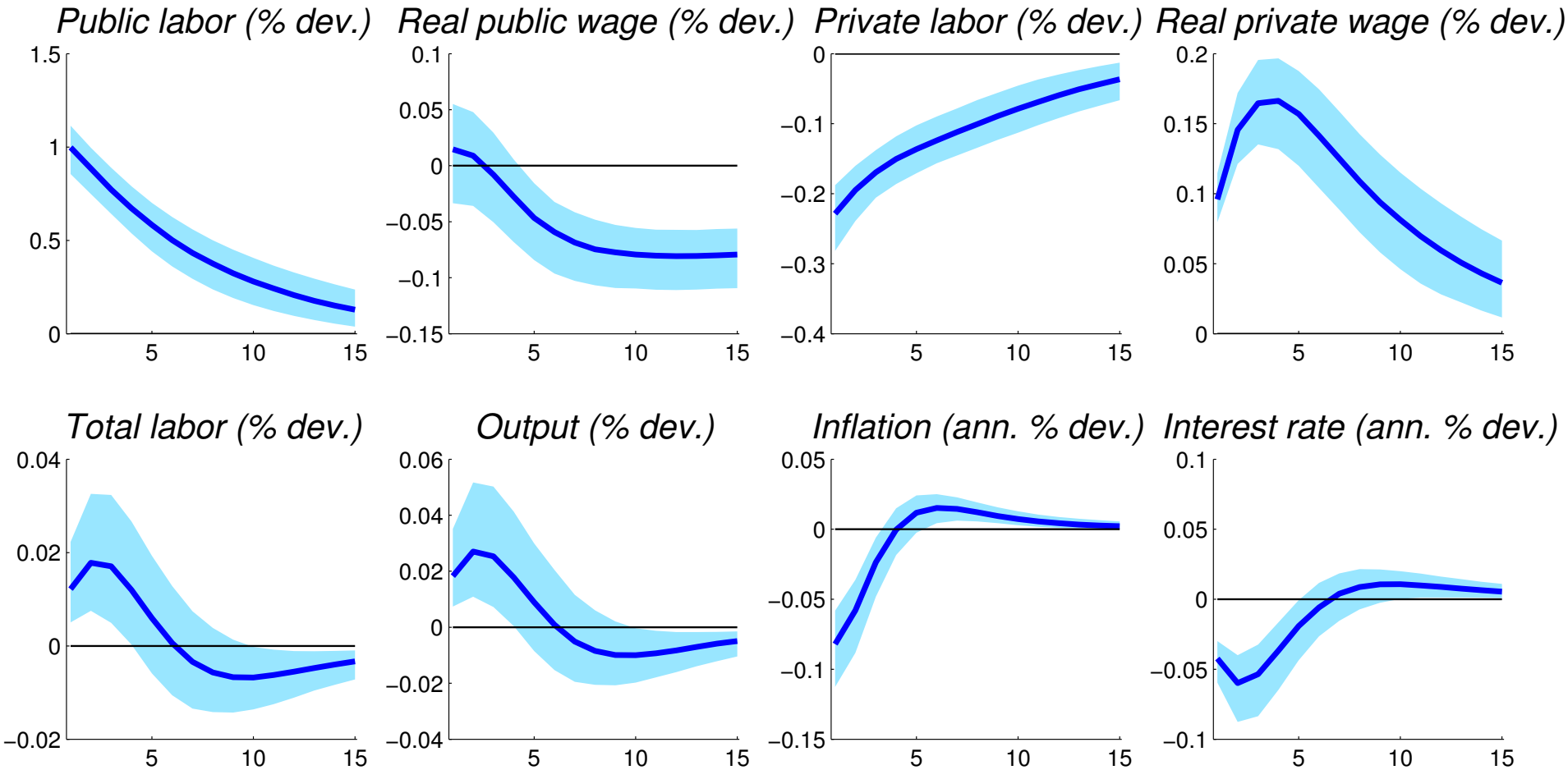
- The model is estimated using traditional Bayesian methods
- Observed variables are the same used for the VAR model
- Non-standard parameters:

	Prior distributions			Posterior distributions			
	type	mean	st. dev.	mean	std. dev.	90% credible set	
σ	Γ	1.75	0.2	0.922	0.189	0.761	1.072
γ	N	–2	0.2	–1.184	0.131	–1.289	–1.076

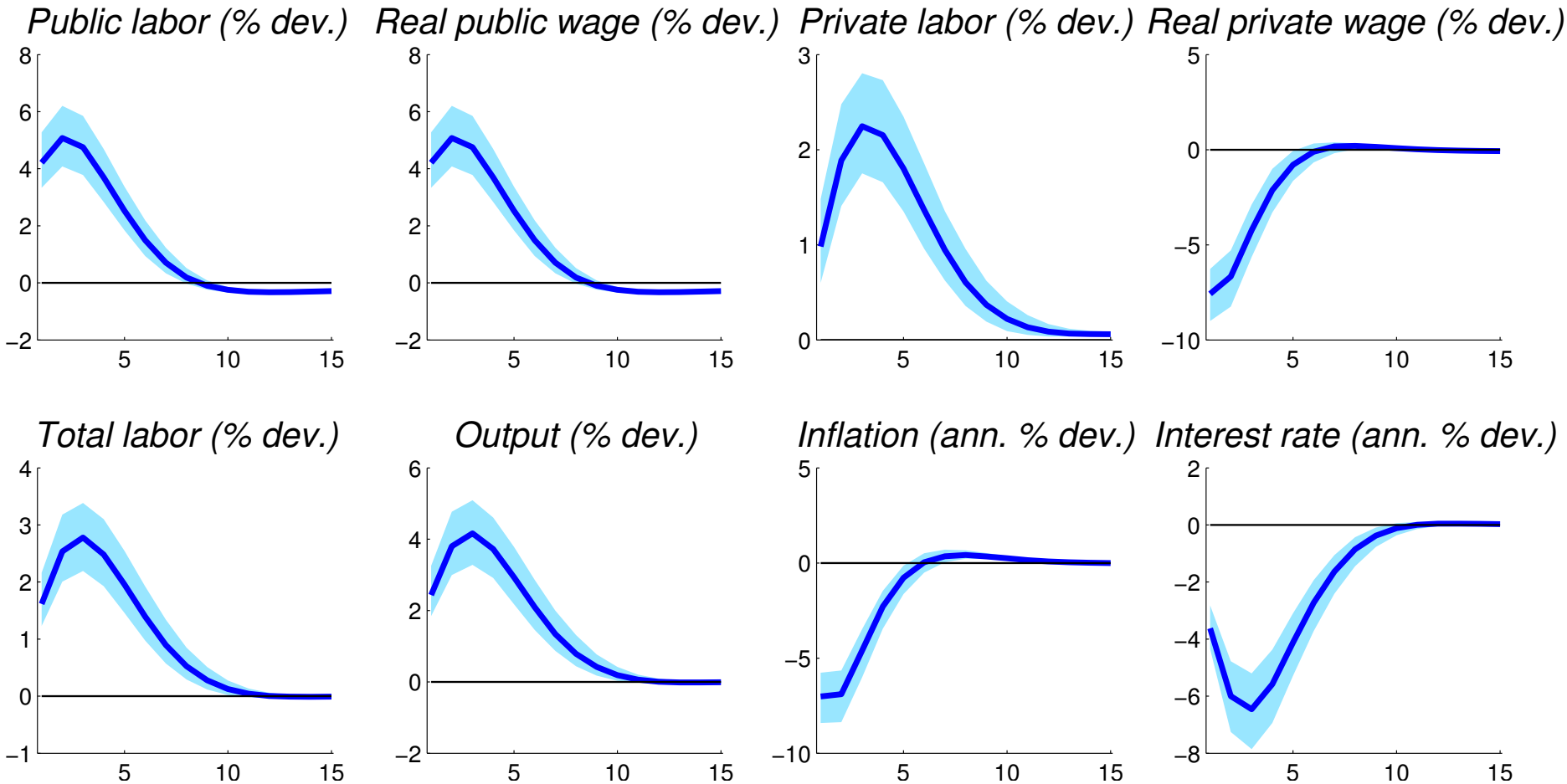
- The model matches observed standard deviations:

	Description	Data	Model
ΔY_t^d	Quarterly GDP growth	1.75	1.80
R_t^d	Annual interest rate	3.50	3.13
π_t^d	Quarterly CPI inflation rate	0.58	0.58
$\Delta W_{g,t}^d$	Quarterly growth of nominal public wages	5.73	6.65
$\Delta W_{p,t}^d$	Quarterly growth of nominal private wages	1.53	1.24
$\Delta L_{g,t}^d$	Quarterly growth of public labor	1.25	1.86
$\Delta L_{p,t}^d$	Quarterly growth of private labor	1.19	1.77

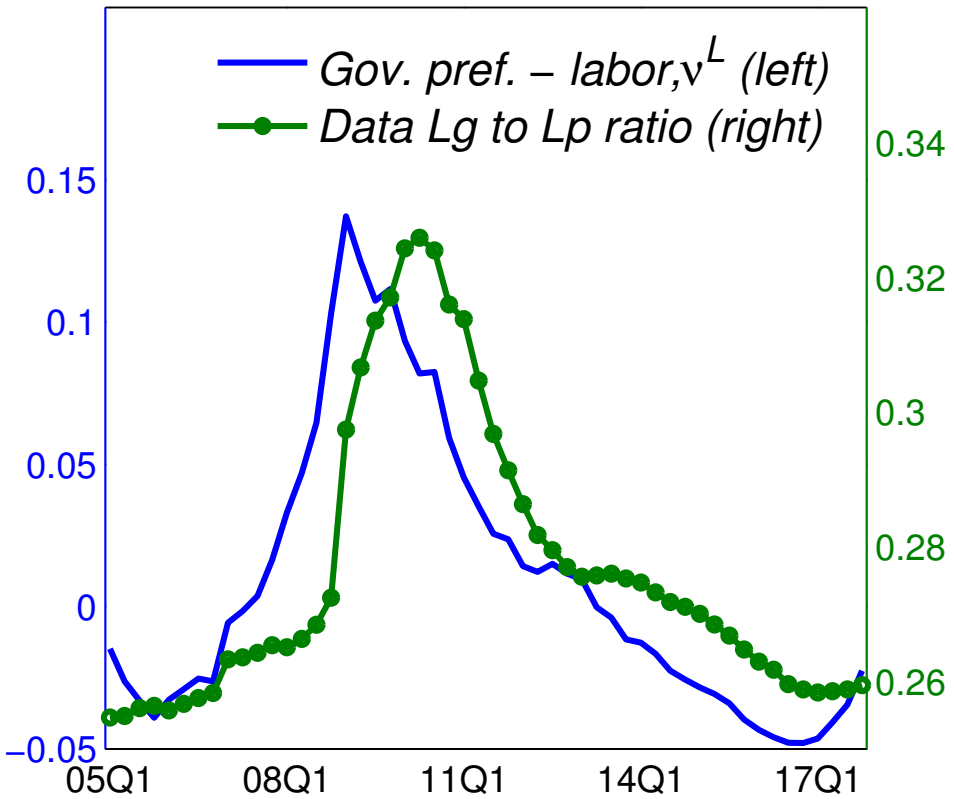
IRFs: public labor objective shock ν_t^L

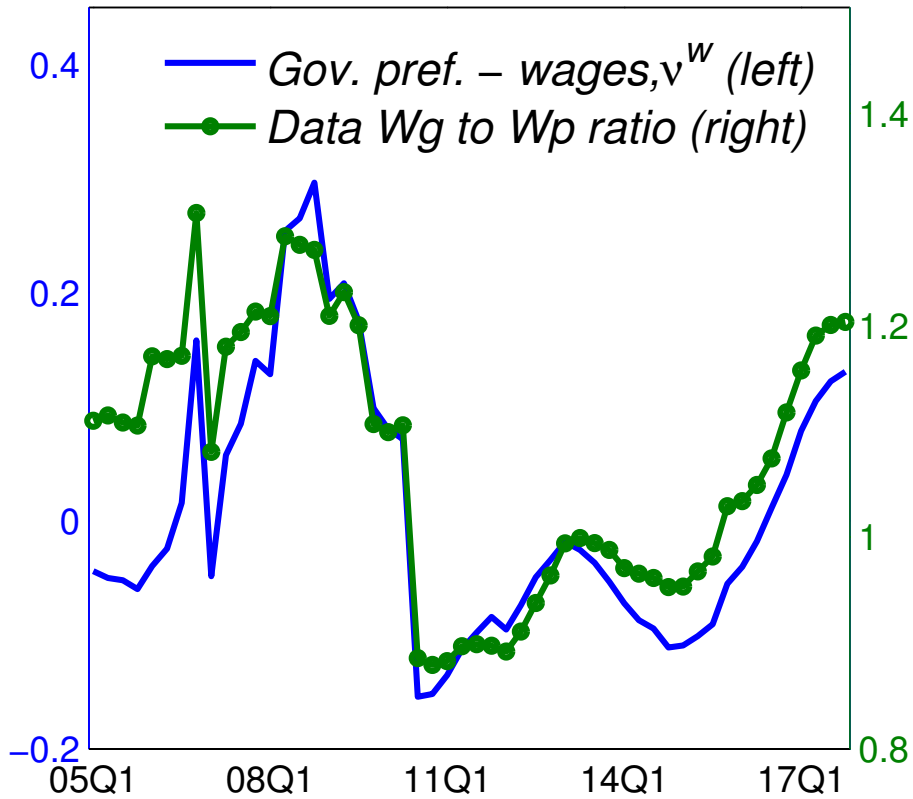


IRFs: private labor (disutility) shock ζ_t^L



Government shocks and relative employment and wages





Conclusion

- Public sector employment and wages are determined in a different setting as compared to the private sector $\rightarrow$ introduce heterogeneity
- Romanian **data** (Bayesian VAR):
  - public job creation crowds out private jobs and is contractionary
  - private job creation crowds in public jobs and is expansionary
- To match theoretical and empirical evidences, we build a **model** with:
  - limited heterogeneity: HH members have public or private sector jobs
  - government wanting to maximize both public jobs and wages
- **Policy implications**:
  - Stimulating private job creation is preferred to increases in public jobs: it crowds–in public sector employment and has overall favorable effects on economic activity

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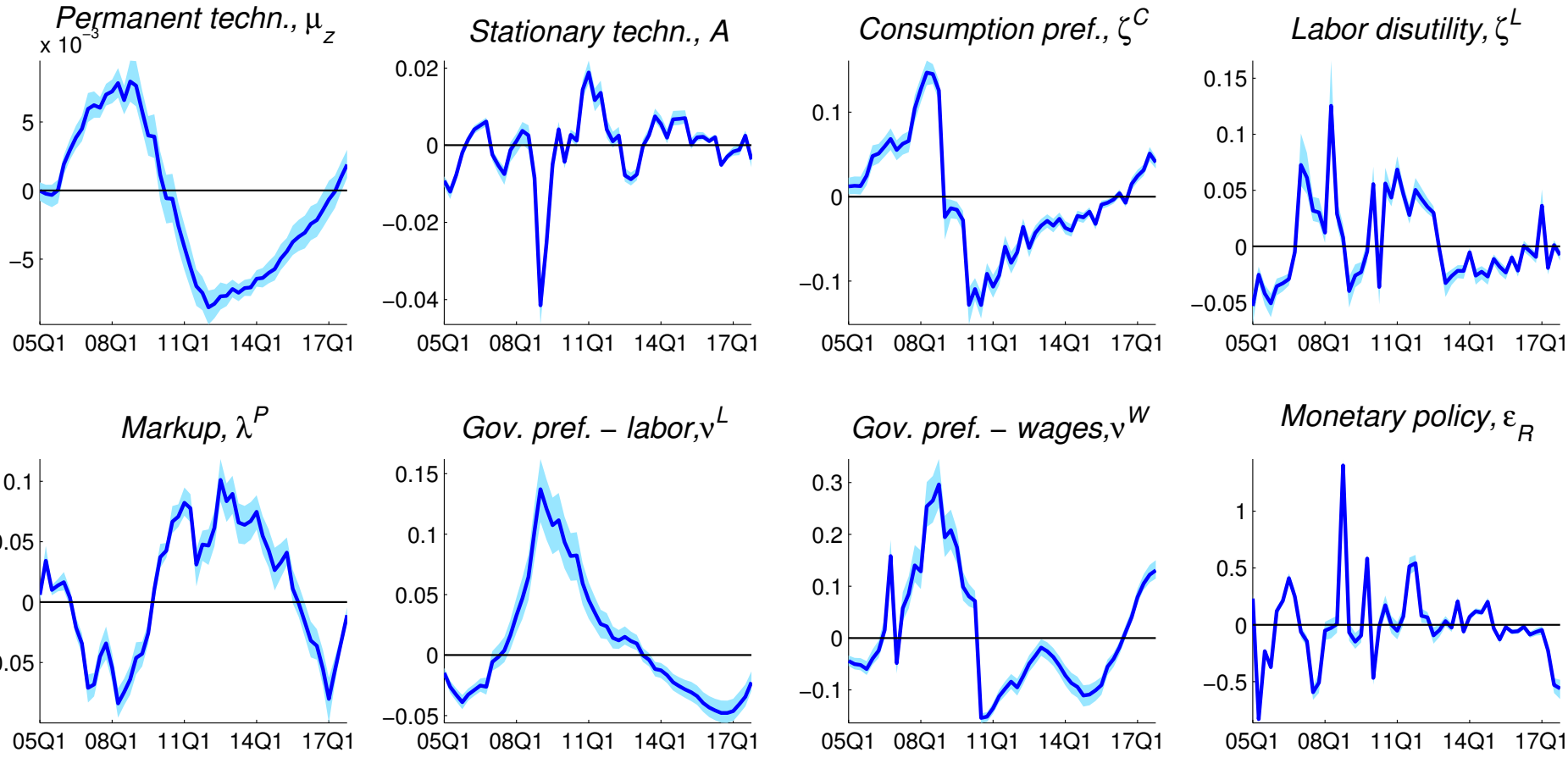
Table: *Calibrated parameters*

	Description	Value	Source
π^{SS}	steady state inflation	1+2.5/400	NBR target
μ_z^{SS}	steady state growth	1+0.8/100	Quarterly GDP growth over the sample
β	discount factor	0.9992	Match equilibrium interest rate of 6%
μ	share of L_p	0.78	Sectoral employment data
η	labor input elasticity	2	Literature, [**?**]
G^{SS}/Y^{SS}	steady state G to Y	0.14	Gov. expenditures to GDP over the sample
W_g^{SS}/W_p^{SS}	steady state wage ratio	1.08	Sectoral data; get ω
$C^{SS}\tau^c/Y^{SS}$	consumption taxes to Y	0.118	EC taxation trends; get τ^c
Labor taxes$/Y^{SS}$	labor taxes to Y	0.111	EC taxation trends; get τ^w
L^{SS}	steady state labor	0.229	Share of working time in data; get A_L
B^{SS}/Y^{SS}	steady state B to Y	0.28	Annual government debt to GDP
ψ	bonds adjustment costs	0.001	Small value
λ^P	equilibrium price markup	1.2	Literature, [**?**]
λ^W	equilibrium wage markup	1.5	Literature, [**?**]

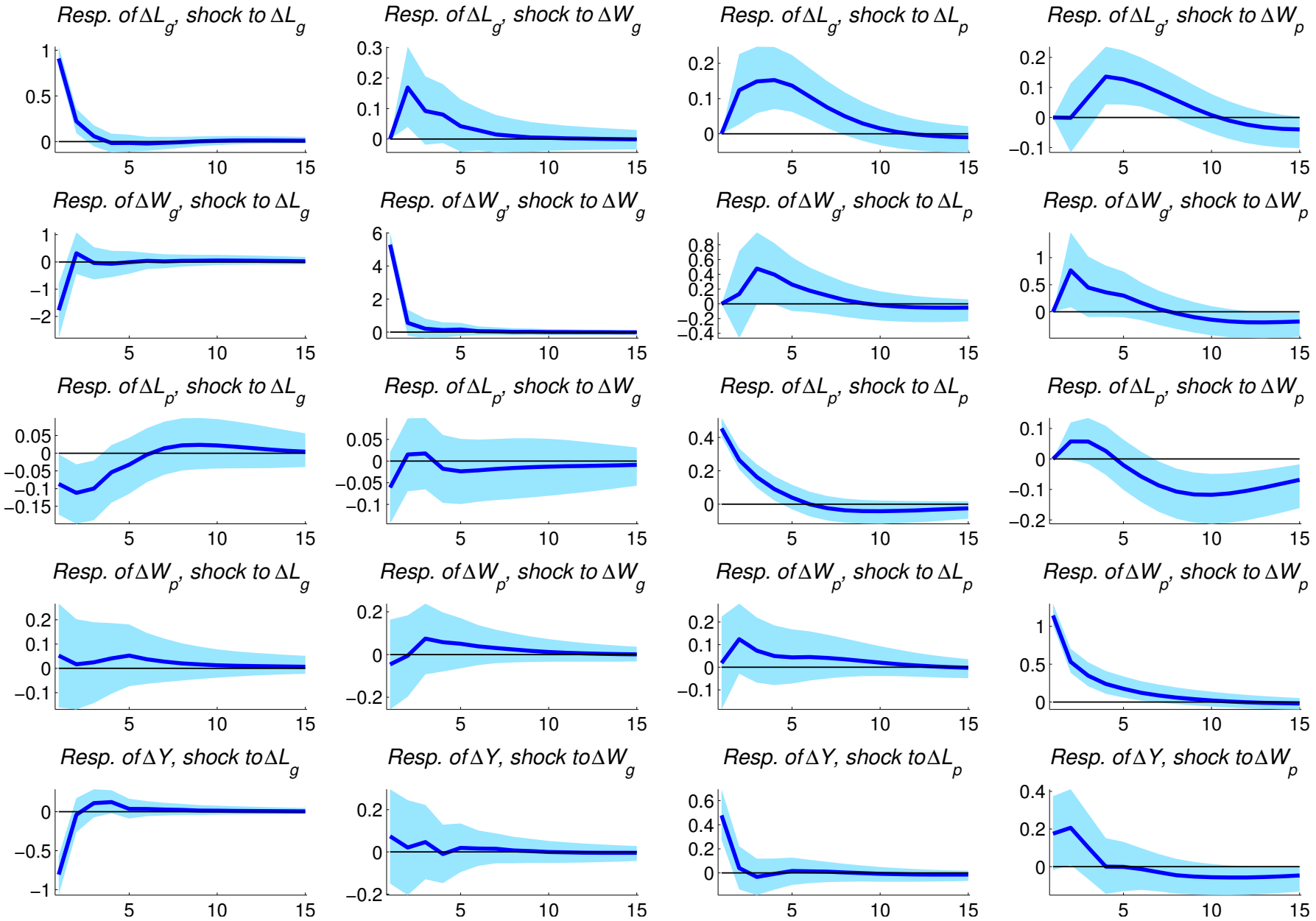
Table: *Estimated parameters*

	Prior distributions			Posterior distributions			
	type	mean	st. dev.	mean	std. dev.	90% credible set	
σ	Γ	1.75	0.2	0.922	0.189	0.761	1.072
h	B	0.5	0.15	0.380	0.091	0.226	0.526
ξ_w	B	0.5	0.05	0.419	0.039	0.361	0.479
κ_w	B	0.5	0.1	0.463	0.105	0.298	0.624
ξ_p	B	0.5	0.05	0.758	0.040	0.727	0.790
κ_p	B	0.5	0.1	0.354	0.105	0.217	0.497
ρ_R	B	0.75	0.1	0.717	0.033	0.670	0.764
ϕ_π	N	2	0.1	1.937	0.097	1.783	2.091
ϕ_y	N	0.25	0.1	0.084	0.032	0.036	0.128
γ	N	–2	0.2	–1.184	0.131	–1.289	–1.076
ρ_A	B	0.5	0.1	0.575	0.076	0.465	0.683
ρ_{μ_z}	B	0.9	0.05	0.908	0.026	0.871	0.946
ρ_{ζ^C}	B	0.5	0.1	0.628	0.075	0.524	0.734
ρ_{ζ^L}	B	0.5	0.1	0.390	0.086	0.273	0.506
ρ_{λ^P}	B	0.5	0.1	0.807	0.038	0.704	0.914
ρ_{ν^L}	B	0.5	0.1	0.891	0.094	0.845	0.941
ρ_{ν^W}	B	0.5	0.1	0.753	0.059	0.646	0.864
$100\cdot\sigma(\varepsilon_A)$	$i\Gamma$	1	Inf	0.682	0.109	0.576	0.787
$100\cdot\sigma(\varepsilon_R)$	$i\Gamma$	1	Inf	0.313	0.039	0.267	0.356
$100\cdot\sigma(\varepsilon_{\mu_z})$	$i\Gamma$	0.5	Inf	0.150	0.026	0.113	0.185
$100\cdot\sigma(\varepsilon_{\zeta^C})$	$i\Gamma$	1	Inf	3.201	1.432	2.490	3.931
$10\cdot\sigma(\varepsilon_{\zeta^L})$	$i\Gamma$	1	Inf	0.363	0.082	0.250	0.476
$100\cdot\sigma(\varepsilon_{\lambda^P})$	$i\Gamma$	1	Inf	1.959	0.311	1.319	2.605
$100\cdot\sigma(\varepsilon_{\nu^L})$	$i\Gamma$	1	Inf	1.123	0.409	0.919	1.318
$10\cdot\sigma(\varepsilon_{\nu^W})$	$i\Gamma$	1	Inf	0.660	0.089	0.554	0.758

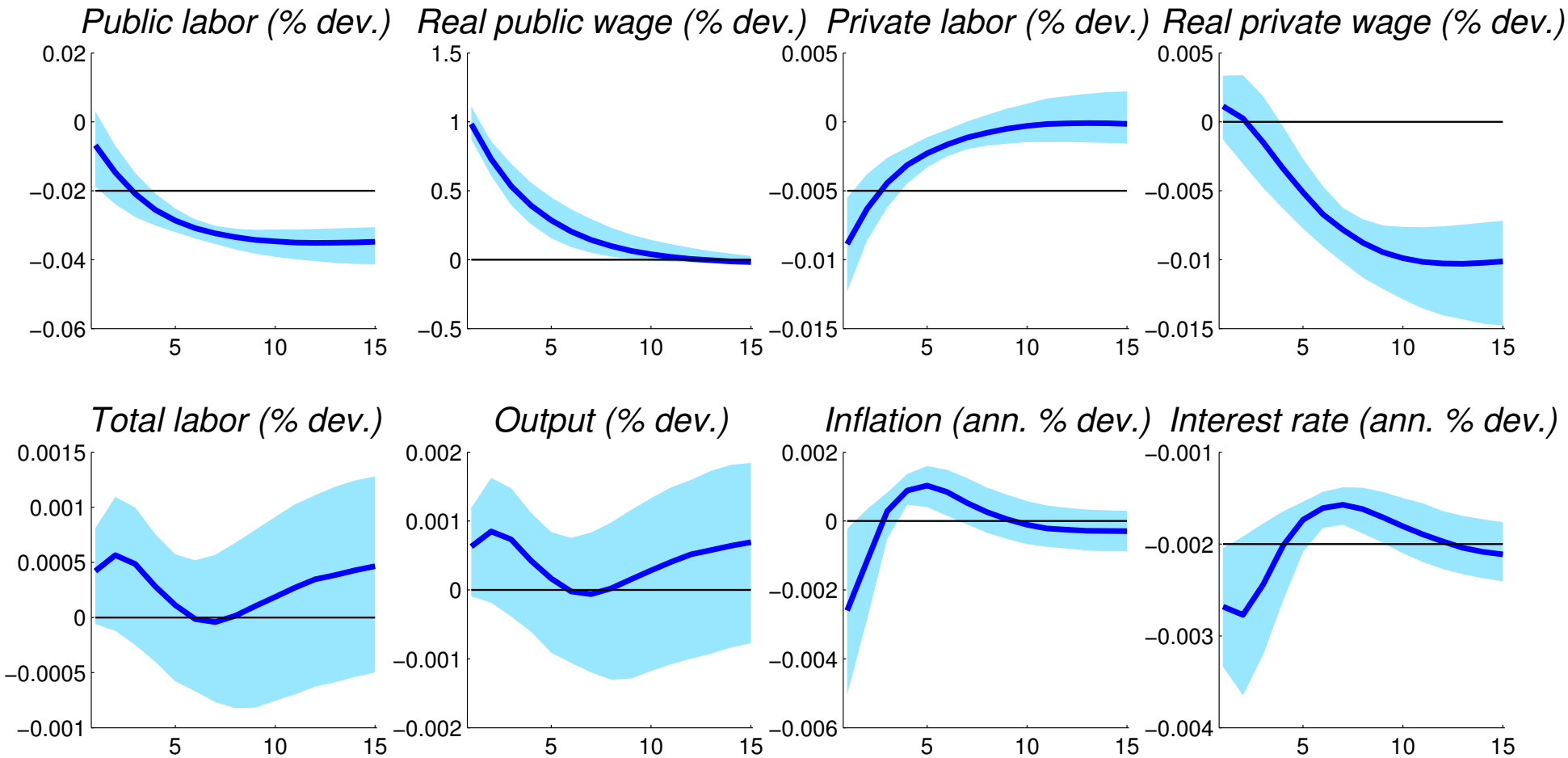
Smoothed shock processes



IRFs: Bayesian VAR

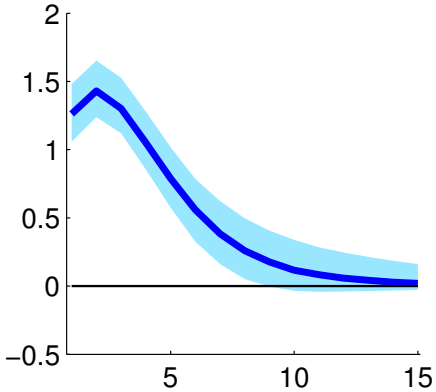


IRFs: public wage objective shock ν_t^W

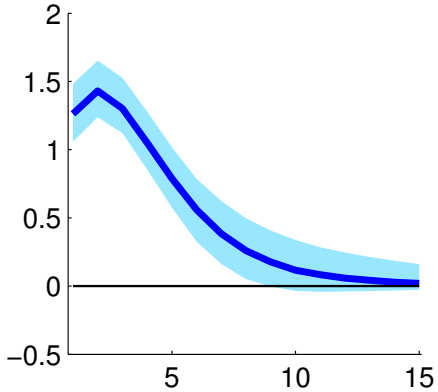


IRFs: markup shock λ_t^P

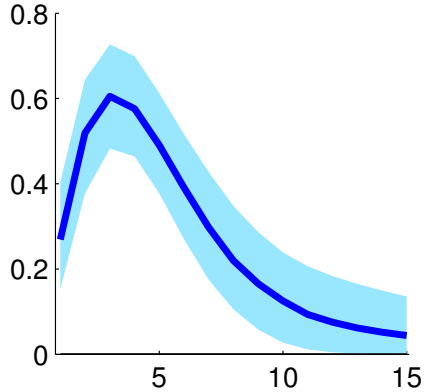
Public labor (% dev.)



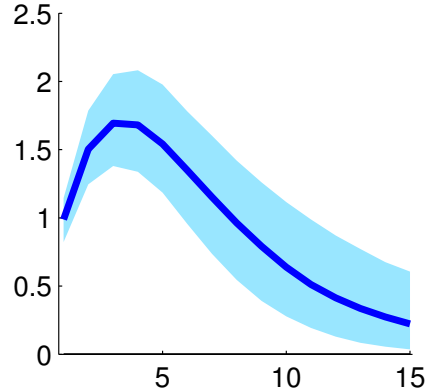
Real public wage (% dev.)



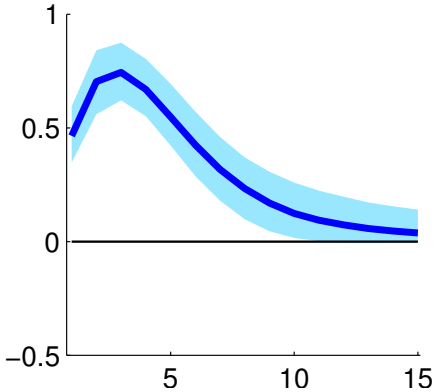
Private labor (% dev.)



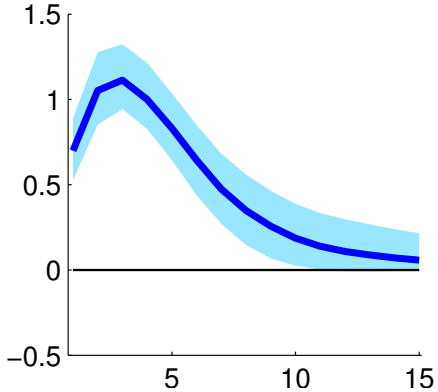
Real private wage (% dev.)



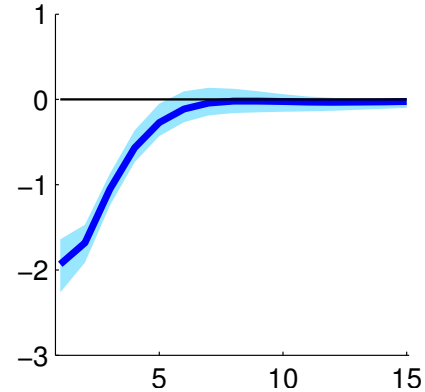
Total labor (% dev.)



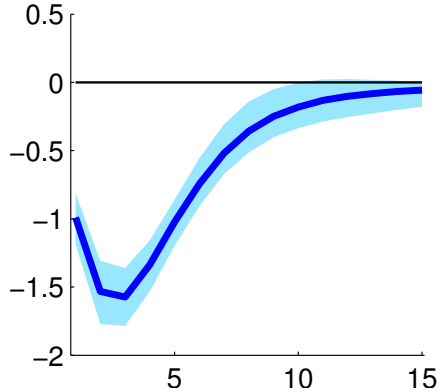
Output (% dev.)



Inflation (ann. % dev.)

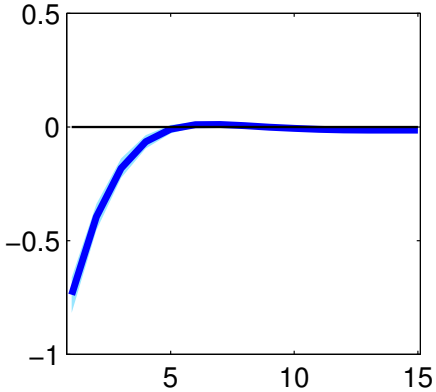


Interest rate (ann. % dev.)

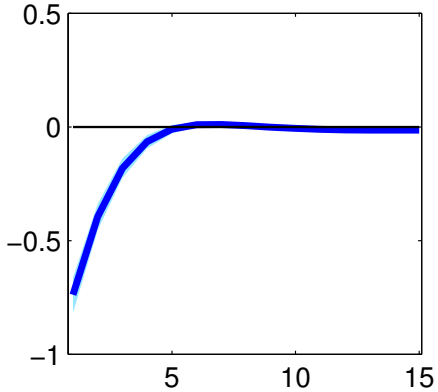


IRFs: monetary policy shock

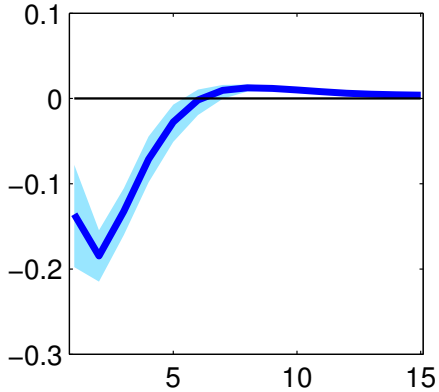
Public labor (% dev.)



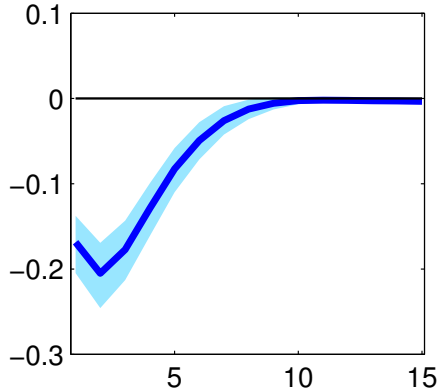
Real public wage (% dev.)



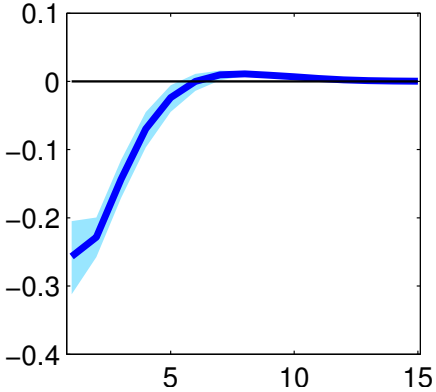
Private labor (% dev.)



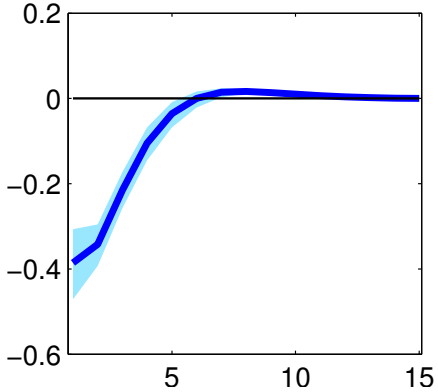
Real private wage (% dev.)



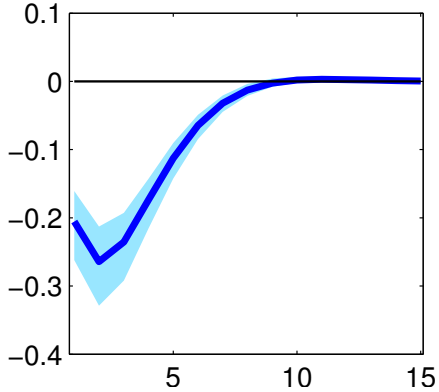
Total labor (% dev.)



Output (% dev.)



Inflation (ann. % dev.)



Interest rate (ann. % dev.)