Why Does Private Consumption Rise after a Government Spending Shock?

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- Empirical studies: increase in public spending : significant and persistent increase in consumption (B&P).
- Violation of neoclassical theory (C should decrease: negative wealth effect).

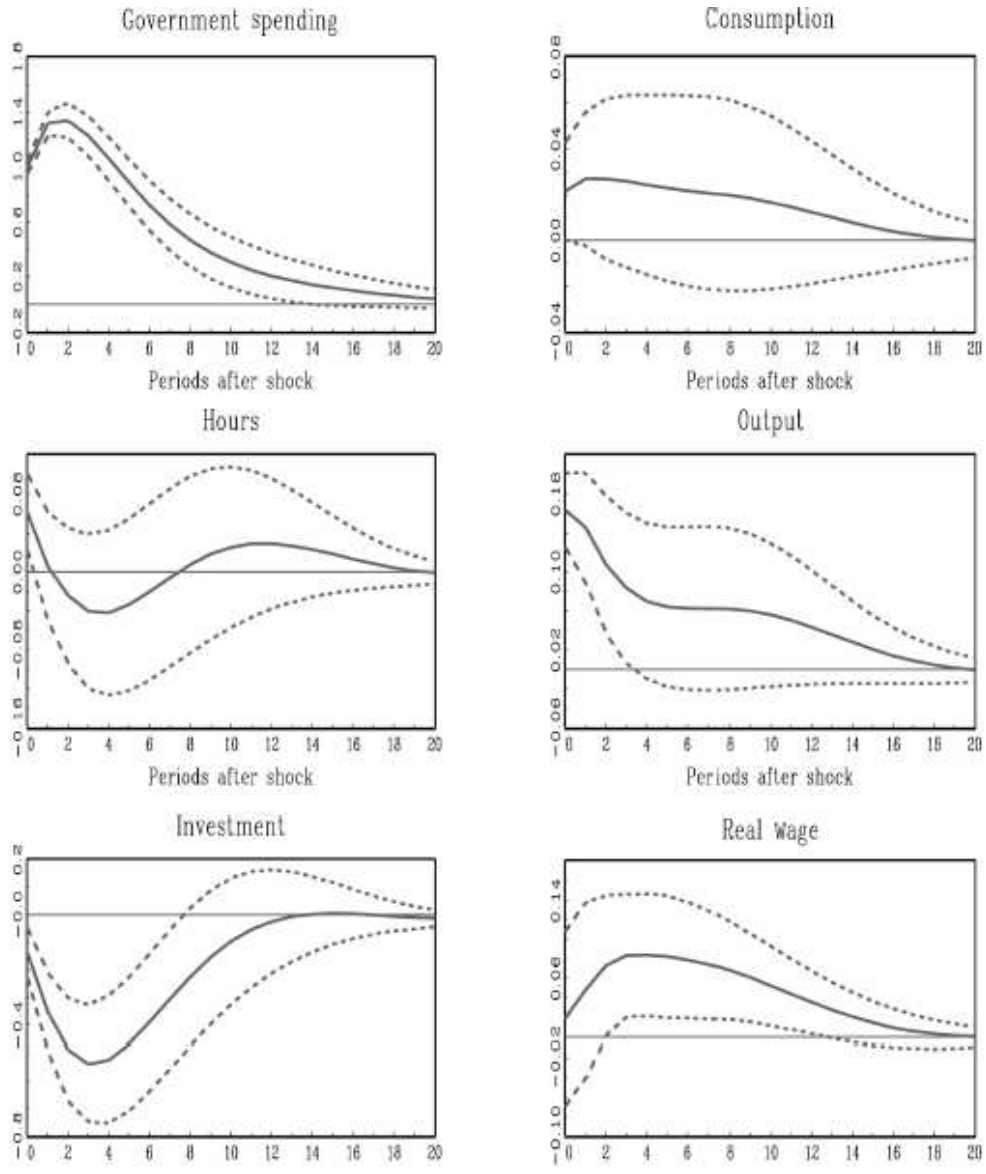
Appropriate framework to study fiscal policy shocks?

- Gali, Lopez-Salido, Valles: NK with non-ricardian households.
  $\longrightarrow$ Need a very high fraction of rule-of-thumb consumers.
  $\longrightarrow$ Coenen, Straub(2005): this fraction small in Euro Area.

Here:

- Ricardian environment, complementarity between public and private spending.
- RBC + G in Utility + habit formation

Refreshment : empirical evidence



VAR-based IR to 1% increase in G shock

The Model

Households

Preferences are:

$$E_0 \sum_{t=0}^{\infty} \beta^t u(\tilde{C}_t, \tilde{C}_{t-1}, N_t) = E_t \sum_{t=0}^{\infty} \beta^t \frac{1}{1-\epsilon} \left(\frac{\tilde{C}_t}{\tilde{C}_{t-1}^{\gamma}} \right)^{1-\epsilon} + \psi \ln(1-N_t)$$

- $\tilde{C}_t$ is effective consumption, $1 - N_t$ is leisure.
- $\gamma \in (0, 1)$: degree of habit formation, $\epsilon > 0$, $\psi > 0$.

- Effective consumption is a CES index of C and G:

$$\tilde{C}_t = \left[\phi C_t^{\frac{\nu-1}{\nu}} + (1-\phi) G_t^{\frac{\nu-1}{\nu}} \right]^{\frac{\nu}{\nu-1}}$$

- ϕ is the weight of private consumption. ($\phi = 1$ and $\gamma = 0$: RBC)
- $\nu > 0$ is the elasticity of substitution btw C and G. If $\nu = 0$: C_t and G_t are perfect complements, if $\nu \to \infty$: perfect substitutes.

Budget constraint: $C_t + I_t + \frac{\kappa}{2} \left(\frac{I_t}{K_t} - \delta \right)^2 K_t \leq \omega_t N_t + r_t K_t - T_t$

Firms:

- $Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$ with $\ln A_t = (1-\rho_A)\ln A + \rho_A \ln A_{t-1} + \mu_{At}$

Government:

- $G_t = T_t$ with $\ln G_t = (1-\rho_G)\ln G + \rho_G \ln G_{t-1} + \mu_{Gt}$

Market clearing:

- $Y_t = C_t + I_t + G_t + \frac{\kappa}{2}\left(\frac{I_t}{K_t} - \delta\right)^2 K_t$

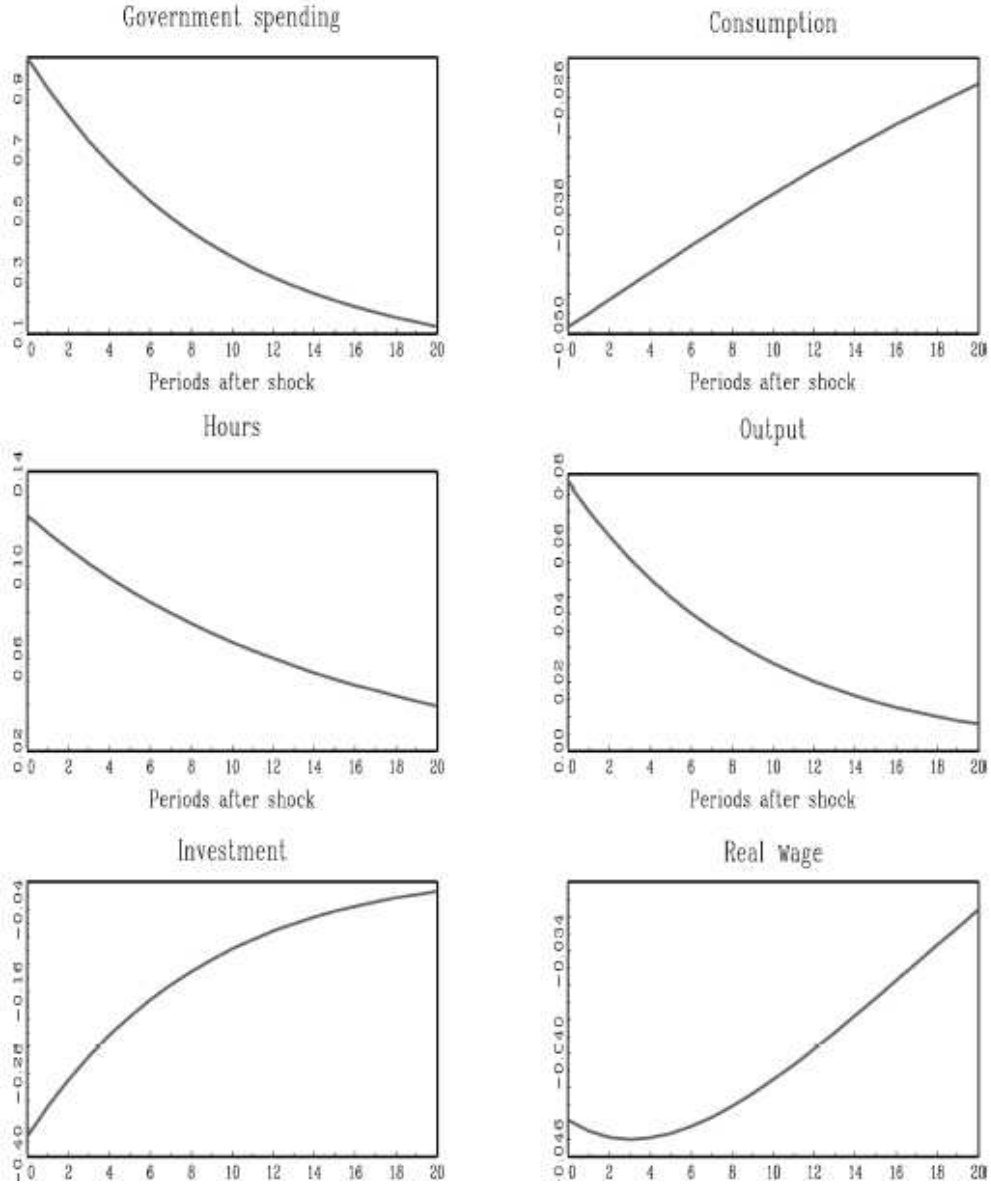
Optimization and loglinearization:

- 9 equations, 9 variables $(\lambda_t, \tilde{C}_t, C_t, N_t, I_t, K_{t+1}, Y_t, \omega_t, r_t)$.

Implication:

- $\frac{\partial \hat{\lambda}_t}{\partial \hat{G}_t} = (1-\phi)\left(\frac{G}{\tilde{C}}\right)^{\frac{\nu-1}{\nu}} \{\frac{1}{\nu} - \epsilon - \frac{\beta\gamma(\epsilon-1)(1+\gamma-\rho_G)}{1-\beta\gamma}\}$

Refreshment : Standard RBC ($\phi = 1$ and $\gamma = 0$)



IR to 1% increase in G shock

RBC + G in Utility, $\gamma = 0$

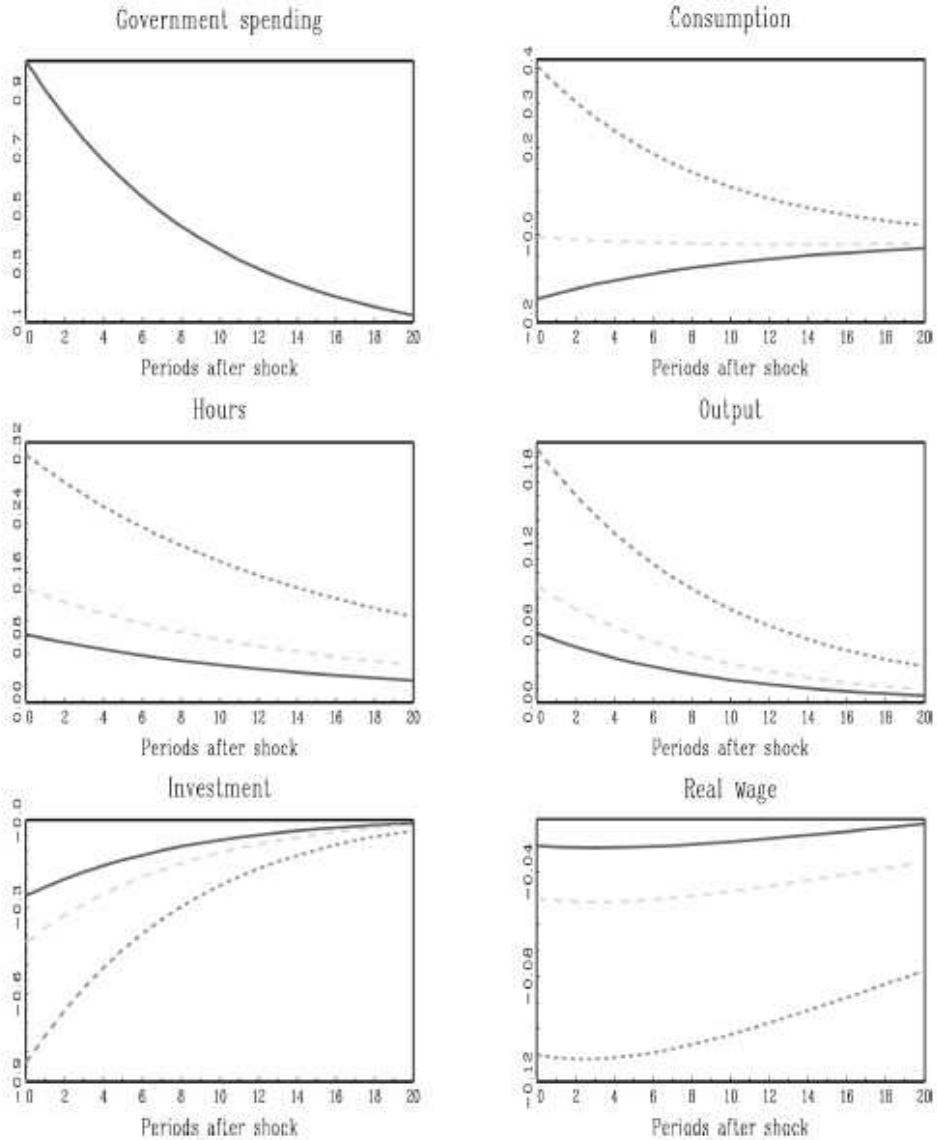


FIGURE 3 Impulse responses to a 1% government spending shock for different values of ν ($\gamma = 0$). Solid lines: $\nu = 1$; dashed lines: $\nu = 0.45$; dotted lines: $\nu = 0.25$

Why different results? $\frac{\partial \hat{\lambda}_t}{\partial \hat{G}_t}$ as the same sign as $\frac{1}{\nu} - \epsilon$.

RBC + G in Utility + habit ($\gamma \in (0,1)$)

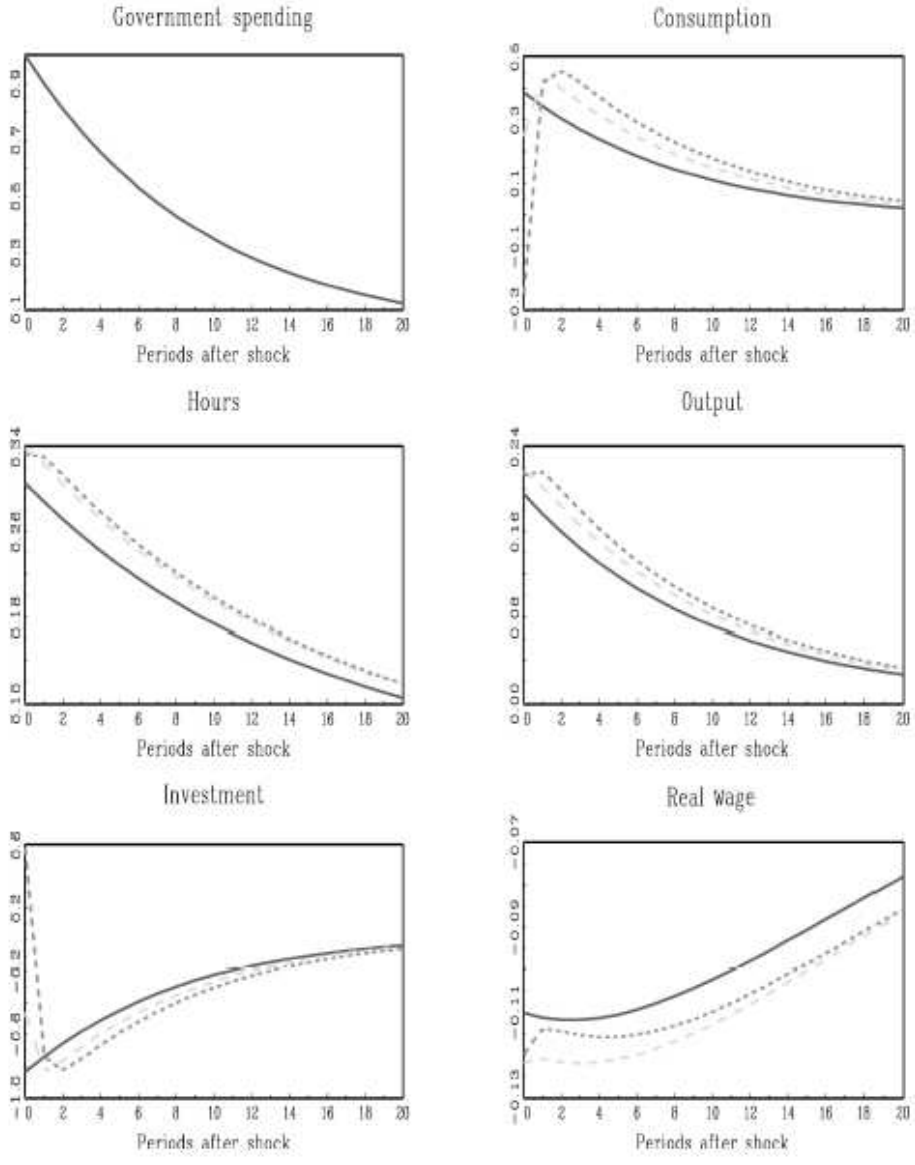


FIGURE 4 Impulse responses to a 1% government spending shock for different values of γ ($\nu = 0.25$). Solid lines: $\gamma = 0$; dashed lines: $\gamma = 0.5$; dotted lines: $\gamma = 0.8$

Summary:

- RBC: only wealth effect : $C \searrow$ & monotonicity.
- RBC + G in Utility : wealth effect + complementarity effect: $C \searrow$ or $\nearrow$ & monotonicity.
- RBC + G in Utility + habit: wealth effect + complementarity effect (dampened): $C \searrow$ or $\nearrow$ & non-monotonicity.

$\Rightarrow$ Need strong complementarity (low ν) and moderate habit formation ($\gamma \simeq 0.5$).

Estimation of parameters

TABLE 1
Values of calibrated parameters

Description	Parameter	Value
Structural parameters		
Weight of private spending in effective consumption	ϕ	0.8
Curvature parameter	ϵ	2.0
Elasticity of output with respect to capital	α	0.36
Depreciation rate of capital	δ	0.025
Steady-state values		
Fraction of time worked	N	0.31
Government-spending-to-output ratio	G/Y	0.2

TABLE 2
Maximum-likelihood estimates

Description	Parameter	Estimate
Elasticity of substitution	ν	0.3320
		(0.0478)
Habit-formation parameter	γ	0.2497
		(0.1240)
Subjective discount factor	β	0.9999
		(0.0075)
Adjustment-cost parameter	κ	0.9503
		(2.2956)
Autocorrelation coefficient of A_t	ρ_A	0.8726
		(0.0341)
Autocorrelation coefficient of G_t	ρ_G	0.9118
		(0.0592)
Standard deviation of μ_{At}	σ_{μ_A}	0.0047
		(0.0005)
Standard deviation of μ_{Gt}	σ_{μ_G}	0.0127
		(0.0028)

NOTES: Figures between parentheses are standard errors. The restrictions imposed on the parameters are $\gamma, \beta \in (0, 1)$, $\rho_A, \rho_G \in (-1, 1)$, and $\nu, \kappa, \sigma_{\mu_A}, \sigma_{\mu_G} \in (0, \infty)$.

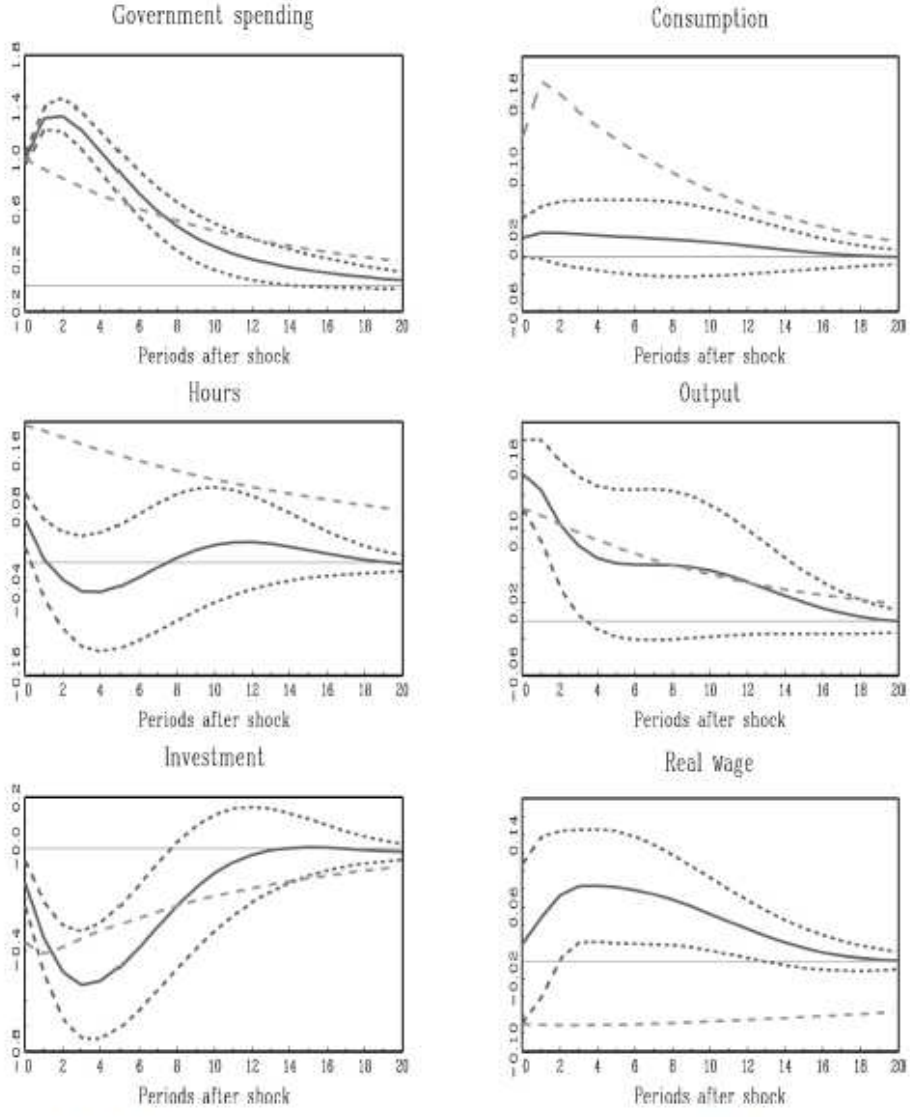


FIGURE 5 Impulse responses to a 1% government spending shock. Solid lines: VAR-based responses; dotted lines: error bands; dashed lines: model-based responses

Conclusions

- Strong complementarity between public and private spending.
- Limited habit formation.
- Estimated model replicates quite well the IR of macro variables to a G shock (non-monotonicity and $\nearrow$ in C, U-shape of I).
- Model replicates 2nd moments beter than standard RBC.

- Not all types of public goods are complements!
- Optimal behavior of government?