Would the euro area benefit from greater labor mobility? Technical Appendix*

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Abstract

We assess how within euro area labor mobility impacts economic dynamics in response to shocks. In the analysis we use an estimated two-region monetary union dynamic stochastic general equilibrium model that allows for a varying degree of labor mobility across regions. We find that, in contrast with traditional optimal currency area predictions, enhanced labor mobility can either mitigate or exacerbate the extent to which the two regions respond differently to shocks. The effects depend crucially on the nature of shocks and variable of interest. In some circumstances, even when it contributes to aligning the responses of the two regions, labor mobility may complicate monetary policy tradeoffs. Moreover, the presence and strength of financial frictions have important implications for the effects of labor mobility. If the periphery's risk premium is more responsive to its indebtedness than our estimates, there are various shocks for which labor mobility may help stabilize the economy. Finally, the euro area's economic performance following the Global Financial Crisis would not have been necessarily smoother with enhanced labor mobility.

JEL classification codes: F41, F45, E44, E3, E4

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A Model details

We set the model in terms of a monetary union (MU) with two regions, denoted by $j \in \{\mathcal{C}, \mathcal{P}\}$, with mass of households equal to ϖ^j. Each region consumes goods from each other's firms, and provides labor to each other, except in the case of region specific labor. Monetary Policy is MU-wide. We characterize the economy of the $\mathcal{C}$ but the one for the $\mathcal{P}$ is perfectly symmetric, except where noted.

A.1 Households

The representative household in region $\mathcal{C}$ chooses paths for consumption, $C_t^{\mathcal{C}}$, and labor supply to each labor market, $L_{\mathcal{C},t}^{\mathcal{C}}$ and $L_{\mathcal{P},t}^{\mathcal{C}}$, in order to maximize the following intertemporal utility function:

$$E_t \sum_{T=t}^{\infty} (\beta^{\mathcal{C}})^T \xi_{\beta,T}^{\mathcal{C}} \left[\frac{\left(\frac{C_T^{\mathcal{C}}}{Z_T^{\mathcal{C}}} - h^{\mathcal{C}} \frac{C_{T-1}^{\mathcal{C}}}{Z_{T-1}^{\mathcal{C}}} \right)^{1-\sigma^{\mathcal{C}}}}{1-\sigma^{\mathcal{C}}} - \varphi^{\mathcal{C}} \xi_{l,T}^{\mathcal{C}} \frac{\left(\tilde{L}_T^{\mathcal{C}} \right)^{1+\nu^{\mathcal{C}}}}{1+\nu^{\mathcal{C}}} \right],$$

where $Z_t^{\mathcal{C}}$ is total factor productivity, $\beta^{\mathcal{C}} \in (0,1)$ is the time discount factor, $\xi_{\beta,t}^{\mathcal{C}}$ is a temporary shock to the time discount factor, $h^{\mathcal{C}} \in (0,1)$ is the parameter controlling the degree of consumption habits, and $\sigma^{\mathcal{C}} > 0$ is the coefficient of relative risk-aversion, $\xi_{l,t}^{\mathcal{C}}$ is a temporary shock to the relative disutility of labor, and $\nu^{\mathcal{C}} > 0$ controls the convexity of disutility. The aggregate $\tilde{L}_t^{\mathcal{C}}$ represents the disutility of supplying labor to firms in each of the two regions, given by

$$\tilde{L}_t^{\mathcal{C}} \equiv \left[(\gamma_l^{\mathcal{C}})^{-\frac{1}{\eta_l^{\mathcal{C}}}} (L_{\mathcal{C},t}^{\mathcal{C}})^{\frac{\eta_l^{\mathcal{C}}+1}{\eta_l^{\mathcal{C}}}} + (1-\gamma_l^{\mathcal{C}})^{-\frac{1}{\eta_l^{\mathcal{C}}}} (L_{\mathcal{P},t}^{\mathcal{C}})^{\frac{\eta_l^{\mathcal{C}}+1}{\eta_l^{\mathcal{C}}}} \right]^{\frac{\eta_l^{\mathcal{C}}}{\eta_l^{\mathcal{C}}+1}} \tag{A.1}$$

where $\eta_l^{\mathcal{C}}$ controls the sensitivity of labor supply to the relative wage differential in the two regions, $L_{j,t}^{\mathcal{C}}$ is labor supplied to firms of region j, and $\gamma_l^{\mathcal{C}} \in [0,1)$ controls the home bias in labor supply.

The budget constraint is given by:

$$P_t^{\mathcal{C}} C_t^{\mathcal{C}} + B_t^{\mathcal{C}} + (1+\Upsilon_t) B_{\mathcal{P},t}^{\mathcal{C}} = R_{t-1} B_{t-1}^{\mathcal{C}} + R_{t-1}^{\mathcal{P}} B_{\mathcal{P},t-1}^{\mathcal{C}} + W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{C}} + W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} + \mathcal{D}_t^{\mathcal{C}} + \mathcal{T}_t^{\mathcal{C}}, \tag{A.2}$$

where $P_t^{\mathcal{C}}$ is the aggregate price level in region $\mathcal{C}$, $B_t^{\mathcal{C}}$ is the nominal value of government bonds from region $\mathcal{C}$, R_t is the gross nominal gross interest rate of government bonds issued by region $\mathcal{C}$ in period t, $B_{\mathcal{P},t}^{\mathcal{C}}$ is the nominal value of bonds from region $\mathcal{P}$ held by households of region $\mathcal{C}$ (per capita), Υ_t is a transaction cost incurred to invest in bonds from region $\mathcal{P}$, $R_t^{\mathcal{P}}$ is the gross yield on bonds from region $\mathcal{P}$ issued in period t, W_t^j is the wage rate received for labor supplied to region j, $\mathcal{D}_t^{\mathcal{C}}$ are the dividends distributed by the firms, and $\mathcal{T}_t^{\mathcal{C}}$ are government net transfers to the households.

The budget constraint for households of region $\mathcal{P}$ is different to reflect their inability to invest or borrow using bonds from region $\mathcal{C}$. Instead they can borrow in type $\mathcal{P}$ bonds. Their budget constraint is given by:

$$P_t^{\mathcal{P}} C_t^{\mathcal{P}} - B_t^{\mathcal{P}} = -R_{t-1}^{\mathcal{P}} B_{t-1}^{p} + W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{P}} + W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{P}} + \mathcal{D}_t^{\mathcal{P}} + \mathcal{T}_t^{\mathcal{P}}, \tag{A.3}$$

where $B_t^{\mathcal{P}}$ is the per capita level of borrowing by households of region $\mathcal{P}$.

The transaction cost is taken as a given by the households, but is determined in equilibrium by

$$1 + \Upsilon_t = (1 + \Upsilon) \exp \left[\upsilon \left(\frac{B_t^{\mathcal{P}}}{P_{y,t}^{\mathcal{P}} Y_t^{\mathcal{P}}} - b_y^{\mathcal{P}} \right) + \xi_{B,t} \right], \tag{A.4}$$

where Υ is the steady state risk premium, υ controls the elasticity of the term premium with respect to the ratio of debt to nominal output, $B_t^{\mathcal{P}}$ is the total amount of bonds issued by region $\mathcal{P}$, $Y_t^{\mathcal{P}}$ is the level of real output in region $\mathcal{P}$, $P_{y,t}^{\mathcal{P}}$ is the price level of output in region $\mathcal{P}$, $b_y^{\mathcal{P}}$ is the steady state ratio of debt to nominal output in region $\mathcal{P}$, and $\xi_{B,t}$ is an exogenous shock to the term premium.

The FOC w.r.t. consumption is given by

$$0 = \frac{\xi_{\beta,t}^{\mathcal{C}}}{Z_t^{\mathcal{C}}} \left(\frac{C_t^{\mathcal{C}}}{Z_t^{\mathcal{C}}} - h^{\mathcal{C}} \frac{C_{t-1}^{\mathcal{C}}}{Z_{t-1}^{\mathcal{C}}} \right)^{-\sigma^{\mathcal{C}}} - \beta^{\mathcal{C}} h^{\mathcal{C}} E_t \left[\frac{\xi_{\beta,t+1}^{\mathcal{C}}}{Z_t^{\mathcal{C}}} \left(\frac{C_{t+1}^{\mathcal{C}}}{Z_{t+1}^{\mathcal{C}}} - h^{\mathcal{C}} \frac{C_t^{\mathcal{C}}}{Z_t^{\mathcal{C}}} \right)^{-\sigma^{\mathcal{C}}} \right] - \tilde{\lambda}_t^{\mathcal{C}} P_t^{\mathcal{C}}$$

and define $\lambda_t^{\mathcal{C}} \equiv \tilde{\lambda}_t^{\mathcal{C}} P_t^{\mathcal{C}} Z_t^{\mathcal{C}}$ as the real detrended multiplier, and $C_{z,t}^{\mathcal{C}} \equiv C_t^{\mathcal{C}} / Z_t^{\mathcal{C}}$ as detrended consumption. We can then write

$$\lambda_t^{\mathcal{C}} = \xi_{\beta,t}^{\mathcal{C}} \left(C_{z,t}^{\mathcal{C}} - h^{\mathcal{C}} C_{z,t-1}^{\mathcal{C}} \right)^{-\sigma^{\mathcal{C}}} - \beta^{\mathcal{C}} h^{\mathcal{C}} E_t \left[\xi_{\beta,t+1}^{\mathcal{C}} \left(C_{z,t+1}^{\mathcal{C}} - h^{\mathcal{C}} C_{z,t}^{\mathcal{C}} \right)^{-\sigma^{\mathcal{C}}} \right] \tag{A.5}$$

The marginal utility for region $\mathcal{P}$ households is similarly given by

$$\lambda_t^{\mathcal{P}} = \xi_{\beta,t}^{\mathcal{P}} \left(C_{z,t}^{\mathcal{P}} - h^{\mathcal{P}} C_{z,t-1}^{\mathcal{P}} \right)^{-\sigma^{\mathcal{P}}} - \beta^{\mathcal{P}} h^{\mathcal{P}} E_t \left[\xi_{\beta,t+1}^{\mathcal{P}} \left(C_{z,t+1}^{\mathcal{P}} - h^{\mathcal{P}} C_{z,t}^{\mathcal{P}} \right)^{-\sigma^{\mathcal{P}}} \right]. \tag{A.6}$$

The FOC w.r.t. bonds of region $\mathcal{C}$ is given by

$$0 = \beta^{\mathcal{C}} E_t \left[\tilde{\lambda}_{t+1}^{\mathcal{C}} R_t \right] - \tilde{\lambda}_t^{\mathcal{C}}$$

hence

$$1 = E_t \left[\beta^{\mathcal{C}} \frac{\lambda_{t+1}^{\mathcal{C}}}{\lambda_t^{\mathcal{C}}} \frac{R_t}{e^{\gamma} \xi_{z,t+1}^{\mathcal{C}} \Pi_{t+1}^{\mathcal{C}}} \right], \tag{A.7}$$

where $\Pi_t^{\mathcal{C}} \equiv P_t^{\mathcal{C}} / P_{t-1}^{\mathcal{C}}$ is the gross inflation rate; γ is the steady state rate of growth for both regions; and $\xi_{z,t}^{\mathcal{C}} \equiv Z_t^{\mathcal{C}} / Z_{t-1}^{\mathcal{C}} e^{-\gamma}$ is the gross growth rate of productivity in region $\mathcal{C}$, in deviations from steady state growth rate.

The FOC w.r.t. bonds of region $\mathcal{P}$ is given by

$$0 = \beta^{\mathcal{C}} E_t \left[\tilde{\lambda}^{\mathcal{C}}_{t+1} \frac{R^{\mathcal{P}}_t}{1+\Upsilon_t} \right] - \tilde{\lambda}^{\mathcal{C}}_t$$

hence

$$1 = E_t \left[\beta^{\mathcal{C}} \frac{\lambda^{\mathcal{C}}_{t+1}}{\lambda^{\mathcal{C}}_t} \frac{R^{\mathcal{P}}_t}{e^{\gamma} \xi^{\mathcal{C}}_{z,t+1} \Pi^{\mathcal{C}}_{t+1} (1+\Upsilon_t)} \right]. \tag{A.8}$$

The FOC w.r.t borrowing by region $\mathcal{P}$ is given by:

$$1 = E_t \left[\beta^{p} \frac{\lambda^{\mathcal{P}}_{t+1}}{\lambda^{\mathcal{P}}_t} \frac{\xi^{\mathcal{P}}_{z,t}}{\xi^{\mathcal{P}}_{z,t+1}} \frac{R^{\mathcal{P}}_t}{e^{\gamma} \xi^{\mathcal{C}}_{z,t+1} \Pi^{\mathcal{P}}_{t+1}} \right], \tag{A.9}$$

where we assume that $Z^{\mathcal{P}}_t \equiv Z^{\mathcal{C}}_t \xi^{\mathcal{P}}_{z,t}$.

For convenience, define the pricing kernel of nominal cash flows, $\Lambda^{\mathcal{C}}_{t,T}$

$$\Lambda^{\mathcal{C}}_{t,T} \equiv (\beta^{\mathcal{C}})^{T-t} \frac{\lambda^{\mathcal{C}}_T}{\lambda^{\mathcal{C}}_t} \frac{Z^{\mathcal{C}}_t}{Z^{\mathcal{C}}_T} \frac{P^{\mathcal{C}}_t}{P^{\mathcal{C}}_T}.$$

The FOC w.r.t. labor supplied are

$$L^{\mathcal{C}}_{\mathcal{C},t} = \gamma^{\mathcal{C}}_l \left(\frac{W^{\mathcal{C}}_t}{\tilde{W}^{\mathcal{C}}_t} \right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}}_t$$

$$L^{\mathcal{C}}_{\mathcal{P},t} = (1-\gamma^{\mathcal{C}}_l) \left(\frac{W^{\mathcal{P}}_t}{\tilde{W}^{\mathcal{C}}_t} \right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}}_t$$

with

$$\varphi^{\mathcal{C}} \xi^{\mathcal{C}}_{l,t} (\tilde{L}^{\mathcal{C}}_t)^{\nu^{\mathcal{C}}} = \tilde{\lambda}^{\mathcal{C}}_t \tilde{W}^{\mathcal{C}}_t,$$

and $\tilde{W}^{\mathcal{C}}_t$ is an auxiliary aggregate wage such that

$$(\tilde{W}^{\mathcal{C}}_t)^{1+\eta^{\mathcal{C}}_l} = \gamma^{\mathcal{C}}_l (W^{\mathcal{C}}_t)^{1+\eta^{\mathcal{C}}_l} + (1-\gamma^{\mathcal{C}}_l)(W^{\mathcal{P}}_t)^{1+\eta^{\mathcal{C}}_l}.$$

Define $w^j_{z,t} \equiv W^j_t/(P^j_t Z^j_t)$ as the detrended real wage paid by firms in region j, and similarly for $\tilde{w}^j_{z,t}$. Also define the real exchange rate for region $\mathcal{P}$ as

$$s_t \equiv P^{\mathcal{C}}_t / P^{\mathcal{P}}_t, \tag{A.10}$$

so that we can write

$$L^{\mathcal{C}}_{\mathcal{C},t} = \gamma^{\mathcal{C}}_l \left(\frac{w^{\mathcal{C}}_{z,t}}{\tilde{w}^{\mathcal{C}}_{z,t}} \right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}}_t \tag{A.11}$$

$$L^{\mathcal{C}}_{\mathcal{P},t} = (1-\gamma^{\mathcal{C}}_l) \left(\frac{\xi^{\mathcal{P}}_{z,t}}{s_t} \frac{w^{\mathcal{P}}_{z,t}}{\tilde{w}^{\mathcal{C}}_{z,t}} \right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}}_t \tag{A.12}$$

with

$$\varphi^{\mathcal{C}} \xi^{\mathcal{C}}_{l,t} (\tilde{L}^{\mathcal{C}}_t)^{\nu^{\mathcal{C}}} = \lambda^{\mathcal{C}}_t \tilde{w}^{\mathcal{C}}_{z,t}, \tag{A.13}$$

and

$$(\tilde{w}^{\mathcal{C}}_{z,t})^{1+\eta^{\mathcal{C}}_l} = \gamma^{\mathcal{C}}_l (w^{\mathcal{C}}_{z,t})^{1+\eta^{\mathcal{C}}_l} + (1-\gamma^{\mathcal{C}}_l) \left(\frac{\xi^{\mathcal{P}}_{z,t}}{s_t} w^{\mathcal{P}}_{z,t} \right)^{1+\eta^{\mathcal{C}}_l}. \tag{A.14}$$

Similarly we can write labor supply relations for region $\mathcal{P}$:

$$L^{\mathcal{P}}_{\mathcal{P},t} = \gamma^{\mathcal{P}}_l \left(\frac{w^{\mathcal{P}}_{z,t}}{\tilde{w}^{\mathcal{P}}_{z,t}} \right)^{\eta^{\mathcal{P}}_l} \tilde{L}^{\mathcal{P}}_t \tag{A.15}$$

$$L^{\mathcal{P}}_{\mathcal{C},t} = (1-\gamma^{\mathcal{P}}_l) \left(\frac{s_t}{\xi^{\mathcal{P}}_{z,t}} \frac{w^{\mathcal{C}}_{z,t}}{\tilde{w}^{\mathcal{P}}_{z,t}} \right)^{\eta^{\mathcal{P}}_l} \tilde{L}^{\mathcal{P}}_t \tag{A.16}$$

with

$$\varphi^{\mathcal{P}} \xi^{\mathcal{P}}_{l,t} (\tilde{L}^{\mathcal{P}}_t)^{\nu^{\mathcal{P}}} = \lambda^{\mathcal{P}}_t \tilde{w}^{\mathcal{P}}_{z,t}, \tag{A.17}$$

and

$$(\tilde{w}^{\mathcal{P}}_{z,t})^{1+\eta^{\mathcal{P}}_l} = \gamma^{\mathcal{P}}_l (w^{\mathcal{P}}_{z,t})^{1+\eta^{\mathcal{P}}_l} + (1-\gamma^{\mathcal{P}}_l) \left(\frac{s_t}{\xi^{\mathcal{P}}_{z,t}} w^{\mathcal{C}}_{z,t} \right)^{1+\eta^{\mathcal{P}}_l}. \tag{A.18}$$

A.2 Final Goods Firms

The final good is produced combining intermediate goods from both regions according to the following technology:

$$\mathcal{Y}^{\mathcal{C}}_t = \left((\gamma^{\mathcal{C}}_y)^{\frac{1}{\eta^{\mathcal{C}}_y}} (Y^{\mathcal{C}}_{\mathcal{C},t})^{\frac{\eta^{\mathcal{C}}_y - 1}{\eta^{\mathcal{C}}_y}} + (1-\gamma^{\mathcal{C}}_y)^{\frac{1}{\eta^{\mathcal{C}}_y}} (Y^{\mathcal{C}}_{\mathcal{P},t})^{\frac{\eta^{\mathcal{C}} - 1}{\eta^{\mathcal{C}}_y}} \right)^{\frac{\eta^{\mathcal{C}}_y}{\eta^{\mathcal{C}}_y - 1}}, \tag{A.19}$$

where $\mathcal{Y}^{\mathcal{C}}_t$ is the level of final goods of region $\mathcal{C}$, $Y^{\mathcal{C}}_{j,t}$ is the amount of region j's intermediate goods used by region $\mathcal{C}$, $\eta^{\mathcal{C}}_y > 0$ is the elasticity of substitution across intermediate goods from the two regions, and $\gamma^{\mathcal{C}}_y \in [0, 1)$ controls home bias of consumption.

The price of intermediate goods produced by region j is $P^j_{y,t}$. We set all relative prices relative to corresponding region's final goods prices, $p^j_{y,t} \equiv P^j_{y,t}/P^j_t$.

Cost minimization implies

$$Y^{\mathcal{C}}_{\mathcal{C},t} = \gamma^{\mathcal{C}}_y \left(\frac{P^{\mathcal{C}}_{y,t}}{P^{\mathcal{C}}_t}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_t$$

$$Y^{\mathcal{C}}_{\mathcal{P},t} = (1-\gamma^{\mathcal{C}}_y) \left(\frac{P^{\mathcal{P}}_{y,t}}{P^{\mathcal{C}}_t}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_t$$

and after normalizing by productivity and using relative prices, we get

$$Y^{\mathcal{C}}_{\mathcal{C}z,t} = \gamma^{\mathcal{C}}_y \left(p^{\mathcal{C}}_{y,t}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_{z,t}, \tag{A.20}$$

$$Y^{\mathcal{C}}_{\mathcal{P}z,t} = (1-\gamma^{\mathcal{C}}_y) \left(\frac{p^{\mathcal{P}}_{y,t}}{s_t}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_{z,t}, \tag{A.21}$$

where $Y^{\mathcal{C}}_{jz,t} \equiv Y^{\mathcal{C}}_{\mathcal{C},t}/Z^{\mathcal{C}}_t$ and $\mathcal{Y}^{\mathcal{C}}_{z,t} \equiv \mathcal{Y}^{\mathcal{C}}_t/Z^{\mathcal{C}}_t$.

Relative prices satisfy

$$1 = \gamma^{\mathcal{C}}_y (p^{\mathcal{C}}_{y,t})^{1-\eta^{\mathcal{C}}_y} + (1-\gamma^{\mathcal{C}}_y) \left(\frac{p^{\mathcal{P}}_{y,t}}{s_t}\right)^{1-\eta^{\mathcal{C}}_y}. \tag{A.22}$$

Similarly,

$$Y^{\mathcal{P}}_{\mathcal{P}z,t} = \gamma^{\mathcal{P}}_y \left(p^{\mathcal{P}}_{y,t}\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_{z,t}. \tag{A.23}$$

$$Y^{\mathcal{P}}_{\mathcal{C}z,t} = (1-\gamma^{\mathcal{P}}_y) \left(s_t p^{\mathcal{C}}_{y,t}\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_{z,t} \tag{A.24}$$

and

$$1 = \gamma^{\mathcal{P}}_y (p^{\mathcal{P}}_{y,t})^{1-\eta^{\mathcal{P}}_y} + (1-\gamma^{\mathcal{P}}_y) \left(s_t p^{\mathcal{C}}_{y,t}\right)^{1-\eta^{\mathcal{P}}_y}. \tag{A.25}$$

A.3 Intermediate goods

There is a continuum of firms, with aggregate demand given by

$$Y^{\mathcal{C}}_t = \left(\int_0^1 Y^{\mathcal{C}}_t(i)^{\frac{\theta-1}{\theta}} di\right)^{\frac{\theta}{\theta-1}} \tag{A.26}$$

where $\theta > 0$ is the price elasticity across varieties within each sector.

Cost minimization implies

$$0 = P^{\mathcal{C}}_{y,t} Y^{\mathcal{C}}_t(i)^{-\frac{1}{\theta}} \left(\int_0^1 Y^{\mathcal{C}}_t(i)^{\frac{\theta-1}{\theta}} di\right)^{\frac{\theta}{\theta-1}\frac{1}{\theta}} - P^{\mathcal{C}}_{y,t}(i)$$

which leads to the following demand

$$Y_t^{\mathcal{C}}(i) = \left(\frac{P_{y,t}^{\mathcal{C}}(i)}{P_{y,t}^{\mathcal{C}}}\right)^{-\theta} Y_t^{\mathcal{C}}, \tag{A.27}$$

and the intermediate goods price level is determined by

$$P_{y,t}^{\mathcal{C}} = \left(\int_0^1 P_{y,t}^{\mathcal{C}}(i)^{1-\theta} di\right)^{\frac{1}{1-\theta}} \tag{A.28}$$

Each individual firm uses the following technology:

$$Y_t^{\mathcal{C}}(i) = Z_t^{\mathcal{C}} L_t^{\mathcal{C}}(i), \tag{A.29}$$

where $L_t^{\mathcal{C}}(i)$ is the labor used by firm i in region $\mathcal{C}$, regardless of where that labor originated.

Labor demand is:

$$L_t^{\mathcal{C}}(i) = \frac{Y_t^{\mathcal{C}}(i)}{Z_t^{\mathcal{C}}}. \tag{A.30}$$

The marginal cost is equal across firms,

$$MC_t^{\mathcal{C}} = \frac{W_t^{\mathcal{C}}}{Z_t^{\mathcal{C}}}$$

and in real terms becomes

$$mc_t^{\mathcal{C}} \equiv \frac{MC_t^{\mathcal{C}}}{P_t^{\mathcal{C}}} = w_{z,t}^{\mathcal{C}}. \tag{A.31}$$

Each individual firm's profits are

$$\mathcal{D}_t^{f,\mathcal{C}}(i) = \left[P_{y,t}^{\mathcal{C}}(i) - \xi_{p,t}^{\mathcal{C}} MC_t^{\mathcal{C}}\right] \left(\frac{P_{y,t}^{\mathcal{C}}(i)}{P_{y,t}^{\mathcal{C}}}\right)^{-\theta} Y_t^{\mathcal{C}}(i)$$

where $\xi_{p,t}^{\mathcal{C}}$ is an exogenous markup over marginal costs.

We assume that a fraction $\alpha_p^{\mathcal{C}}$ of firms are not able to re-optimize their price in any given period. In that case they simply index the current price according to

$$P_{y,t}^{\mathcal{C}}(i) = P_{y,t-1}^{\mathcal{C}}(i)(\Pi_{t-1}^{\mathcal{C}})^{\iota_p^{\mathcal{C}}} \Pi^{1-\iota_p^{\mathcal{C}}} \tag{A.32}$$

where Π is steady state gross inflation rate assumed constant across regions, and $\iota_p^{\mathcal{C}}$ is the indexation parameter. This setup implies that each firm that can re-optimize in period t chooses its price level

$\bar{P}^{\mathcal{C}}_{y,t}(i)$ to maximize

$$E_t \sum_{T=t}^{\infty} \left\{ (\alpha^{\mathcal{C}}_p)^{T-t} \Lambda^{\mathcal{C}}_{t,T} \left[\bar{P}^{\mathcal{C}}_{y,t}(i) \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{\iota^{\mathcal{C}}_p} \Pi^{(1-\iota^{\mathcal{C}}_p)(T-t)} - \xi^{\mathcal{C}}_{p,T} MC^{\mathcal{C}}_T \right] \right.$$
$$\left. \times \left[\frac{\bar{P}^{\mathcal{C}}_{y,t}(i)}{P^{\mathcal{C}}_{y,T}} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{\iota^{\mathcal{C}}_p} \Pi^{(1-\iota^{\mathcal{C}}_p)(T-t)} \right]^{-\theta} Y^{\mathcal{C}}_T \right\}$$

FOC is

$$0 = E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p)^{T-t} \Lambda^{\mathcal{C}}_{t,T} (1-\theta) \bar{P}^{\mathcal{C}}_{y,t}(i) (P^{\mathcal{C}}_{y,T})^{\theta} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{(1-\theta)\iota^{\mathcal{C}}_p} \Pi^{(1-\theta)(1-\iota^{\mathcal{C}}_p)(T-t)} Y^{\mathcal{C}}_T$$
$$- E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p)^{T-t} \Lambda^{\mathcal{C}}_{t,T} (-\theta) \bar{P}^{\mathcal{C}}_{y,t}(i)^{-\theta-1} (P^{\mathcal{C}}_{y,T})^{\theta} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{-\theta\iota^{\mathcal{C}}_p} \Pi^{-\theta(1-\iota^{\mathcal{C}}_p)(T-t)} \xi^{\mathcal{C}}_{p,T} MC^{\mathcal{C}}_T Y^{\mathcal{C}}_T.$$

Notice that all firms face the same problem, so that we can write as

$$\bar{P}^{\mathcal{C}}_{y,t} = \frac{E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p)^{T-t} \Lambda^{\mathcal{C}}_{t,T} \frac{\theta}{\theta-1} \xi^{\mathcal{C}}_{p,T} MC^{\mathcal{C}}_T (P^{\mathcal{C}}_{y,T})^{\theta} Y^{\mathcal{C}}_T \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{-\theta\iota^{\mathcal{C}}_p} \Pi^{-\theta(1-\iota^{\mathcal{C}}_p)(T-t)}}{E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p)^{T-t} \Lambda^{\mathcal{C}}_{t,T} (P^{\mathcal{C}}_{y,T})^{\theta} Y^{\mathcal{C}}_T \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{(1-\theta)\iota^{\mathcal{C}}_p} \Pi^{(1-\theta)(1-\iota^{\mathcal{C}}_p)(T-t)}}$$

Plug in the pricing kernel and write in real terms

$$\frac{\bar{P}^{\mathcal{C}}_{y,t}}{P^{\mathcal{C}}_t} = \frac{E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p \beta^{\mathcal{C}})^{T-t} \lambda^{\mathcal{C}}_T \frac{\theta}{\theta-1} \xi^{\mathcal{C}}_{p,T} mc^{\mathcal{C}}_T Y^{\mathcal{C}}_{z,T} \left(p^{\mathcal{C}}_{y,T} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_T}{P^{\mathcal{C}}_t} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{-\theta\iota^{\mathcal{C}}_p} \Pi^{-\theta(1-\iota^{\mathcal{C}}_p)(T-t)}}{E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p \beta^{\mathcal{C}})^{T-t} \lambda^{\mathcal{C}}_T Y^{\mathcal{C}}_{z,T} \left(p^{\mathcal{C}}_{y,T} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_T}{P^{\mathcal{C}}_t} \right)^{\theta-1} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{(1-\theta)\iota_p} \Pi^{(1-\theta)(1-\iota^{\mathcal{C}}_p)(T-t)}}$$

The FOC can be restated as

$$\bar{p}^{\mathcal{C}}_{y,t} \equiv \frac{\bar{P}^{\mathcal{C}}_{y,t}}{P^{\mathcal{C}}_t} = \frac{X^{\mathcal{C}}_{pn,t}}{X^{\mathcal{C}}_{pd,t}},$$

with

$$X^{\mathcal{C}}_{pn,t} \equiv E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p \beta^{\mathcal{C}})^{T-t} \lambda^{\mathcal{C}}_T \frac{\theta}{\theta-1} \xi^{\mathcal{C}}_{p,T} mc^{\mathcal{C}}_T Y^{\mathcal{C}}_{z,s,T} \left(p^{\mathcal{C}}_{y,T} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_T}{P^{\mathcal{C}}_t} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{-\theta\iota^{\mathcal{C}}_p} \Pi^{-\theta(1-\iota^{\mathcal{C}}_p)(T-t)}$$
$$X^{\mathcal{C}}_{pd,t} \equiv E_t \sum_{T=t}^{\infty} (\alpha^{\mathcal{C}}_p \beta^{\mathcal{C}})^{T-t} \lambda^{\mathcal{C}}_T Y^{\mathcal{C}}_{z,T} \left(p^{\mathcal{C}}_{y,T} \right)^{\theta} \left(\frac{P^{\mathcal{C}}_T}{P^{\mathcal{C}}_t} \right)^{\theta-1} \left(\frac{P^{\mathcal{C}}_{T-1}}{P^{\mathcal{C}}_{t-1}} \right)^{(1-\theta)\iota_p} \Pi^{(1-\theta)(1-\iota^{\mathcal{C}}_p)(T-t)}$$

which we can write in recursive form

$$X_{pn,t}^{\mathcal{C}} = \frac{\theta}{\theta - 1}\lambda_t^{\mathcal{C}}\xi_{p,t}^{\mathcal{C}}w_{z,t}^{\mathcal{C}}(p_{y,T}^{\mathcal{C}})^{\theta}Y_{z,t}^{\mathcal{C}} + \alpha_p^{\mathcal{C}}\beta^{\mathcal{C}}E_t\left[\left(\frac{\Pi_{t+1}^{\mathcal{C}}}{(\Pi_t^{\mathcal{C}})^{\iota_p^{\mathcal{C}}}\Pi^{1-\iota_p^{\mathcal{C}}}}\right)^{\theta}X_{pn,t+1}^{\mathcal{C}}\right] \tag{A.33}$$

$$X_{pd,t}^{\mathcal{C}} = \lambda_t^{\mathcal{C}}(p_{y,T}^{\mathcal{C}})^{\theta}Y_{z,t}^{\mathcal{C}} + \alpha_p^{\mathcal{C}}\beta^{\mathcal{C}}E_t\left[\left(\frac{\Pi_{t+1}^{\mathcal{C}}}{(\Pi_t^{\mathcal{C}})^{\iota_p^{\mathcal{C}}}\Pi^{1-\iota_p^{\mathcal{C}}}}\right)^{\theta-1}X_{pd,t+1}^{\mathcal{C}}\right] \tag{A.34}$$

The price index for region $\mathcal{C}$ is given by

$$p_{y,t}^{\mathcal{C}} = \left[(1-\alpha_p^{\mathcal{C}})\left(\frac{X_{pn,t}^{\mathcal{C}}}{X_{pd,t}^{\mathcal{C}}}\right)^{1-\theta} + \alpha_p^{\mathcal{C}}\left(p_{y,t-1}^{\mathcal{C}}\frac{(\Pi_{t-1}^{\mathcal{C}})^{\iota_p^{\mathcal{C}}}\Pi^{1-\iota_p^{\mathcal{C}}}}{\Pi_t^{\mathcal{C}}}\right)^{1-\theta}\right]^{\frac{1}{1-\theta}} \tag{A.35}$$

Similarly we can write the price setting equations for region $\mathcal{P}$:

$$X_{pn,t}^{\mathcal{P}} = \frac{\theta}{\theta - 1}\lambda_t^{\mathcal{P}}\xi_{p,t}^{\mathcal{P}}w_{z,t}^{\mathcal{P}}(p_{y,T}^{\mathcal{P}})^{\theta}Y_{z,t}^{\mathcal{P}} + \alpha_p^{\mathcal{P}}\beta^{\mathcal{P}}E_t\left[\left(\frac{\Pi_{t+1}^{\mathcal{P}}}{(\Pi_t^{\mathcal{P}})^{\iota_p^{\mathcal{P}}}\Pi^{1-\iota_p^{\mathcal{P}}}}\right)^{\theta}X_{pn,t+1}^{\mathcal{P}}\right] \tag{A.36}$$

$$X_{pd,t}^{\mathcal{P}} = \lambda_t^{\mathcal{P}}(p_{y,T}^{\mathcal{P}})^{\theta}Y_{z,t}^{\mathcal{P}} + \alpha_p^{\mathcal{P}}\beta^{\mathcal{P}}E_t\left[\left(\frac{\Pi_{t+1}^{\mathcal{P}}}{(\Pi_t^{\mathcal{P}})^{\iota_p^{\mathcal{P}}}\Pi^{1-\iota_p^{\mathcal{P}}}}\right)^{\theta-1}X_{pd,t+1}^{\mathcal{P}}\right] \tag{A.37}$$

and

$$p_{y,t}^{\mathcal{P}} = \left[(1-\alpha_p^{\mathcal{P}})\left(\frac{X_{pn,t}^{\mathcal{P}}}{X_{pd,t}^{\mathcal{P}}}\right)^{1-\theta} + \alpha_p^{\mathcal{P}}\left(p_{y,t-1}^{\mathcal{P}}\frac{(\Pi_{t-1}^{\mathcal{P}})^{\iota_p^{\mathcal{P}}}\Pi^{1-\iota_p^{\mathcal{P}}}}{\Pi_t^{\mathcal{P}}}\right)^{1-\theta}\right]^{\frac{1}{1-\theta}} \tag{A.38}$$

A.4 Market Clearing

Labor market clearing (per capita):

$$\varpi^{\mathcal{C}}L_t^{\mathcal{C}} = \varpi^{\mathcal{C}}L_{\mathcal{C},t}^{\mathcal{C}} + \varpi^{\mathcal{P}}L_{\mathcal{C},t}^{\mathcal{P}}, \tag{A.39}$$

$$\varpi^{\mathcal{P}}L_t^{\mathcal{P}} = \varpi^{\mathcal{C}}L_{\mathcal{P},t}^{\mathcal{C}} + \varpi^{\mathcal{P}}L_{\mathcal{P},t}^{\mathcal{P}}. \tag{A.40}$$

Intermediate goods markets clear (per capita):

$$\varpi^{\mathcal{C}}Y_t^{\mathcal{C}} = \varpi^{\mathcal{C}}Y_{\mathcal{C},t}^{\mathcal{C}} + \varpi^{\mathcal{P}}Y_{\mathcal{C},t}^{\mathcal{P}},$$

$$\varpi^{\mathcal{P}}Y_t^{\mathcal{P}} = \varpi^{\mathcal{C}}Y_{\mathcal{P},t}^{\mathcal{C}} + \varpi^{\mathcal{P}}Y_{\mathcal{P},t}^{\mathcal{P}}.$$

and after normalizing:

$$\varpi^{\mathcal{C}} Y_{z,t}^{\mathcal{C}} = \varpi^{\mathcal{C}} Y_{\mathcal{C}z,t}^{\mathcal{C}} + \varpi^{\mathcal{P}} \xi_{z,t}^{\mathcal{P}} Y_{\mathcal{C}z,t}^{\mathcal{P}}, \tag{A.41}$$

$$\varpi^{\mathcal{P}} Y_{z,t}^{\mathcal{P}} = \varpi^{\mathcal{C}} \frac{Y_{\mathcal{P}z,t}^{\mathcal{C}}}{\xi_{z,t}^{\mathcal{P}}} + \varpi^{\mathcal{P}} Y_{\mathcal{P}z,t}^{\mathcal{P}}. \tag{A.42}$$

Bonds clearing condition:

$$\varpi^{\mathcal{C}} B_{\mathcal{P},t}^{\mathcal{C}} = \varpi^{\mathcal{P}} B_t^{\mathcal{P}}, \tag{A.43}$$

$$B_t^{\mathcal{C}} = 0, \tag{A.44}$$

where we assume that bonds of region $\mathcal{C}$ are in zero net supply.

The final goods market clears to yield the aggregate spending condition:

$$P_t^{\mathcal{C}} \mathcal{Y}_t^{\mathcal{C}} = P_t^{\mathcal{C}} C_t^{\mathcal{C}} + P_t^{\mathcal{C}} G_t^{\mathcal{C}} + \frac{\varpi^{\mathcal{P}}}{\varpi^{\mathcal{C}}} \Upsilon_t B_t^{\mathcal{P}},$$

$$P_t^{\mathcal{P}} \mathcal{Y}_t^{\mathcal{P}} = P_t^{\mathcal{P}} C_t^{\mathcal{P}} + P_t^{\mathcal{P}} G_t^{\mathcal{P}},$$

and after normalizing variables,

$$\mathcal{Y}_{z,t}^{\mathcal{C}} = C_{z,t}^{\mathcal{C}} + G_{z,t}^{\mathcal{C}} + \frac{1-\varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}} \frac{\xi_{z,t}^{\mathcal{P}}}{s_t} \Upsilon_t b_{z,t}^{\mathcal{P}}, \tag{A.45}$$

$$\mathcal{Y}_{z,t}^{\mathcal{P}} = C_{z,t}^{\mathcal{P}} + G_{z,t}^{\mathcal{P}}, \tag{A.46}$$

where $b_{z,t}^{\mathcal{P}} \equiv B_t^{\mathcal{P}} / (Z_t^{\mathcal{P}} P_t^{\mathcal{P}})$.

Government expenditures are given by

$$G_{z,t}^{\mathcal{C}} = \xi_{g,t}^{\mathcal{C}}, \tag{A.47}$$

$$G_{z,t}^{\mathcal{P}} = \xi_{g,t}^{\mathcal{P}}, \tag{A.48}$$

where $G_{z,t}^{j} \equiv \frac{G_t^j}{Z_t^j}$ for $j \in \mathcal{C}, \mathcal{P}$.

Assume zero net supply of bonds by both governments, so that the government budget constraints are

$$0 = P_t^{\mathcal{C}} G_t^{\mathcal{C}} + \mathcal{T}_t^{\mathcal{C}}, \tag{A.49}$$

$$0 = P_t^{\mathcal{P}} G_t^{\mathcal{P}} + \mathcal{T}_t^{\mathcal{P}}. \tag{A.50}$$

Using the budget constraint we can plug in all the dividends from firms and transfers from the government

$$
\begin{aligned}
P_t^{\mathcal{C}} C_t^{\mathcal{C}} = {} & R_{t-1}^{\mathcal{P}} B_{\mathcal{P},t-1}^{\mathcal{C}} - (1+\Upsilon_t) B_{\mathcal{P},t}^{\mathcal{C}} \\
& + W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{C}} + W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \\
& + \mathcal{D}_t^{\mathcal{C}} + \mathcal{T}_t^{\mathcal{C}}.
\end{aligned}
$$

Use the government budget constraint, aggregate spending condition and the dividends distributed

$$
\begin{aligned}
P_t^{\mathcal{C}} \mathcal{Y}_t^{\mathcal{C}} = {} & R_{t-1}^{\mathcal{P}} B_{\mathcal{P},t-1}^{\mathcal{C}} - B_{\mathcal{P},t}^{\mathcal{C}} \\
& + W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{C}} + W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \\
& + P_{y,t}^{\mathcal{C}} Y_t^{\mathcal{C}} - W_t^{\mathcal{C}} L_t^{\mathcal{C}}.
\end{aligned}
$$

Use zero profits in final goods sector and market clearing in goods, labor and bonds markets

$$
\begin{aligned}
P_{y,t}^{\mathcal{C}} Y_{\mathcal{C},t}^{\mathcal{C}} + P_{y,t}^{\mathcal{P}} Y_{\mathcal{P},t}^{\mathcal{C}} = {} & \frac{\varpi^{\mathcal{P}}}{\varpi^{\mathcal{C}}} \left(R_{t-1}^{\mathcal{P}} B_{t-1}^{\mathcal{P}} - B_t^{\mathcal{P}} \right) \\
& + W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{C}} + W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \\
& + P_{y,t}^{\mathcal{C}} Y_{\mathcal{C},t}^{\mathcal{C}} + \frac{\varpi^{\mathcal{P}}}{\varpi^{\mathcal{C}}} P_{y,t}^{\mathcal{C}} Y_{\mathcal{C},t}^{\mathcal{P}} - W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{C}} - \frac{\varpi^{\mathcal{P}}}{\varpi^{\mathcal{C}}} W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{P}},
\end{aligned}
$$

and simplify to get the balance of payments

$$
\varpi^{\mathcal{C}} \left(P_{y,t}^{\mathcal{P}} Y_{\mathcal{P},t}^{\mathcal{C}} - W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \right) = \varpi^{\mathcal{P}} \left(R_{t-1}^{\mathcal{P}} B_{t-1}^{\mathcal{P}} - B_t^{\mathcal{P}} + P_{y,t}^{\mathcal{C}} Y_{\mathcal{C},t}^{\mathcal{P}} - W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{P}} \right),
$$

or, equivalently,

$$
\varpi^{\mathcal{C}} \left(P_{y,t}^{\mathcal{P}} Y_{\mathcal{P},t}^{\mathcal{C}} - W_t^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \right) - \varpi^{\mathcal{P}} \left(P_{y,t}^{\mathcal{C}} Y_{\mathcal{C},t}^{\mathcal{P}} - W_t^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{P}} \right) = \varpi^{\mathcal{P}} \left(R_{t-1}^{\mathcal{P}} B_{t-1}^{\mathcal{P}} - B_t^{\mathcal{P}} \right).
$$

After normalizing we get:

$$
\varpi^{\mathcal{C}} \left(p_{y,t}^{\mathcal{P}} Y_{\mathcal{P}z,t}^{\mathcal{C}} - \xi_{z,t}^{\mathcal{P}} w_{z,t}^{\mathcal{P}} L_{\mathcal{P},t}^{\mathcal{C}} \right) - \varpi^{\mathcal{P}} s_t \left(\xi_{z,t}^{\mathcal{P}} p_{y,t}^{\mathcal{C}} Y_{\mathcal{C}z,t}^{\mathcal{P}} - w_{z,t}^{\mathcal{C}} L_{\mathcal{C},t}^{\mathcal{P}} \right) = \varpi^{\mathcal{P}} \left(\frac{\xi_{z,t-1}^{\mathcal{P}} s_t R_{t-1}^{\mathcal{P}}}{e^{\gamma} \xi_{z,t}^{\mathcal{C}} s_{t-1} \Pi_t^{\mathcal{C}}} b_{z,t-1}^{\mathcal{P}} - \xi_{z,t}^{\mathcal{P}} b_{z,t}^{\mathcal{P}} \right). \tag{A.51}
$$

A.5 Monetary Policy

The monetary authority sets R_t according to the following rule:

$$
\frac{R_t}{R} = \left(\frac{R_{t-1}}{R} \right)^{\rho_r} \left[\left(\frac{\Pi_t}{\Pi^*} \right)^{\phi_\pi} \left(\frac{Y_{z,t}}{Y_{z,t-1}} \xi_{z,t}^{\mathcal{C}} \right)^{\phi_{\Delta y}} \right]^{1-\rho_r} \xi_{m,t}, \tag{A.52}
$$

where

$$Y_{z,t} \equiv (Y_{z,t}^{\mathcal{C}})^{\varpi_m^{\mathcal{C}}} (\xi_{z,t}^{\mathcal{P}} Y_{z,t}^{\mathcal{P}})^{1-\varpi_m^{\mathcal{C}}}, \tag{A.53}$$

$$\Pi_t \equiv (\Pi_t^{\mathcal{C}})^{\varpi_m^{\mathcal{C}}} (\Pi_t^{\mathcal{P}})^{1-\varpi_m^{\mathcal{C}}}. \tag{A.54}$$

B Steady State

B.1 All Steady State Equations

Marginal Utility of income

$$\lambda^{\mathcal{C}} = (1-h^{\mathcal{C}})^{-\sigma^{\mathcal{C}}} (1-\beta^{\mathcal{C}} h^{\mathcal{C}}) \left(C_z^{\mathcal{C}}\right)^{-\sigma^{\mathcal{C}}} \tag{B.1}$$

$$\lambda^{\mathcal{P}} = (1-h^{\mathcal{P}})^{-\sigma^{\mathcal{P}}} (1-\beta^{\mathcal{P}} h^{\mathcal{P}}) \left(C_z^{\mathcal{P}}\right)^{-\sigma^{\mathcal{P}}} \tag{B.2}$$

Euler Equations

$$1 = \beta^{\mathcal{C}} \frac{R}{e^{\gamma}\Pi} \tag{B.3}$$

$$1 = \beta^{\mathcal{P}} \frac{R^{\mathcal{P}}}{e^{\gamma}\Pi} \tag{B.4}$$

$$R^{\mathcal{P}} = R(1+\Upsilon) \tag{B.5}$$

Interest rate premium

$$\frac{b_z^{\mathcal{P}}}{p_y^{\mathcal{P}} Y_z^{\mathcal{P}}} = b_y^{\mathcal{P}} \tag{B.6}$$

Labor supply:

$$L_{\mathcal{C}}^{\mathcal{C}} = \gamma_l^{\mathcal{C}} \left(\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}} \tilde{L}^{\mathcal{C}} \tag{B.7}$$

$$L_{\mathcal{P}}^{\mathcal{C}} = (1-\gamma_l^{\mathcal{C}}) \left(\frac{\xi_z^{\mathcal{P}}}{s} \frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}} \tilde{L}^{\mathcal{C}} \tag{B.8}$$

$$\varphi^{\mathcal{C}} (\tilde{L}^{\mathcal{C}})^{\nu^{\mathcal{C}}} = \lambda^{\mathcal{C}} \tilde{w}_z^{\mathcal{C}} \tag{B.9}$$

$$(\tilde{w}_z^{\mathcal{C}})^{1+\eta_l^{\mathcal{C}}} = \gamma_l^{\mathcal{C}} (w_z^{\mathcal{C}})^{1+\eta_l^{\mathcal{C}}} + (1-\gamma_l^{\mathcal{C}}) \left(\frac{\xi_z^{\mathcal{P}}}{s} w_z^{\mathcal{P}}\right)^{1+\eta_l^{\mathcal{C}}} \tag{B.10}$$

$$L_{\mathcal{P}}^{\mathcal{P}} = \gamma_l^{\mathcal{P}} \left(\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}} \tilde{L}^{\mathcal{P}} \tag{B.11}$$

$$L_{\mathcal{C}}^{\mathcal{P}} = (1-\gamma_l^{\mathcal{P}}) \left(\frac{s}{\xi_z^{\mathcal{P}}} \frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}} \tilde{L}^{\mathcal{P}} \tag{B.12}$$

$$\varphi^{\mathcal{P}}(\tilde{L}^{\mathcal{P}})^{\nu^{\mathcal{P}}} = \lambda^{\mathcal{P}}\tilde{w}_z^{\mathcal{P}} \tag{B.13}$$

$$(\tilde{w}_z^{\mathcal{P}})^{1+\eta_l^{\mathcal{P}}} = \gamma_l^{\mathcal{P}}(w_z^{\mathcal{P}})^{1+\eta_l^{\mathcal{P}}} + (1-\gamma_l^{\mathcal{P}})\left(\frac{s}{\xi_z^{\mathcal{P}}}w_z^{\mathcal{C}}\right)^{1+\eta_l^{\mathcal{P}}} \tag{B.14}$$

Final goods sector

$$Y_{\mathcal{C}z}^{\mathcal{C}} = \gamma_y^{\mathcal{C}}\left(p_y^{\mathcal{C}}\right)^{-\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{C}}, \tag{B.15}$$

$$Y_{\mathcal{P}z}^{\mathcal{C}} = (1-\gamma_y^{\mathcal{C}})\left(\frac{p_y^{\mathcal{P}}}{s}\right)^{-\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{C}}, \tag{B.16}$$

$$1 = \gamma_y^{\mathcal{C}}(p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}} + (1-\gamma_y^{\mathcal{C}})\left(\frac{p_y^{\mathcal{P}}}{s}\right)^{1-\eta_y^{\mathcal{C}}}. \tag{B.17}$$

$$Y_{\mathcal{P}z}^{\mathcal{P}} = \gamma_y^{\mathcal{P}}\left(p_y^{\mathcal{P}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}} \tag{B.18}$$

$$Y_{\mathcal{C}z}^{\mathcal{P}} = (1-\gamma_y^{\mathcal{P}})\left(sp_y^{\mathcal{C}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}} \tag{B.19}$$

$$1 = \gamma_y^{\mathcal{P}}(p_y^{\mathcal{P}})^{1-\eta_y^{\mathcal{P}}} + (1-\gamma_y^{\mathcal{P}})\left(sp_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}. \tag{B.20}$$

Intermediate goods sector

$$L^{\mathcal{C}} = Y_z^{\mathcal{C}} \tag{B.21}$$

$$L^{\mathcal{P}} = Y_z^{\mathcal{P}} \tag{B.22}$$

Price Setting

$$p_y^{\mathcal{C}} = \frac{X_{pn}^{\mathcal{C}}}{X_{pd}^{\mathcal{C}}} \tag{B.23}$$

$$X_{pn}^{\mathcal{C}} = \frac{1}{1-\alpha_p^{\mathcal{C}}\beta^{\mathcal{C}}}\frac{\theta}{\theta-1}\lambda^{\mathcal{C}}w_z^{\mathcal{C}}(p_y^{\mathcal{C}})^{\theta}Y_z^{\mathcal{C}} \tag{B.24}$$

$$X_{pd}^{\mathcal{C}} = \frac{1}{1-\alpha_p^{\mathcal{C}}\beta^{\mathcal{C}}}\lambda^{\mathcal{C}}(p_y^{\mathcal{C}})^{\theta}Y_z^{\mathcal{C}} \tag{B.25}$$

$$p_y^{\mathcal{P}} = \frac{X_{pn}^{\mathcal{P}}}{X_{pd}^{\mathcal{P}}} \tag{B.26}$$

$$X_{pn}^{\mathcal{P}} = \frac{1}{1-\alpha_p^{\mathcal{P}}\beta^{\mathcal{P}}}\frac{\theta}{\theta-1}\lambda^{\mathcal{P}}w_z^{\mathcal{P}}(p_y^{\mathcal{P}})^{\theta}Y_z^{\mathcal{P}} \tag{B.27}$$

$$X_{pd}^{\mathcal{P}} = \frac{1}{1-\alpha_p^{\mathcal{P}}\beta^{\mathcal{P}}}\lambda^{\mathcal{P}}(p_y^{\mathcal{P}})^{\theta}Y_z^{\mathcal{P}} \tag{B.28}$$

Labor market clearing:

$$\varpi^{\mathcal{C}} L^{\mathcal{C}} = \varpi^{\mathcal{C}} L^{\mathcal{C}}_{\mathcal{C}} + (1-\varpi^{\mathcal{C}}) L^{\mathcal{P}}_{\mathcal{C}} \tag{B.29}$$

$$(1-\varpi^{\mathcal{C}}) L^{\mathcal{P}} = \varpi^{\mathcal{C}} L^{\mathcal{C}}_{\mathcal{P}} + (1-\varpi^{\mathcal{C}}) L^{\mathcal{P}}_{\mathcal{P}} \tag{B.30}$$

Intermediate goods market clearing:

$$\varpi^{\mathcal{C}} Y^{\mathcal{C}}_z = \varpi^{\mathcal{C}} Y^{\mathcal{C}}_{\mathcal{C}z} + (1-\varpi^{\mathcal{C}}) \xi^{\mathcal{P}}_z Y^{\mathcal{P}}_{\mathcal{C}z} \tag{B.31}$$

$$(1-\varpi^{\mathcal{C}}) Y^{\mathcal{P}}_z = \varpi^{\mathcal{C}} \frac{Y^{\mathcal{C}}_{\mathcal{P}z}}{\xi^{\mathcal{P}}_z} + (1-\varpi^{\mathcal{C}}) Y^{\mathcal{P}}_{\mathcal{P}z} \tag{B.32}$$

Aggregate spending condition:

$$\mathcal{Y}^{\mathcal{C}}_z = C^{\mathcal{C}}_z + G^{\mathcal{C}}_z + \frac{1-\varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}} \frac{\xi^{\mathcal{P}}_z}{s} \Upsilon b^{\mathcal{P}}_z \tag{B.33}$$

$$\mathcal{Y}^{\mathcal{P}}_z = C^{\mathcal{P}}_z + G^{\mathcal{P}}_z \tag{B.34}$$

Balance of payments

$$\varpi^{\mathcal{C}} \left(p^{\mathcal{P}}_y Y^{\mathcal{C}}_{\mathcal{P}z} - \xi^{\mathcal{P}}_z w^{\mathcal{P}}_z L^{\mathcal{C}}_{\mathcal{P}} \right) - (1-\varpi^{\mathcal{C}}) s \left(\xi^{\mathcal{P}}_z p^{\mathcal{C}}_y Y^{\mathcal{P}}_{\mathcal{C}z} - w^{\mathcal{C}}_z L^{\mathcal{P}}_{\mathcal{C}} \right) = (1-\varpi^{\mathcal{C}}) \left(\frac{R^{\mathcal{P}}}{e^{\gamma} \Pi^{\mathcal{C}}} - 1 \right) \xi^{\mathcal{P}}_z b^{\mathcal{P}}_z \tag{B.35}$$

Monetary Union aggregates

$$Y_z = (Y^{\mathcal{C}}_z)^{\varpi^{\mathcal{C}}_m} (\xi^{\mathcal{P}}_z Y^{\mathcal{P}}_z)^{1-\varpi^{\mathcal{C}}_m} \tag{B.36}$$

$$\Pi = (\Pi^{\mathcal{C}})^{\varpi^{\mathcal{C}}_m} (\Pi^{\mathcal{P}})^{1-\varpi^{\mathcal{C}}_m}. \tag{B.37}$$

B.2 Simplified Steady State Relations

We estimate/calibrate the following

$$\Pi = \Pi^{\mathcal{P}} = \Pi^{\mathcal{C}} \tag{B.38}$$

$$\beta = \beta^{\mathcal{C}} \tag{B.39}$$

$$Y^{\mathcal{C}}_z = 1 \quad \text{(but leave it in derivations for now)} \tag{B.40}$$

$$\varrho^j_{G,Y} \equiv \frac{P^j G^j}{P^j_y Y^j} = \frac{G^j_z}{p^j_y Y^j_z} \tag{B.41}$$

$$b^{\mathcal{P}}_y \equiv \frac{b^{\mathcal{P}}_z}{p^p_y Y^{\mathcal{P}}_z} \tag{B.42}$$

with $j \in \{\mathcal{C}, \mathcal{P}\}$.

The Euler equation gives the interest rate in $\mathcal{C}$

$$R = e^{\gamma}\beta^{-1}\Pi \tag{B.43}$$

The risk premium gives the interest in $\mathcal{P}$

$$R^{\mathcal{P}} = R(1+\Upsilon) \tag{B.44}$$

The last Euler equation gives the relationship between the two discount rates:

$$\beta^{\mathcal{P}} = \frac{\beta}{1+\Upsilon} \tag{B.45}$$

Interest rate premium allows us to substitute out $b_z^{\mathcal{P}}$.

$$b_z^{\mathcal{P}} = b_y^{\mathcal{P}} p_y^{\mathcal{P}} Y_z^{\mathcal{P}} \tag{B.46}$$

Price setting implies that

$$w_z^{\mathcal{C}} = \bar{\theta}^{-1} p_y^{\mathcal{C}} \tag{B.47}$$

$$w_z^{\mathcal{P}} = \bar{\theta}^{-1} p_y^{\mathcal{P}} \tag{B.48}$$

with

$$\bar{\theta} \equiv \frac{\theta}{\theta - 1}$$

The price indeces of final goods are

$$1 = \gamma_y^{\mathcal{C}} (p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}} + (1-\gamma_y^{\mathcal{C}}) \left(\frac{p_y^{\mathcal{P}}}{s}\right)^{1-\eta_y^{\mathcal{C}}}$$

$$1 = \gamma_y^{\mathcal{P}} (p_y^{\mathcal{P}})^{1-\eta_y^{\mathcal{P}}} + (1-\gamma_y^{\mathcal{P}}) \left(s p_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}$$

and we can solve them for:

$$p_y^{\mathcal{P}} = \left(\frac{1-(1-\gamma_y^{\mathcal{P}})\left(s p_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}}{\gamma_y^{\mathcal{P}}}\right)^{\frac{1}{1-\eta_y^{\mathcal{P}}}} \tag{B.49}$$

$$s = \left(\frac{1-\gamma_y^{\mathcal{C}}(p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}}}{1-\gamma_y^{\mathcal{C}}}\right)^{-\frac{1}{1-\eta_y^{\mathcal{C}}}} p_y^{\mathcal{P}} \tag{B.50}$$

which define $p_y^{\mathcal{P}}$ and s as functions of $p_y^{\mathcal{C}}$. Notice that we can further simplify the expression for s

to express it solely as a function of $p_y^{\mathcal{C}}$,

$$s = \left(\frac{1-\gamma_y^{\mathcal{C}}(p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}}}{1-\gamma_y^{\mathcal{C}}}\right)^{-\frac{1}{1-\eta_y^{\mathcal{C}}}} \left[\gamma_y^{\mathcal{P}} + (1-\gamma_y^{\mathcal{P}})\left(\frac{1-\gamma_y^{\mathcal{C}}(p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}}}{1-\gamma_y^{\mathcal{C}}}\right)^{-\frac{1-\eta_y^{\mathcal{P}}}{1-\eta_y^{\mathcal{C}}}} \left(p_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}\right]^{-\frac{1}{1-\eta_y^{\mathcal{P}}}}$$

$\Rightarrow$

$$s = \left[\gamma_y^{\mathcal{P}}\left(\frac{1-\gamma_y^{\mathcal{C}}(p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}}}{1-\gamma_y^{\mathcal{C}}}\right)^{\frac{1-\eta_y^{\mathcal{P}}}{1-\eta_y^{\mathcal{C}}}} + (1-\gamma_y^{\mathcal{P}})\left(p_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}\right]^{-\frac{1}{1-\eta_y^{\mathcal{P}}}}$$

Use labor demand by firms to substitute out L^j:

$$L^{\mathcal{C}} = Y_z^{\mathcal{C}} \tag{B.51}$$

$$L^{\mathcal{P}} = Y_z^{\mathcal{P}} \tag{B.52}$$

Labor demands are

$$L_{\mathcal{C}}^{\mathcal{C}} = \gamma_l^{\mathcal{C}}\left(\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}} \tilde{L}^{\mathcal{C}} \tag{B.53}$$

$$L_{\mathcal{P}}^{\mathcal{C}} = (1-\gamma_l^{\mathcal{C}})\left(\frac{\xi_z^{\mathcal{P}}}{s}\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}} \tilde{L}^{\mathcal{C}} \tag{B.54}$$

and

$$L_{\mathcal{P}}^{\mathcal{P}} = \gamma_l^{\mathcal{P}}\left(\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}} \tilde{L}^{\mathcal{P}} \tag{B.55}$$

$$L_{\mathcal{C}}^{\mathcal{P}} = (1-\gamma_l^{\mathcal{P}})\left(\frac{s}{\xi_z^{\mathcal{P}}}\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}} \tilde{L}^{\mathcal{P}} \tag{B.56}$$

Average wages are given by:

$$\tilde{w}_z^{\mathcal{C}} = \left[\gamma_l^{\mathcal{C}}(w_z^{\mathcal{C}})^{1+\eta_l^{\mathcal{C}}} + (1-\gamma_l^{\mathcal{C}})\left(\frac{\xi_z^{\mathcal{P}}}{s}w_z^{\mathcal{P}}\right)^{1+\eta_l^{\mathcal{C}}}\right]^{\frac{1}{1+\eta_l^{\mathcal{C}}}} \tag{B.57}$$

$$\tilde{w}_z^{\mathcal{P}} = \left[\gamma_l^{\mathcal{P}}(w_z^{\mathcal{P}})^{1+\eta_l^{\mathcal{P}}} + (1-\gamma_l^{\mathcal{P}})\left(\frac{s}{\xi_z^{\mathcal{P}}}w_z^{\mathcal{C}}\right)^{1+\eta_l^{\mathcal{P}}}\right]^{\frac{1}{1+\eta_l^{\mathcal{P}}}} \tag{B.58}$$

Intermediate goods demands are given by:

$$Y^{\mathcal{C}}_{\mathcal{C}z} = \gamma^{\mathcal{C}}_y \left(p^{\mathcal{C}}_y\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_z, \tag{B.59}$$

$$Y^{\mathcal{C}}_{\mathcal{P}z} = (1-\gamma^{\mathcal{C}}_y)\left(\frac{p^{\mathcal{P}}_y}{s}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_z, \tag{B.60}$$

and

$$Y^{\mathcal{P}}_{\mathcal{P}z} = \gamma^{\mathcal{P}}_y \left(p^{\mathcal{P}}_y\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_z \tag{B.61}$$

$$Y^{\mathcal{P}}_{\mathcal{C}z} = (1-\gamma^{\mathcal{P}}_y)\left(s p^{\mathcal{C}}_y\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_z \tag{B.62}$$

Labor market clearing:

$$\varpi^{\mathcal{C}} Y^{\mathcal{C}}_z = \varpi^{\mathcal{C}}\gamma^{\mathcal{C}}_l \left(\frac{w^{\mathcal{C}}_z}{\tilde{w}^{\mathcal{C}}_z}\right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}} + (1-\varpi^{\mathcal{C}})(1-\gamma^{\mathcal{P}}_l)\left(\frac{s}{\xi^{\mathcal{P}}_z}\frac{w^{\mathcal{C}}_z}{\tilde{w}^{\mathcal{P}}_z}\right)^{\eta^{\mathcal{P}}_l} \tilde{L}^{\mathcal{P}} \tag{B.63}$$

$$(1-\varpi^{\mathcal{C}}) Y^{\mathcal{P}}_z = \varpi^{\mathcal{C}}(1-\gamma^{\mathcal{C}}_l)\left(\frac{\xi^{\mathcal{P}}_z}{s}\frac{w^{\mathcal{P}}_z}{\tilde{w}^{\mathcal{C}}_z}\right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}} + (1-\varpi^{\mathcal{C}})\gamma^{\mathcal{P}}_l \left(\frac{w^{\mathcal{P}}_z}{\tilde{w}^{\mathcal{P}}_z}\right)^{\eta^{\mathcal{P}}_l} \tilde{L}^{\mathcal{P}} \tag{B.64}$$

Intermediate goods market clearing:

$$\varpi^{\mathcal{C}} Y^{\mathcal{C}}_z = \varpi^{\mathcal{C}}\gamma^{\mathcal{C}}_y \left(p^{\mathcal{C}}_y\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_z + (1-\varpi^{\mathcal{C}})(1-\gamma^{\mathcal{P}}_y)\xi^{\mathcal{P}}_z \left(s p^{\mathcal{C}}_y\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_z \tag{B.65}$$

$$(1-\varpi^{\mathcal{C}}) Y^{\mathcal{P}}_z = \varpi^{\mathcal{C}}(1-\gamma^{\mathcal{C}}_y)\frac{1}{\xi^{\mathcal{P}}_z}\left(\frac{p^{\mathcal{P}}_y}{s}\right)^{-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_z + (1-\varpi^{\mathcal{C}})\gamma^{\mathcal{P}}_y \left(p^{\mathcal{P}}_y\right)^{-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_z \tag{B.66}$$

Balance of payments

$$\begin{aligned} 0 = {} & \varpi^{\mathcal{C}}\left((1-\gamma^{\mathcal{C}}_y)\left(\frac{p^{\mathcal{P}}_y}{s}\right)^{1-\eta^{\mathcal{C}}_y} \mathcal{Y}^{\mathcal{C}}_z - (1-\gamma^{\mathcal{C}}_l)\frac{\xi^{\mathcal{P}}_z}{s} w^{\mathcal{P}}_z \left(\frac{\xi^{\mathcal{P}}_z}{s}\frac{w^{\mathcal{P}}_z}{\tilde{w}^{\mathcal{C}}_z}\right)^{\eta^{\mathcal{C}}_l} \tilde{L}^{\mathcal{C}}\right) \\ & - (1-\varpi^{\mathcal{C}})\left((1-\gamma^{\mathcal{P}}_y)\frac{\xi^{\mathcal{P}}_z}{s}\left(s p^{\mathcal{C}}_y\right)^{1-\eta^{\mathcal{P}}_y} \mathcal{Y}^{\mathcal{P}}_z - (1-\gamma^{\mathcal{P}}_l) w^{\mathcal{C}}_z \left(\frac{s}{\xi^{\mathcal{P}}_z}\frac{w^{\mathcal{C}}_z}{\tilde{w}^{\mathcal{P}}_z}\right)^{\eta^{\mathcal{P}}_l} \tilde{L}^{\mathcal{P}}\right) \\ & - (1-\varpi^{\mathcal{C}})\left(\frac{R^{\mathcal{P}}}{e^{\gamma}\Pi^{\mathcal{C}}} - 1\right) b^{\mathcal{P}}_y \frac{\xi^{\mathcal{P}}_z}{s} p^{\mathcal{P}}_y Y^{\mathcal{P}}_z \end{aligned} \tag{B.67}$$

The aggregate spending conditions yield consumption, conditional on total spending, govt spending, and debt:

$$C^{\mathcal{C}}_z = \mathcal{Y}^{\mathcal{C}}_z - G^{\mathcal{C}}_z - \frac{1-\varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}}\frac{\xi^{\mathcal{P}}_z}{s}\Upsilon b^{\mathcal{P}}_z \tag{B.68}$$

$$C^{\mathcal{P}}_z = \mathcal{Y}^{\mathcal{P}}_z - G^{\mathcal{P}}_z \tag{B.69}$$

The definitions of the MUI will yield the lagrange multipliers as functions of consumption:

$$\lambda^{\mathcal{C}} = (1-h^{\mathcal{C}})^{-\sigma^{\mathcal{C}}}(1-\beta^{\mathcal{C}}h^{\mathcal{C}})\left(C_z^{\mathcal{C}}\right)^{-\sigma^{\mathcal{C}}} \tag{B.70}$$

$$\lambda^{\mathcal{P}} = (1-h^{\mathcal{P}})^{-\sigma^{\mathcal{P}}}(1-\beta^{\mathcal{P}}h^{\mathcal{P}})\left(C_z^{\mathcal{P}}\right)^{-\sigma^{\mathcal{P}}} \tag{B.71}$$

The labor supply relations can be used to determine labor disutility, given aggregate labor supply, lagrange multipliers and wages:

$$\varphi^{\mathcal{C}} = \lambda^{\mathcal{C}}\tilde{w}_z^{\mathcal{C}}(\tilde{L}^{\mathcal{C}})^{-\nu^{\mathcal{C}}} \tag{B.72}$$

$$\varphi^{\mathcal{P}} = \lambda^{\mathcal{P}}\tilde{w}_z^{\mathcal{P}}(\tilde{L}^{\mathcal{P}})^{-\nu^{\mathcal{P}}} \tag{B.73}$$

B.3 Set Relative Labor and GDP

Consider the case in which we set the following ratios:

$$\varrho_{\tilde{L}}^{\mathcal{P}} \equiv \frac{\tilde{L}^{\mathcal{P}}}{\tilde{L}^{\mathcal{C}}}$$

$$\varrho_{y}^{\mathcal{P}} \equiv \frac{(1-\varpi^{\mathcal{C}})P_y^{\mathcal{P}}Y^{\mathcal{P}}}{\varpi^{\mathcal{C}}P_y^{\mathcal{C}}Y^{\mathcal{C}}}$$

which imply:

$$\tilde{L}^{\mathcal{P}} = \varrho_{\tilde{L}}^{\mathcal{P}}\tilde{L}^{\mathcal{C}} \tag{B.74}$$

$$Y_z^{\mathcal{P}} = \varrho_y^{\mathcal{P}}\frac{\varpi^{\mathcal{C}}}{1-\varpi^{\mathcal{C}}}\frac{sp_y^{\mathcal{C}}}{\xi_z^{\mathcal{P}}p_y^{\mathcal{P}}}Y_z^{\mathcal{C}} \tag{B.75}$$

The intermediate goods market clearing:

$$\varpi^{\mathcal{C}}Y_z^{\mathcal{C}} = \varpi^{\mathcal{C}}\gamma_y^{\mathcal{C}}\left(p_y^{\mathcal{C}}\right)^{-\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{C}} + (1-\varpi^{\mathcal{C}})(1-\gamma_y^{\mathcal{P}})\xi_z^{\mathcal{P}}\left(sp_y^{\mathcal{C}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}}$$

$$(1-\varpi^{\mathcal{C}})Y_z^{\mathcal{P}} = \varpi^{\mathcal{C}}(1-\gamma_y^{\mathcal{C}})\frac{1}{\xi_z^{\mathcal{P}}}\left(\frac{p_y^{\mathcal{P}}}{s}\right)^{-\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{C}} + (1-\varpi^{\mathcal{C}})\gamma_y^{\mathcal{P}}\left(p_y^{\mathcal{P}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}}$$

is a system of equations, that for a given set of relative prices, can be solved for $\mathcal{Y}_z^{\mathcal{C}}$ and $\mathcal{Y}_z^{\mathcal{P}}$. Starting with the first condition we get

$$\mathcal{Y}_z^{\mathcal{C}} = \frac{\left(p_y^{\mathcal{C}}\right)^{\eta_y^{\mathcal{C}}}}{\gamma_y^{\mathcal{C}}}Y_z^{\mathcal{C}} - \frac{1-\varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}}\frac{1-\gamma_y^{\mathcal{P}}}{\gamma_y^{\mathcal{C}}}\xi_z^{\mathcal{P}}\left(sp_y^{\mathcal{C}}\right)^{-\eta_y^{\mathcal{P}}}\left(p_y^{\mathcal{C}}\right)^{\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{P}} \tag{B.76}$$

We can then plug $\mathcal{Y}_z^{\mathcal{C}}$ into the second intermediate goods market clearing

$$(1-\varpi^{\mathcal{C}})Y_z^{\mathcal{P}} = \varpi^{\mathcal{C}}\frac{1-\gamma_y^{\mathcal{C}}}{\gamma_y^{\mathcal{C}}}\frac{1}{\xi_z^{\mathcal{P}}}\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{-\eta_y^{\mathcal{C}}} Y_z^{\mathcal{C}}$$
$$+\left(1-\frac{1-\gamma_y^{\mathcal{C}}}{\gamma_y^{\mathcal{C}}}\frac{1-\gamma_y^{\mathcal{P}}}{\gamma_y^{\mathcal{P}}}\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{\eta_y^{\mathcal{P}}-\eta_y^{\mathcal{C}}}\right)(1-\varpi^{\mathcal{C}})\gamma_y^{\mathcal{P}}\left(p_y^{\mathcal{P}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}}$$

where we can plug in the assumption for the GDP ratio and simplify:

$$\left[1-\frac{1-\gamma_y^{\mathcal{C}}}{\gamma_y^{\mathcal{C}}}\frac{1-\gamma_y^{\mathcal{P}}}{\gamma_y^{\mathcal{P}}}\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{\eta_y^{\mathcal{P}}-\eta_y^{\mathcal{C}}}\right](1-\varpi^{\mathcal{C}})\gamma_y^{\mathcal{P}}\left(p_y^{\mathcal{P}}\right)^{-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}}$$
$$=\left[\varrho_y^{\mathcal{P}}-\frac{1-\gamma_y^{\mathcal{C}}}{\gamma_y^{\mathcal{C}}}\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{1-\eta_y^{\mathcal{C}}}\right]\frac{1-\varpi^{\mathcal{C}}}{\varrho_y^{\mathcal{P}}}Y_z^{\mathcal{P}}$$

and finally,

$$\mathcal{Y}_z^{\mathcal{P}} = \frac{\gamma_y^{\mathcal{C}}-(1-\gamma_y^{\mathcal{C}})\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{1-\eta_y^{\mathcal{C}}}(\varrho_y^{\mathcal{P}})^{-1}}{\gamma_y^{\mathcal{C}}\gamma_y^{\mathcal{P}}-(1-\gamma_y^{\mathcal{C}})(1-\gamma_y^{\mathcal{P}})\left(\frac{p_y^{\mathcal{P}}}{sp_y^{\mathcal{C}}}\right)^{\eta_y^{\mathcal{P}}-\eta_y^{\mathcal{C}}}}\left(p_y^{\mathcal{P}}\right)^{\eta_y^{\mathcal{P}}}Y_z^{\mathcal{P}} \tag{B.77}$$

Plug the relative labor supply into the first of the labor market clearing conditions to get

$$\tilde{L}^{\mathcal{C}} = \frac{\varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}\gamma_l^{\mathcal{C}}\left(\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{-\eta_l^{\mathcal{C}}}+(1-\varpi^{\mathcal{C}})(1-\gamma_l^{\mathcal{P}})\left(\frac{s}{\xi_z^{\mathcal{P}}}\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{-\eta_l^{\mathcal{P}}}\varrho_{\tilde{L}}^{\mathcal{P}}}Y_z^{\mathcal{C}} \tag{B.78}$$

The second labor market clearing condition and the balance of payments then form a two equation system to solve for $p_y^{\mathcal{C}}$ and $\xi_z^{\mathcal{P}}$,

$$0=\varpi^{\mathcal{C}}(1-\gamma_l^{\mathcal{C}})\left(\frac{\xi_z^{\mathcal{P}}}{s}\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}}\tilde{L}^{\mathcal{C}}+(1-\varpi^{\mathcal{C}})\gamma_l^{\mathcal{P}}\left(\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}}\tilde{L}^{\mathcal{P}}-(1-\varpi^{\mathcal{C}})Y_z^{\mathcal{P}} \tag{B.79}$$

$$0=\varpi^{\mathcal{C}}\left((1-\gamma_y^{\mathcal{C}})\left(\frac{p_y^{\mathcal{P}}}{s}\right)^{1-\eta_y^{\mathcal{C}}}\mathcal{Y}_z^{\mathcal{C}}-(1-\gamma_l^{\mathcal{C}})\frac{\xi_z^{\mathcal{P}}}{s}w_z^{\mathcal{P}}\left(\frac{\xi_z^{\mathcal{P}}}{s}\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{\eta_l^{\mathcal{C}}}\tilde{L}^{\mathcal{C}}\right) \tag{B.80}$$
$$-(1-\varpi^{\mathcal{C}})\left((1-\gamma_y^{\mathcal{P}})\frac{\xi_z^{\mathcal{P}}}{s}\left(sp_y^{\mathcal{C}}\right)^{1-\eta_y^{\mathcal{P}}}\mathcal{Y}_z^{\mathcal{P}}-(1-\gamma_l^{\mathcal{P}})w_z^{\mathcal{C}}\left(\frac{s}{\xi_z^{\mathcal{P}}}\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{\eta_l^{\mathcal{P}}}\tilde{L}^{\mathcal{P}}\right)$$
$$-(1-\varpi^{\mathcal{C}})\left(\frac{R^{\mathcal{P}}}{e^{\gamma}\Pi^{\mathcal{C}}}-1\right)b_y^{\mathcal{P}}\frac{\xi_z^{\mathcal{P}}}{s}p_y^{\mathcal{P}}Y_z^{\mathcal{P}}$$

C Log-Linear Equations

We use notation $\hat{x}_t \equiv \ln x_t/x$ for generic variable x_t, unless otherwise noted.

Marginal utility of income

$$\begin{aligned}\hat{\lambda}_t^{\mathcal{C}} = &\frac{1}{1-\beta^{\mathcal{C}}h^{\mathcal{C}}}\left[\hat{\xi}_{\beta,t}^{\mathcal{C}} - \frac{\sigma^{\mathcal{C}}}{1-h^{\mathcal{C}}}\left(\hat{C}_{z,t}^{\mathcal{C}} - h^{\mathcal{C}}\hat{C}_{z,t-1}^{\mathcal{C}}\right)\right] \\ &- \frac{\beta^{\mathcal{C}}h^{\mathcal{C}}}{1-\beta^{\mathcal{C}}h^{\mathcal{C}}}E_t\left[\hat{\xi}_{\beta,t+1}^{\mathcal{C}} - \frac{\sigma^{\mathcal{C}}}{1-h^{\mathcal{C}}}\left(\hat{C}_{z,t+1}^{\mathcal{C}} - h^{\mathcal{C}}\hat{C}_{z,t}^{\mathcal{C}}\right)\right]\end{aligned} \tag{C.1}$$

$$\begin{aligned}\hat{\lambda}_t^{\mathcal{P}} = &\frac{1}{1-\beta^{\mathcal{P}}h^{\mathcal{P}}}\left[\hat{\xi}_{\beta,t}^{\mathcal{P}} - \frac{\sigma^{\mathcal{P}}}{1-h^{\mathcal{P}}}\left(\hat{C}_{z,t}^{\mathcal{P}} - h^{\mathcal{P}}\hat{C}_{z,t-1}^{\mathcal{P}}\right)\right] \\ &- \frac{\beta^{\mathcal{P}}h^{\mathcal{P}}}{1-\beta^{\mathcal{P}}h^{\mathcal{P}}}E_t\left[\hat{\xi}_{\beta,t+1}^{\mathcal{P}} - \frac{\sigma^{\mathcal{P}}}{1-h^{\mathcal{P}}}\left(\hat{C}_{z,t+1}^{\mathcal{P}} - h^{\mathcal{P}}\hat{C}_{z,t}^{\mathcal{P}}\right)\right]\end{aligned} \tag{C.2}$$

Euler equations

$$0 = E_t\left[\hat{\lambda}_{t+1}^{\mathcal{C}} - \hat{\lambda}_t^{\mathcal{C}} - \hat{\xi}_{z,t+1}^{\mathcal{C}} + \hat{R}_t - \pi_{t+1}^{\mathcal{C}}\right] \tag{C.3}$$

$$0 = E_t\left[\hat{\lambda}_{t+1}^{\mathcal{P}} - \hat{\lambda}_t^{\mathcal{P}} + \hat{\xi}_{z,t}^{\mathcal{P}} - \hat{\xi}_{z,t+1}^{\mathcal{P}} - \hat{\xi}_{z,t+1}^{\mathcal{C}} + \hat{R}_t^{\mathcal{P}} - \pi_{t+1}^{\mathcal{P}}\right] \tag{C.4}$$

$$\hat{R}_t^{\mathcal{P}} = \hat{R}_t + \hat{\Upsilon}_t \tag{C.5}$$

with $\pi_t \equiv \ln \Pi_t/\Pi$; and $\hat{\Upsilon}_t \equiv \ln(1+\Upsilon_t/1+\Upsilon)$.

Interest rate premium

$$\hat{\Upsilon}_t = \upsilon\left(\hat{b}_{z,t}^{\mathcal{P}} - \hat{p}_{y,t}^{\mathcal{P}} - \hat{Y}_{z,t}^{\mathcal{P}}\right) + \hat{\xi}_{B,t} \tag{C.6}$$

Labor supply

$$\hat{L}_{\mathcal{C},t}^{\mathcal{C}} = \hat{\bar{L}}_t^{\mathcal{C}} + \eta_l^{\mathcal{C}}\left(\hat{w}_{z,t}^{\mathcal{C}} - \hat{\bar{w}}_{z,t}^{\mathcal{C}}\right) \tag{C.7}$$

$$\hat{L}_{\mathcal{P},t}^{\mathcal{C}} = \hat{\bar{L}}_t^{\mathcal{C}} + \eta_l^{\mathcal{C}}\left(\hat{\xi}_{z,t}^{\mathcal{P}} - \hat{s}_t + \hat{w}_{z,t}^{\mathcal{P}} - \hat{\bar{w}}_{z,t}^{\mathcal{C}}\right) \tag{C.8}$$

$$\hat{L}_{\mathcal{P},t}^{\mathcal{P}} = \hat{\bar{L}}_t^{\mathcal{P}} + \eta_l^{\mathcal{P}}\left(\hat{w}_{z,t}^{\mathcal{P}} - \hat{\bar{w}}_{z,t}^{\mathcal{P}}\right) \tag{C.9}$$

$$\hat{L}_{\mathcal{C},t}^{\mathcal{P}} = \hat{\bar{L}}_t^{\mathcal{P}} + \eta_l^{\mathcal{P}}\left(\hat{s}_t - \hat{\xi}_{z,t}^{\mathcal{P}} + \hat{w}_{z,t}^{\mathcal{C}} - \hat{\bar{w}}_{z,t}^{\mathcal{P}}\right) \tag{C.10}$$

with

$$\hat{\tilde{L}}_t^{\mathcal{C}} = (\nu^{\mathcal{C}})^{-1} \left(\hat{\lambda}_t^{\mathcal{C}} + \hat{\tilde{w}}_{z,t}^{\mathcal{C}} - \hat{\xi}_{l,t}^{\mathcal{C}}\right) \tag{C.11}$$

$$\hat{\tilde{L}}_t^{\mathcal{P}} = (\nu^{\mathcal{P}})^{-1} \left(\hat{\lambda}_t^{\mathcal{P}} + \hat{\tilde{w}}_{z,t}^{\mathcal{P}} - \hat{\xi}_{l,t}^{\mathcal{P}}\right) \tag{C.12}$$

$$\hat{\tilde{w}}_{z,t}^{\mathcal{C}} = \tilde{\gamma}_l^{\mathcal{C}} \hat{w}_{z,t}^{\mathcal{C}} + (1 - \tilde{\gamma}_l^{\mathcal{C}}) \left(\hat{\xi}_{z,t}^{\mathcal{P}} - \hat{s}_t + \hat{w}_{z,t}^{\mathcal{P}}\right) \tag{C.13}$$

$$\hat{\tilde{w}}_{z,t}^{\mathcal{P}} = \tilde{\gamma}_l^{\mathcal{P}} \hat{w}_{z,t}^{\mathcal{P}} + (1 - \tilde{\gamma}_l^{\mathcal{P}}) \left(\hat{s}_t - \hat{\xi}_{z,t}^{\mathcal{P}} + \hat{w}_{z,t}^{\mathcal{C}}\right) \tag{C.14}$$

with

$$\tilde{\gamma}_l^{\mathcal{C}} \equiv \gamma_l^{\mathcal{C}} \left(\frac{w_z^{\mathcal{C}}}{\tilde{w}_z^{\mathcal{C}}}\right)^{1+\eta_l^{\mathcal{C}}}$$

$$\tilde{\gamma}_l^{\mathcal{P}} \equiv \gamma_l^{\mathcal{P}} \left(\frac{w_z^{\mathcal{P}}}{\tilde{w}_z^{\mathcal{P}}}\right)^{1+\eta_l^{\mathcal{P}}}$$

Intermediate goods demand by each region

$$\hat{Y}_{\mathcal{C}z,t}^{\mathcal{C}} = \hat{\mathcal{Y}}_{z,t}^{\mathcal{C}} - \eta_y^{\mathcal{C}} \hat{p}_{y,t}^{\mathcal{C}} \tag{C.15}$$

$$\hat{Y}_{\mathcal{P}z,t}^{\mathcal{C}} = \hat{\mathcal{Y}}_{z,t}^{\mathcal{C}} - \eta_y^{\mathcal{C}} \left(\hat{p}_{y,t}^{\mathcal{P}} - \hat{s}_t\right) \tag{C.16}$$

$$\hat{Y}_{\mathcal{P}z,t}^{\mathcal{P}} = \hat{\mathcal{Y}}_{z,t}^{\mathcal{P}} - \eta_y^{\mathcal{P}} \hat{p}_{y,t}^{\mathcal{P}} \tag{C.17}$$

$$\hat{Y}_{\mathcal{C}z,t}^{\mathcal{P}} = \hat{\mathcal{Y}}_{z,t}^{\mathcal{P}} - \eta_y^{\mathcal{P}} \left(\hat{s}_t + \hat{p}_{y,t}^{\mathcal{C}}\right) \tag{C.18}$$

Relative prices

$$0 = \tilde{\gamma}_y^{\mathcal{C}} \hat{p}_{y,t}^{\mathcal{C}} + (1 - \tilde{\gamma}_y^{\mathcal{C}}) \left(\hat{p}_{y,t}^{\mathcal{P}} - \hat{s}_t\right) \tag{C.19}$$

$$0 = \tilde{\gamma}_y^{\mathcal{P}} \hat{p}_{y,t}^{\mathcal{P}} + (1 - \tilde{\gamma}_y^{\mathcal{P}}) \left(\hat{p}_{y,t}^{\mathcal{C}} + \hat{s}_t\right) \tag{C.20}$$

with

$$\tilde{\gamma}_y^{\mathcal{C}} \equiv \gamma_y^{\mathcal{C}} (p_y^{\mathcal{C}})^{1-\eta_y^{\mathcal{C}}}$$

$$\tilde{\gamma}_y^{\mathcal{P}} \equiv \gamma_y^{\mathcal{P}} (p_y^{\mathcal{P}})^{1-\eta_y^{\mathcal{P}}}$$

Intermediate goods sector factor demand

$$\hat{L}_t^{\mathcal{C}} = \hat{Y}_{z,t}^{\mathcal{C}} \tag{C.21}$$

$$\hat{L}_t^{\mathcal{P}} = \hat{Y}_{z,t}^{\mathcal{P}} \tag{C.22}$$

Price setting

For the core we have

$$
\begin{aligned}
\hat{p}^{\mathcal{C}}_{y,t} &= (1-\alpha^{\mathcal{C}}_p)\left(\hat{X}^{\mathcal{C}}_{pn,t} - \hat{X}^{\mathcal{C}}_{pd,t}\right) + \alpha^{\mathcal{C}}_p\left(\hat{p}^{\mathcal{C}}_{y,t-1} - \pi^{\mathcal{C}}_t + \iota^{\mathcal{C}}_p\pi^{\mathcal{C}}_{t-1}\right)\\
\hat{X}^{\mathcal{C}}_{pn,t} &= (1-\alpha^{\mathcal{C}}_p\beta^{\mathcal{C}})\left(\hat{\lambda}^{\mathcal{C}}_t + \hat{\xi}^{\mathcal{C}}_{p,t} + \hat{w}^{\mathcal{C}}_{z,t} + \theta\hat{p}^{\mathcal{C}}_{y,t} + \hat{Y}^{\mathcal{C}}_{z,t}\right) + \alpha^{\mathcal{C}}_p\beta^{\mathcal{C}}E_t\left[\hat{X}^{\mathcal{C}}_{pn,t+1} + \theta\left(\pi^{\mathcal{C}}_{t+1} - \iota^{\mathcal{C}}_p\pi^{\mathcal{C}}_t\right)\right]\\
\hat{X}^{\mathcal{C}}_{pd,t} &= (1-\alpha^{\mathcal{C}}_p\beta^{\mathcal{C}})\left(\hat{\lambda}^{\mathcal{C}}_t + \theta\hat{p}^{\mathcal{C}}_{y,t} + \hat{Y}^{\mathcal{C}}_{z,t}\right) + \alpha^{\mathcal{C}}_p\beta^{\mathcal{C}}E_t\left[\hat{X}^{\mathcal{C}}_{pd,t+1} + (\theta-1)\left(\pi^{\mathcal{C}}_{t+1} - \iota^{\mathcal{C}}_p\pi^{\mathcal{C}}_t\right)\right]
\end{aligned}
$$

Define

$$
\tilde{\pi}^{\mathcal{C}}_{y,t} \equiv \hat{p}^{\mathcal{C}}_{y,t} - \hat{p}^{\mathcal{C}}_{y,t-1} + \pi^{\mathcal{C}}_t - \iota^{\mathcal{C}}_p\pi^{\mathcal{C}}_{t-1} \tag{C.23}
$$

and write

$$
\begin{aligned}
\hat{X}^{\mathcal{C}}_{pn,t} - \hat{X}^{\mathcal{C}}_{pd,t} - \hat{p}^{\mathcal{C}}_{y,t} &= \frac{\alpha^{\mathcal{C}}_p}{1-\alpha^{\mathcal{C}}_p}\tilde{\pi}^{\mathcal{C}}_{y,t}\\
\hat{X}^{\mathcal{C}}_{pn,t} - \hat{X}^{\mathcal{C}}_{pd,t} - \hat{p}^{\mathcal{C}}_{y,t} &= (1-\alpha^{\mathcal{C}}_p\beta^{\mathcal{C}})\left(\hat{\xi}^{\mathcal{C}}_{p,t} + \hat{w}^{\mathcal{C}}_{z,t} - \hat{p}^{\mathcal{C}}_{y,t}\right)\\
&\quad + \alpha^{\mathcal{C}}_p\beta^{\mathcal{C}}E_t\left[\left(\hat{X}^{\mathcal{C}}_{pn,t+1} - \hat{X}^{\mathcal{C}}_{pd,t+1} - \hat{p}^{\mathcal{C}}_{y,t+1}\right) + \tilde{\pi}^{\mathcal{C}}_{y,t+1}\right]
\end{aligned}
$$

which we can combine to get

$$
\tilde{\pi}^{\mathcal{C}}_{y,t} = \zeta^{\mathcal{C}}_p\left(\hat{\xi}^{\mathcal{C}}_{p,t} + \hat{w}^{\mathcal{C}}_{z,t} - \hat{p}^{\mathcal{C}}_{y,t}\right) + \beta^{\mathcal{C}}E_t\left[\tilde{\pi}^{\mathcal{C}}_{y,t+1}\right] \tag{C.24}
$$

with

$$
\zeta^{\mathcal{C}}_p \equiv \frac{(1-\alpha^{\mathcal{C}}_p)(1-\alpha^{\mathcal{C}}_p\beta^{\mathcal{C}})}{\alpha^{\mathcal{C}}_p}
$$

Similarly we can write for the periphery

$$
\begin{aligned}
\hat{p}^{\mathcal{P}}_{y,t} &= (1-\alpha^{\mathcal{P}}_p)\left(\hat{X}^{\mathcal{P}}_{pn,t} - \hat{X}^{\mathcal{P}}_{pd,t}\right) + \alpha^{\mathcal{P}}_p\left(\hat{p}^{\mathcal{P}}_{y,t-1} - \pi^{\mathcal{P}}_t + \iota^{\mathcal{P}}_p\pi^{\mathcal{P}}_{t-1}\right)\\
\hat{X}^{\mathcal{P}}_{pn,t} &= (1-\alpha^{\mathcal{P}}_p\beta^{\mathcal{P}})\left(\hat{\lambda}^{\mathcal{P}}_t + \hat{\xi}^{\mathcal{P}}_{p,t} + \hat{w}^{\mathcal{P}}_{z,t} + \theta\hat{p}^{\mathcal{P}}_{y,t} + \hat{Y}^{\mathcal{P}}_{z,t}\right) + \alpha^{\mathcal{P}}_p\beta^{\mathcal{P}}E_t\left[\hat{X}^{\mathcal{P}}_{pn,t+1} + \theta\left(\pi^{\mathcal{P}}_{t+1} - \iota^{\mathcal{P}}_p\pi^{\mathcal{P}}_t\right)\right]\\
\hat{X}^{\mathcal{P}}_{pd,t} &= (1-\alpha^{\mathcal{P}}_p\beta^{\mathcal{P}})\left(\hat{\lambda}^{\mathcal{P}}_t + \theta\hat{p}^{\mathcal{P}}_{y,t} + \hat{Y}^{\mathcal{P}}_{z,t}\right) + \alpha^{\mathcal{P}}_p\beta^{\mathcal{P}}E_t\left[\hat{X}^{\mathcal{P}}_{pd,t+1} + (\theta-1)\left(\pi^{\mathcal{P}}_{t+1} - \iota^{\mathcal{P}}_p\pi^{\mathcal{P}}_t\right)\right]
\end{aligned}
$$

and combine to get

$$
\tilde{\pi}^{\mathcal{P}}_{y,t} = \zeta^{\mathcal{P}}_p\left(\hat{\xi}^{\mathcal{P}}_{p,t} + \hat{w}^{\mathcal{P}}_{z,t} - \hat{p}^{\mathcal{P}}_{y,t}\right) + \beta^{\mathcal{P}}E_t\left[\tilde{\pi}^{\mathcal{P}}_{y,t+1}\right] \tag{C.25}
$$

with

$$
\tilde{\pi}^{\mathcal{P}}_{y,t} \equiv \hat{p}^{\mathcal{P}}_{y,t} - \hat{p}^{\mathcal{P}}_{y,t-1} + \pi^{\mathcal{P}}_t - \iota^{\mathcal{P}}_p\pi^{\mathcal{P}}_{t-1} \tag{C.26}
$$

and

$$
\zeta^{\mathcal{P}}_p \equiv \frac{(1-\alpha^{\mathcal{P}}_p)(1-\alpha^{\mathcal{P}}_p\beta^{\mathcal{P}})}{\alpha^{\mathcal{P}}_p}
$$

Labor market clearing

$$\hat{L}_t^{\mathcal{C}} = \zeta_L^{\mathcal{C}} \hat{L}_{\mathcal{C},t}^{\mathcal{C}} + (1 - \zeta_L^{\mathcal{C}}) \hat{L}_{\mathcal{C},t}^{\mathcal{P}} \tag{C.27}$$

$$\hat{L}_t^{\mathcal{P}} = (1 - \zeta_L^{\mathcal{P}}) \hat{L}_{\mathcal{P},t}^{\mathcal{C}} + \zeta_L^{\mathcal{P}} \hat{L}_{\mathcal{P},t}^{\mathcal{P}} \tag{C.28}$$

with

$$\zeta_L^{\mathcal{C}} \equiv \frac{L_{\mathcal{C}}^{\mathcal{C}}}{L^{\mathcal{C}}}$$

$$\zeta_L^{\mathcal{P}} \equiv \frac{L_{\mathcal{P}}^{\mathcal{P}}}{L^{\mathcal{P}}}$$

Intermediate goods market clearing

$$\hat{Y}_{z,t}^{\mathcal{C}} = \zeta_Y^{\mathcal{C}} \hat{Y}_{\mathcal{C}z,t}^{\mathcal{C}} + (1 - \zeta_Y^{\mathcal{C}}) \left(\hat{\xi}_{z,t}^{\mathcal{P}} + \hat{Y}_{\mathcal{C}z,t}^{\mathcal{P}} \right) \tag{C.29}$$

$$\hat{Y}_{z,t}^{\mathcal{P}} = (1 - \zeta_Y^{\mathcal{P}}) \left(\hat{Y}_{\mathcal{P}z,t}^{\mathcal{C}} - \hat{\xi}_{z,t}^{\mathcal{P}} \right) + \zeta_Y^{\mathcal{P}} \hat{Y}_{\mathcal{P}z,t}^{\mathcal{P}} \tag{C.30}$$

with

$$\zeta_Y^{\mathcal{C}} \equiv \frac{Y_{\mathcal{C}z}^{\mathcal{C}}}{Y_z^{\mathcal{C}}}$$

$$\zeta_Y^{\mathcal{P}} \equiv \frac{Y_{\mathcal{P}z}^{\mathcal{P}}}{Y_z^{\mathcal{P}}}$$

Aggregate spending conditions

$$\hat{\mathcal{Y}}_{z,t}^{\mathcal{C}} = \zeta_{\mathcal{Y},C}^{\mathcal{C}} \hat{C}_{z,t}^{\mathcal{C}} + \zeta_{\mathcal{Y},G}^{\mathcal{C}} \hat{G}_{z,t}^{\mathcal{C}} + (1 - \zeta_{\mathcal{Y},C}^{\mathcal{C}} - \zeta_{\mathcal{Y},G}^{\mathcal{C}}) \left(\hat{\xi}_{z,t}^{\mathcal{P}} - \hat{s}_t + \hat{b}_{z,t}^{\mathcal{P}} \right) + \zeta_{\mathcal{Y},\Upsilon}^{\mathcal{C}} \hat{\Upsilon}_t \tag{C.31}$$

$$\hat{\mathcal{Y}}_{z,t}^{\mathcal{P}} = \zeta_{\mathcal{Y},C}^{\mathcal{P}} \hat{C}_{z,t}^{\mathcal{P}} + \zeta_{\mathcal{Y},G}^{\mathcal{P}} \hat{G}_{z,t}^{\mathcal{P}} \tag{C.32}$$

with

$$\zeta_{\mathcal{Y},C}^{j} \equiv \frac{C_z^j}{\mathcal{Y}_z^j}$$

$$\zeta_{\mathcal{Y},G}^{j} \equiv \frac{G_z^j}{\mathcal{Y}_z^j}$$

$$\zeta_{\mathcal{Y},\Upsilon}^{\mathcal{C}} \equiv \frac{1 - \varpi^{\mathcal{C}}}{\varpi^{\mathcal{C}}} \frac{\xi_z^{\mathcal{P}}}{s} \frac{b_z^{\mathcal{P}}}{\mathcal{Y}^{\mathcal{C}}} (1 + \Upsilon)$$

for $j \in \{\mathcal{C}, \mathcal{P}\}$.

Government expenditures

$$\hat{G}^{\mathcal{C}}_{z,t} = \hat{\xi}^{\mathcal{C}}_{g,t} \tag{C.33}$$

$$\hat{G}^{\mathcal{P}}_{z,t} = \hat{\xi}^{\mathcal{P}}_{g,t} \tag{C.34}$$

Real exchange rate

$$\hat{s}_t = \pi^{\mathcal{C}}_t - \pi^{\mathcal{P}}_t + \hat{s}_{t-1} \tag{C.35}$$

Balance of payments

$$\begin{aligned}
0 = & -\varpi^{\mathcal{C}} p^{\mathcal{P}}_y Y^{\mathcal{C}}_{\mathcal{P}z} \left(\hat{p}^{\mathcal{P}}_{y,t} + \hat{Y}^{\mathcal{C}}_{\mathcal{P}z,t}\right) + \varpi^{\mathcal{C}} \xi^{\mathcal{P}}_z w^{\mathcal{P}}_z L^{\mathcal{C}}_{\mathcal{P}} \left(\hat{\xi}^{\mathcal{P}}_{z,t} + \hat{w}^{\mathcal{P}}_{z,t} + \hat{L}^{\mathcal{C}}_{\mathcal{P},t}\right) \\
& + (1-\varpi^{\mathcal{C}}) s \xi^{\mathcal{P}}_z p^{\mathcal{C}}_y Y^{\mathcal{P}}_{\mathcal{C}z} \left(\hat{s}_t + \hat{\xi}^{\mathcal{P}}_{z,t} + \hat{p}^{\mathcal{C}}_{y,t} + \hat{Y}^{\mathcal{P}}_{\mathcal{C}z,t}\right) - (1-\varpi^{\mathcal{C}}) s w^{\mathcal{C}}_z L^{\mathcal{P}}_{\mathcal{C}} \left(\hat{s}_t + \hat{w}^{\mathcal{C}}_{z,t} + \hat{L}^{\mathcal{P}}_{\mathcal{C},t}\right) \\
& + (1-\varpi^{\mathcal{C}}) \frac{\xi^{\mathcal{P}}_z R^{\mathcal{P}}}{e^{\gamma} \Pi^{\mathcal{C}}} b^{\mathcal{P}}_z \left(\hat{\xi}^{\mathcal{P}}_{z,t-1} + \hat{s}_t + \hat{R}^{\mathcal{P}}_{t-1} - \hat{\xi}^{\mathcal{C}}_{z,t} - \hat{s}_{t-1} - \pi^{\mathcal{C}}_t + \hat{b}^{\mathcal{P}}_{z,t-1}\right) \\
& - (1-\varpi^{\mathcal{C}}) \xi^{\mathcal{P}}_z b^{\mathcal{P}}_z \left(\hat{\xi}^{\mathcal{P}}_{z,t} + \hat{b}^{\mathcal{P}}_{z,t}\right)
\end{aligned} \tag{C.36}$$

Monetary policy

$$\hat{R}_t = \rho_r \hat{R}_{t-1} + (1-\rho_r) \left[\phi_\pi \pi_t + \phi_{\Delta y} \left(\hat{Y}_{z,t} - \hat{Y}_{z,t-1} + \hat{\xi}^{\mathcal{C}}_{z,t}\right)\right] + \hat{\xi}_{m,t} \tag{C.37}$$

and

$$\hat{Y}_{z,t} = \varpi^{\mathcal{C}}_m \hat{Y}^{\mathcal{C}}_{z,t} + (1-\varpi^{\mathcal{C}}_m) \left(\hat{\xi}^{\mathcal{P}}_{z,t} + \hat{Y}^{\mathcal{P}}_{z,t}\right) \tag{C.38}$$

$$\pi_t = \varpi^{\mathcal{C}}_m \pi^{\mathcal{C}}_t + (1-\varpi^{\mathcal{C}}_m) \pi^{\mathcal{P}}_t \tag{C.39}$$

D List of Variables

Endogenous variables

- $\hat{\lambda}^j_t$: marginal utility of income of households in region j
- $\hat{C}^j_{z,t}$: households consumption (normalized by productivity) in region j
- $\hat{R}_t$: risk free nominal interest rate in the core
- $\hat{R}^{\mathcal{P}}_t$: nominal interest rate in the periphery
- $\hat{\Upsilon}_t$: periphery risk premium
- π^j_t: consumption price inflation in region j
- $\hat{b}^{\mathcal{P}}_{z,t}$: real periphery's debt, normalized by productivity

- $\hat{Y}^j_{z,t}$: real output in region j, normalized by productivity
- $\hat{p}^j_{y,t}$: relative price of output (vis-a-vis consumption price) in region j
- $\hat{L}^j_{i,t}$: labor supplied by households in region j to firms in region i
- $\hat{\tilde{L}}^j_t$: region j's aggregate disutility of supplying labor to both regions
- $\hat{w}^j_{z,t}$: real wage normalized by productivity in region j
- $\hat{\tilde{w}}^j_{z,t}$: weighted average of region j's households supply of labor to both regions
- $\hat{s}_t$: real exchange rate of the periphery
- $\hat{Y}^j_{iz,t}$: region j's demand for intermediate goods from region i, normalized by productivity
- $\hat{\mathcal{Y}}^j_{z,t}$: final goods level in region j, normalized by productivity
- $\hat{L}^j_t$: labor hired by firms in region j
- $\tilde{\pi}^j_{y,t}$: region j's goods inflation net of indexation
- $\hat{G}^j_{z,t}$: region j's government spending, normalized by productivity
- $\hat{Y}_t$: aggregate output tracked by monetary policy
- π_t: aggregate inflation tracked by monetary policy

Exogenous variables

- $\hat{\xi}^j_{\beta,t}$: shock to households discount factor in region j
- $\hat{\xi}_{z,t}$: common shock to productivity in both regions
- $\hat{\xi}^{\mathcal{P}}_{z,t}$: shock to the productivity in the periphery relative to productivity in the core
- $\hat{\xi}_{B,t}$: shock to periphery's risk premium
- $\hat{\xi}^j_{l,t}$: shock to the disutility of labor supply in region j
- $\hat{\xi}^j_{p,t}$: Shock to region j's price markup
- $\hat{\xi}^j_{g,t}$: shock to government spending in region j
- $\xi_{m,t}$: shock to the monetary policy rule

E List of Parameters

- $\varpi^{\mathcal{C}}$: core's population share
- $\varpi_m^{\mathcal{C}}$: weight of core's output/inflation on the aggregate output/inflation tracked in interest rate rule
- $\varrho_{\tilde{L}}^{\mathcal{P}}$: periphery-core ratio of labor aggregate in steady state
- $\varrho_y^{\mathcal{P}}$: periphery-core nominal GDP ratio in steady state
- $\varrho_{G,Y}^{j}$: government spending to output ratio in steady state in region j
- $b_y^{\mathcal{P}}$: periphery's debt to GDP ratio in steady state
- θ: intermediate goods price elasticity across varieties within each sector
- γ: steady state productivity growth rate
- Π: steady state gross inflation rate
- Υ: steady state net risk premium
- β^j: discount factor in region j
- σ^j: intertemporal elasticity of substitution for consumption in region j
- h^j: consumption habits parameter in region j
- υ: sensitivity of the periphery's risk premium to the debt-to-output ratio
- γ_l^j: labor supply home bias in region j
- ν^j: convexity of labor disutility of region j
- η_l^j: labor supply sensitivity to relative wages in region j
- η_y^j: elasticity of substitution across intermediate goods in region j
- γ_y^j: home bias in intermediate goods demand in region j
- ι_p^j: price indexation parameter in region j
- α_p^j: Calvo probability of not adjusting prices for firms in region j
- ζ_p^j: slope of the Phillips Curve in region j
- ρ_r: interest rate smoothing
- ϕ_π: interest rate rule response to inflation

- $\phi_{\Delta y}$: interest rate rule response to output growth
- ρ_{ξ}^{j}: auto-regressive parameter in shock ξ of region j
- σ_{ξ}^{j}: standard deviation of innovations to shock ξ of region j

F Estimation Results

F.1 No Labor Mobility Model Estimation

	Prior				Posterior					
	Dist	5%	Median	95%	Mode	Mean	SD	5%	Median	95%
$\varpi^{\mathcal{C}}$	C	—	0.610	—	—	—	—	—	—	—
$\varpi_m^{\mathcal{C}}$	C	—	0.680	—	—	—	—	—	—	—
$\varrho_y^{\mathcal{P}}$	C	—	0.500	—	—	—	—	—	—	—
$\varrho_{\tilde{L}}^{\mathcal{P}}$	C	—	1.000	—	—	—	—	—	—	—
$\varrho_{G,Y}^{\mathcal{C}}$	C	—	0.490	—	—	—	—	—	—	—
$\varrho_{G,Y}^{\mathcal{P}}$	C	—	0.450	—	—	—	—	—	—	—
$b_y^{\mathcal{P}}$	C	—	0.600	—	—	—	—	—	—	—
θ	C	—	11.000	—	—	—	—	—	—	—
400γ	G	0.783	1.445	2.406	1.215	1.207	0.242	0.825	1.197	1.618
$400(\Pi - 1)$	G	1.254	1.958	2.887	1.965	2.083	0.501	1.322	2.048	2.965
$400(\frac{R}{\Pi} - 1)$	G	1.254	1.958	2.887	0.914	1.004	0.223	0.660	0.991	1.394
400Υ	G	0.348	0.493	0.675	0.471	0.491	0.090	0.350	0.486	0.646
$\bar{L}^{\mathcal{C}}$	N	−3.290	0.000	3.290	1.379	1.168	1.285	−0.940	1.162	3.276
$\bar{L}^{\mathcal{P}}$	N	−3.290	0.000	3.290	0.564	0.818	1.515	−1.685	0.830	3.298
$\sigma^{\mathcal{C}}$	G	1.254	1.958	2.887	2.510	2.432	0.520	1.638	2.401	3.340
$\sigma^{\mathcal{P}}$	G	1.254	1.958	2.887	1.865	1.835	0.464	1.147	1.796	2.651
$h^{\mathcal{C}}$	B	0.335	0.500	0.665	0.695	0.720	0.062	0.614	0.722	0.818
$h^{\mathcal{P}}$	B	0.335	0.500	0.665	0.787	0.792	0.046	0.713	0.796	0.860
υ	G	0.061	0.257	0.686	0.000	0.000	0.000	0.000	0.000	0.001
$\nu^{\mathcal{C}}$	G	0.783	1.445	2.406	1.430	1.614	0.402	1.000	1.588	2.324
$\nu^{\mathcal{P}}$	G	0.783	1.445	2.406	0.887	1.122	0.233	0.766	1.108	1.529
$\eta_y^{\mathcal{C}}$	G	0.620	0.699	0.784	0.686	0.703	0.048	0.627	0.702	0.785
$\eta_y^{\mathcal{P}}$	G	0.620	0.699	0.784	0.745	0.762	0.061	0.666	0.760	0.865
$\gamma_y^{\mathcal{C}}$	B	0.664	0.752	0.828	0.841	0.831	0.043	0.754	0.835	0.895
$\gamma_y^{\mathcal{P}}$	B	0.664	0.752	0.828	0.859	0.851	0.033	0.791	0.854	0.900
$\iota_p^{\mathcal{C}}$	B	0.035	0.267	0.679	0.007	0.041	0.035	0.004	0.031	0.110
$\iota_p^{\mathcal{P}}$	B	0.035	0.267	0.679	0.014	0.060	0.051	0.005	0.046	0.163
$\alpha_p^{\mathcal{C}}$	B	0.524	0.707	0.853	0.705	0.726	0.049	0.646	0.726	0.808
$\alpha_p^{\mathcal{P}}$	B	0.524	0.707	0.853	0.766	0.781	0.048	0.699	0.782	0.858
ρ_r	B	0.035	0.267	0.679	0.643	0.723	0.053	0.627	0.729	0.797
ϕ_π	G	1.254	1.958	2.887	1.087	1.196	0.082	1.088	1.181	1.353
ϕ_y	G	0.222	0.474	0.868	0.098	0.207	0.078	0.096	0.197	0.351

Table F.1: No labor mobility model posterior distribution

	Prior				Posterior					
	Dist	5%	Median	95%	Mode	Mean	SD	5%	Median	95%
$\rho_\beta^\mathcal{C}$	B	0.321	0.733	0.965	0.966	0.926	0.034	0.860	0.934	0.967
$\rho_\beta^\mathcal{P}$	B	0.321	0.733	0.965	0.936	0.918	0.025	0.872	0.921	0.953
$\rho_z^\mathcal{C}$	B	0.321	0.733	0.965	0.201	0.208	0.058	0.111	0.208	0.303
$\rho_z^\mathcal{P}$	B	0.321	0.733	0.965	0.979	0.959	0.018	0.927	0.961	0.985
$\rho_l^\mathcal{C}$	B	0.321	0.733	0.965	0.981	0.976	0.012	0.954	0.977	0.994
$\rho_l^\mathcal{P}$	B	0.321	0.733	0.965	0.906	0.904	0.038	0.836	0.908	0.959
$\rho_g^\mathcal{C}$	B	0.321	0.733	0.965	0.906	0.793	0.149	0.499	0.826	0.974
$\rho_g^\mathcal{P}$	B	0.321	0.733	0.965	0.895	0.705	0.188	0.342	0.738	0.951
$\rho_p^\mathcal{C}$	B	0.321	0.733	0.965	0.997	0.973	0.026	0.922	0.980	0.997
$\rho_p^\mathcal{P}$	B	0.321	0.733	0.965	0.972	0.882	0.077	0.726	0.900	0.973
ρ_B	B	0.321	0.733	0.965	0.699	0.696	0.053	0.599	0.700	0.776
ρ_m	B	0.321	0.733	0.965	0.482	0.366	0.095	0.207	0.367	0.519
$\sigma_\beta^\mathcal{C}$	IG1	0.166	0.343	1.237	3.497	3.833	0.863	2.625	3.718	5.437
$\sigma_\beta^\mathcal{P}$	IG1	0.166	0.343	1.237	5.892	6.412	1.675	4.103	6.189	9.450
$\sigma_z^\mathcal{C}$	IG1	0.166	0.343	1.237	0.508	0.518	0.043	0.451	0.515	0.593
$\sigma_z^\mathcal{P}$	IG1	0.166	0.343	1.237	0.536	0.553	0.047	0.482	0.550	0.636
$\sigma_l^\mathcal{C}$	IG1	0.166	0.343	1.237	0.837	1.079	0.152	0.850	1.068	1.345
$\sigma_l^\mathcal{P}$	IG1	0.166	0.343	1.237	1.199	1.379	0.176	1.116	1.364	1.693
$\sigma_g^\mathcal{C}$	IG1	0.166	0.343	1.237	0.175	0.185	0.041	0.125	0.181	0.260
$\sigma_g^\mathcal{P}$	IG1	0.166	0.343	1.237	0.214	0.297	0.099	0.162	0.282	0.477
$\sigma_p^\mathcal{C}$	IG1	0.166	0.343	1.237	1.150	1.360	0.287	1.039	1.302	1.871
$\sigma_p^\mathcal{P}$	IG1	0.166	0.343	1.237	1.687	2.825	1.515	1.515	2.328	5.912
σ_B	IG1	0.166	0.343	1.237	0.143	0.146	0.013	0.127	0.145	0.168
σ_m	IG1	0.166	0.343	1.237	0.140	0.133	0.016	0.110	0.131	0.161

Table F.1: No labor mobility model posterior distribution (continued)

F.2 Labor Mobility Model Estimation

	Prior				Posterior					
	Dist	5%	Median	95%	Mode	Mean	SD	5%	Median	95%
$\varpi^{\mathcal{C}}$	C	—	0.610	—	—	—	—	—	—	—
$\varpi_m^{\mathcal{C}}$	C	—	0.680	—	—	—	—	—	—	—
$\varrho_y^{\mathcal{P}}$	C	—	0.500	—	—	—	—	—	—	—
$\varrho_{\tilde{L}}^{\mathcal{P}}$	C	—	1.000	—	—	—	—	—	—	—
$\varrho_{G,Y}^{\mathcal{C}}$	C	—	0.490	—	—	—	—	—	—	—
$\varrho_{G,Y}^{\mathcal{P}}$	C	—	0.450	—	—	—	—	—	—	—
$b_y^{\mathcal{P}}$	C	—	0.600	—	—	—	—	—	—	—
θ	C	—	11.000	—	—	—	—	—	—	—
400γ	G	0.783	1.445	2.406	1.181	1.177	0.244	0.787	1.170	1.590
$400(\Pi - 1)$	G	1.254	1.958	2.887	1.956	2.103	0.498	1.349	2.067	2.978
$400(R/\Pi - 1)$	G	1.254	1.958	2.887	0.953	1.062	0.234	0.704	1.046	1.471
400Υ	G	0.348	0.493	0.675	0.476	0.495	0.094	0.350	0.490	0.657
$\bar{L}^{\mathcal{C}}$	N	−3.290	0.000	3.290	1.393	0.438	1.251	−1.584	0.421	2.534
$\bar{L}^{\mathcal{P}}$	N	−3.290	0.000	3.290	0.891	1.009	1.422	−1.324	1.014	3.334
$\sigma^{\mathcal{C}}$	G	1.254	1.958	2.887	2.487	2.411	0.520	1.627	2.374	3.316
$\sigma^{\mathcal{P}}$	G	1.254	1.958	2.887	1.712	1.758	0.471	1.064	1.714	2.603
$h^{\mathcal{C}}$	B	0.335	0.500	0.665	0.677	0.717	0.068	0.600	0.720	0.823
$h^{\mathcal{P}}$	B	0.335	0.500	0.665	0.765	0.780	0.050	0.692	0.785	0.855
υ	G	0.061	0.257	0.686	0.000	0.002	0.002	0.000	0.002	0.006
$\gamma_l^{\mathcal{C}}$	B	0.570	0.760	0.897	0.983	0.973	0.013	0.949	0.975	0.990
$\gamma_l^{\mathcal{P}}$	B	0.570	0.760	0.897	0.990	0.985	0.007	0.973	0.986	0.994
$\nu^{\mathcal{C}}$	G	0.783	1.445	2.406	1.745	1.924	0.471	1.207	1.891	2.758
$\nu^{\mathcal{P}}$	G	0.783	1.445	2.406	0.946	1.279	0.283	0.851	1.258	1.776
$\eta_l^{\mathcal{C}}$	G	1.838	1.998	2.167	1.987	1.987	0.100	1.825	1.986	2.153
$\eta_l^{\mathcal{P}}$	G	1.838	1.998	2.167	1.967	1.962	0.100	1.802	1.960	2.128
$\eta_y^{\mathcal{C}}$	G	0.620	0.699	0.784	0.684	0.694	0.048	0.617	0.693	0.775
$\eta_y^{\mathcal{P}}$	G	0.620	0.699	0.784	0.731	0.751	0.059	0.657	0.748	0.851
$\gamma_y^{\mathcal{C}}$	B	0.664	0.752	0.828	0.832	0.827	0.042	0.753	0.831	0.890
$\gamma_y^{\mathcal{P}}$	B	0.664	0.752	0.828	0.845	0.843	0.034	0.783	0.845	0.894
$\iota_p^{\mathcal{C}}$	B	0.035	0.267	0.679	0.008	0.046	0.041	0.004	0.035	0.125
$\iota_p^{\mathcal{P}}$	B	0.035	0.267	0.679	0.014	0.069	0.059	0.006	0.054	0.184

Table F.2: Labor mobility model posterior distribution

	Prior				Posterior					
	Dist	5%	Median	95%	Mode	Mean	SD	5%	Median	95%
$\alpha_p^{\mathcal{C}}$	B	0.524	0.707	0.853	0.707	0.721	0.049	0.641	0.722	0.801
$\alpha_p^{\mathcal{P}}$	B	0.524	0.707	0.853	0.786	0.813	0.048	0.729	0.817	0.885
α_r	B	0.035	0.267	0.679	0.675	0.754	0.042	0.679	0.758	0.816
ϕ_π	G	1.254	1.958	2.887	1.119	1.316	0.124	1.154	1.296	1.547
ϕ_y	G	0.222	0.474	0.868	0.136	0.292	0.100	0.146	0.282	0.470
$\rho_\beta^{\mathcal{C}}$	B	0.321	0.733	0.965	0.964	0.879	0.051	0.782	0.887	0.948
$\rho_\beta^{\mathcal{P}}$	B	0.321	0.733	0.965	0.930	0.915	0.026	0.867	0.918	0.952
$\rho_z^{\mathcal{C}}$	B	0.321	0.733	0.965	0.204	0.226	0.059	0.127	0.226	0.323
$\rho_z^{\mathcal{P}}$	B	0.321	0.733	0.965	0.986	0.975	0.014	0.948	0.977	0.994
$\rho_l^{\mathcal{C}}$	B	0.321	0.733	0.965	0.982	0.982	0.010	0.963	0.983	0.997
$\rho_l^{\mathcal{P}}$	B	0.321	0.733	0.965	0.910	0.924	0.036	0.859	0.927	0.976
$\rho_g^{\mathcal{C}}$	B	0.321	0.733	0.965	0.897	0.776	0.159	0.466	0.809	0.972
$\rho_g^{\mathcal{P}}$	B	0.321	0.733	0.965	0.853	0.664	0.189	0.309	0.692	0.923
$\rho_p^{\mathcal{C}}$	B	0.321	0.733	0.965	0.994	0.961	0.030	0.903	0.968	0.994
$\rho_p^{\mathcal{P}}$	B	0.321	0.733	0.965	0.949	0.807	0.107	0.595	0.831	0.939
ρ_B	B	0.321	0.733	0.965	0.699	0.669	0.065	0.553	0.675	0.766
ρ_m	B	0.321	0.733	0.965	0.436	0.340	0.085	0.198	0.342	0.479
$\sigma_\beta^{\mathcal{C}}$	IG1	0.166	0.343	1.237	3.519	3.953	0.989	2.654	3.804	5.720
$\sigma_\beta^{\mathcal{P}}$	IG1	0.166	0.343	1.237	5.260	5.857	1.629	3.677	5.620	8.814
$\sigma_z^{\mathcal{C}}$	IG1	0.166	0.343	1.237	0.508	0.516	0.044	0.450	0.513	0.592
$\sigma_z^{\mathcal{P}}$	IG1	0.166	0.343	1.237	0.558	0.590	0.051	0.513	0.586	0.679
$\sigma_l^{\mathcal{C}}$	IG1	0.166	0.343	1.237	0.975	1.417	0.227	1.087	1.394	1.821
$\sigma_l^{\mathcal{P}}$	IG1	0.166	0.343	1.237	1.176	1.511	0.262	1.143	1.479	1.990
$\sigma_g^{\mathcal{C}}$	IG1	0.166	0.343	1.237	0.192	0.204	0.050	0.134	0.198	0.295
$\sigma_g^{\mathcal{P}}$	IG1	0.166	0.343	1.237	0.246	0.414	0.134	0.213	0.404	0.651
$\sigma_p^{\mathcal{C}}$	IG1	0.166	0.343	1.237	1.177	1.426	0.321	1.073	1.360	2.001
$\sigma_p^{\mathcal{P}}$	IG1	0.166	0.343	1.237	2.082	4.814	3.209	1.942	3.666	11.649
σ_B	IG1	0.166	0.343	1.237	0.143	0.144	0.012	0.125	0.143	0.165
σ_m	IG1	0.166	0.343	1.237	0.134	0.130	0.014	0.109	0.128	0.154

Table F.2: Labor mobility model posterior distribution (continued)

G Responses to Shocks

In this section we show the posterior median responses to shocks for the estimated model with no labor mobility and for the counterfactual model with labor mobility, for the full list of shocks in the model.

G.1 Monetary Shock

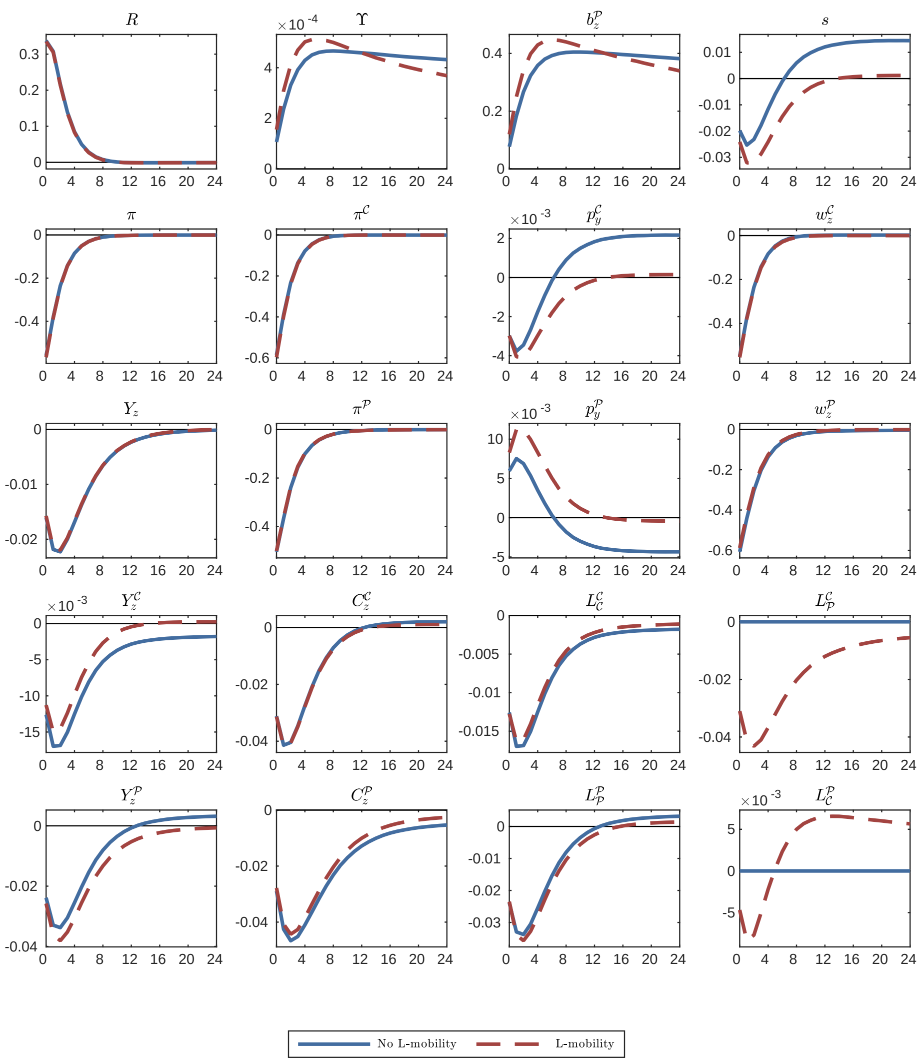

Figure G.1: Responses to one standard deviation monetary policy shock.

G.2 Common Productivity Shock

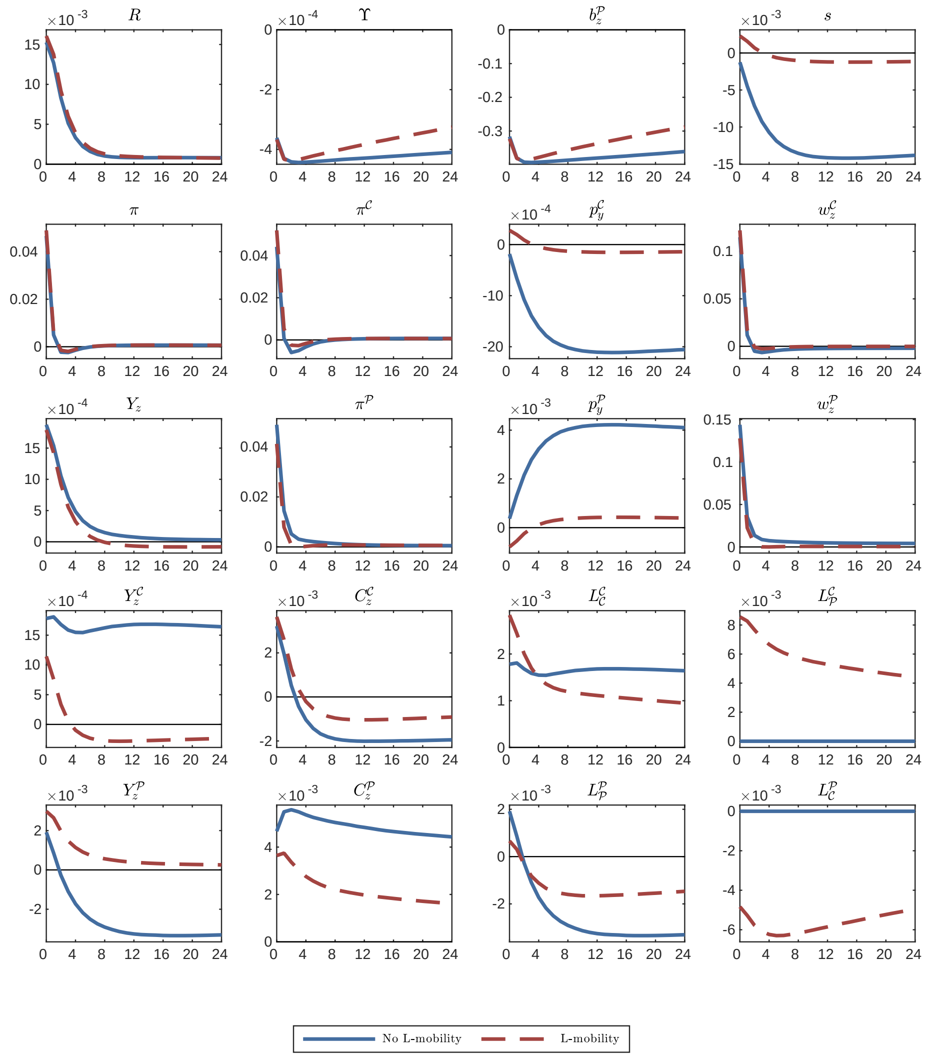

Figure G.2: Responses to one standard deviation common productivity shock.

G.3 Periphery Productivity Shock

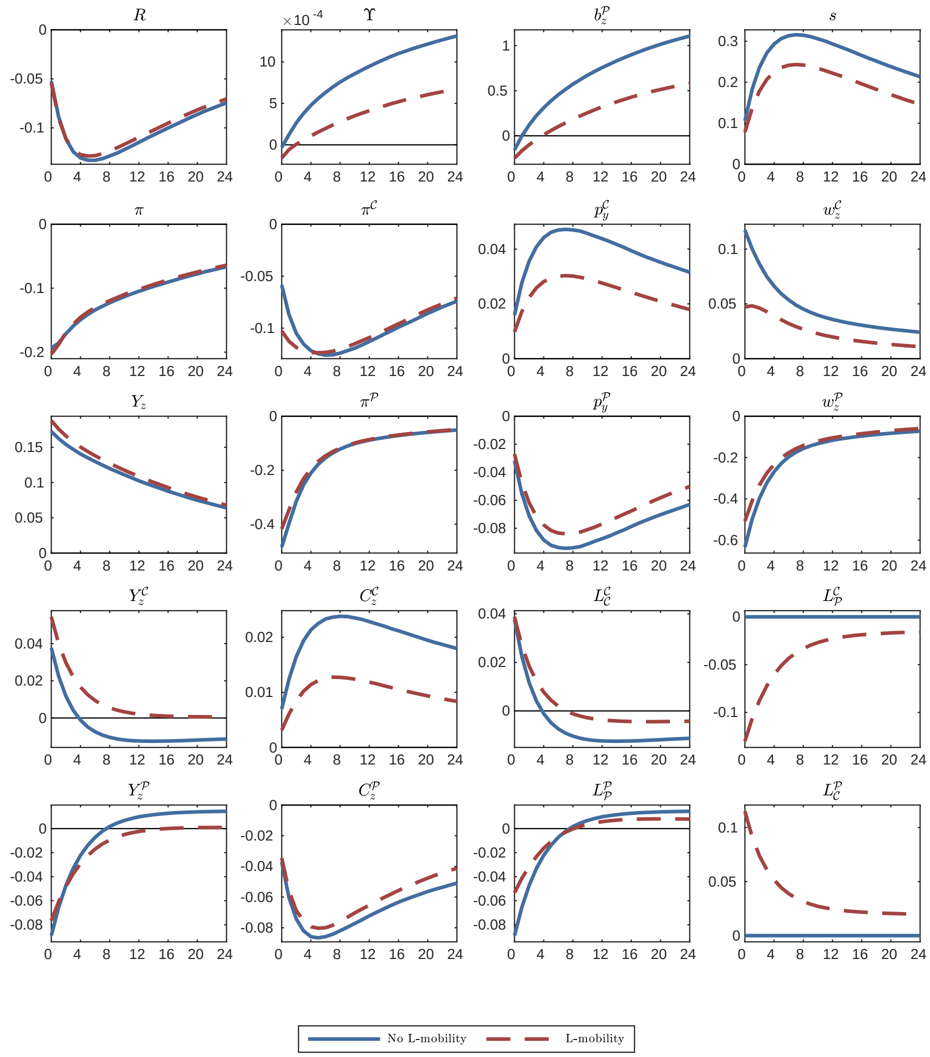

Figure G.3: Responses to one standard deviation periphery productivity shock.

G.4 Core Discount Factor Shock

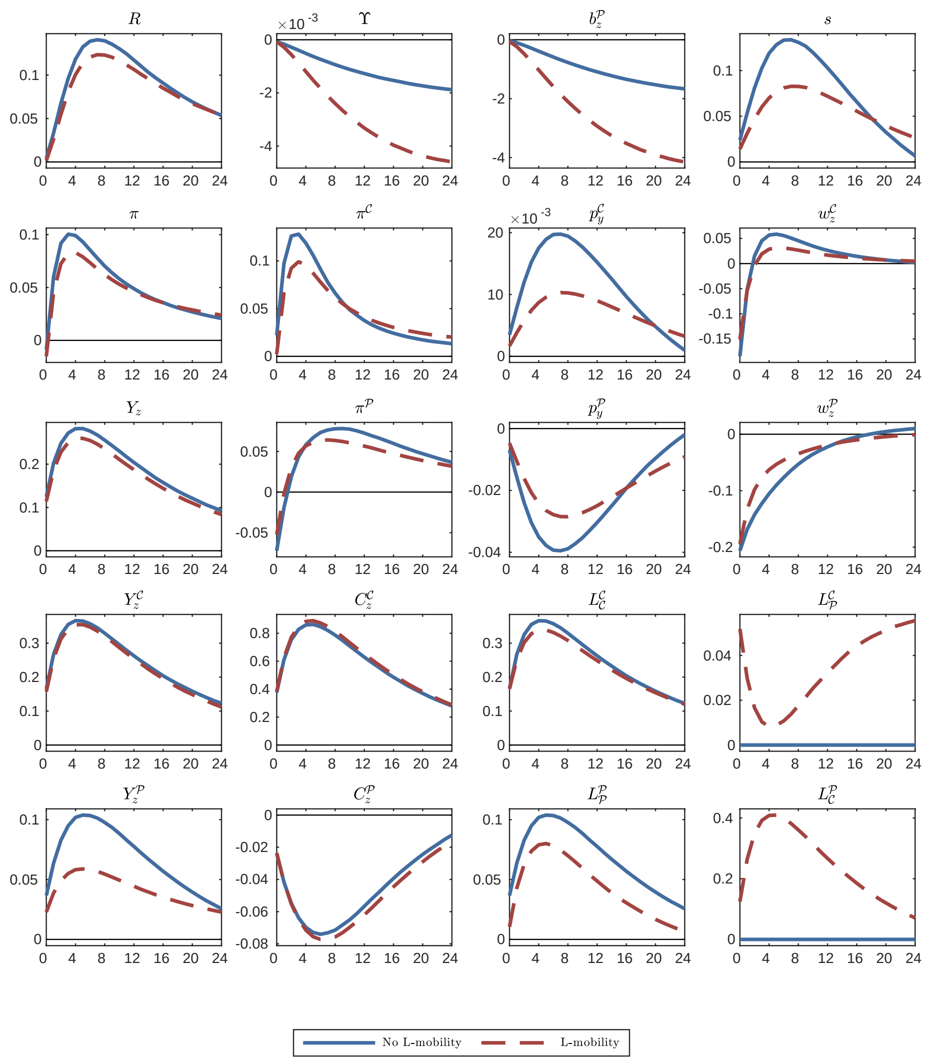

Figure G.4: Responses to one standard deviation core discount factor shock.

G.5 Periphery Discount Factor Shock

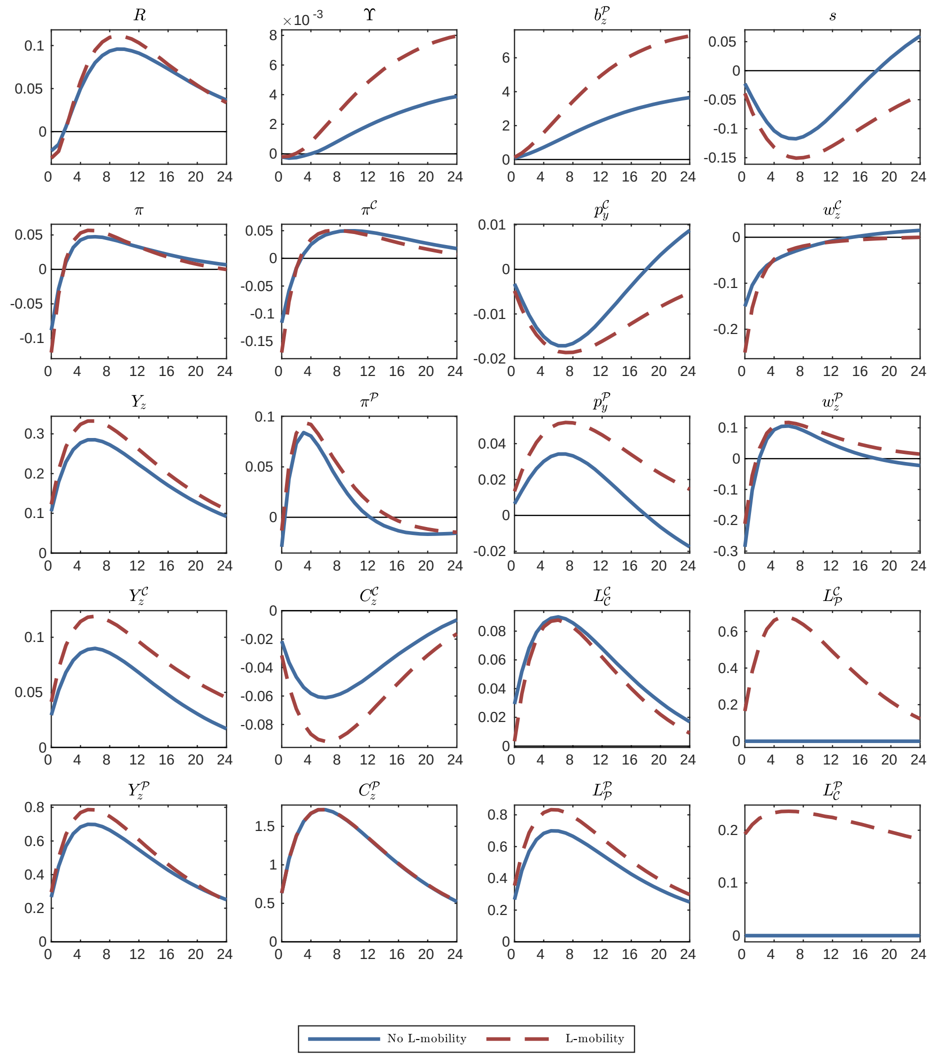

Figure G.5: Responses to one standard deviation periphery discount factor shock.

G.6 Core Labor Disutility Shock

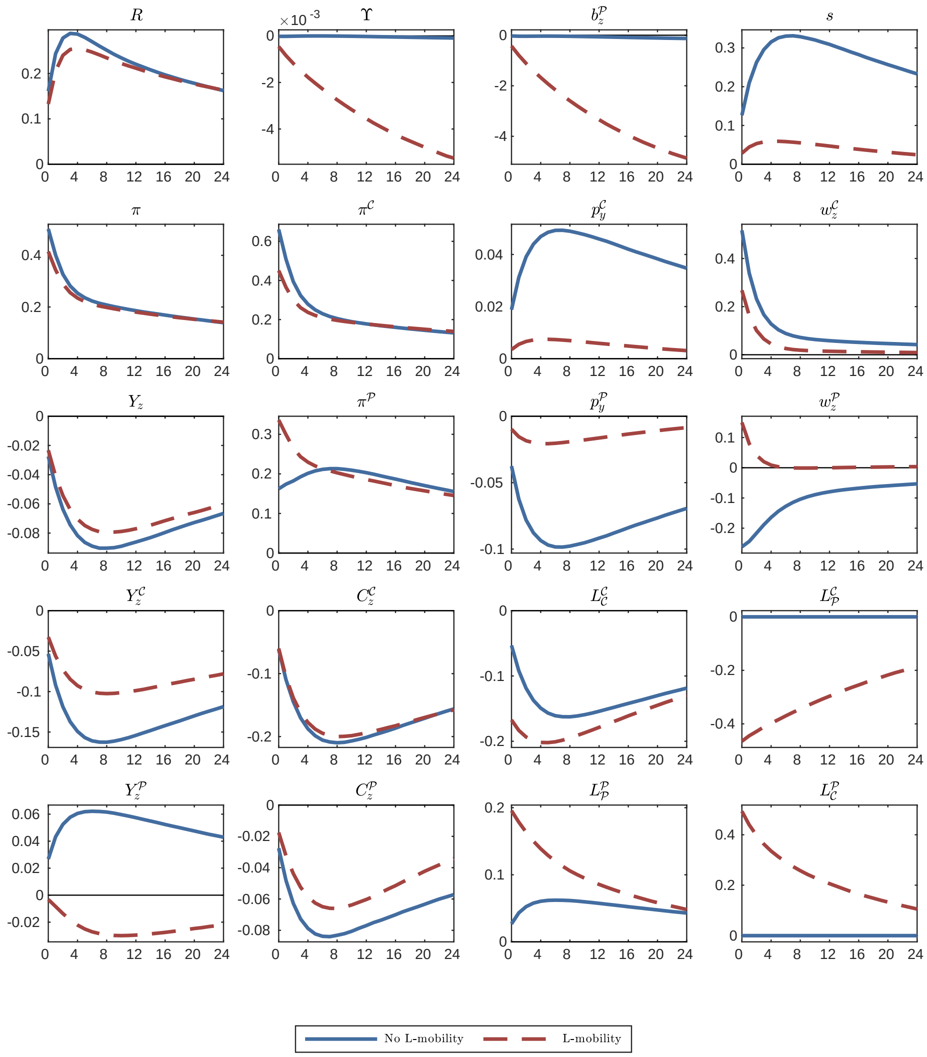

Figure G.6: Responses to one standard deviation core labor disutility shock.

G.7 Periphery Labor Disutility Shock

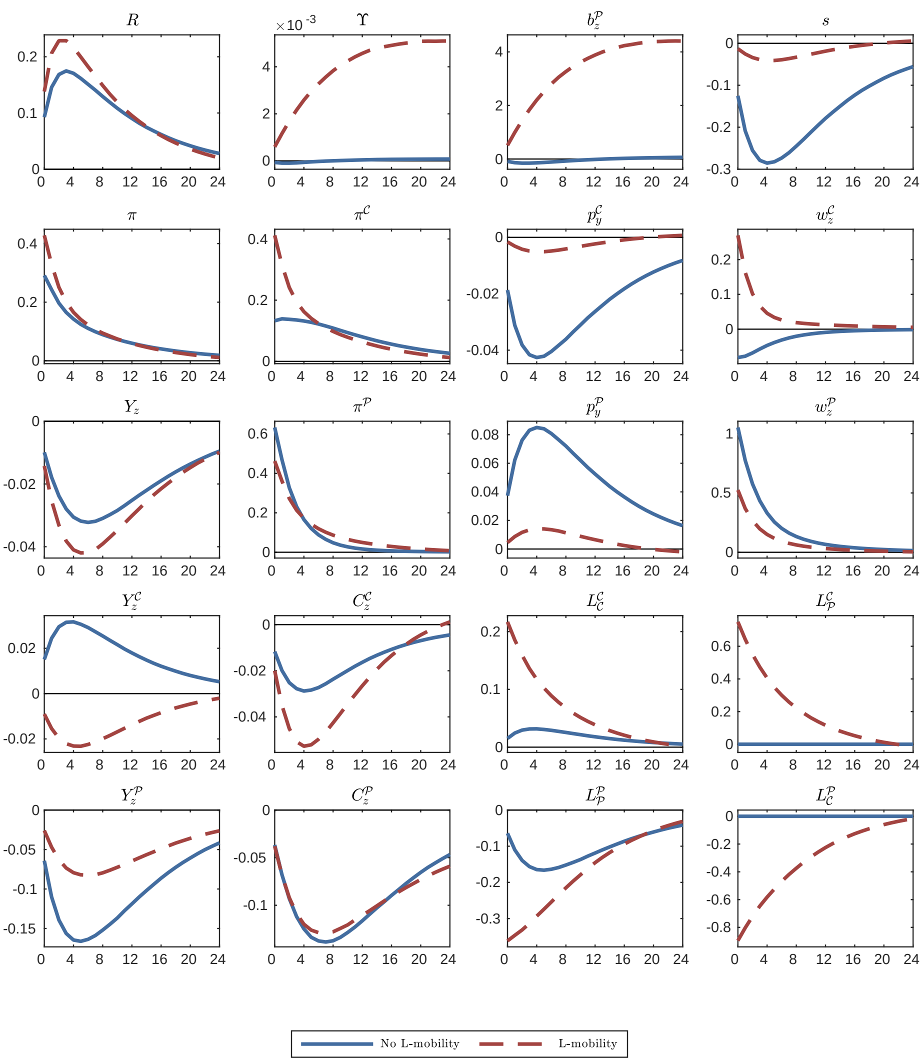

Figure G.7: Responses to one standard deviation periphery labor disutility shock.

G.8 Core Government Spending Shock

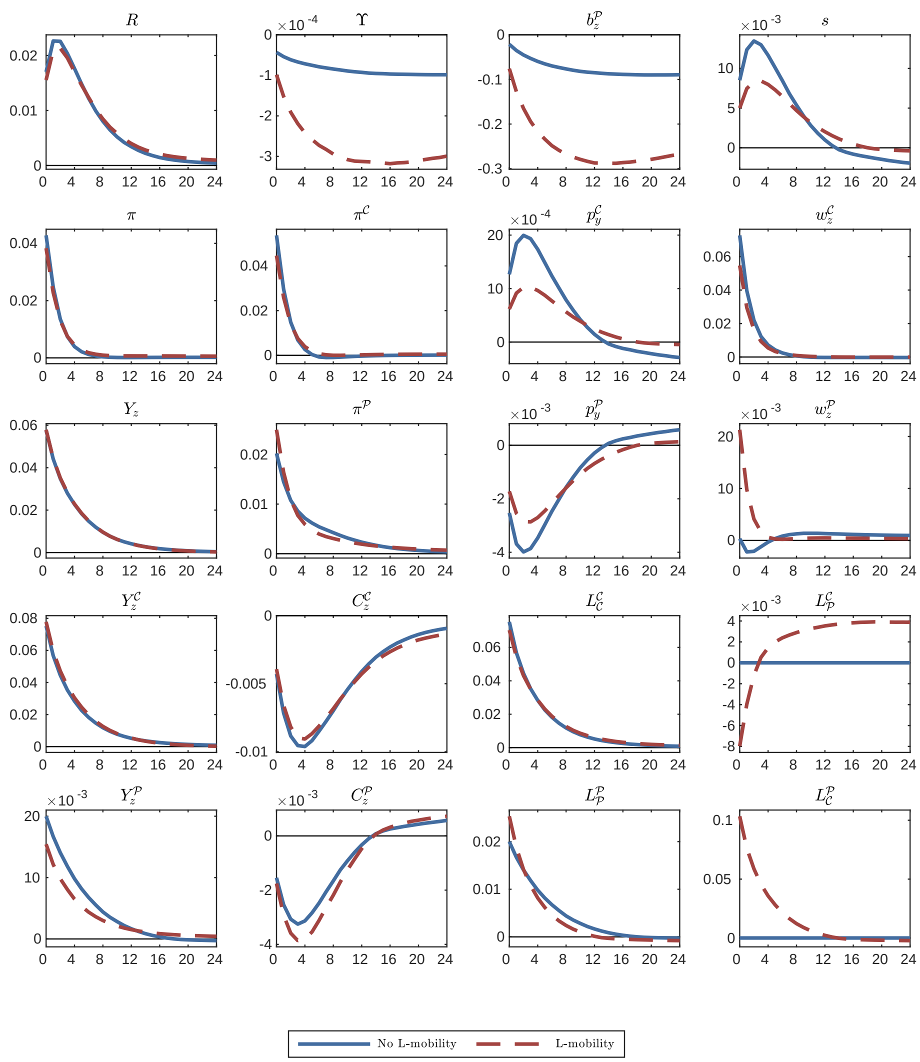

Figure G.8: Responses to one standard deviation core government spending shock.

G.9 Periphery Government Spending Shock

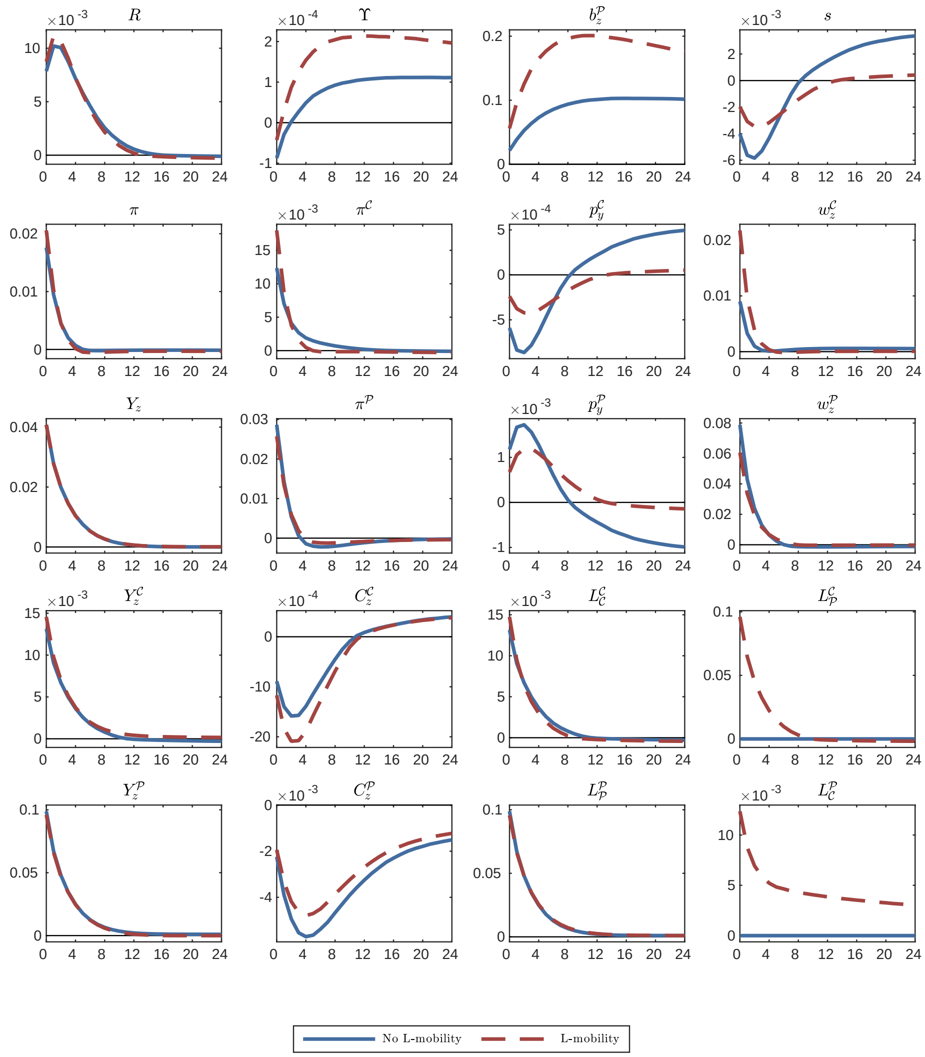

Figure G.9: Responses to one standard deviation periphery government spending shock.

G.10 Core Price Markup Shock

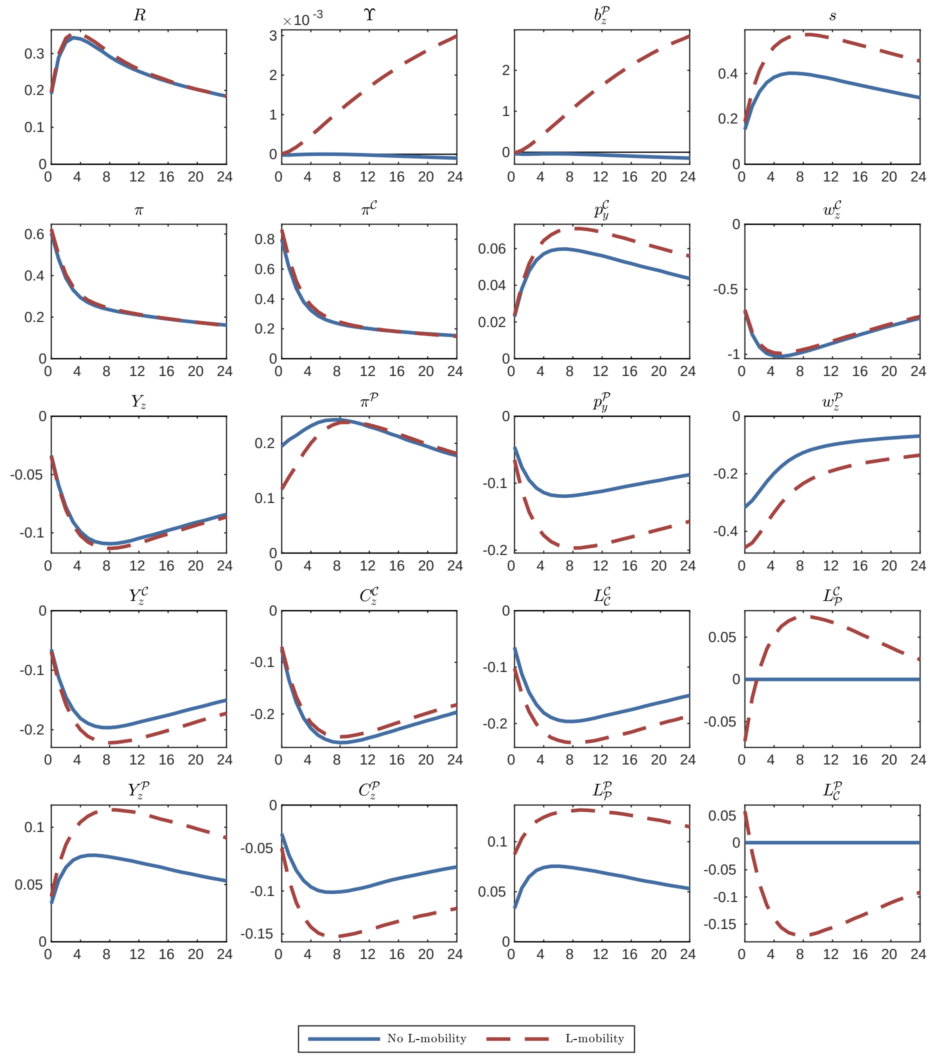

Figure G.10: Responses to one standard deviation core price markup shock.

G.11 Periphery Price Markup Shock

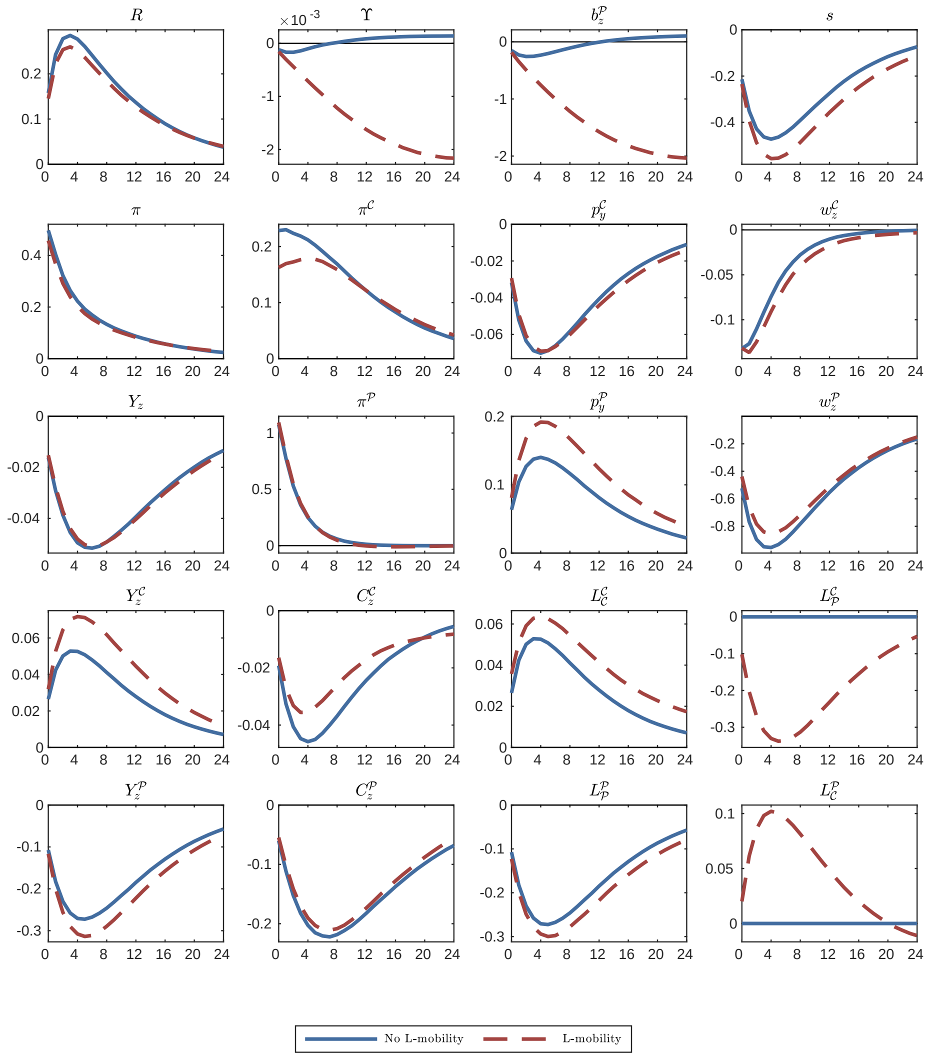

Figure G.11: Responses to one standard deviation periphery price markup shock.

G.12 Periphery Risk Premium Shock

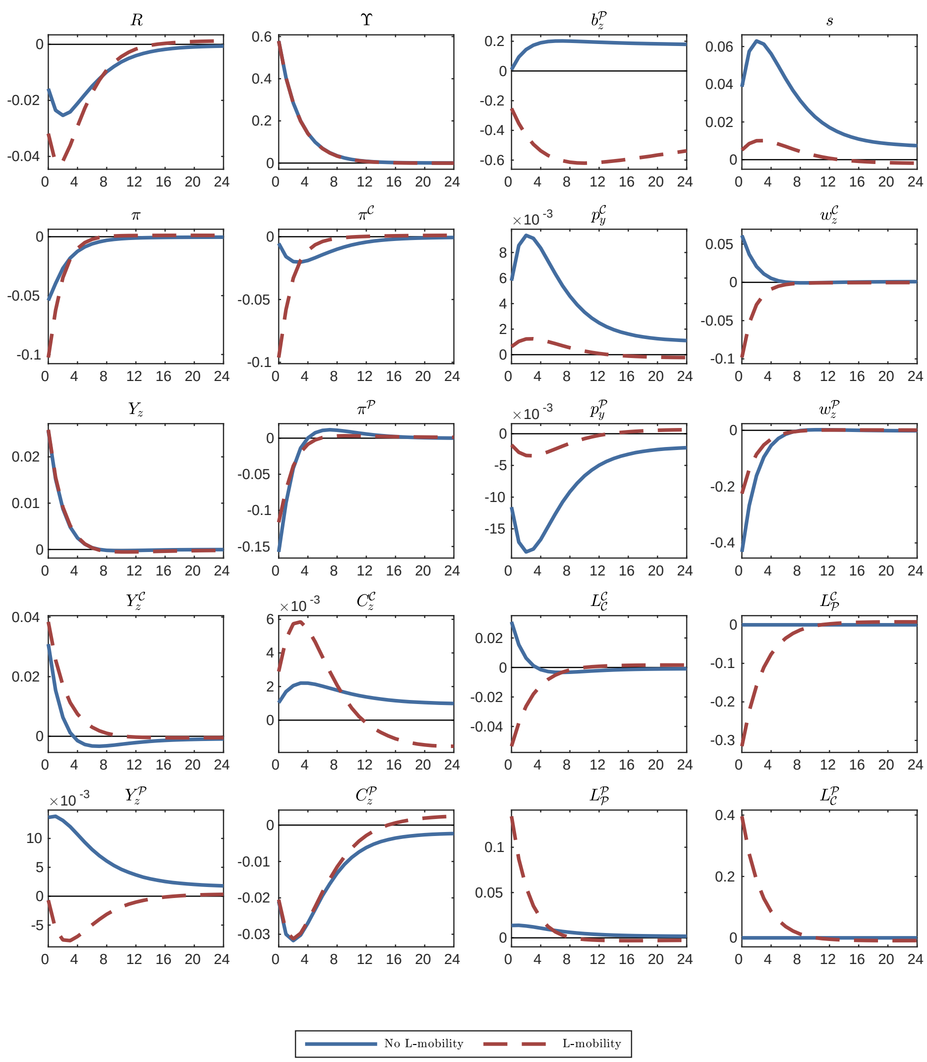

Figure G.12: Responses to one standard deviation periphery risk premium shock.

H Responses to Shocks: Symmetric Case

In this section we compare the responses to the shocks in the same two models but setting all preferences, technology and nominal rigidities to be symmetric across regions. Namely, we set $\sigma^{\mathcal{C}} = \sigma^{\mathcal{P}} = 2.1$, $h^{\mathcal{C}} = h^{\mathcal{P}} = 0.76$, $\nu^{\mathcal{C}} = \nu^{\mathcal{P}} = 1.35$, $\eta_y^{\mathcal{C}} = \eta_y^{\mathcal{P}} = 0.73$, $\gamma_y^{\mathcal{C}} = \gamma_y^{\mathcal{P}} = 0.84$, $\iota_p^{\mathcal{C}} = \iota_p^{\mathcal{P}} = 0.04$, and $\alpha_p^{\mathcal{C}} = \alpha_p^{\mathcal{P}} = 0.75$ (all roughly at the midpoint of the two regions corresponding posterior medians). The other model parameters are drawn from the posterior MCMC sample, as in the baseline results. Figures show median responses for each model. The blue solid and red dashed lines are the same as in baseline results, shown for comparison purposes. The green solid line is the symmetric case without labor mobility, and the orange dashed line is the symmetric case with labor mobility.

H.1 Monetary Shock

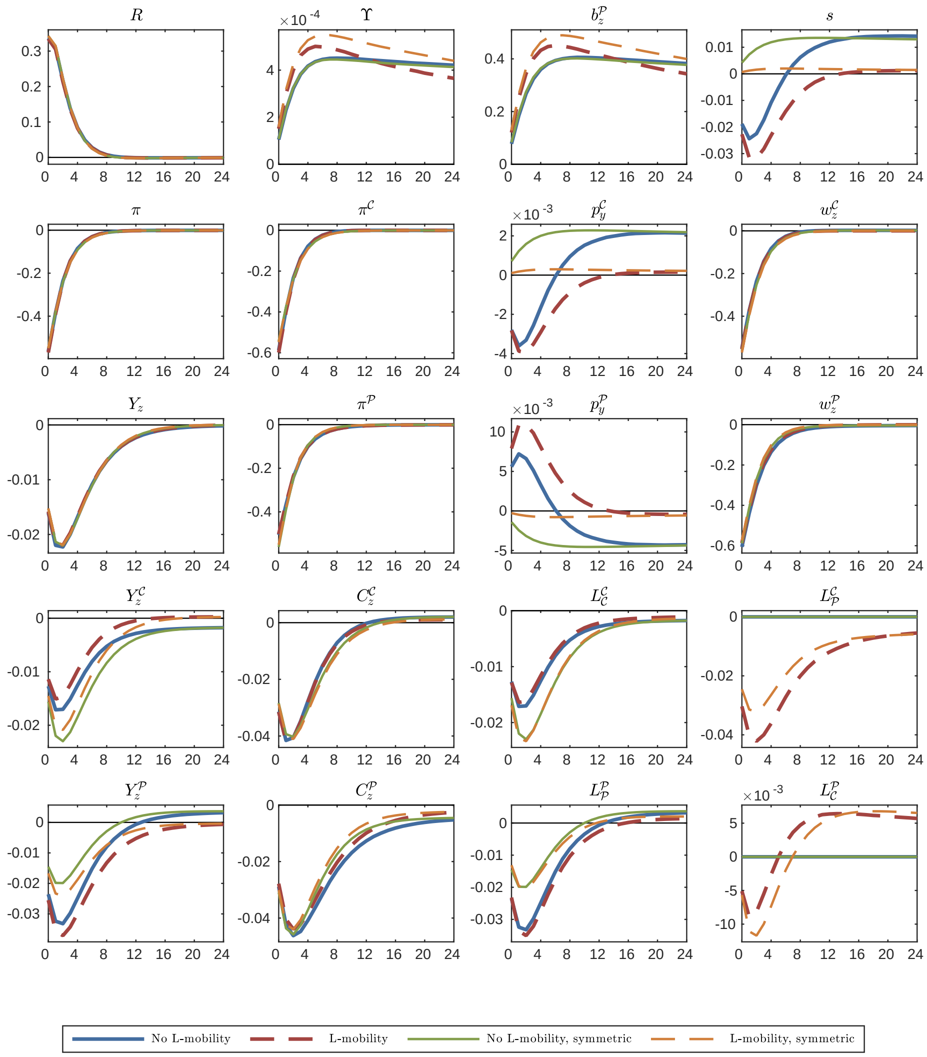

Figure H.1: Responses to one standard deviation monetary policy shock in the case with symmetric preferences, technology and nominal rigidities.

H.2 Common Productivity Shock

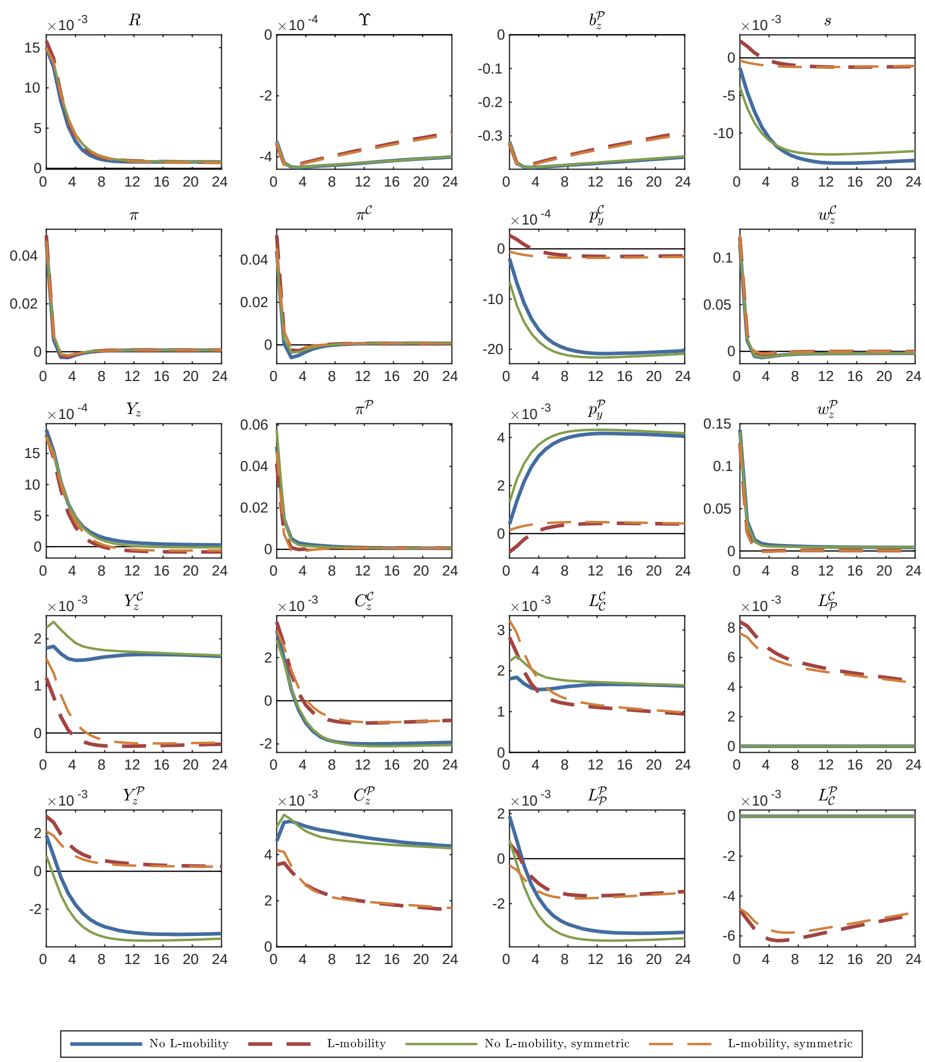

Figure H.2: Responses to one standard deviation common productivity shock in the case with symmetric preferences, technology and nominal rigidities.

H.3 Periphery Productivity Shock

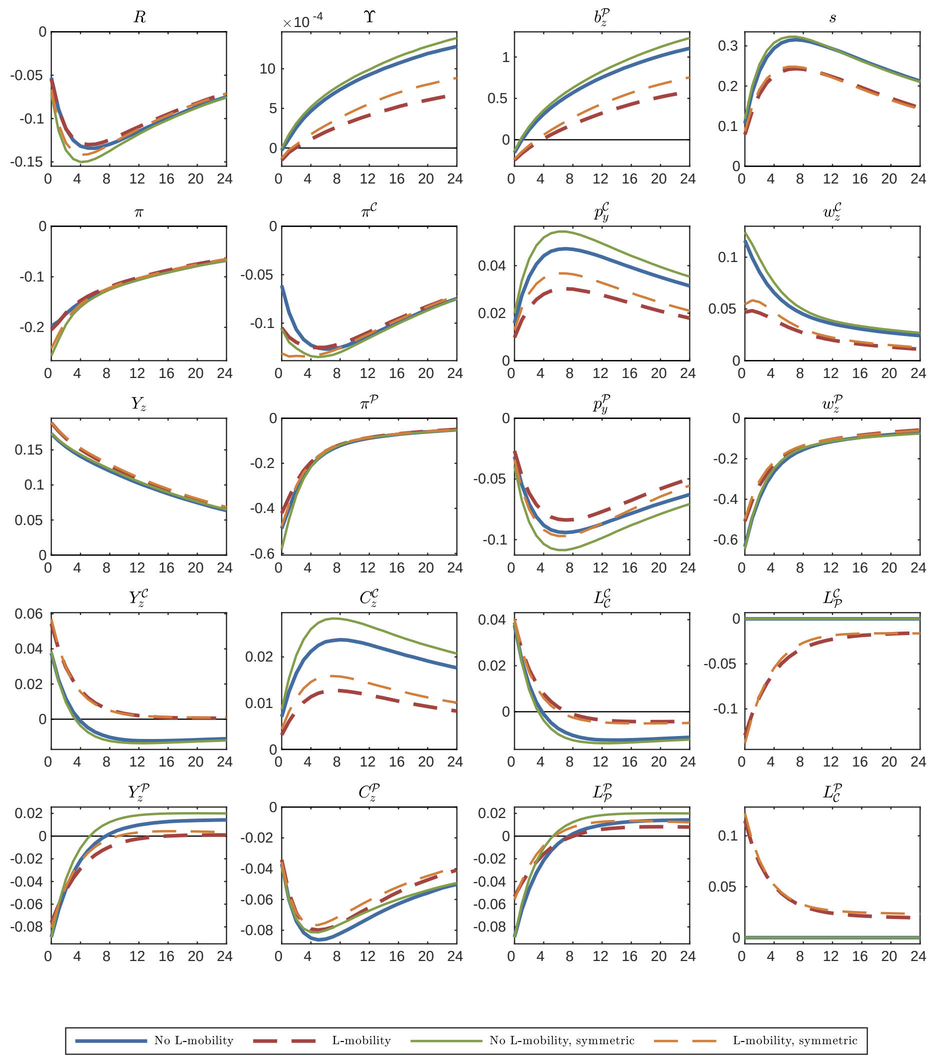

Figure H.3: Responses to one standard deviation periphery productivity shock in the case with symmetric preferences, technology and nominal rigidities.

H.4 Core Discount Factor Shock

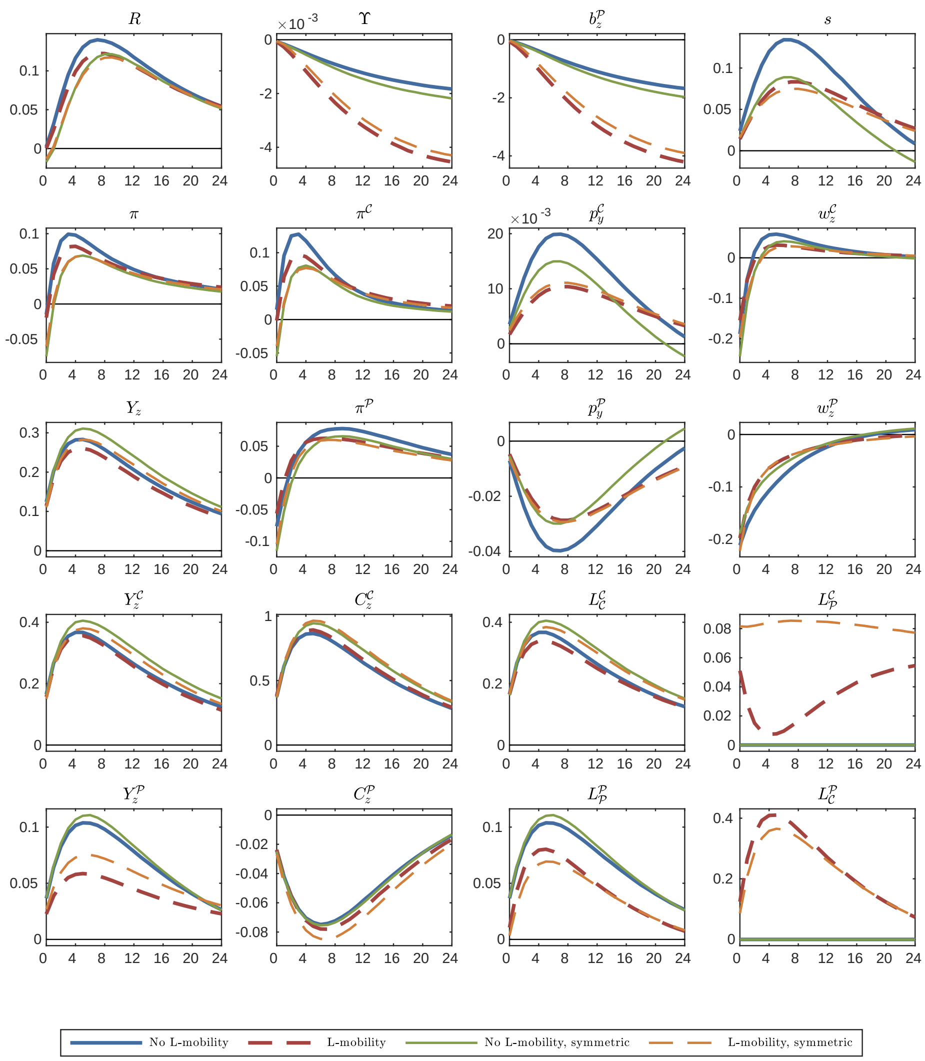

Figure H.4: Responses to one standard deviation core discount factor shock in the case with symmetric preferences, technology and nominal rigidities.

H.5 Periphery Discount Factor Shock

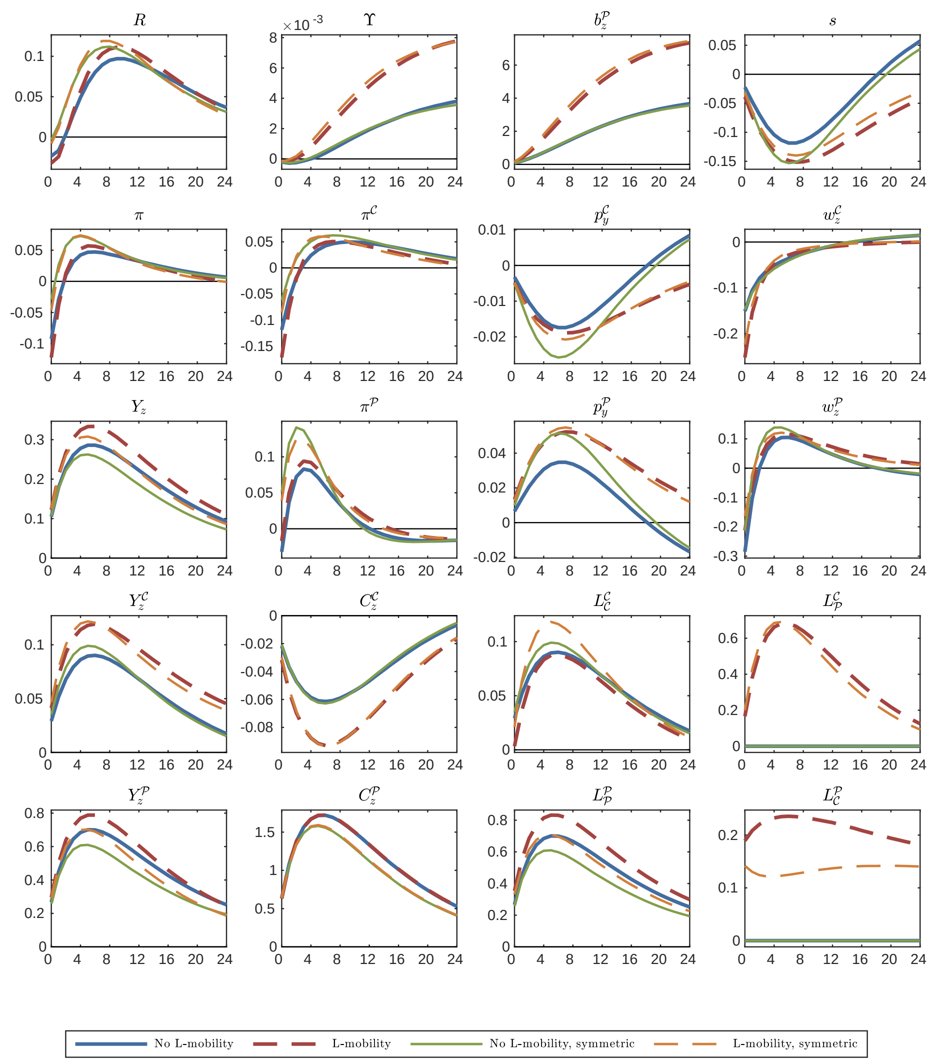

Figure H.5: Responses to one standard deviation periphery discount factor shock in the case with symmetric preferences, technology and nominal rigidities.

H.6 Core Labor Disutility Shock

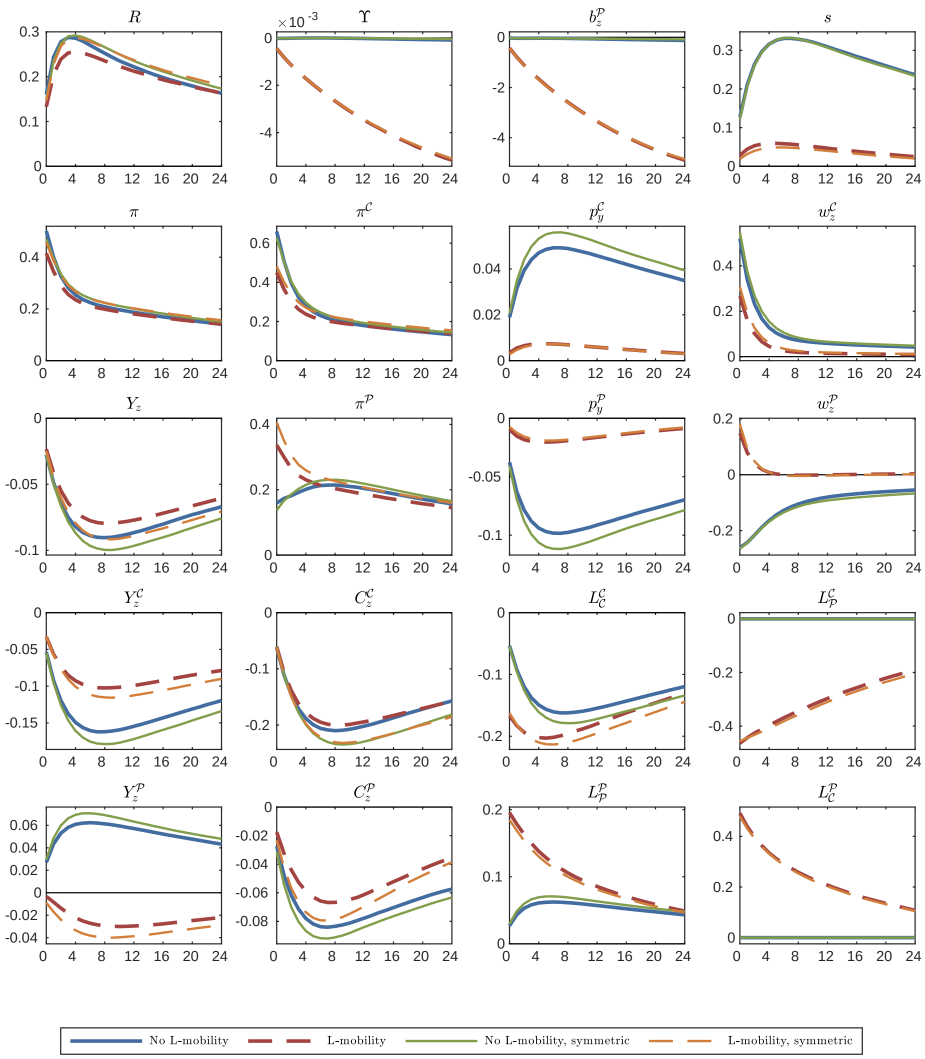

Figure H.6: Responses to one standard deviation core labor disutility shock in the case with symmetric preferences, technology and nominal rigidities.

H.7 Periphery Labor Disutility Shock

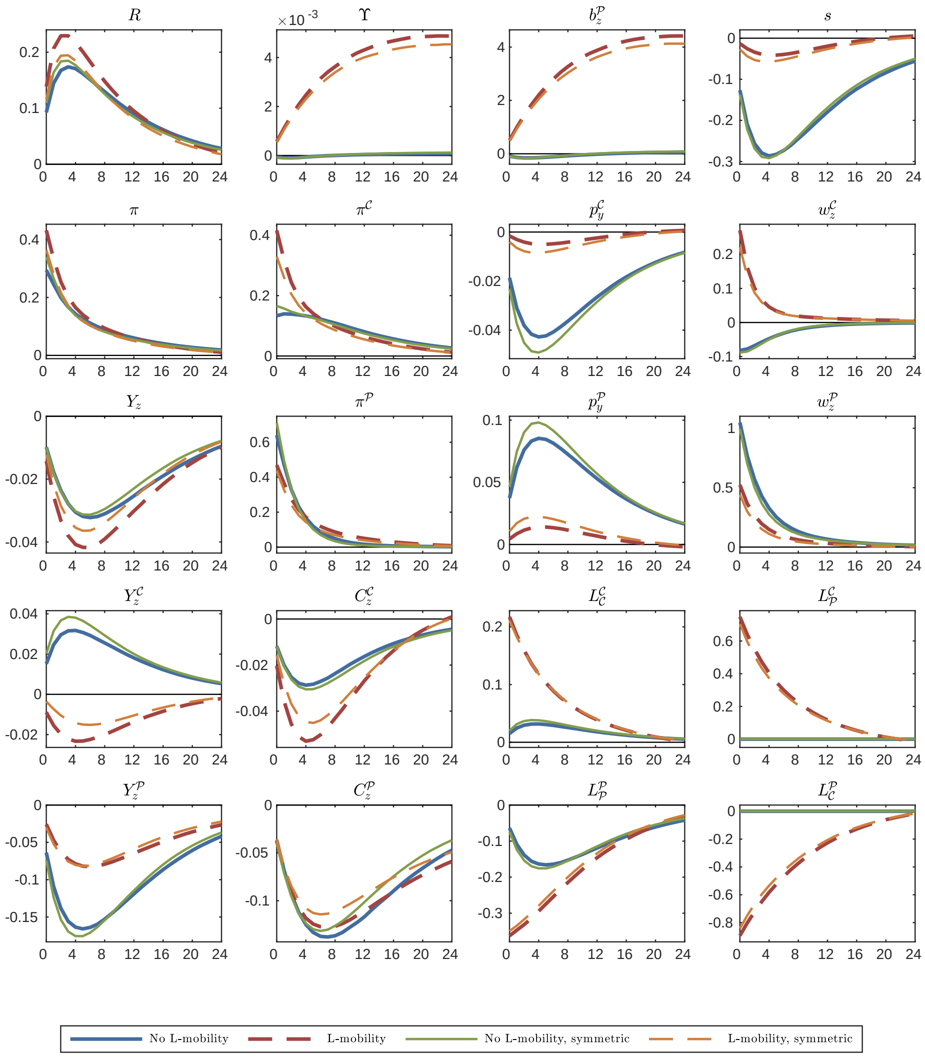

Figure H.7: Responses to one standard deviation periphery labor disutility shock in the case with symmetric preferences, technology and nominal rigidities.

H.8 Core Government Spending Shock

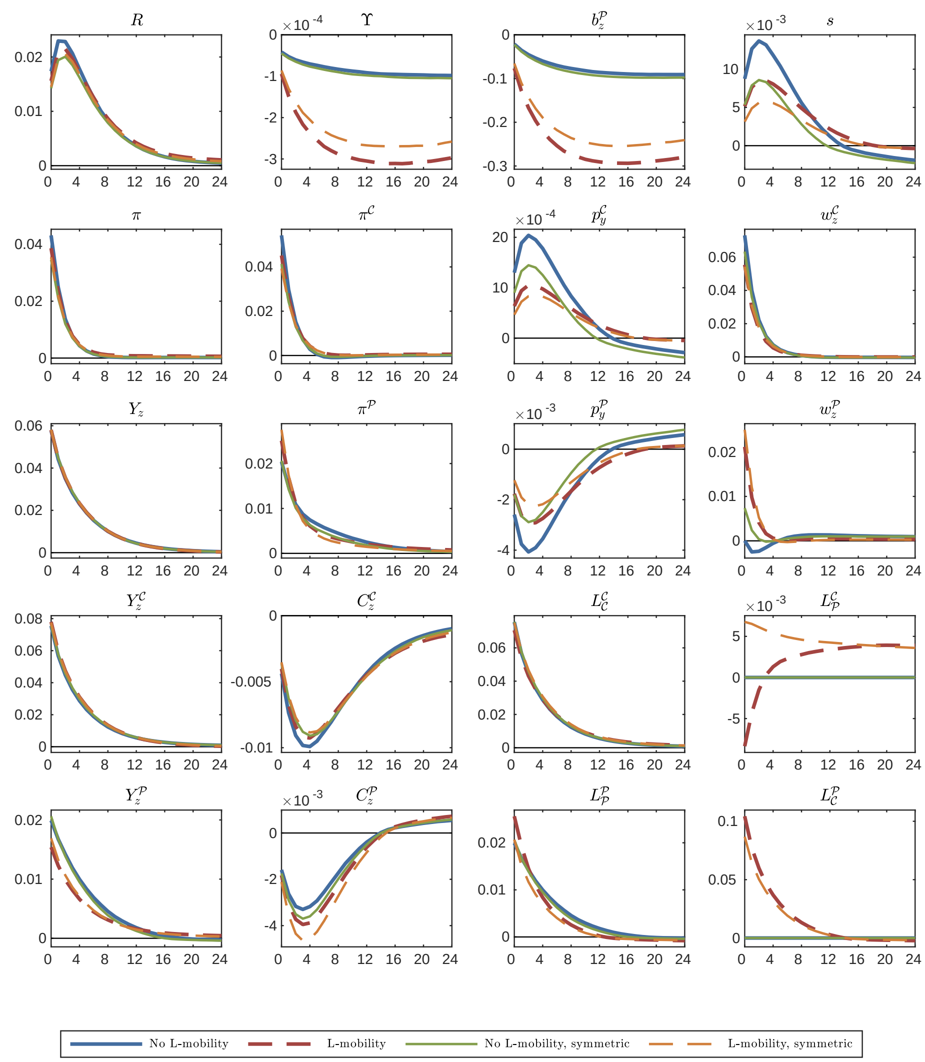

Figure H.8: Responses to one standard deviation core government spending shock in the case with symmetric preferences, technology and nominal rigidities.

H.9 Periphery Government Spending Shock

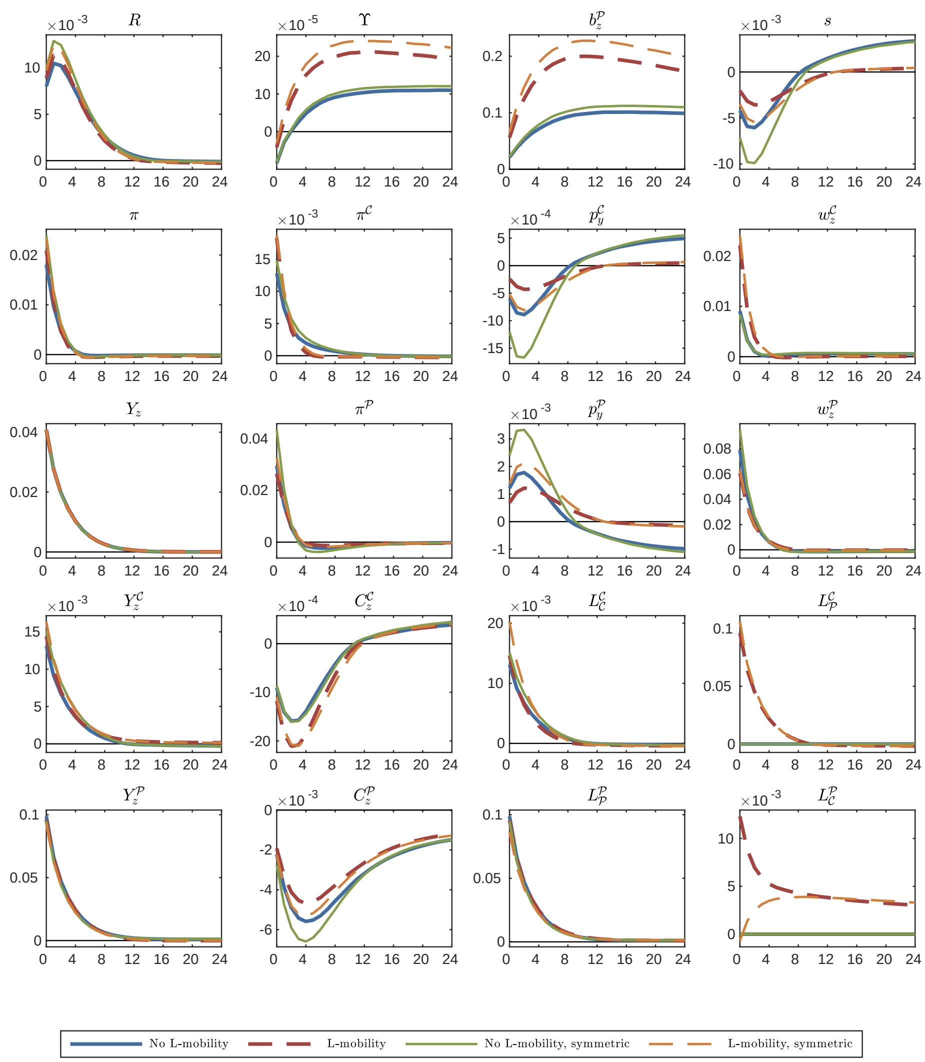

Figure H.9: Responses to one standard deviation periphery government spending shock in the case with symmetric preferences, technology and nominal rigidities.

H.10 Core Price Markup Shock

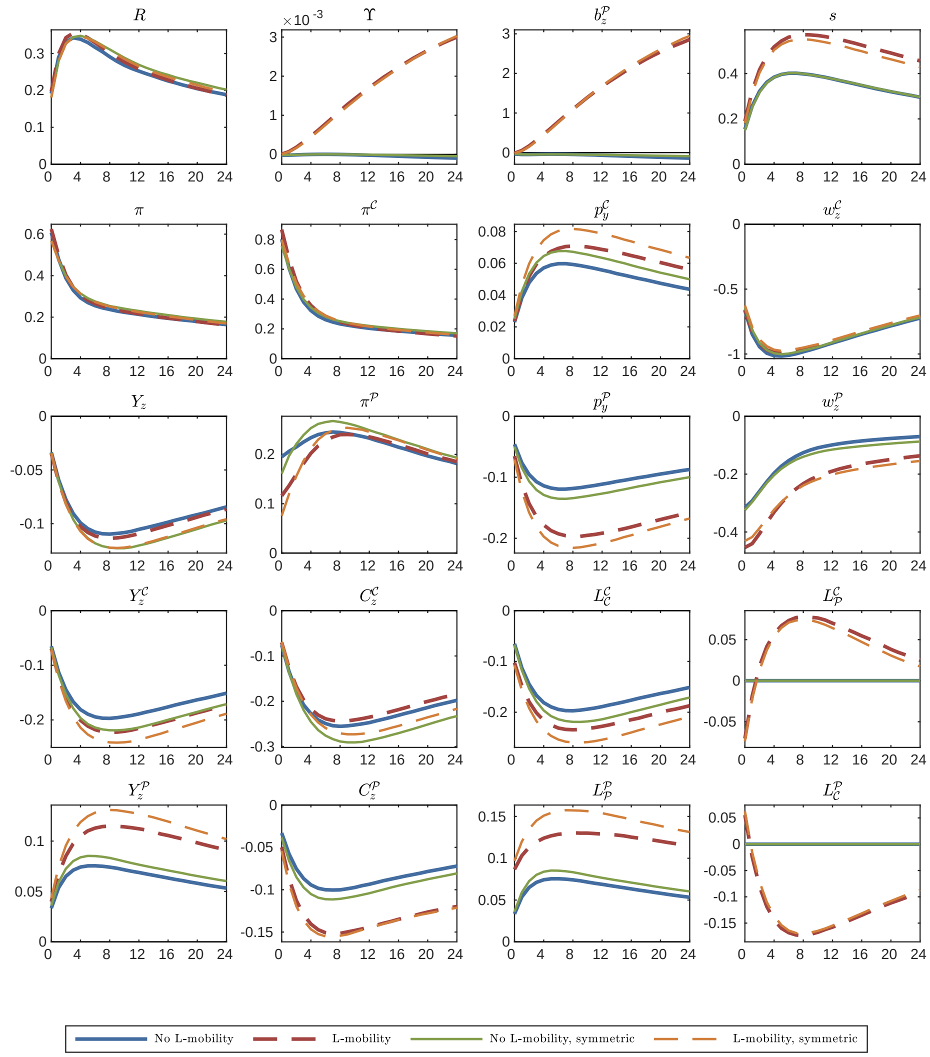

Figure H.10: Responses to one standard deviation core price markup shock in the case with symmetric preferences, technology and nominal rigidities.

H.11 Periphery Price Markup Shock

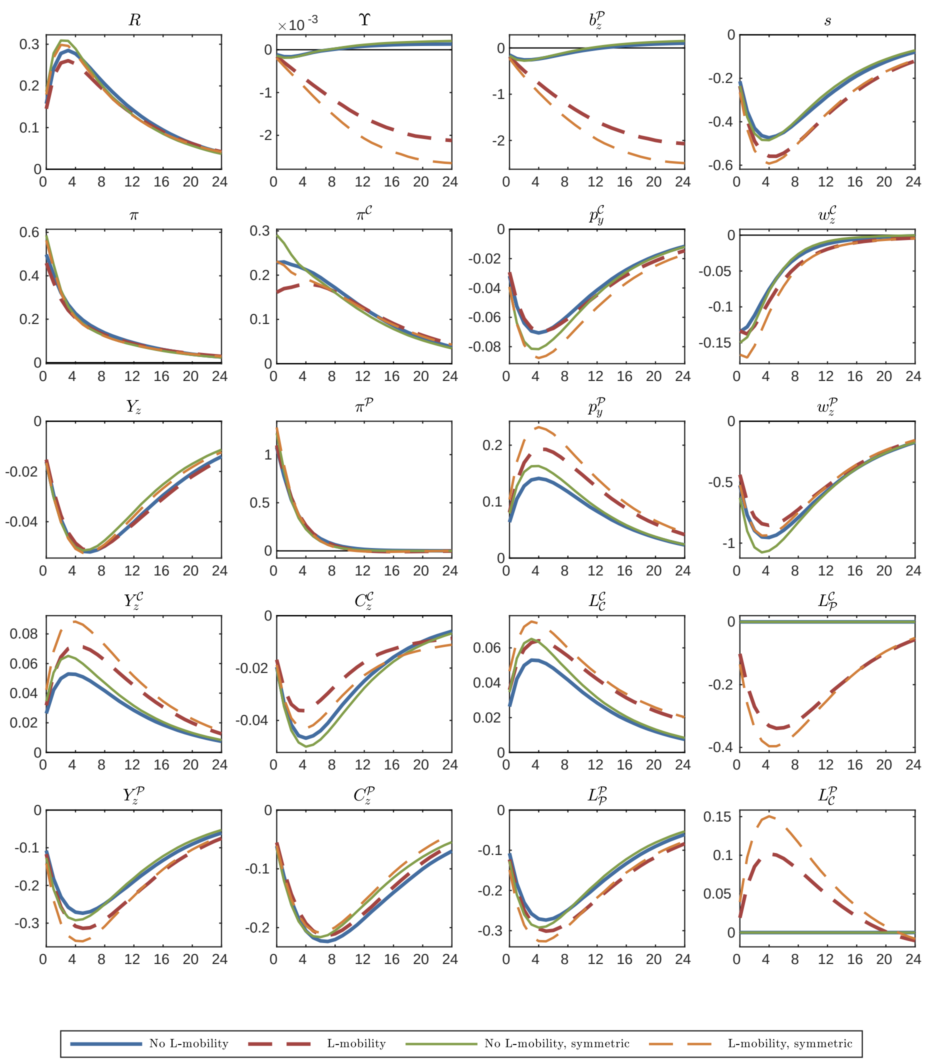

Figure H.11: Responses to one standard deviation periphery price markup shock in the case with symmetric preferences, technology and nominal rigidities.

H.12 Periphery Risk Premium Shock

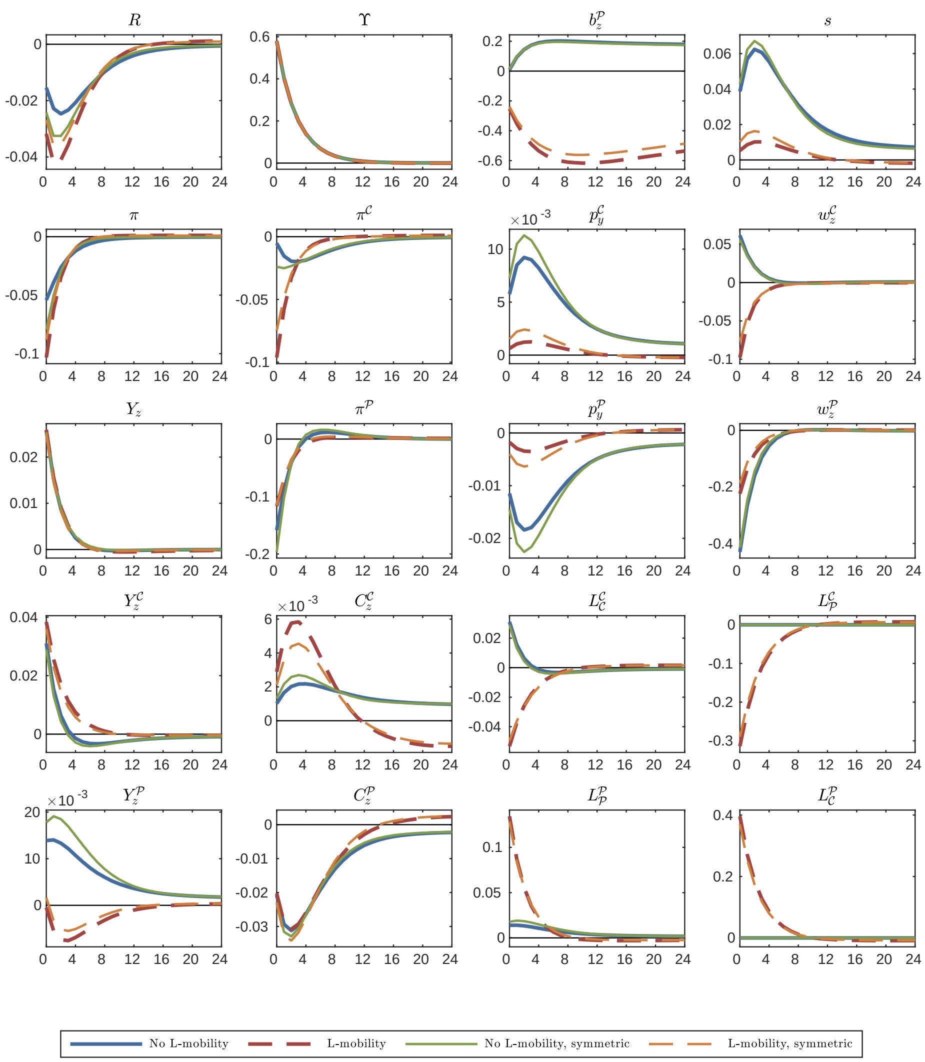

Figure H.12: Responses to one standard deviation periphery risk premium shock in the case with symmetric preferences, technology and nominal rigidities.

I Responses to Shocks: Alternative Goods Elasticity of Substitution

In this section we compare the responses to the shocks in the same two models but setting the elasticity of substitution of goods across the two regions, eta_y to 0.85, instead of drawing those parameters from the posterior distribution (with posterior medians of 0.7 and 0.76 for the core and periphery, respectively). The other model parameters are drawn from the posterior MCMC sample, as in the baseline results. Figures show median responses for each model. The blue solid and red dashed lines are the same as in baseline results, shown for comparison purposes. The green solid line is the case with higher elasticity and no labor mobility; and the orange dashed line is the case with higher elasticity and labor mobility.

I.1 Monetary Shock

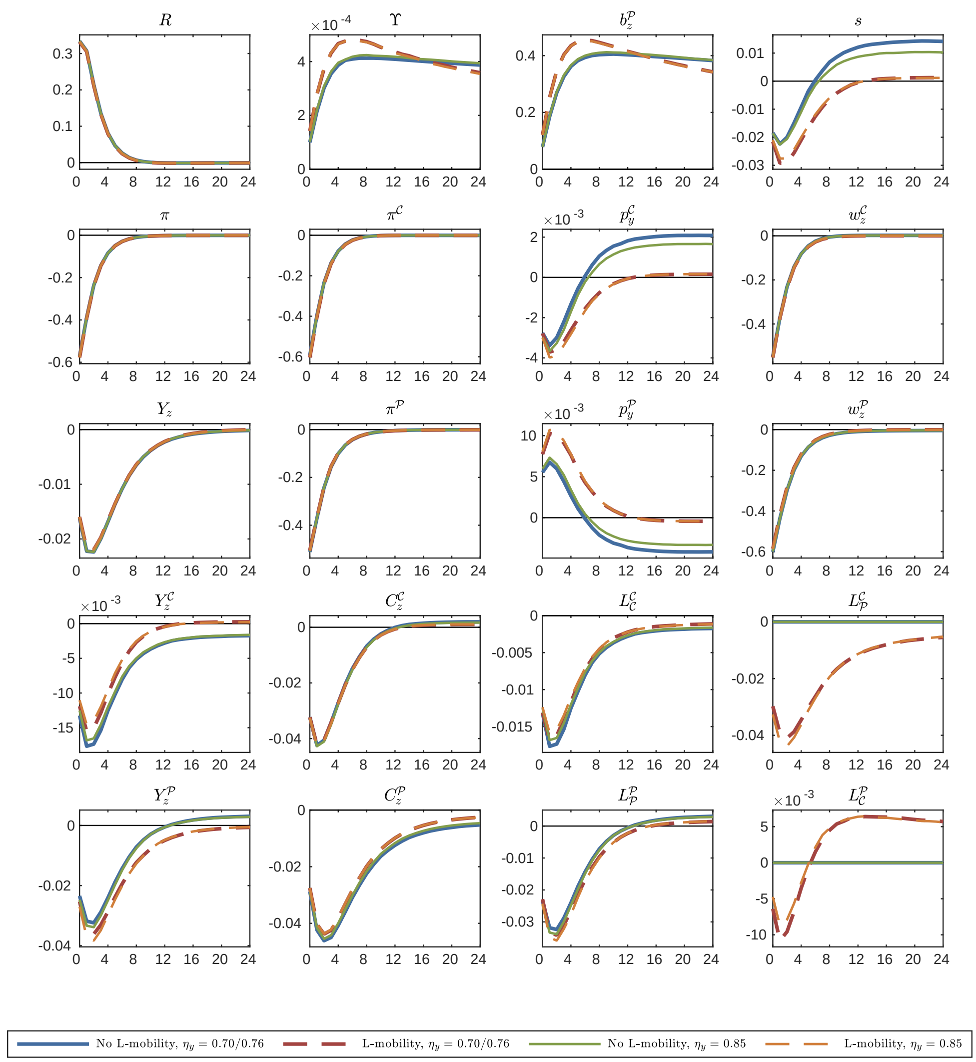

Figure I.1: Responses to one standard deviation monetary policy shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.2 Common Productivity Shock

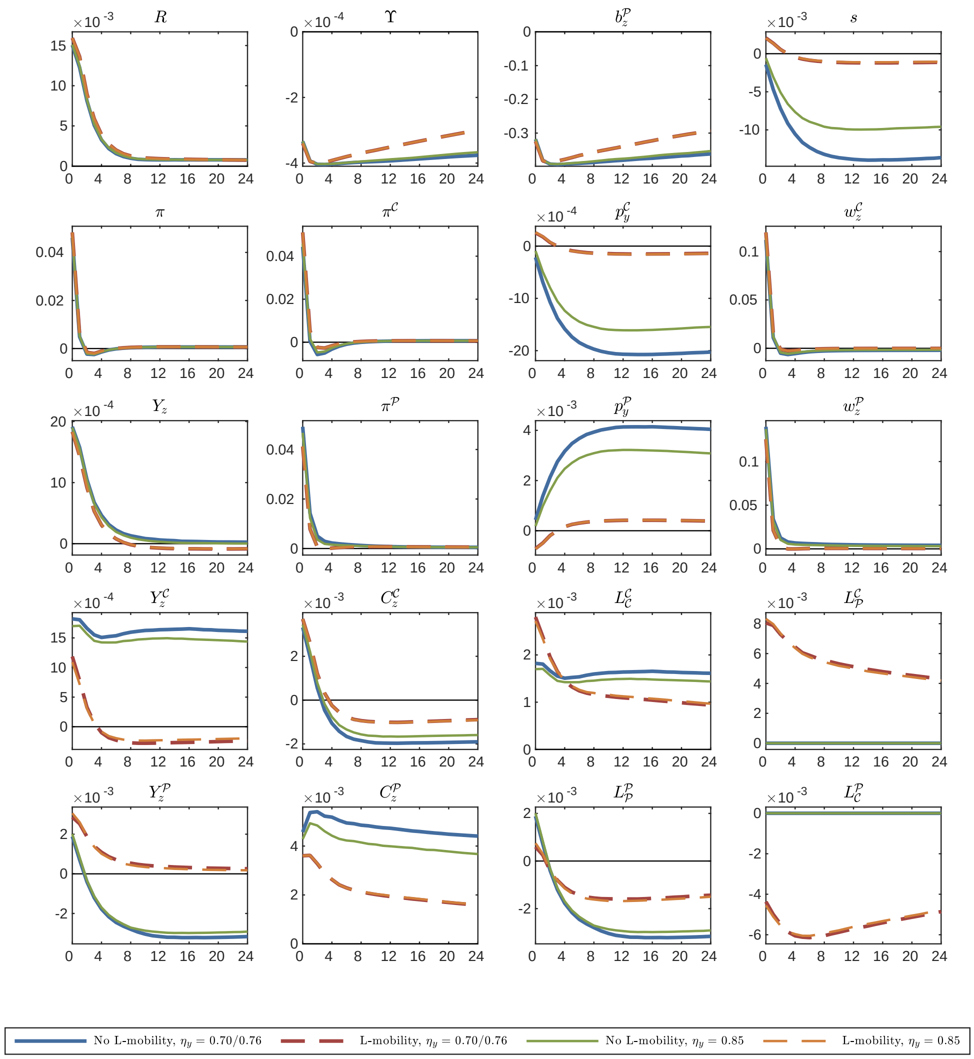

Figure I.2: Responses to one standard deviation common productivity shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.3 Periphery Productivity Shock

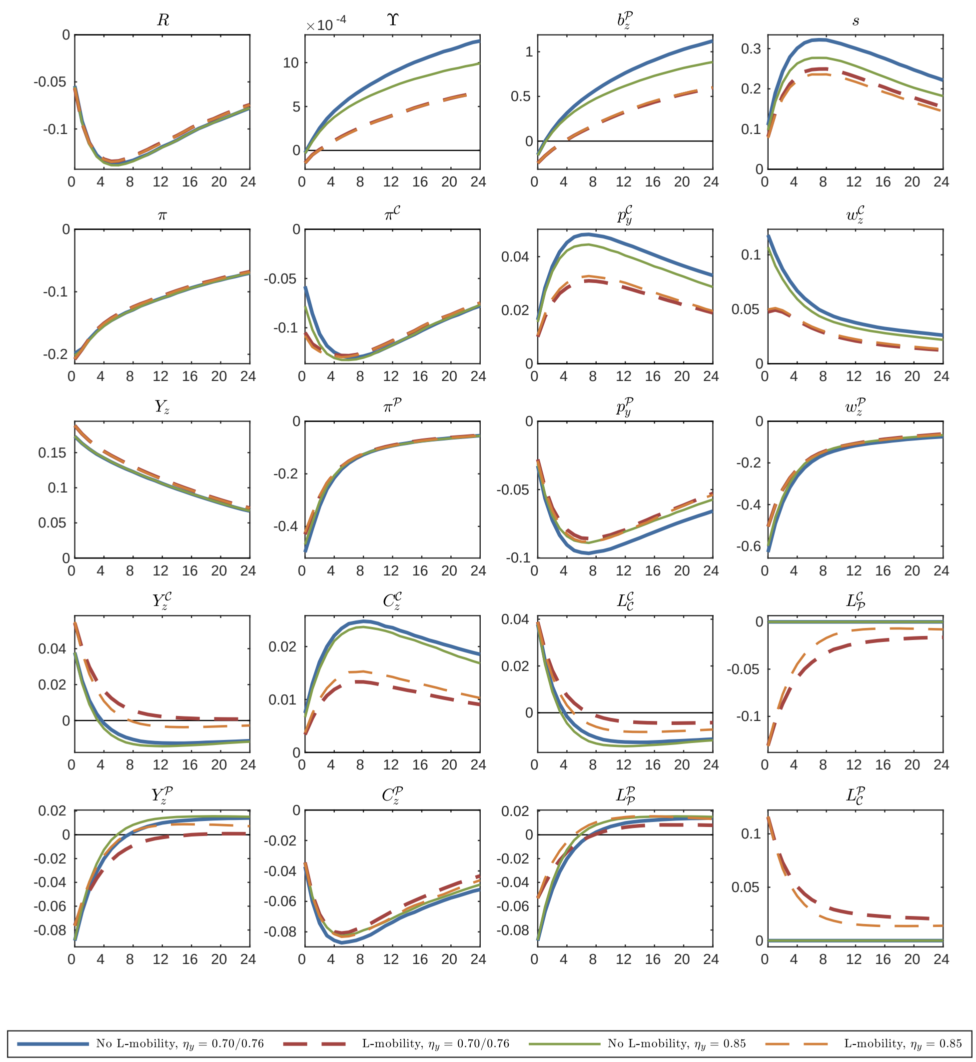

Figure I.3: Responses to one standard deviation periphery productivity shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.4 Core Discount Factor Shock

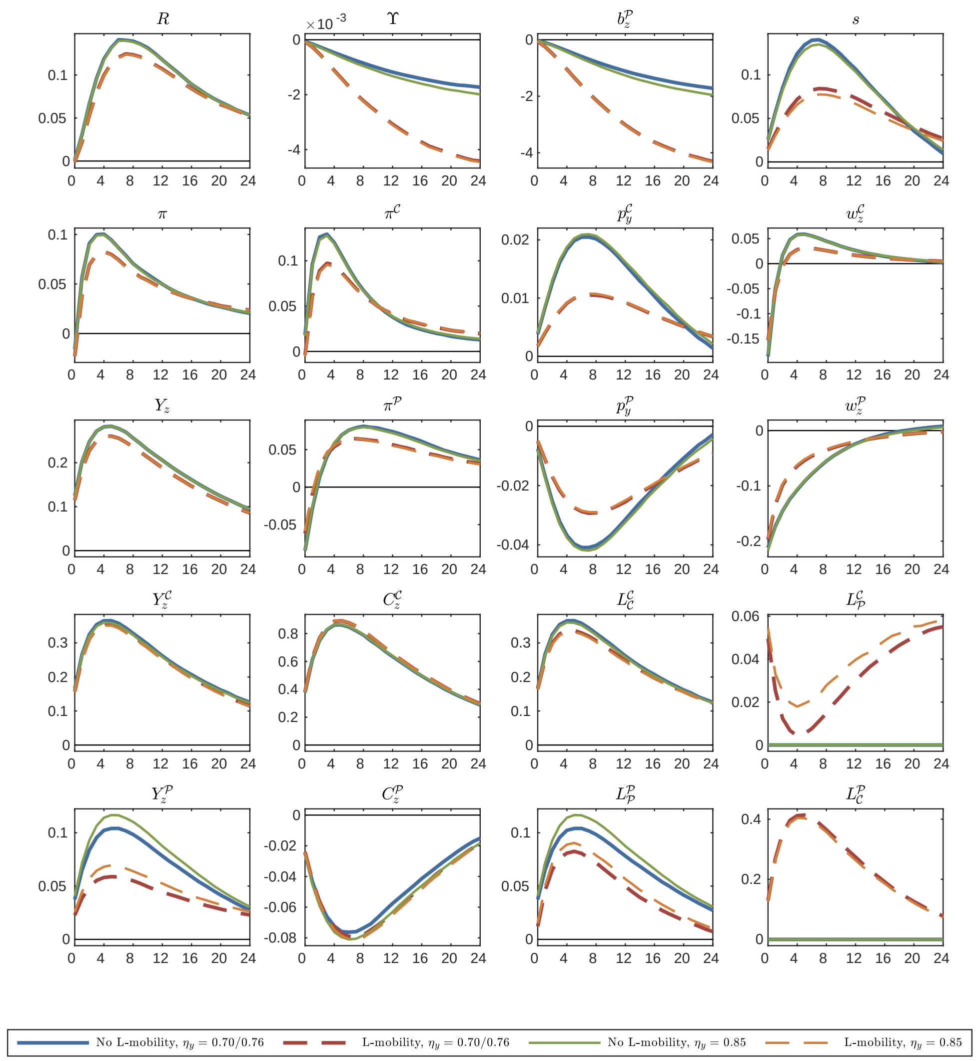

Figure I.4: Responses to one standard deviation core discount factor shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.5 Periphery Discount Factor Shock

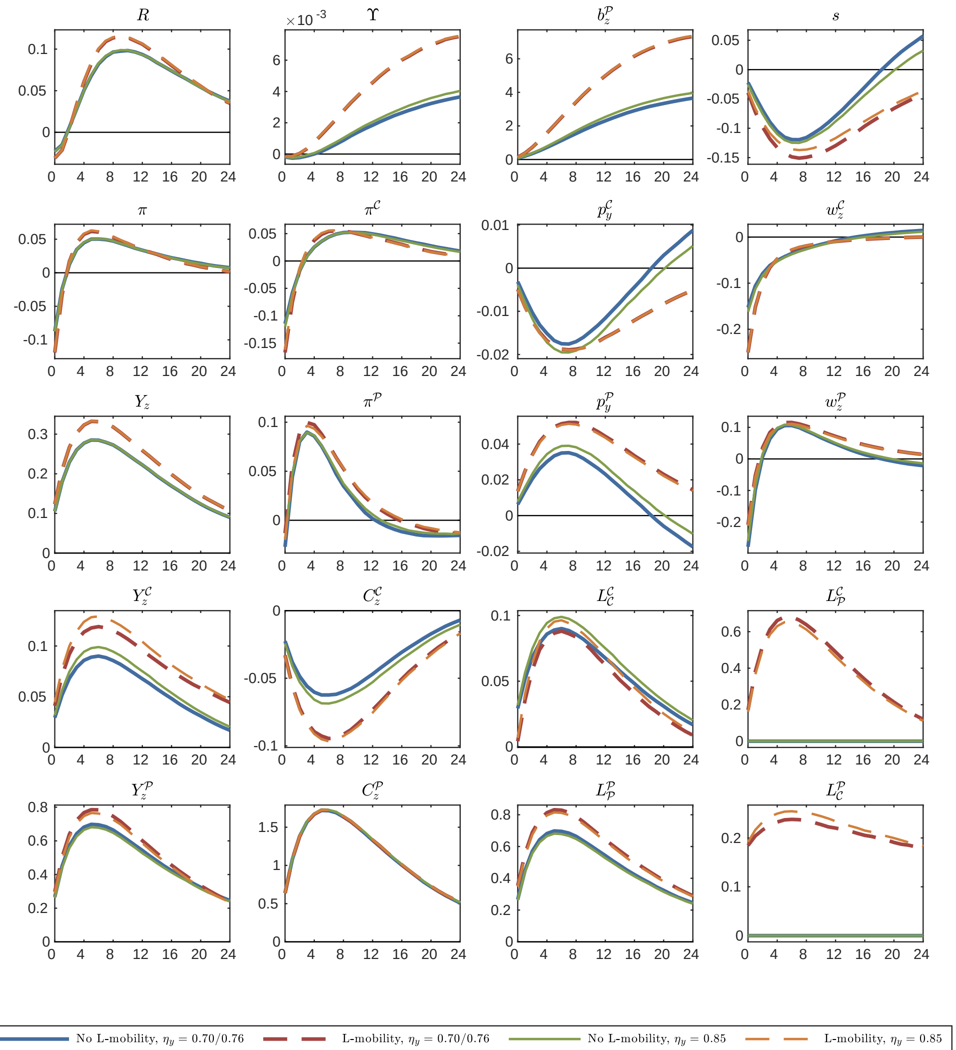

Figure I.5: Responses to one standard deviation periphery discount factor shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.6 Core Labor Disutility Shock

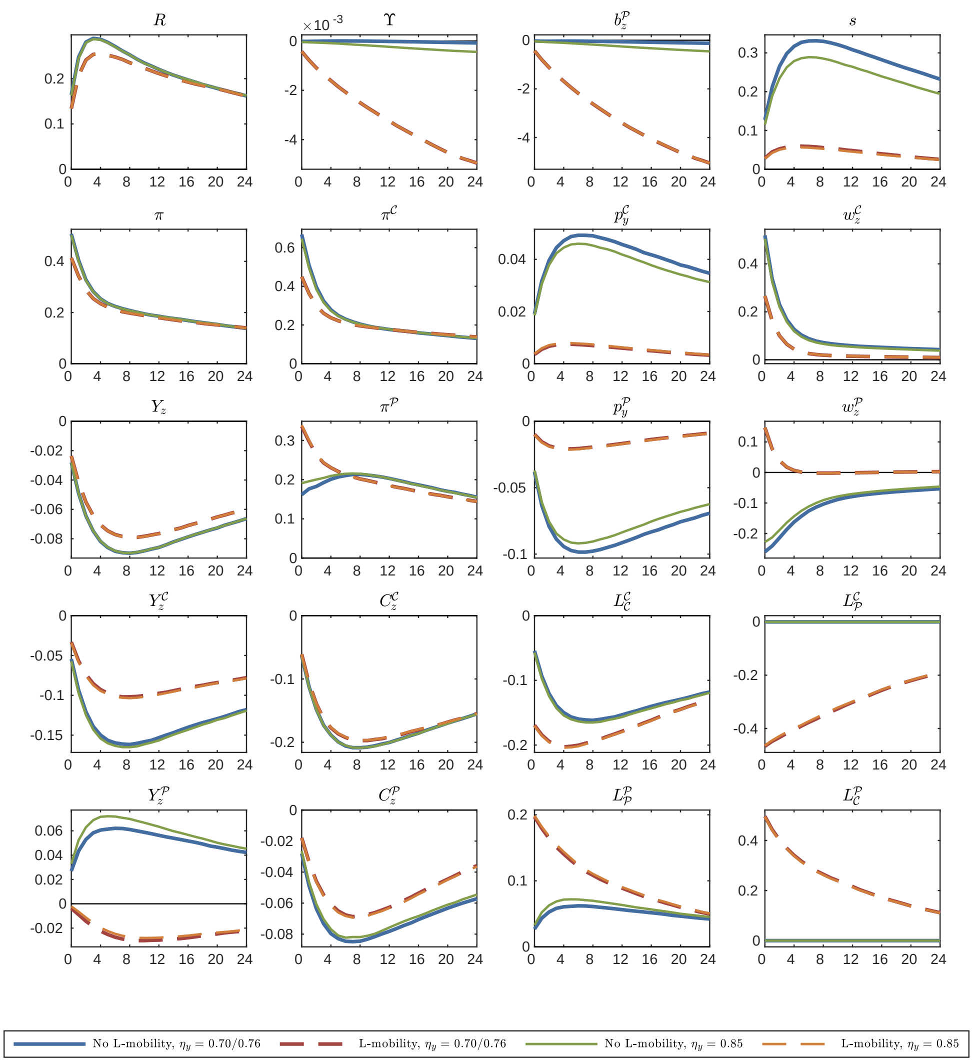

Figure I.6: Responses to one standard deviation core labor disutility shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.7 Periphery Labor Disutility Shock

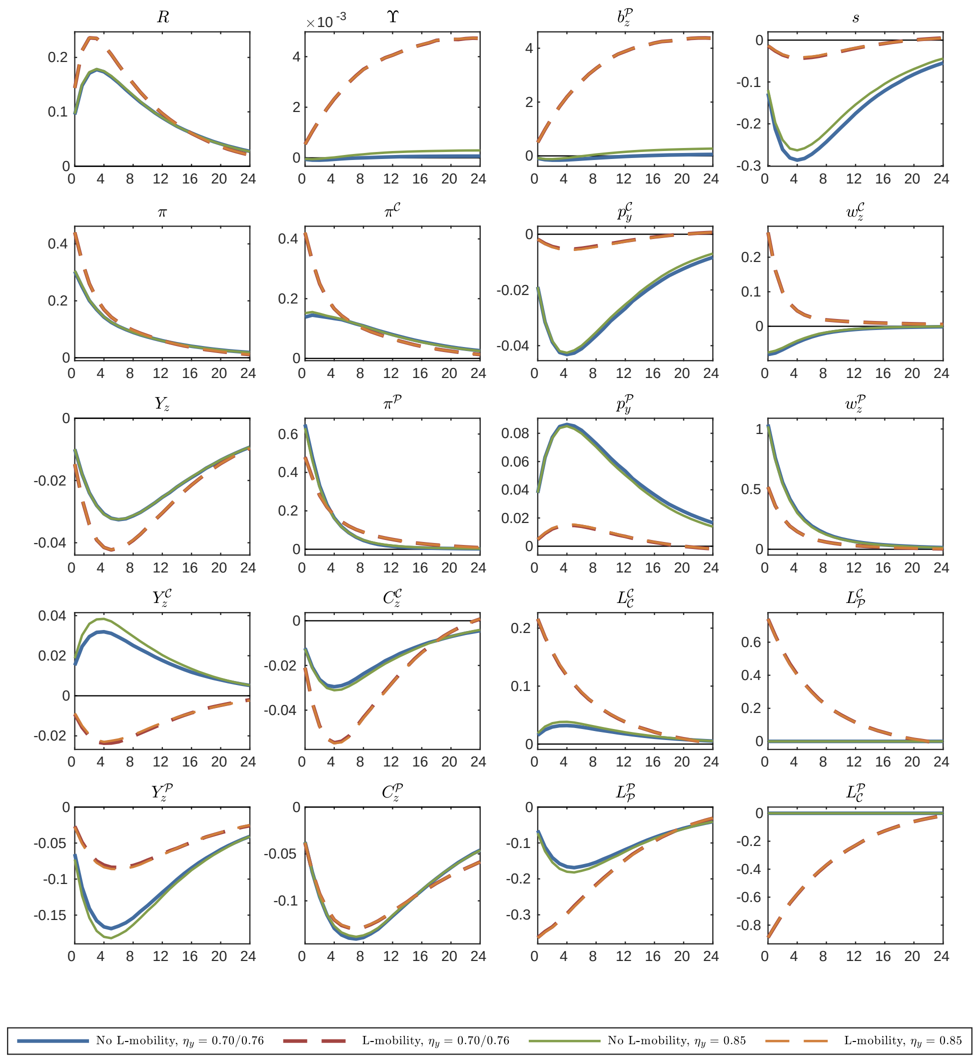

Figure I.7: Responses to one standard deviation periphery labor disutility shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.8 Core Government Spending Shock

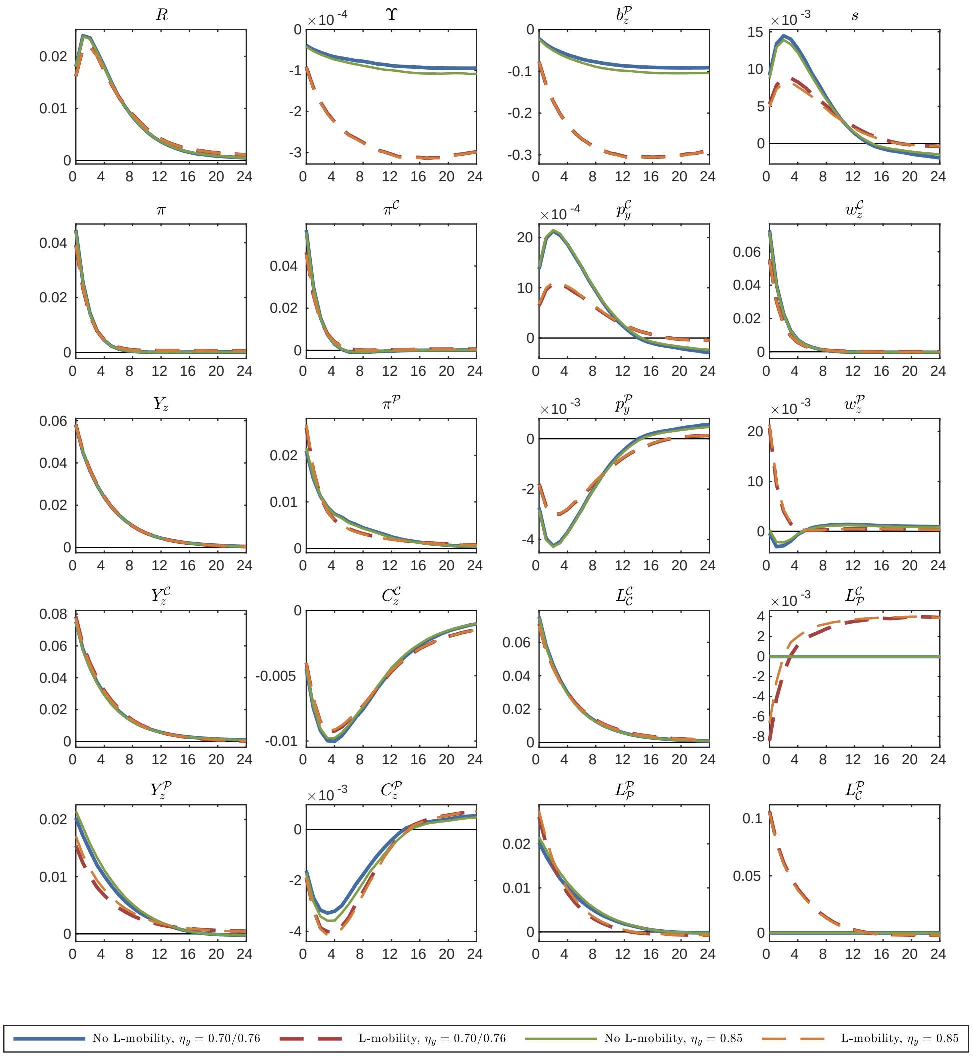

Figure I.8: Responses to one standard deviation core government spending shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.9 Periphery Government Spending Shock

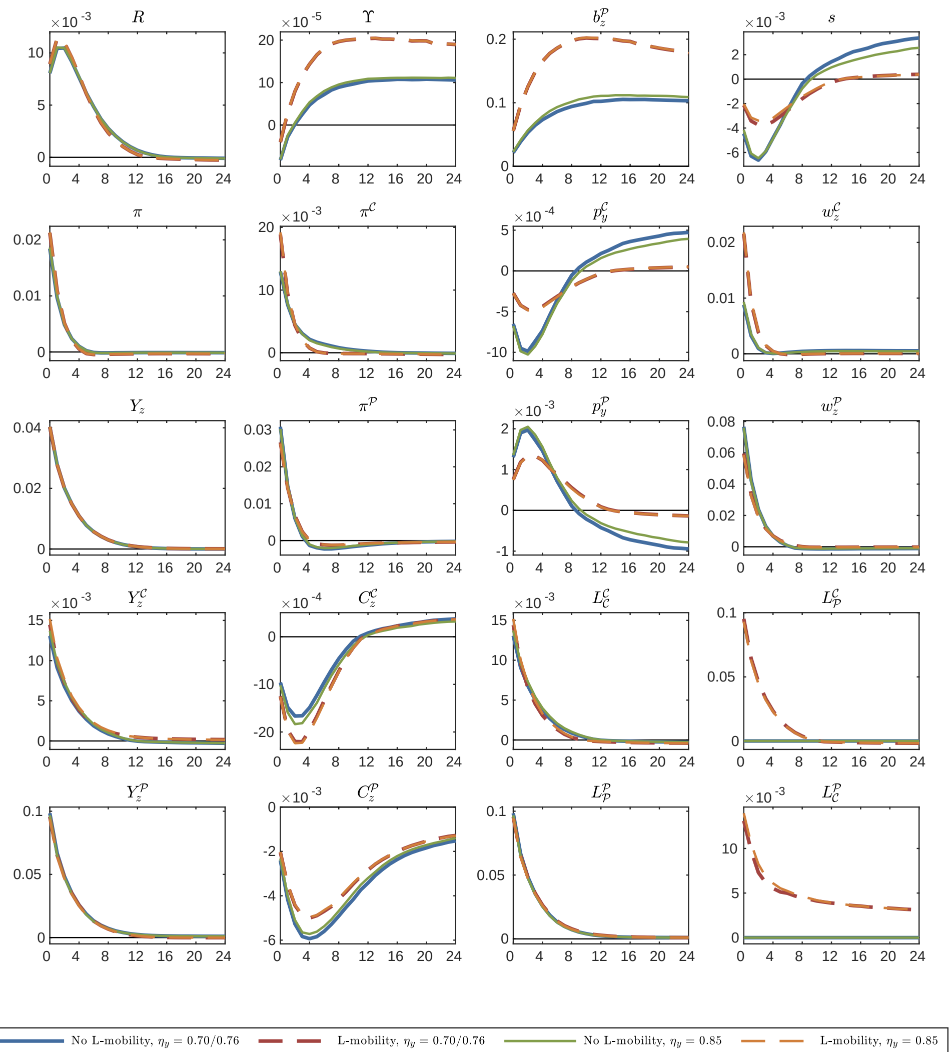

Figure I.9: Responses to one standard deviation periphery government spending shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.10 Core Price Markup Shock

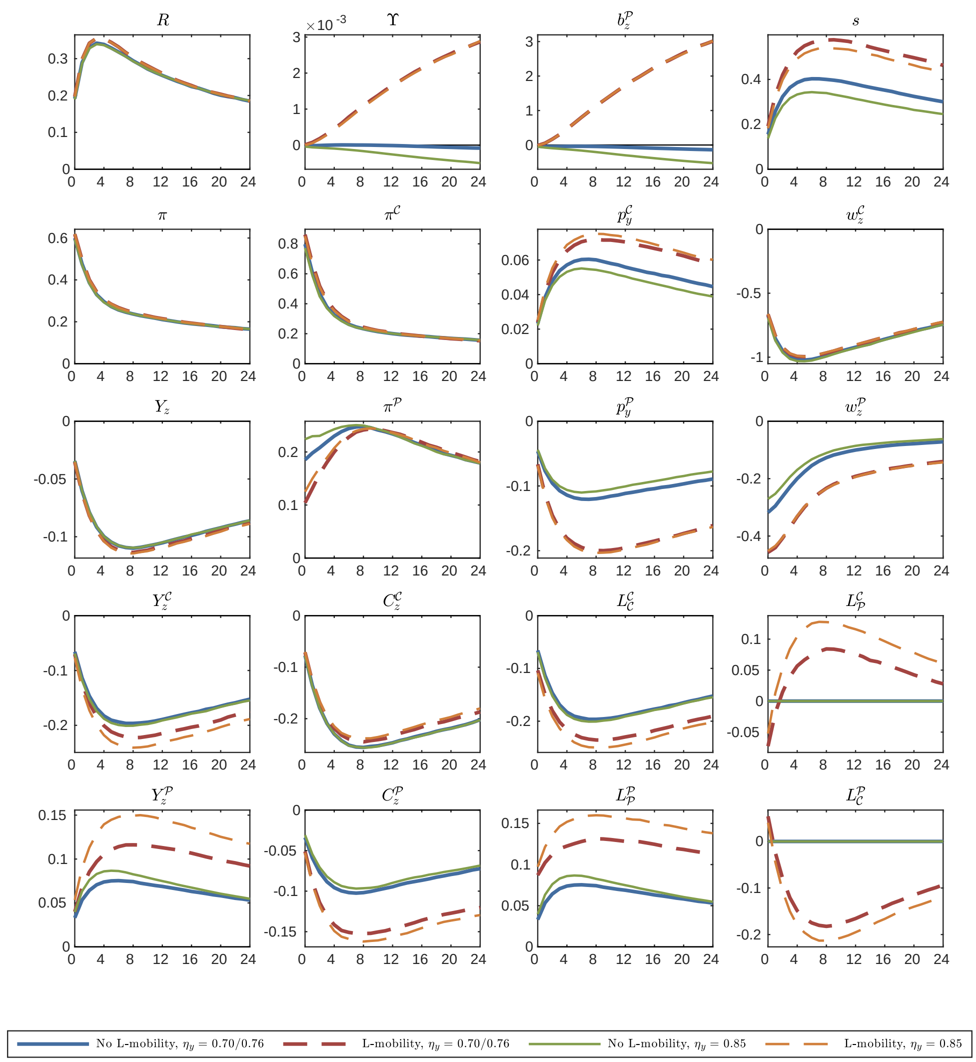

Figure I.10: Responses to one standard deviation core price markup shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.11 Periphery Price Markup Shock

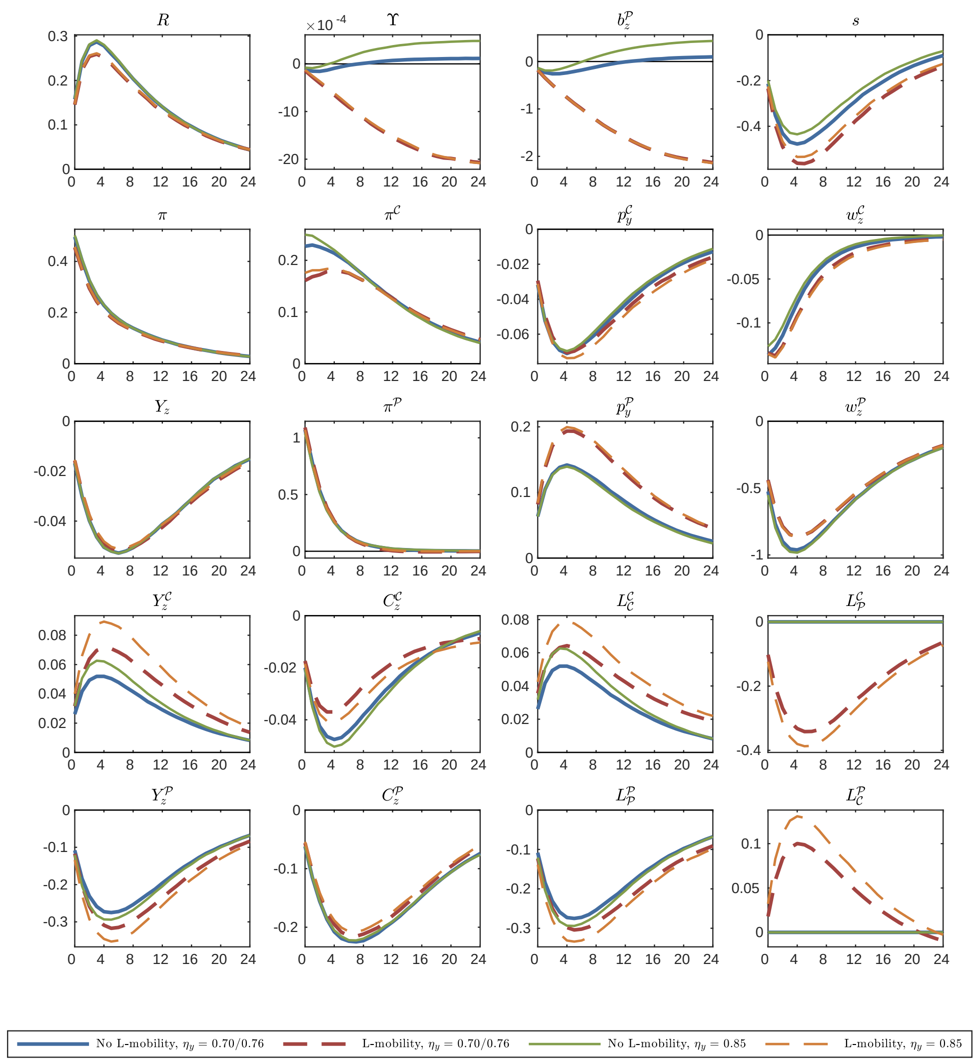

Figure I.11: Responses to one standard deviation periphery price markup shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

I.12 Periphery Risk Premium Shock

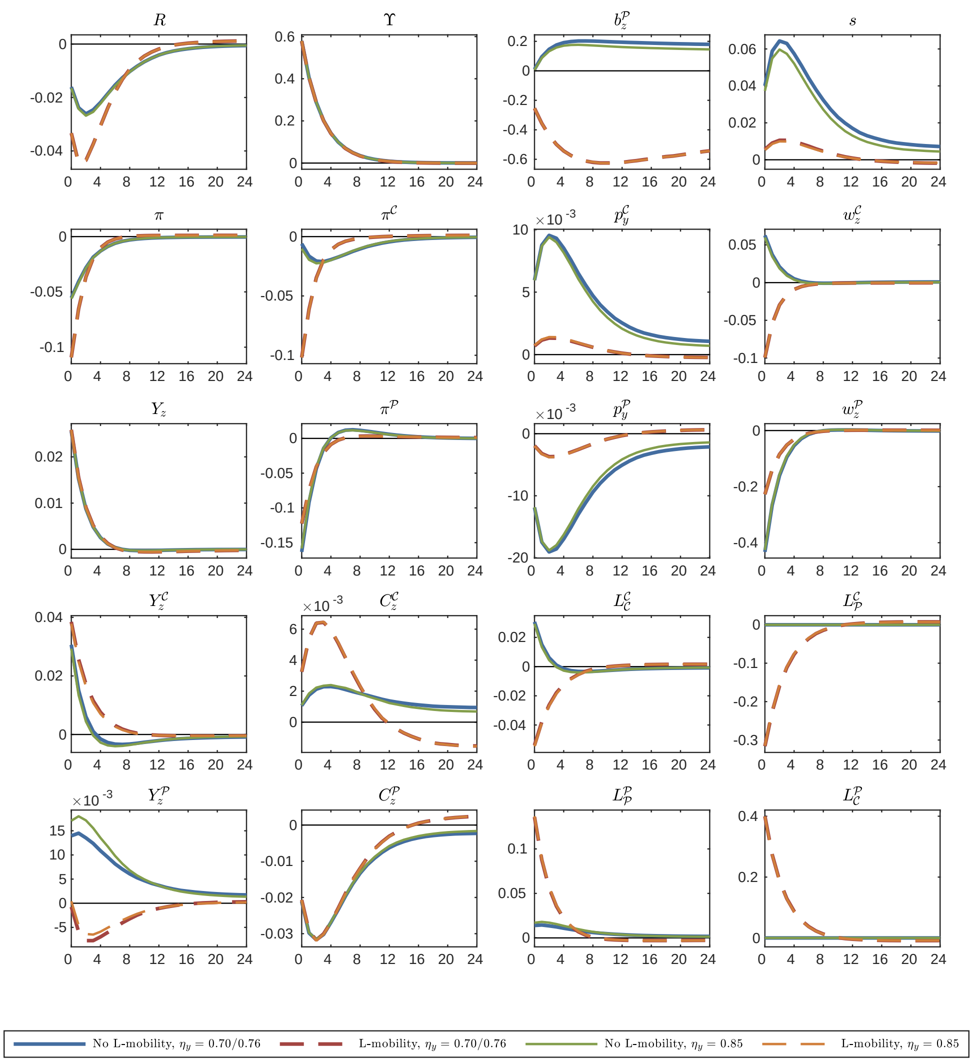

Figure I.12: Responses to one standard deviation periphery risk premium shock in the case with higher elasticity of substitution of goods across the two regions, η_y.

J Responses to Shocks: Endogenous Risk Premium

In this section we compare the responses to the shocks in the same two models but increasing the degree to which the risk premium of the periphery responds to the indebtedness of that region, υ. The posterior distribution is concentrated at negligible response levels, with a median of 0.0003—so that the risk premium is mostly exogenous, with minimal endogenous variation—and in this section we set that parameter at 0.1. The other model parameters are drawn from the posterior MCMC sample, as in the baseline results. Figures show median responses for each model. The blue solid and red dashed lines are the same as in baseline results, shown for comparison purposes. The green solid line is the case with stronger degree of endogeneity of the risk premium in the absence of labor mobility. The orange dashed line is the same case but allowing for labor mobility.

J.1 Monetary Shock

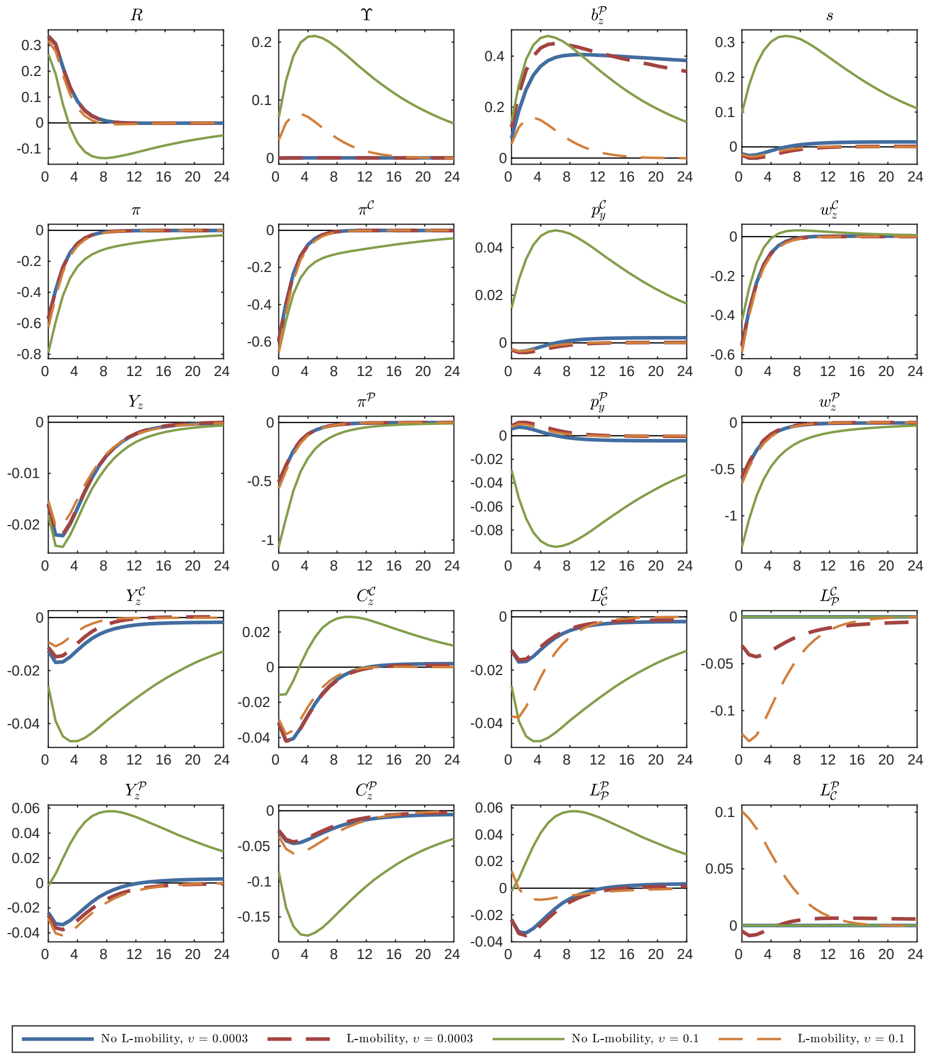

Figure J.1: Responses to one standard deviation monetary policy shock in the case with stronger endogenous risk premium response to debt, υ.

J.2 Common Productivity Shock

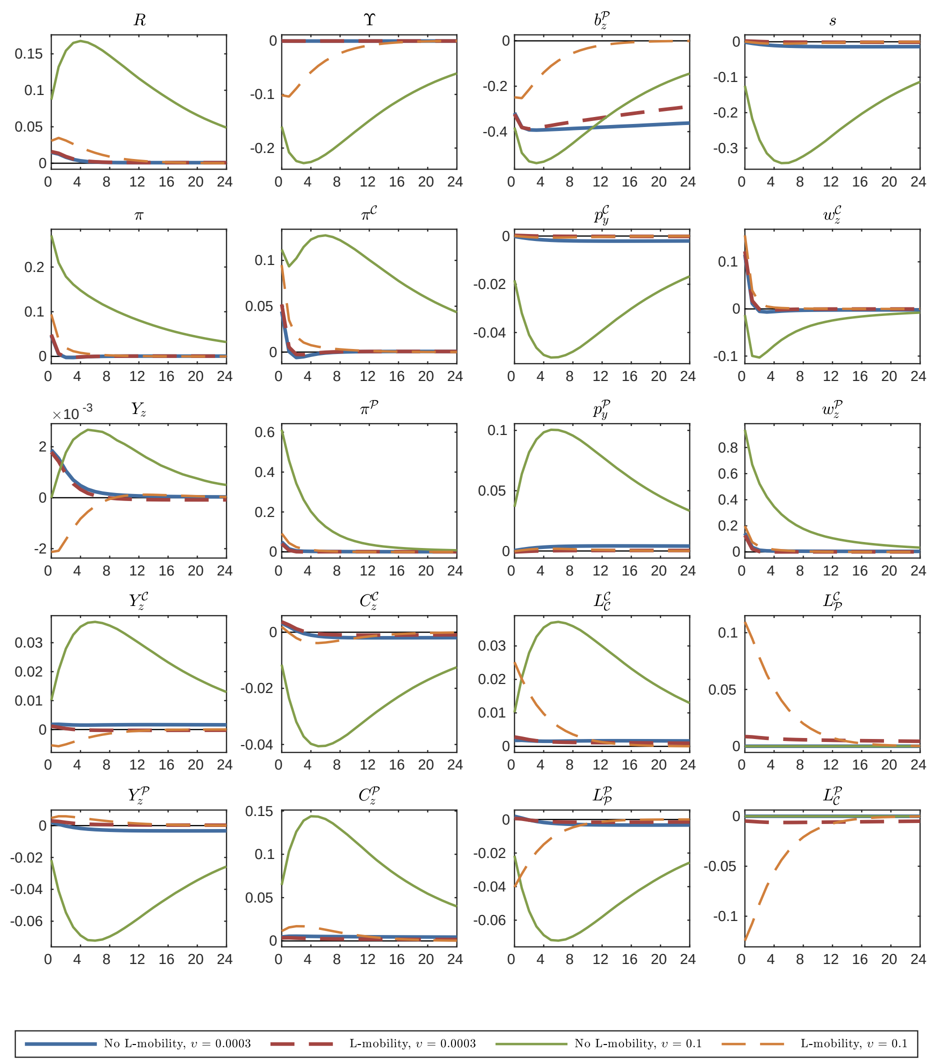

Figure J.2: Responses to one standard deviation common productivity shock in the case with stronger endogenous risk premium response to debt, υ.

J.3 Periphery Productivity Shock

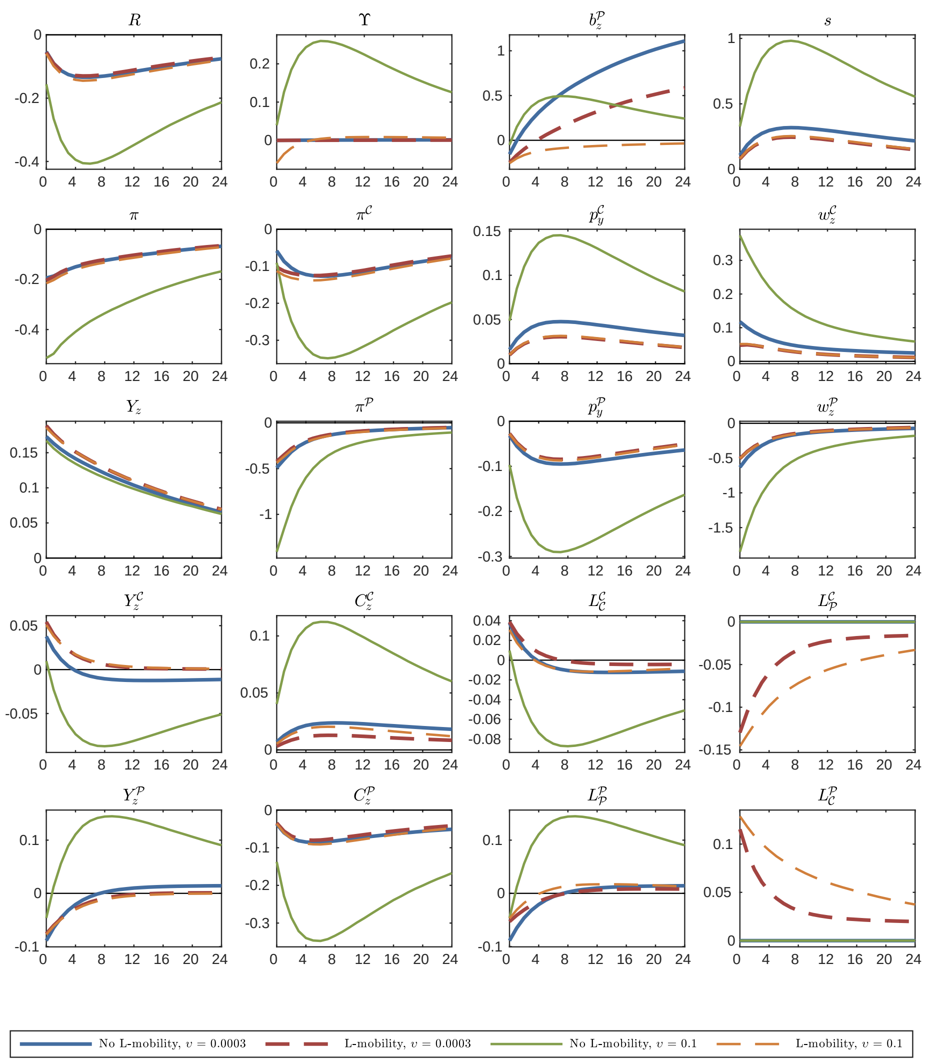

Figure J.3: Responses to one standard deviation periphery productivity shock in the case with stronger endogenous risk premium response to debt, υ.

J.4 Core Discount Factor Shock

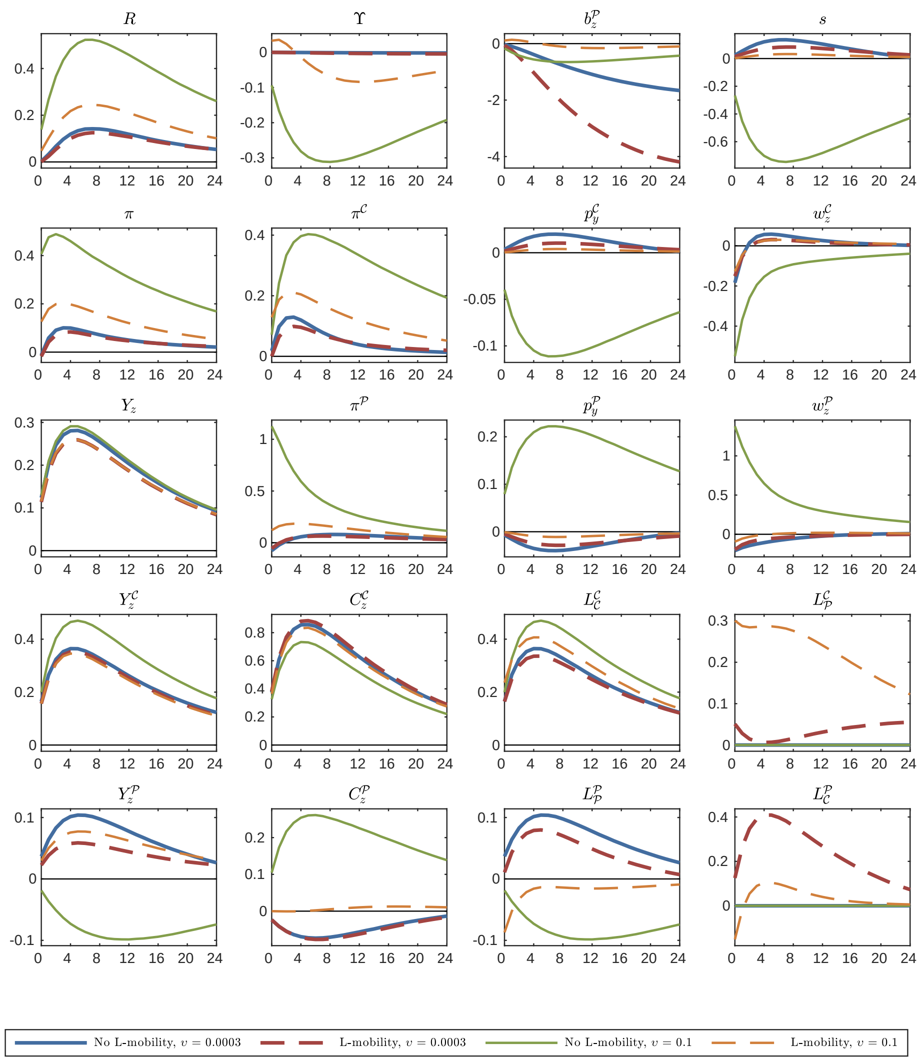

Figure J.4: Responses to one standard deviation core discount factor shock in the case with stronger endogenous risk premium response to debt, υ.

J.5 Periphery Discount Factor Shock

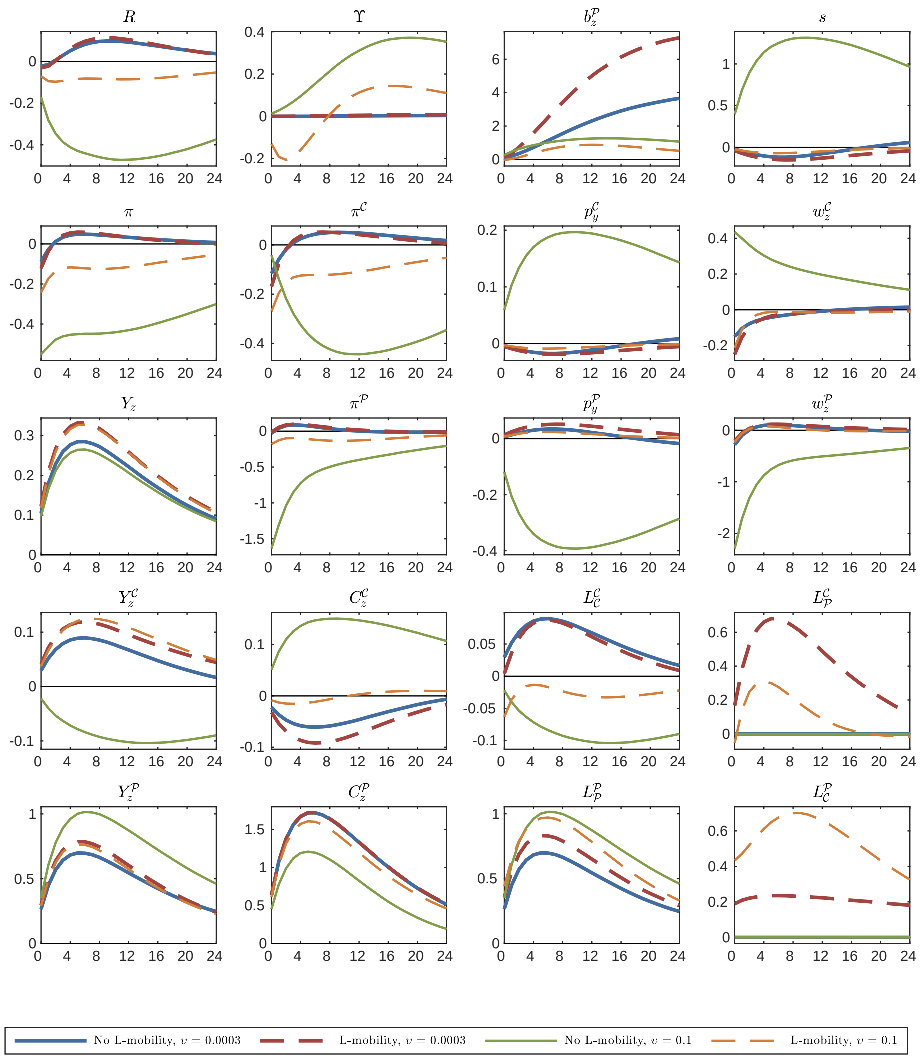

Figure J.5: Responses to one standard deviation periphery discount factor shock in the case with stronger endogenous risk premium response to debt, υ.

J.6 Core Labor Disutility Shock

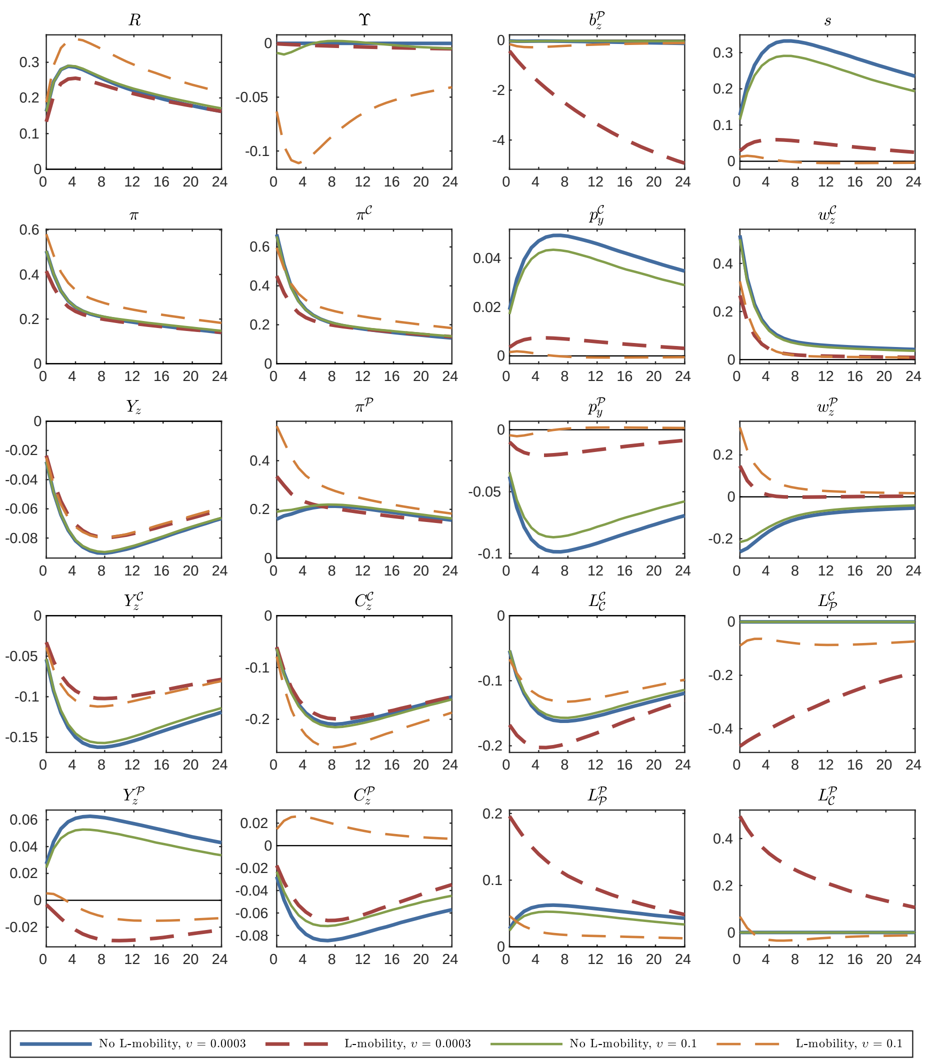

Figure J.6: Responses to one standard deviation core labor disutility shock in the case with stronger endogenous risk premium response to debt, υ.

J.7 Periphery Labor Disutility Shock

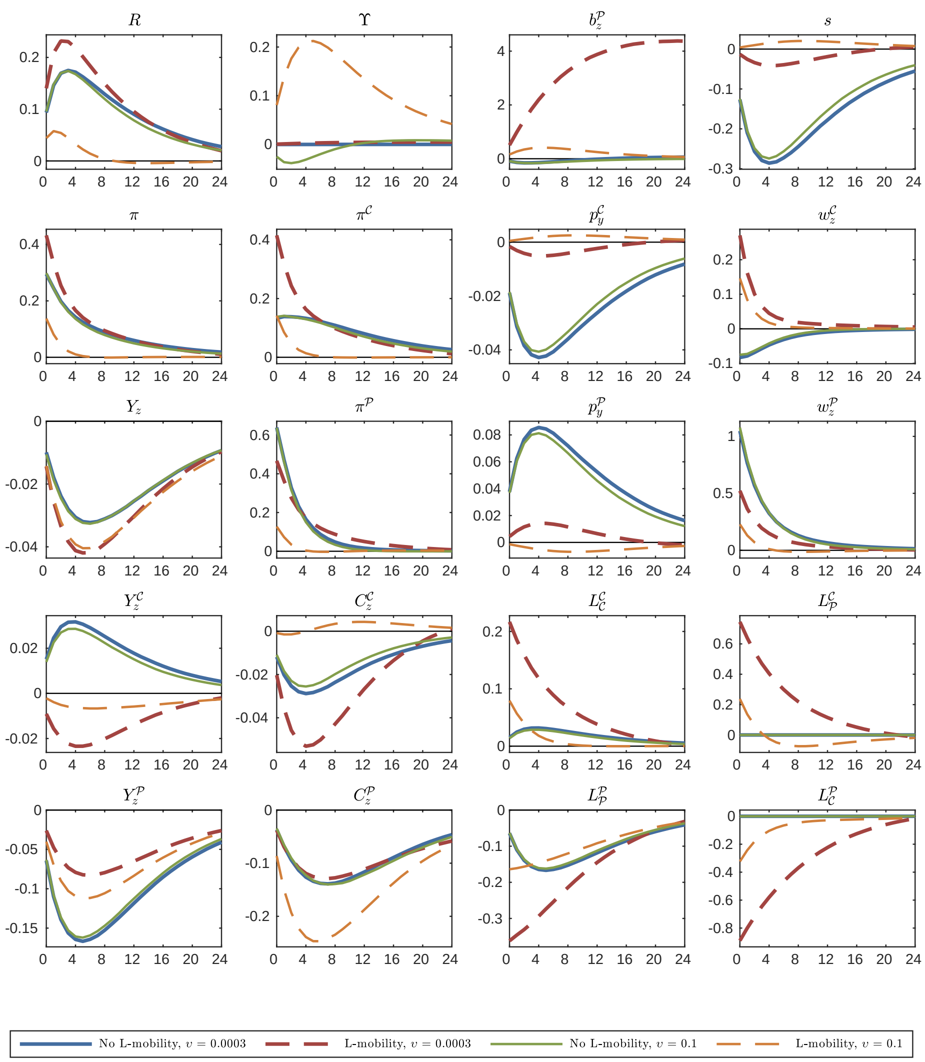

Figure J.7: Responses to one standard deviation periphery labor disutility shock in the case with stronger endogenous risk premium response to debt, υ.

J.8 Core Government Spending Shock

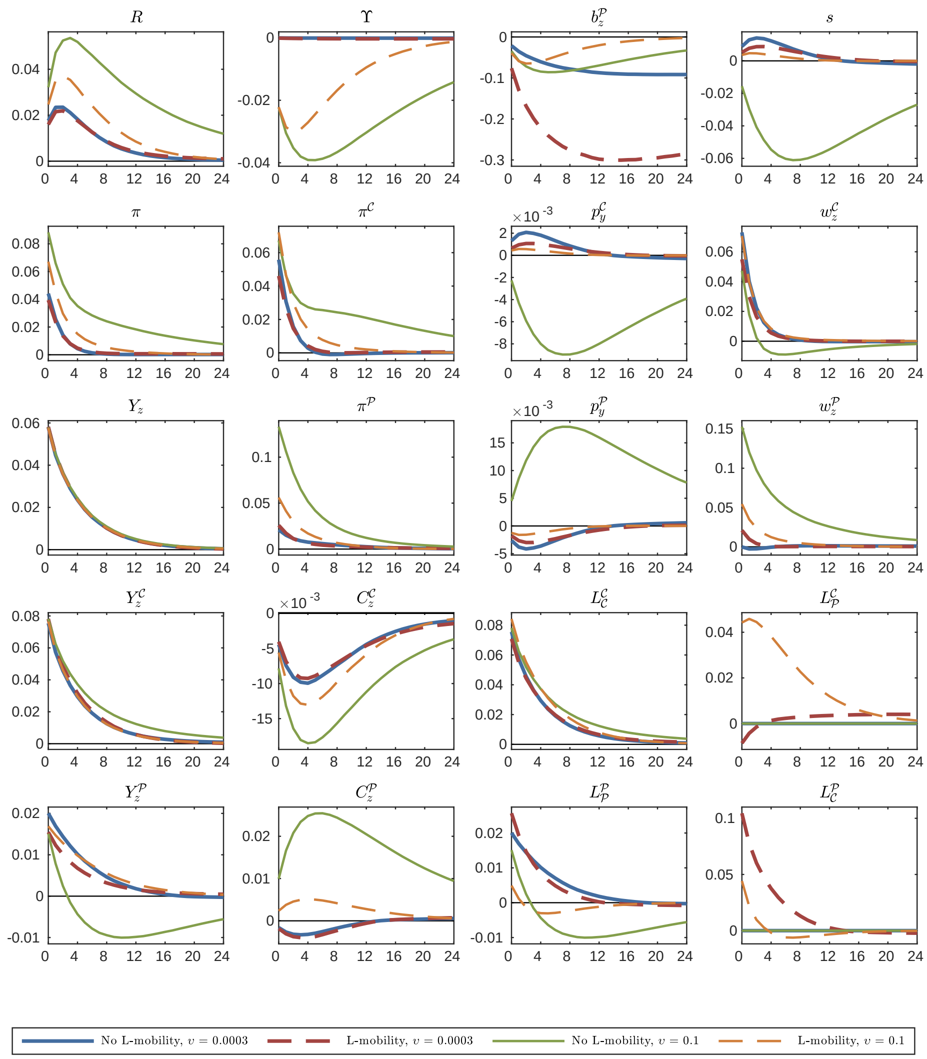

Figure J.8: Responses to one standard deviation core government spending shock in the case with stronger endogenous risk premium response to debt, υ.

J.9 Periphery Government Spending Shock

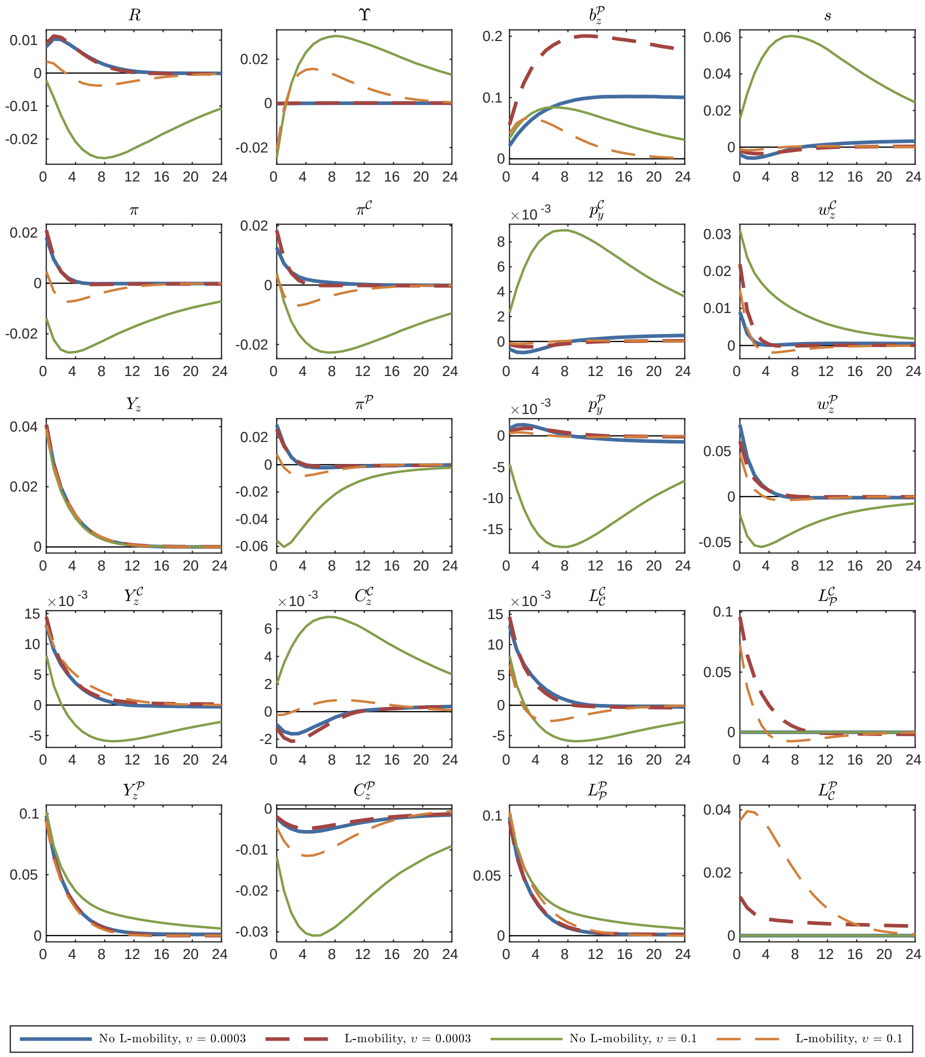

Figure J.9: Responses to one standard deviation periphery government spending shock in the case with stronger endogenous risk premium response to debt, υ.

J.10 Core Price Markup Shock

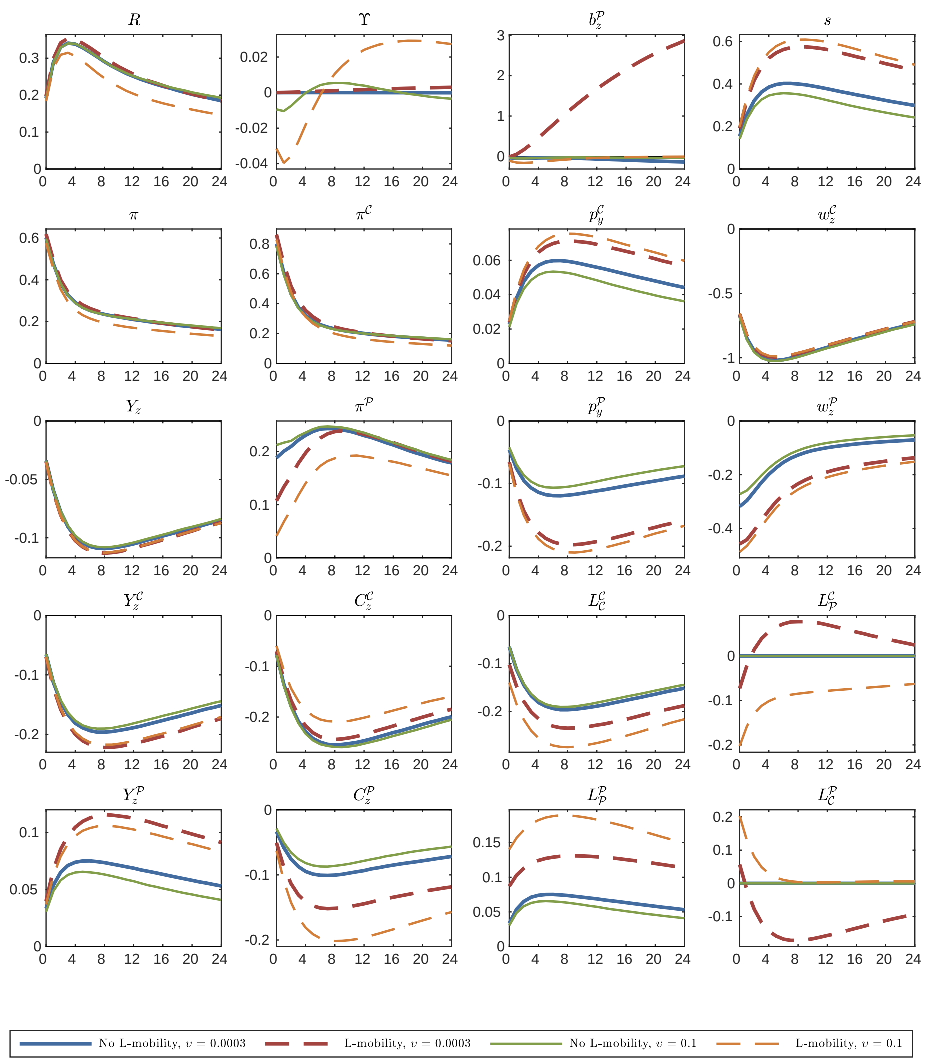

Figure J.10: Responses to one standard deviation core price markup shock in the case with stronger endogenous risk premium response to debt, υ.

J.11 Periphery Price Markup Shock

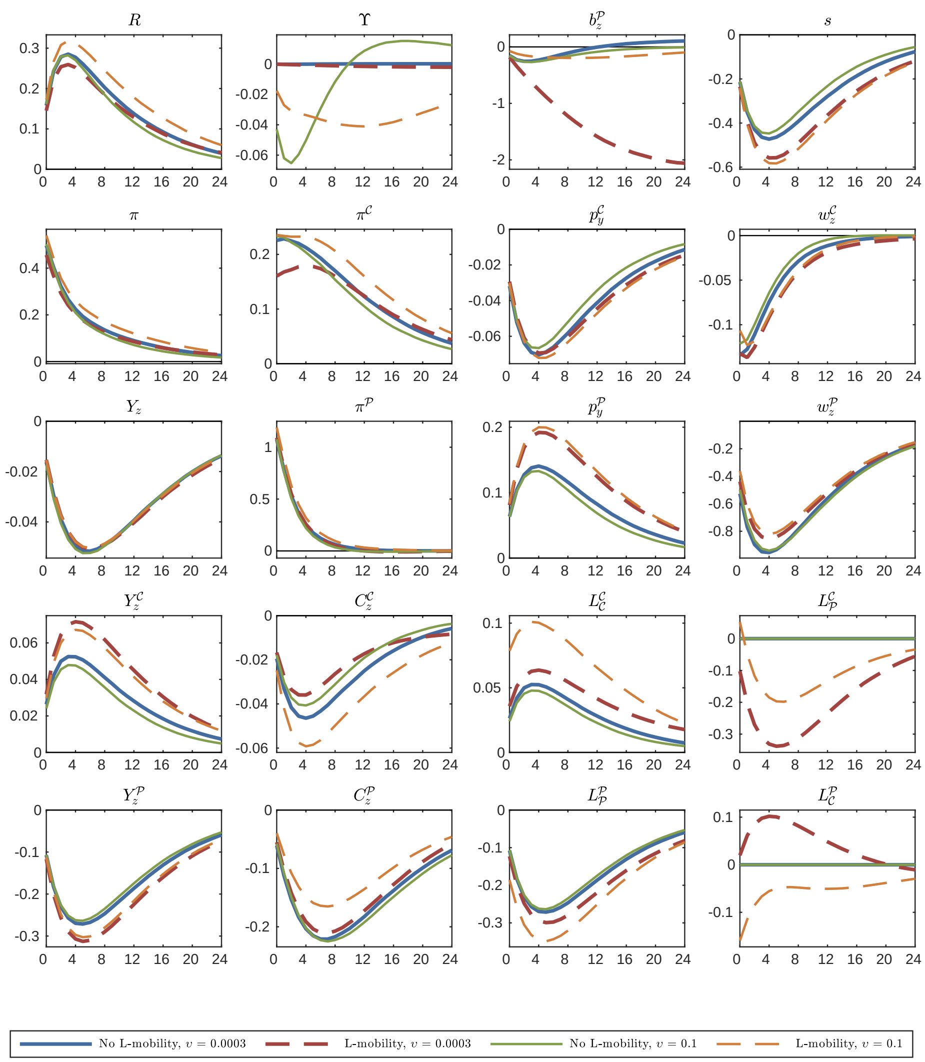

Figure J.11: Responses to one standard deviation periphery price markup shock in the case with stronger endogenous risk premium response to debt, υ.

J.12 Periphery Risk Premium Shock

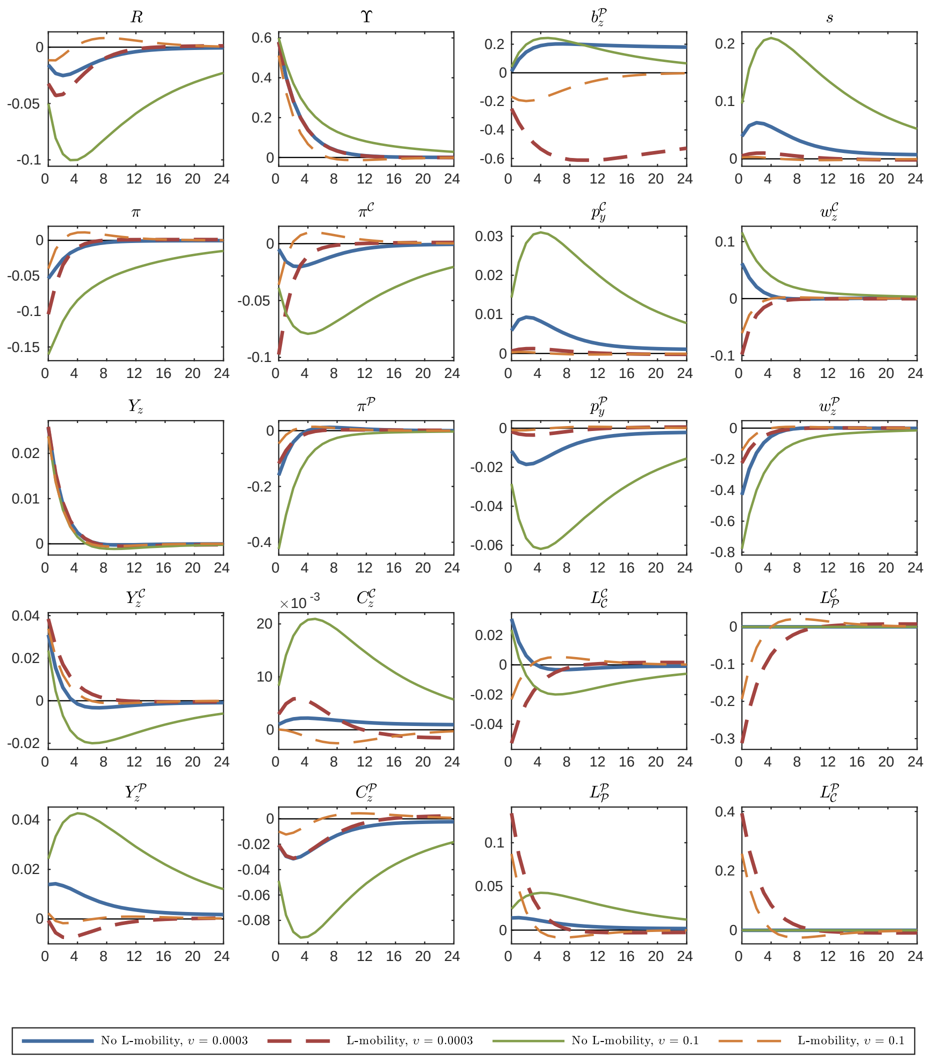

Figure J.12: Responses to one standard deviation periphery risk premium shock in the case with stronger endogenous risk premium response to debt, υ.

K Responses to Shocks: Alternative Elasticity of Substitution of Labor Supply

In this section we compare the responses to the shocks in the same two models but setting the elasticity of substitution of labor supply across the two regions to alternative values. The other model parameters are drawn from the posterior MCMC sample, as in the baseline results. Figures show median responses for each model. The blue solid and red dashed lines are the same as in baseline results for the estimated model with no labor mobility and the baseline counterfactual with $\eta_l = 2$, respectively. The green solid line is the case with labor mobility and lower elasticity of labor supply, $\eta_l = 0.5$; and the orange dashed line is the case with labor mobility and higher elasticity of labor supply, $\eta_l = 5$.

K.1 Monetary Shock

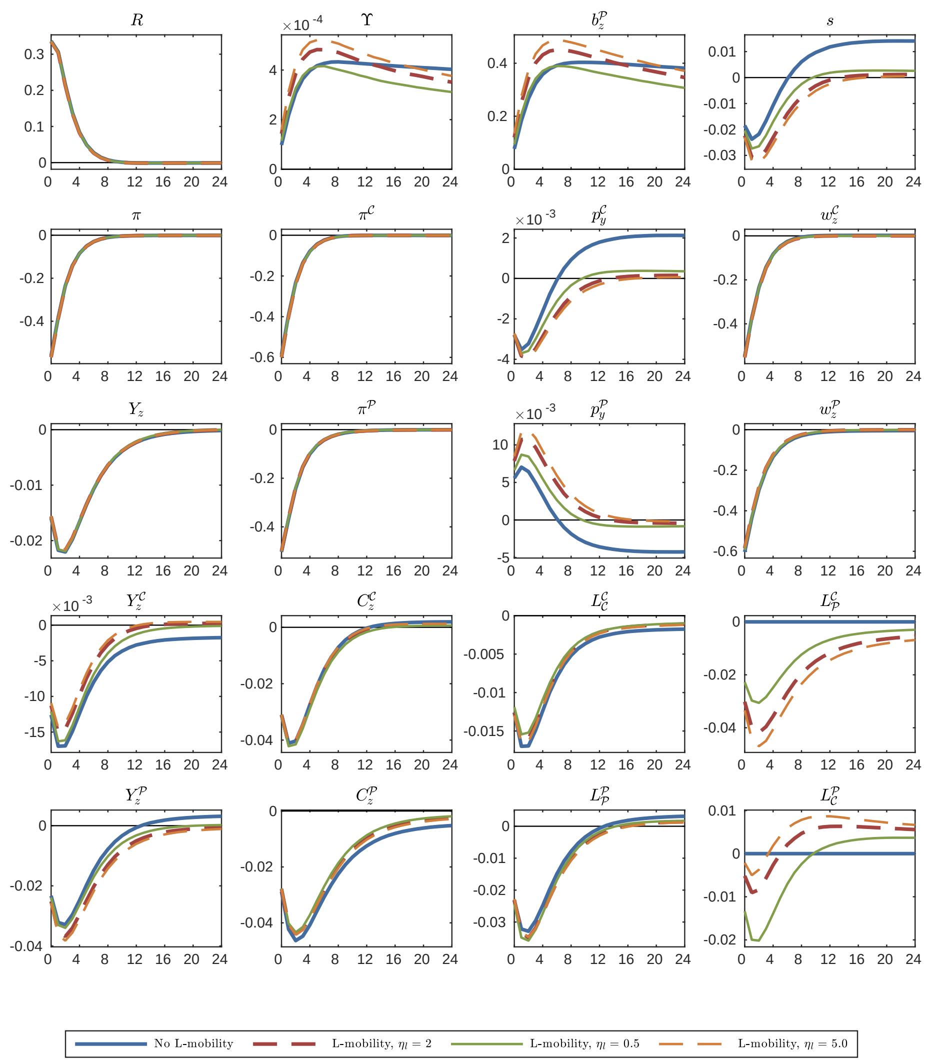

Figure K.1: Responses to one standard deviation monetary policy shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.2 Common Productivity Shock

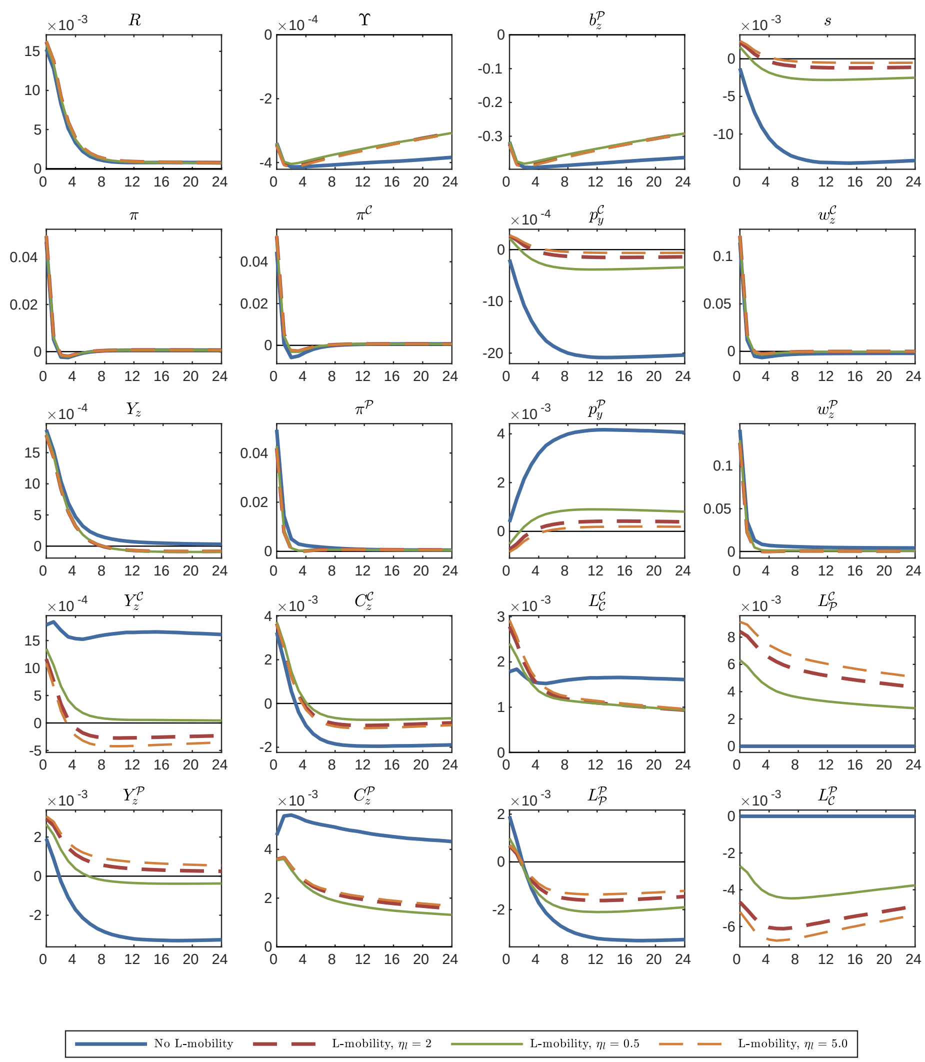

Figure K.2: Responses to one standard deviation common productivity shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.3 Periphery Productivity Shock

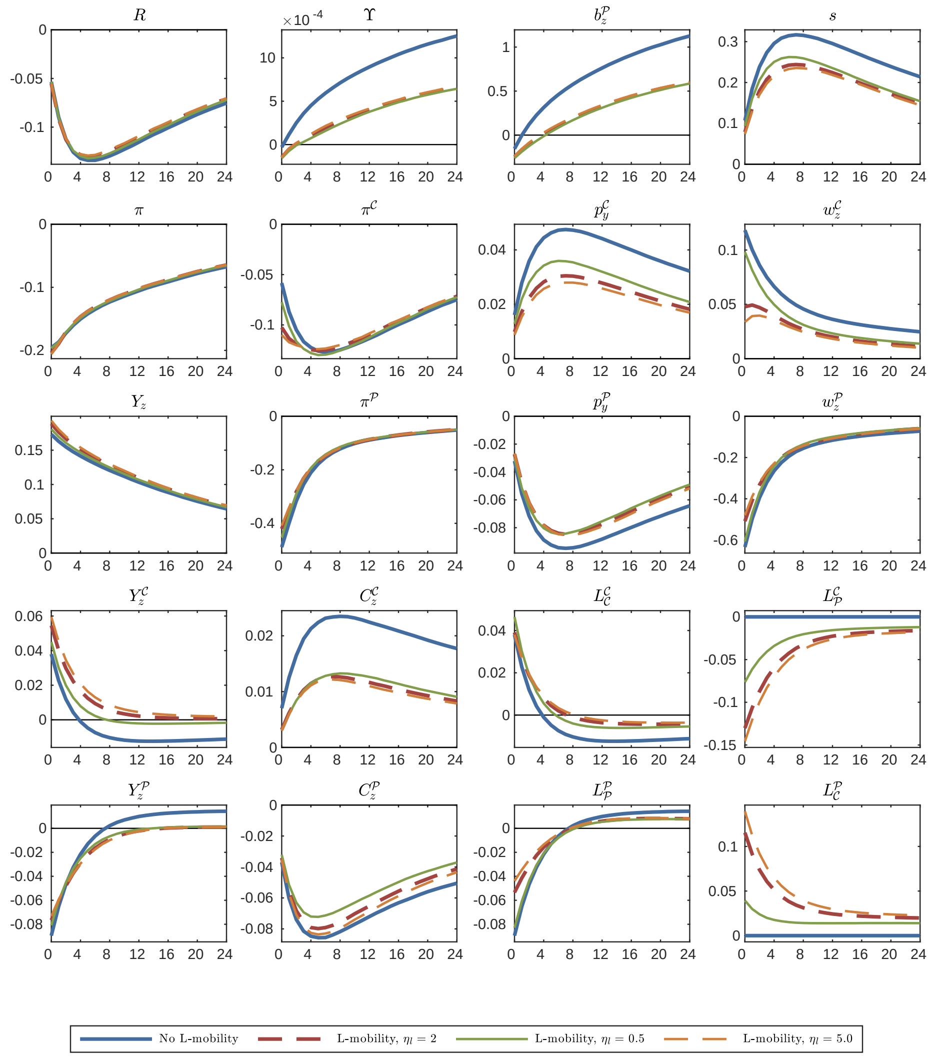

Figure K.3: Responses to one standard deviation periphery productivity shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.4 Core Discount Factor Shock

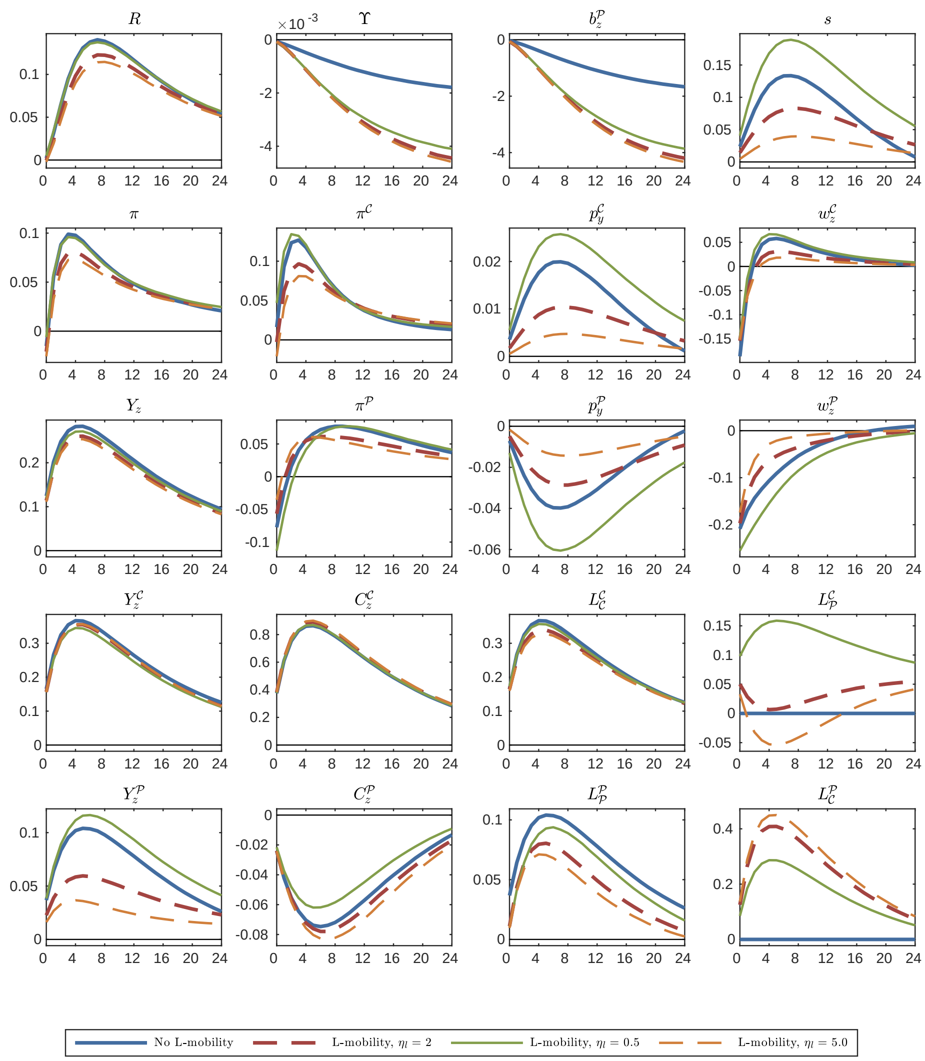

Figure K.4: Responses to one standard deviation core discount factor shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.5 Periphery Discount Factor Shock

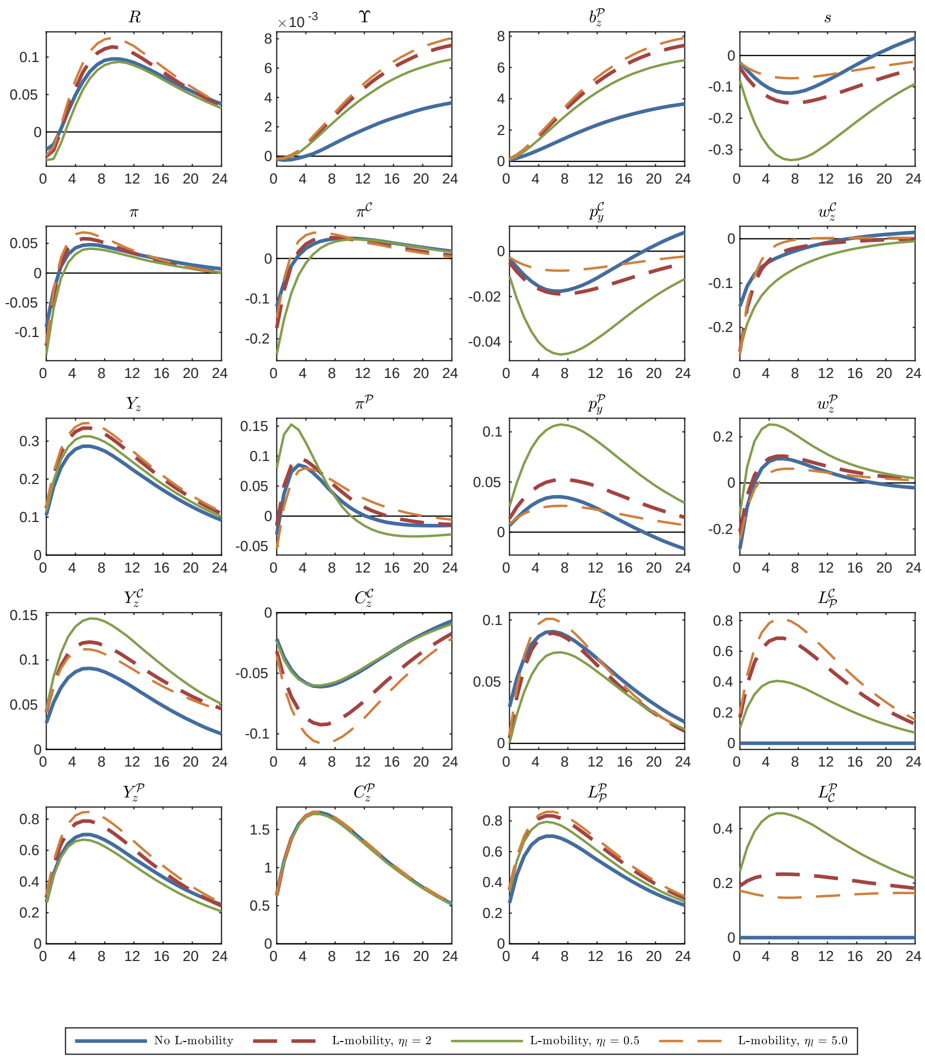

Figure K.5: Responses to one standard deviation periphery discount factor shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.6 Core Labor Disutility Shock

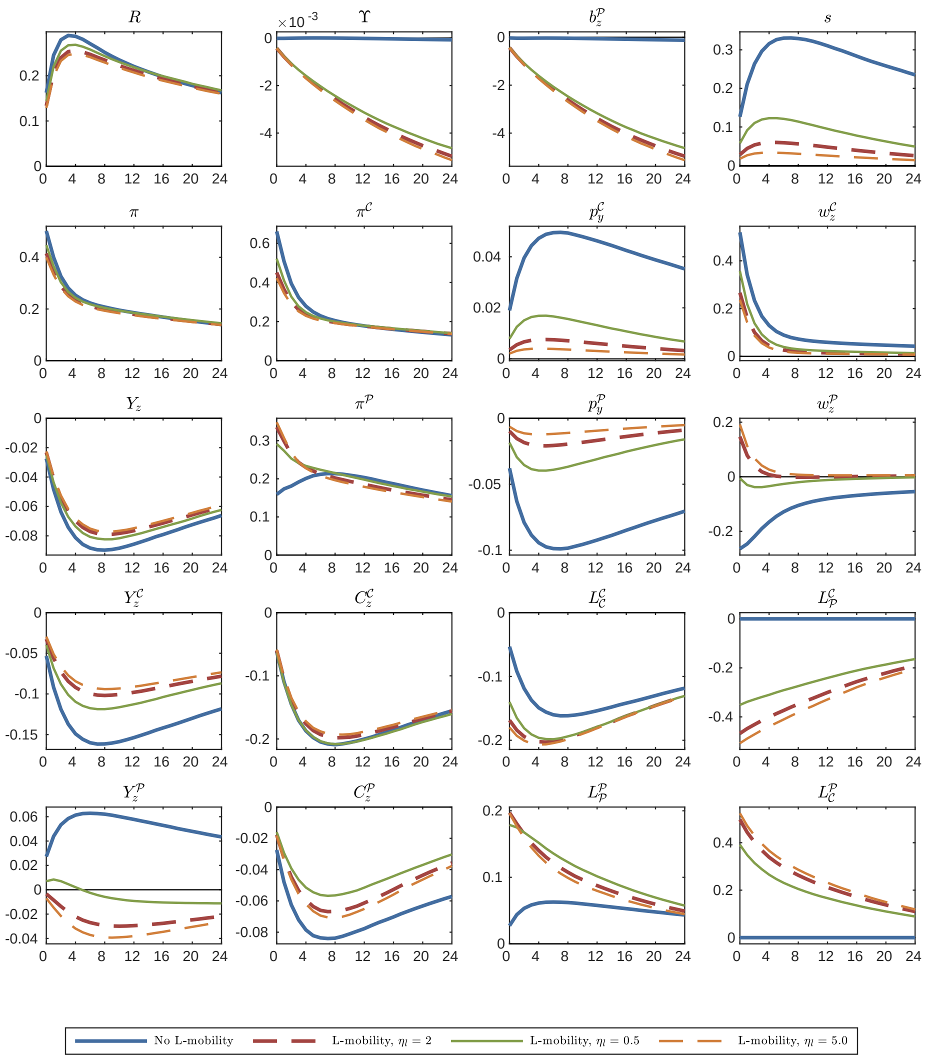

Figure K.6: Responses to one standard deviation core labor disutility shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.7 Periphery Labor Disutility Shock

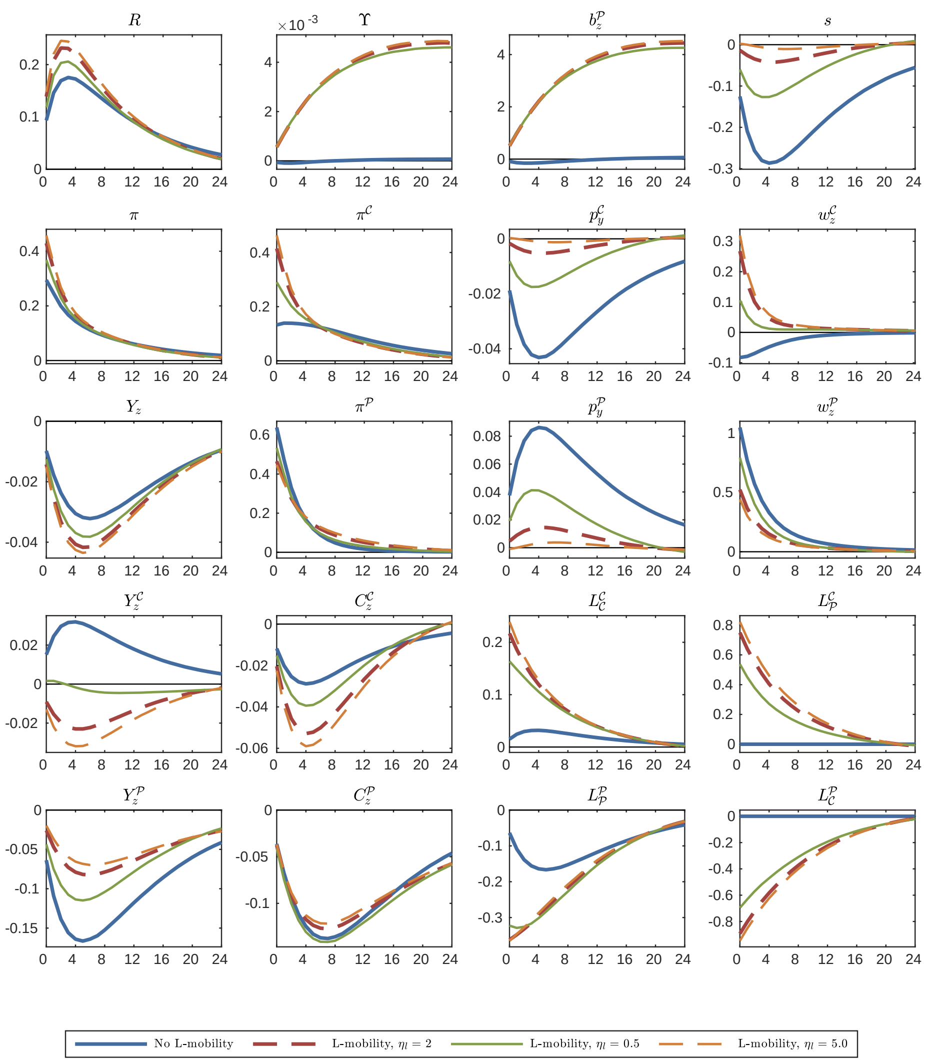

Figure K.7: Responses to one standard deviation periphery labor disutility shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.8 Core Government Spending Shock

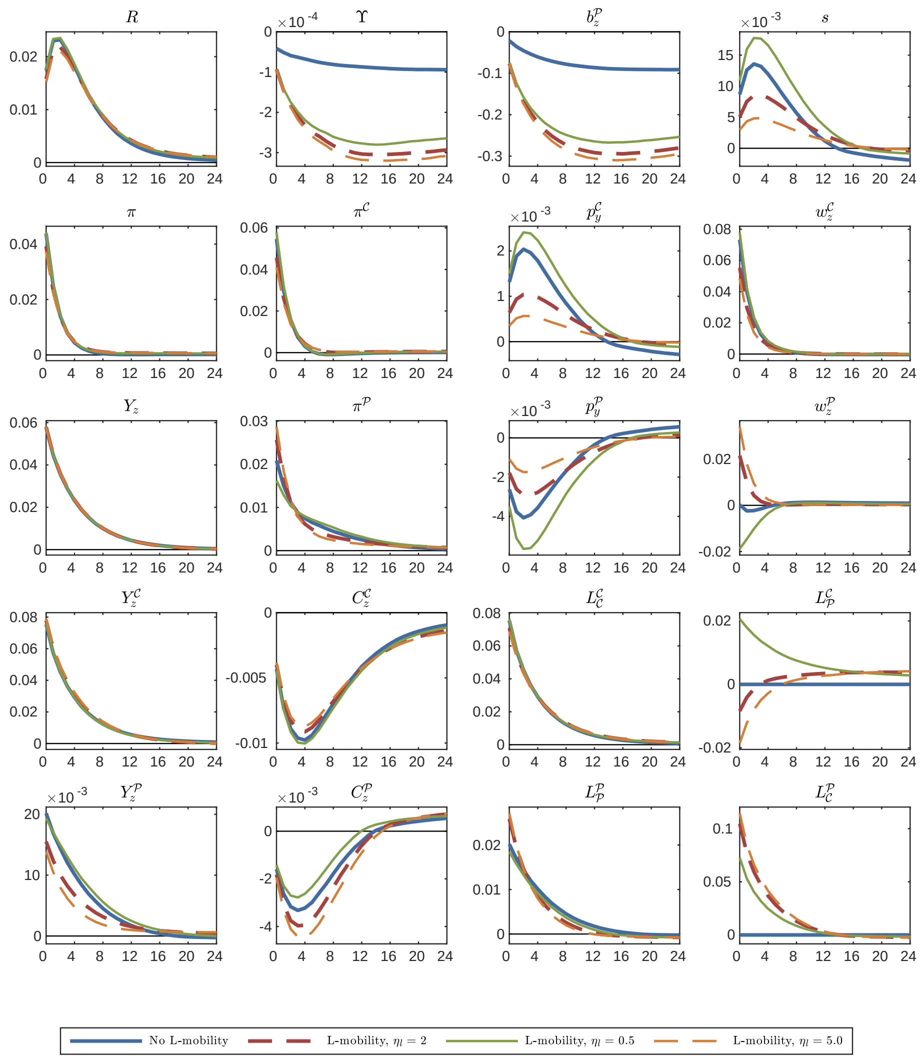

Figure K.8: Responses to one standard deviation core government spending shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.9 Periphery Government Spending Shock

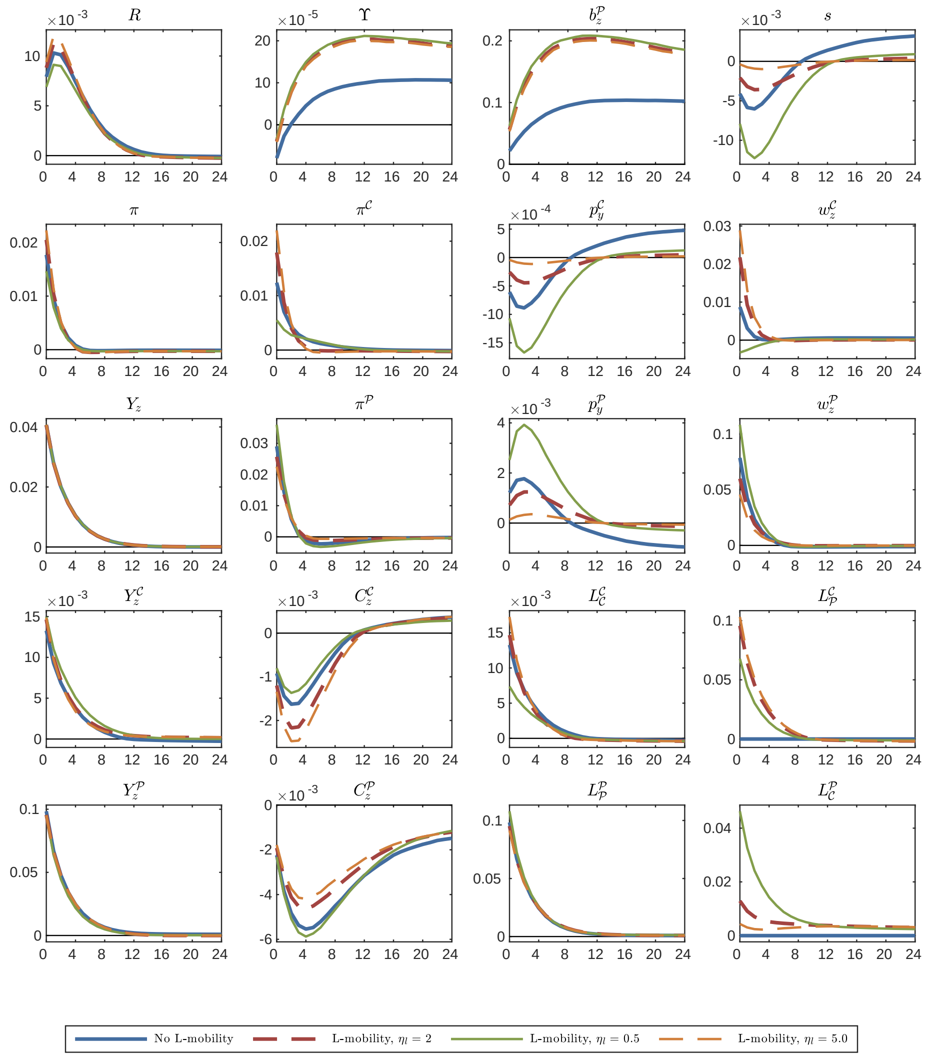

Figure K.9: Responses to one standard deviation periphery government spending shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.10 Core Price Markup Shock

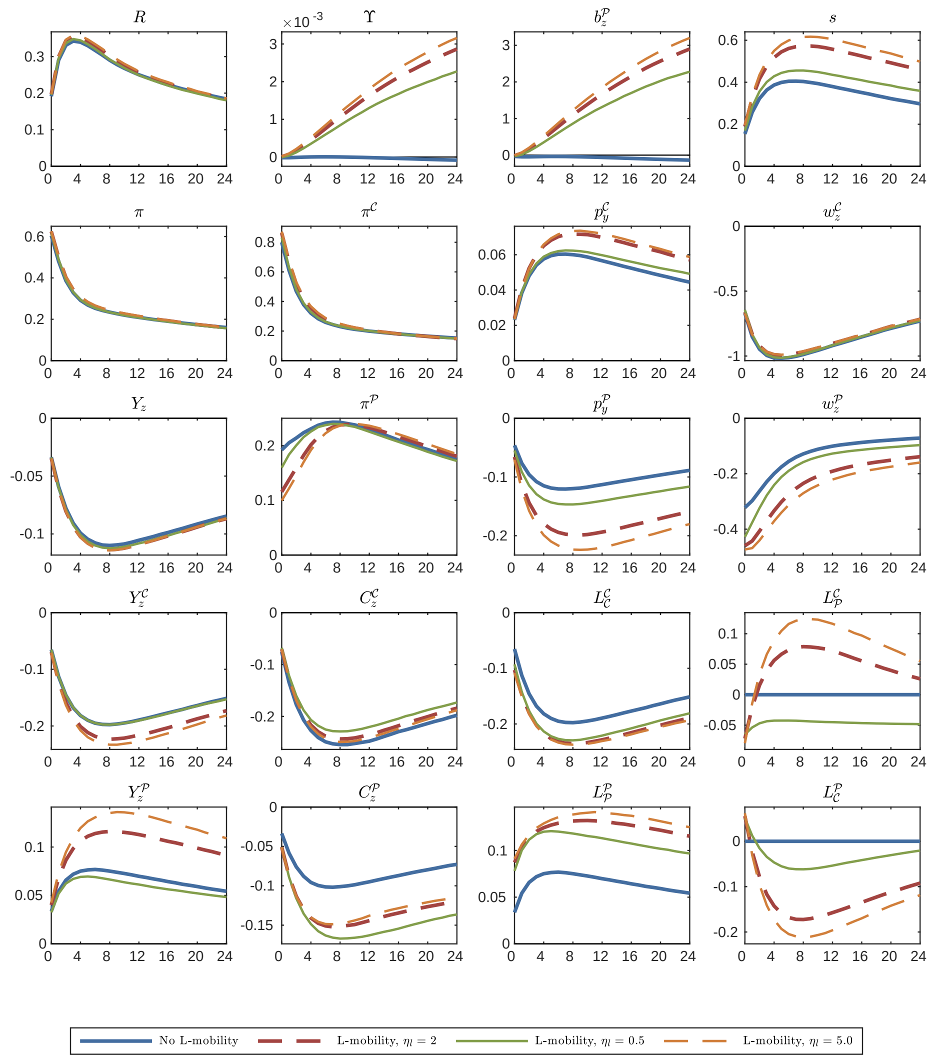

Figure K.10: Responses to one standard deviation core price markup shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.11 Periphery Price Markup Shock

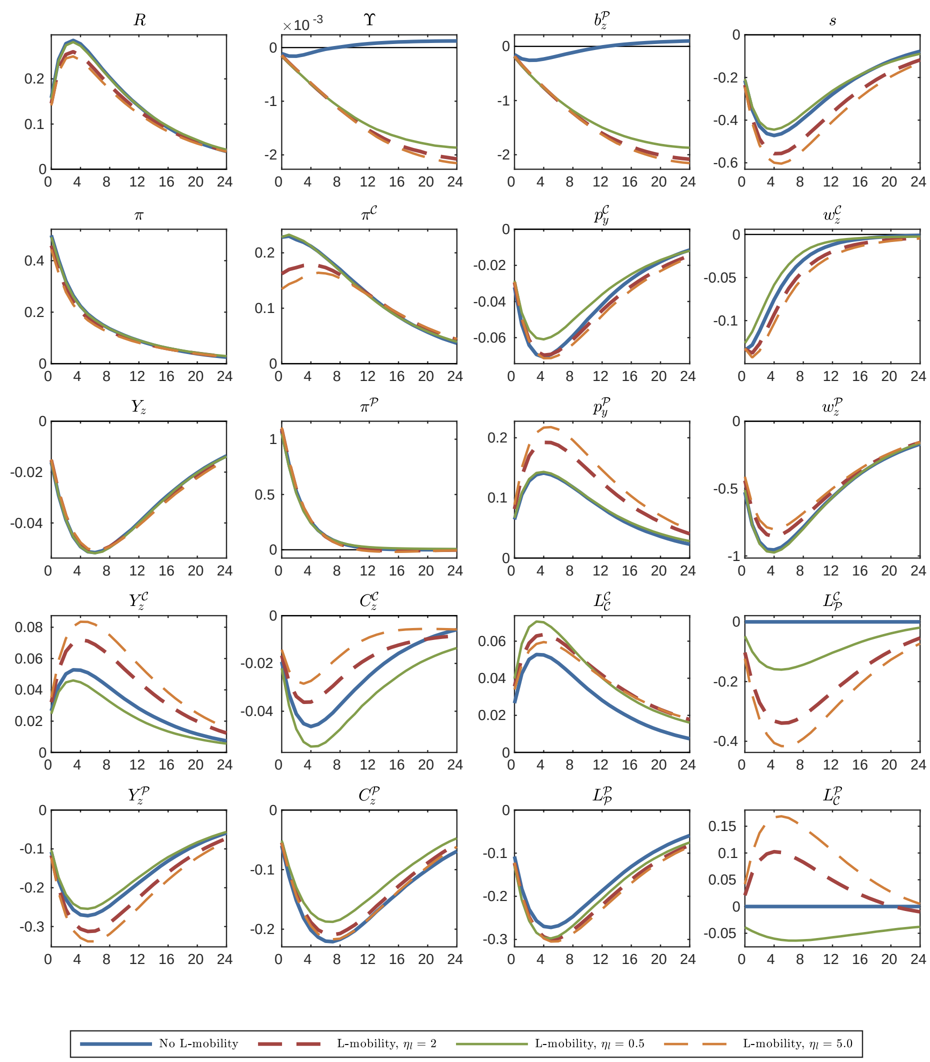

Figure K.11: Responses to one standard deviation periphery price markup shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

K.12 Periphery Risk Premium Shock

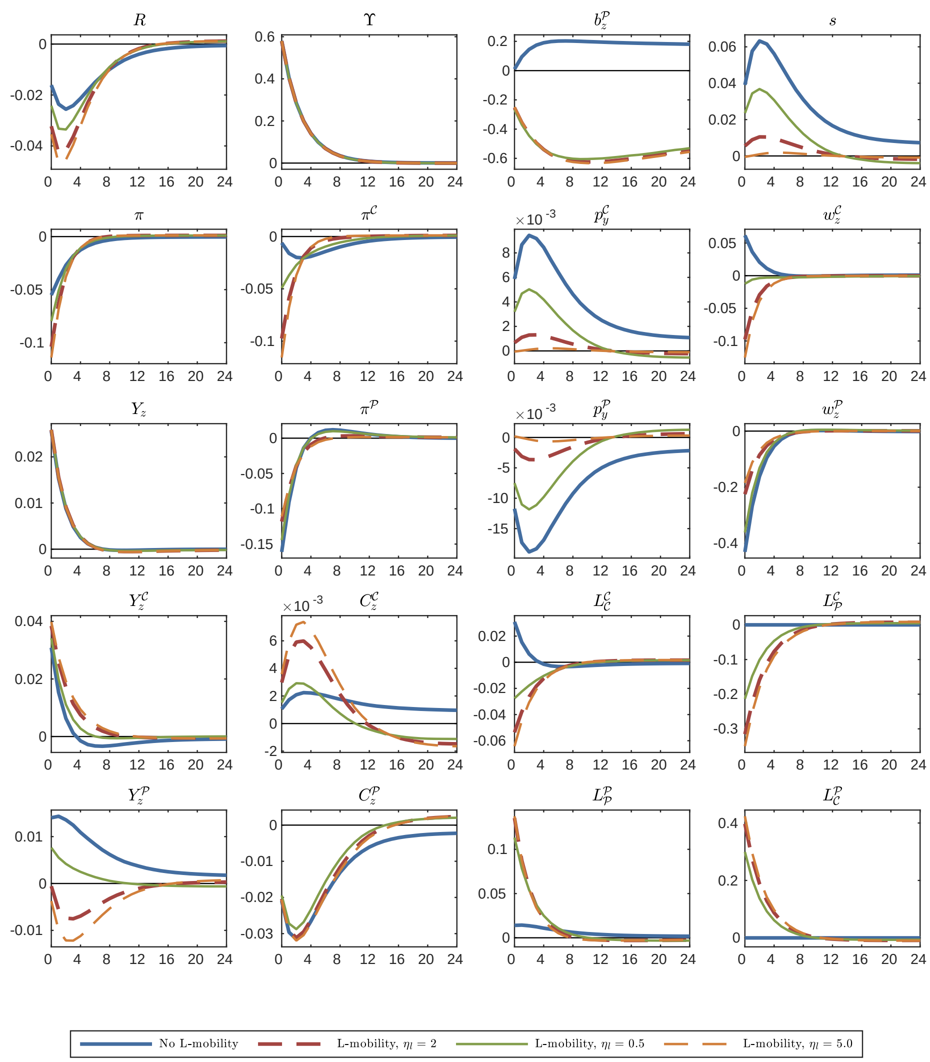

Figure K.12: Responses to one standard deviation periphery risk premium shock for alternative elasticities of substitution of labor supply across the two regions, η_l.

L Responses to Shocks: Alternative Home Bias of Labor Supply

In this section we compare the responses to the shocks in the same two models but setting the level of home bias labor supply across the two regions to alternative values. The other model parameters are drawn from the posterior MCMC sample, as in the baseline results. Figures show median responses for each model. The blue solid and red dashed lines are the same as in baseline results for the estimated model with no labor mobility and the baseline counterfactual with $\gamma_l = 0.75$, respectively. The green solid line is the case with labor mobility and lower elasticity of labor supply, $\gamma_l = 0.50$; and the orange dashed line is the case with labor mobility and higher elasticity of labor supply, $\gamma_l = 0.95$.

L.1 Monetary Shock

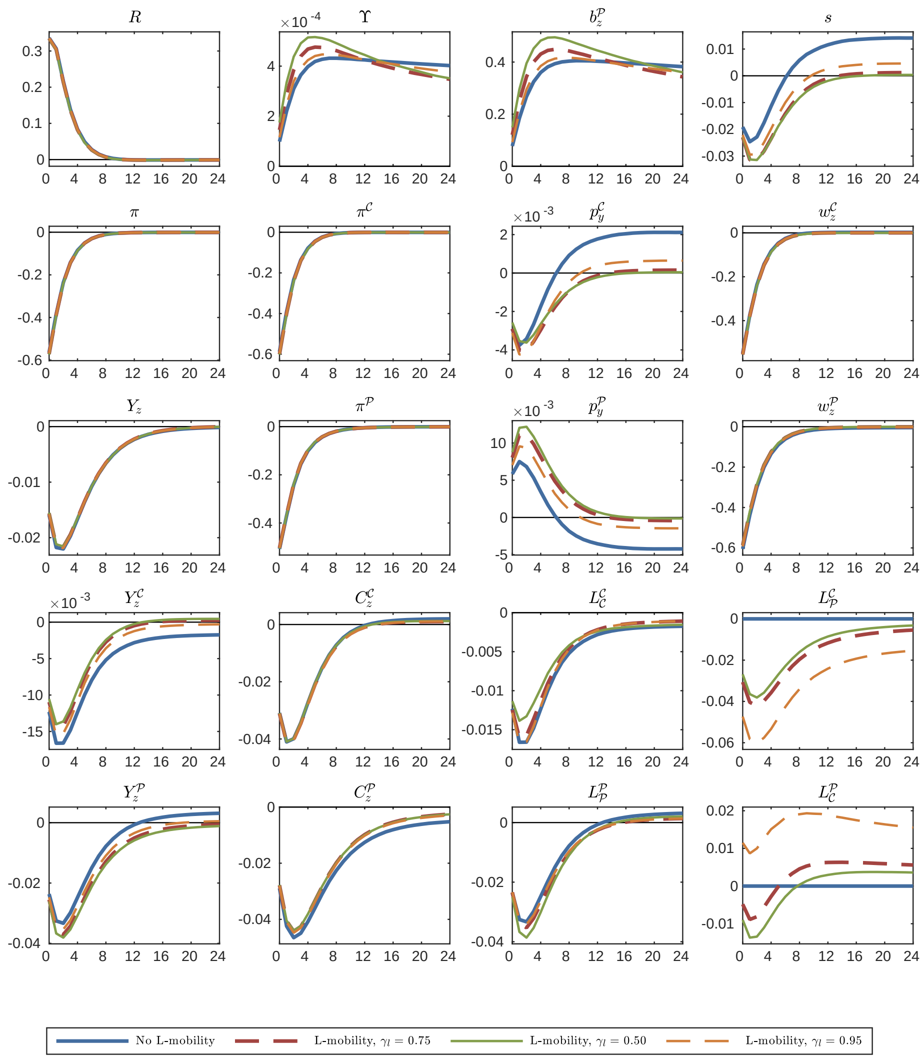

Figure L.1: Responses to one standard deviation monetary policy shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.2 Common Productivity Shock

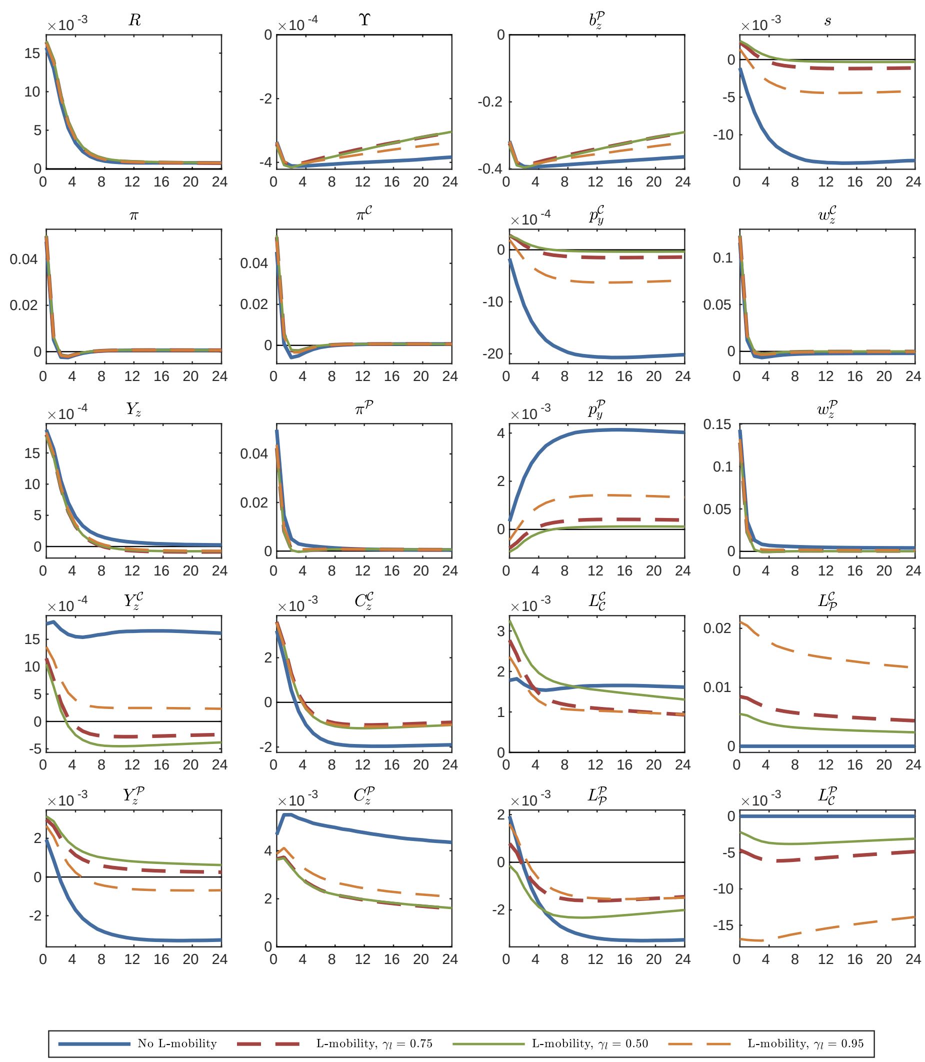

Figure L.2: Responses to one standard deviation common productivity shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.3 Periphery Productivity Shock

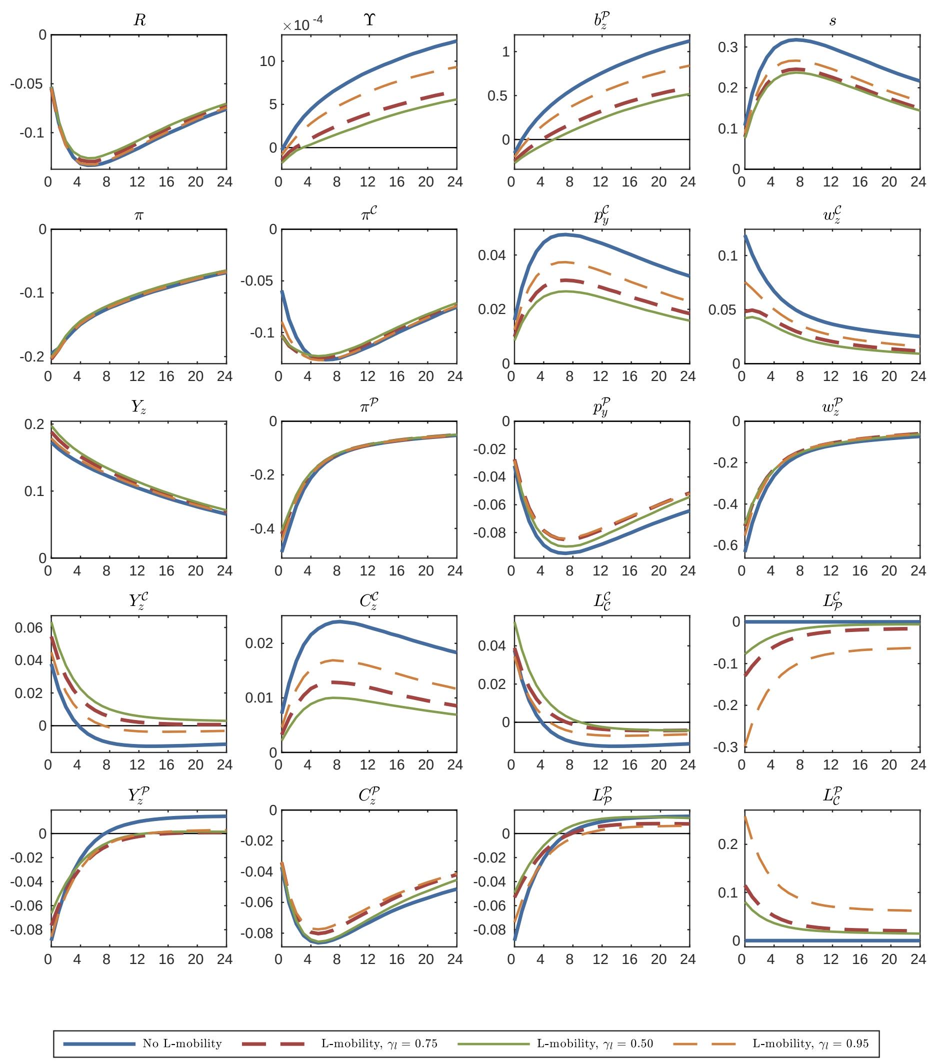

Figure L.3: Responses to one standard deviation periphery productivity shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.4 Core Discount Factor Shock

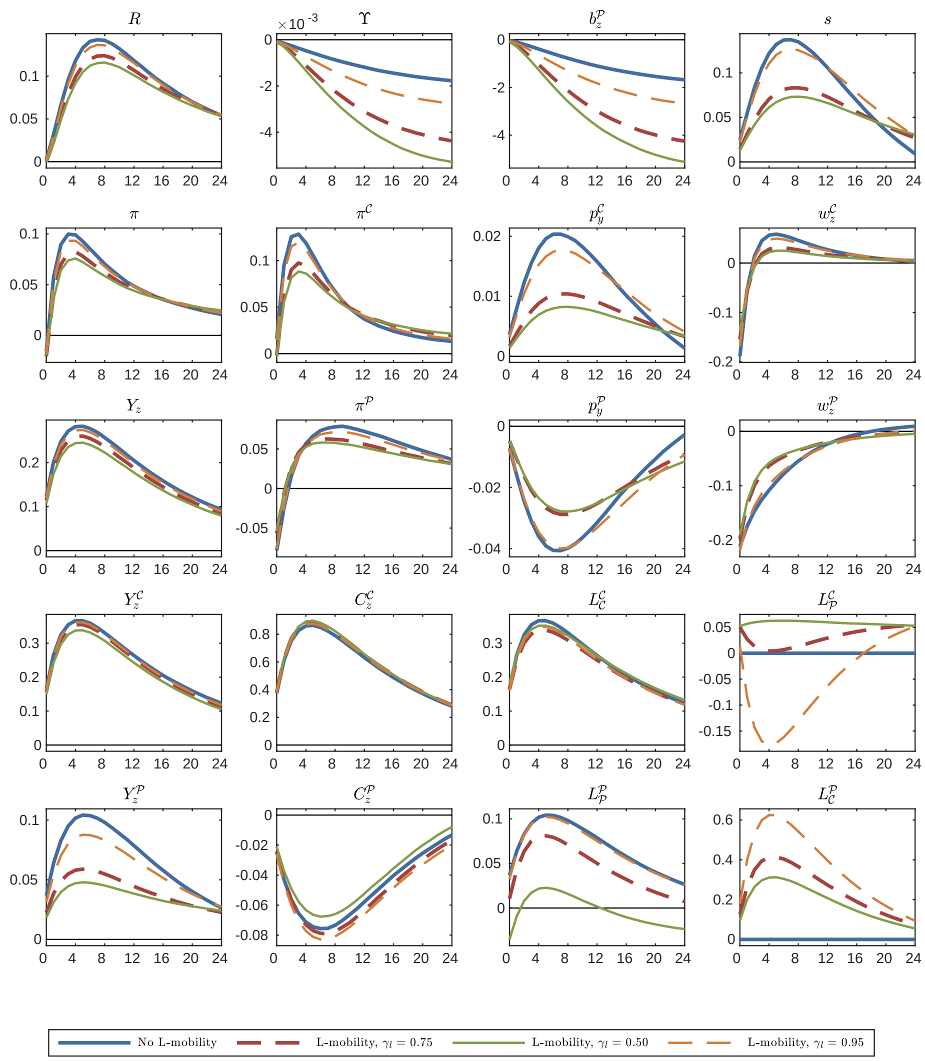

Figure L.4: Responses to one standard deviation core discount factor shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.5 Periphery Discount Factor Shock

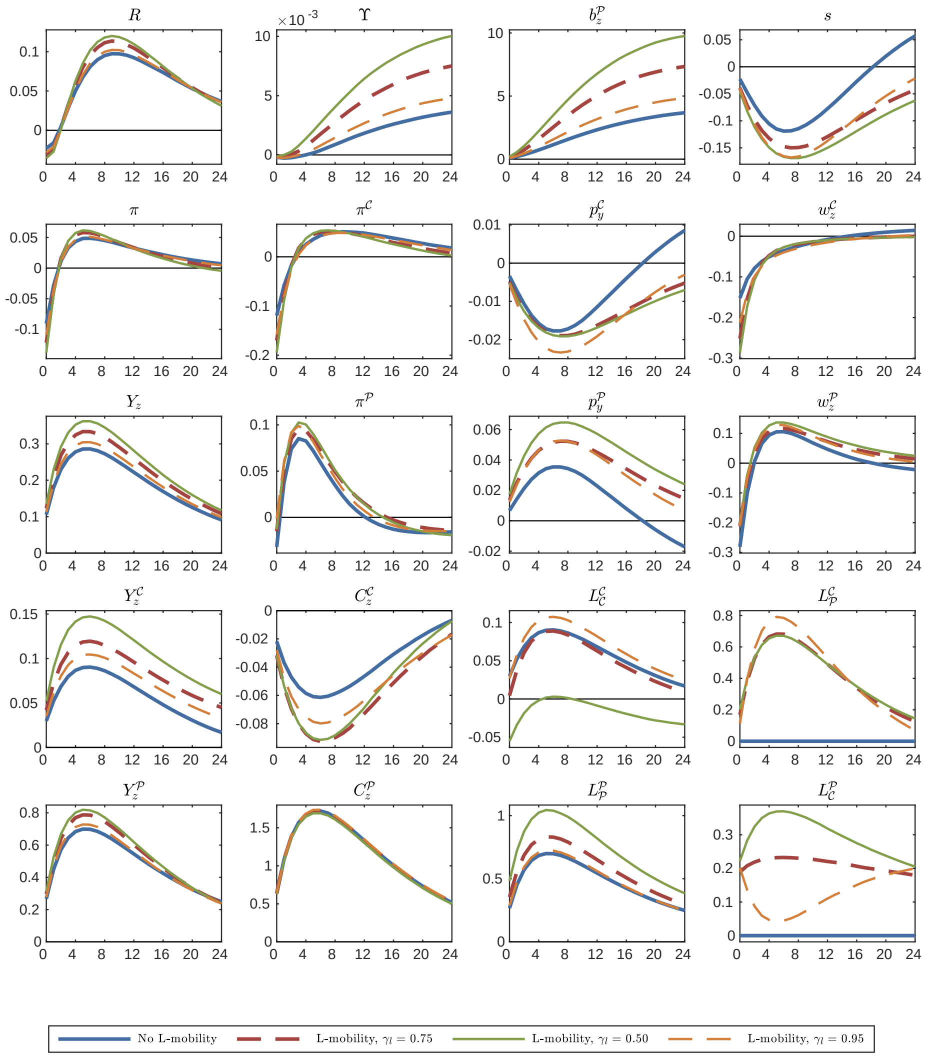

Figure L.5: Responses to one standard deviation periphery discount factor shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.6 Core Labor Disutility Shock

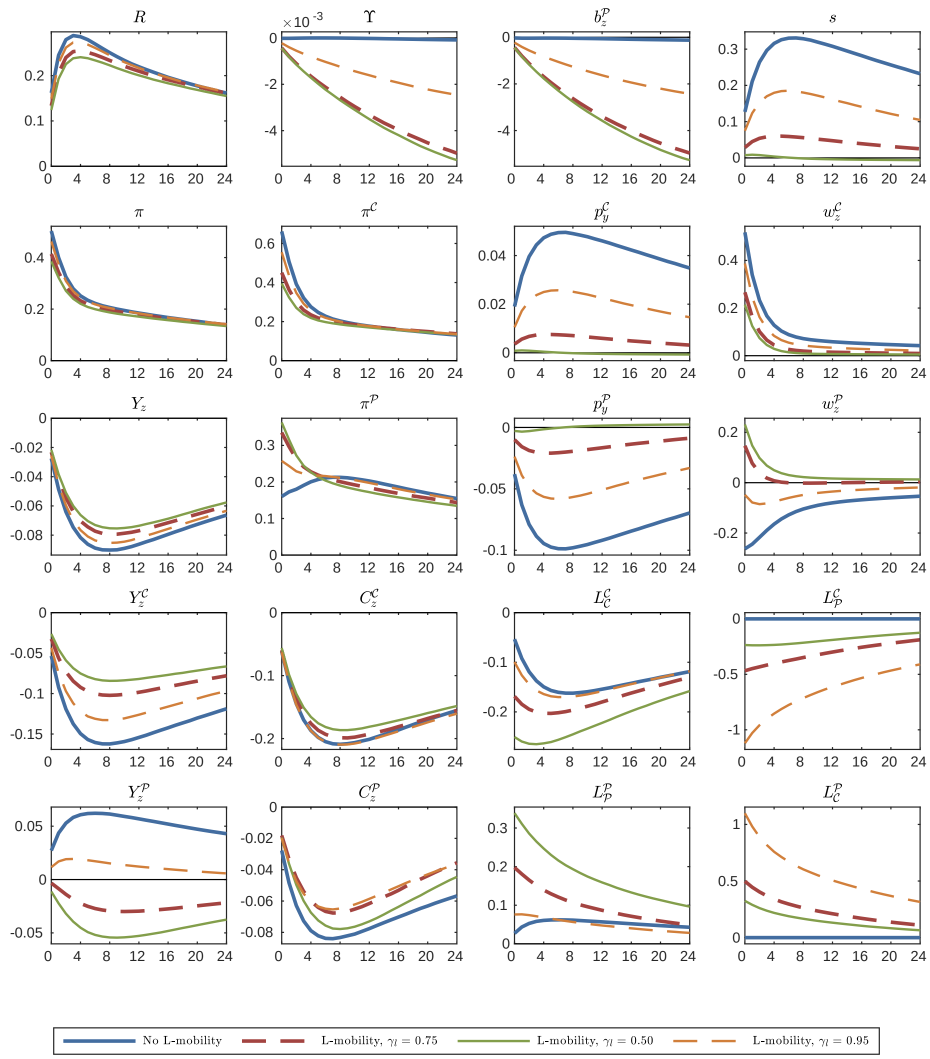

Figure L.6: Responses to one standard deviation core labor disutility shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.7 Periphery Labor Disutility Shock

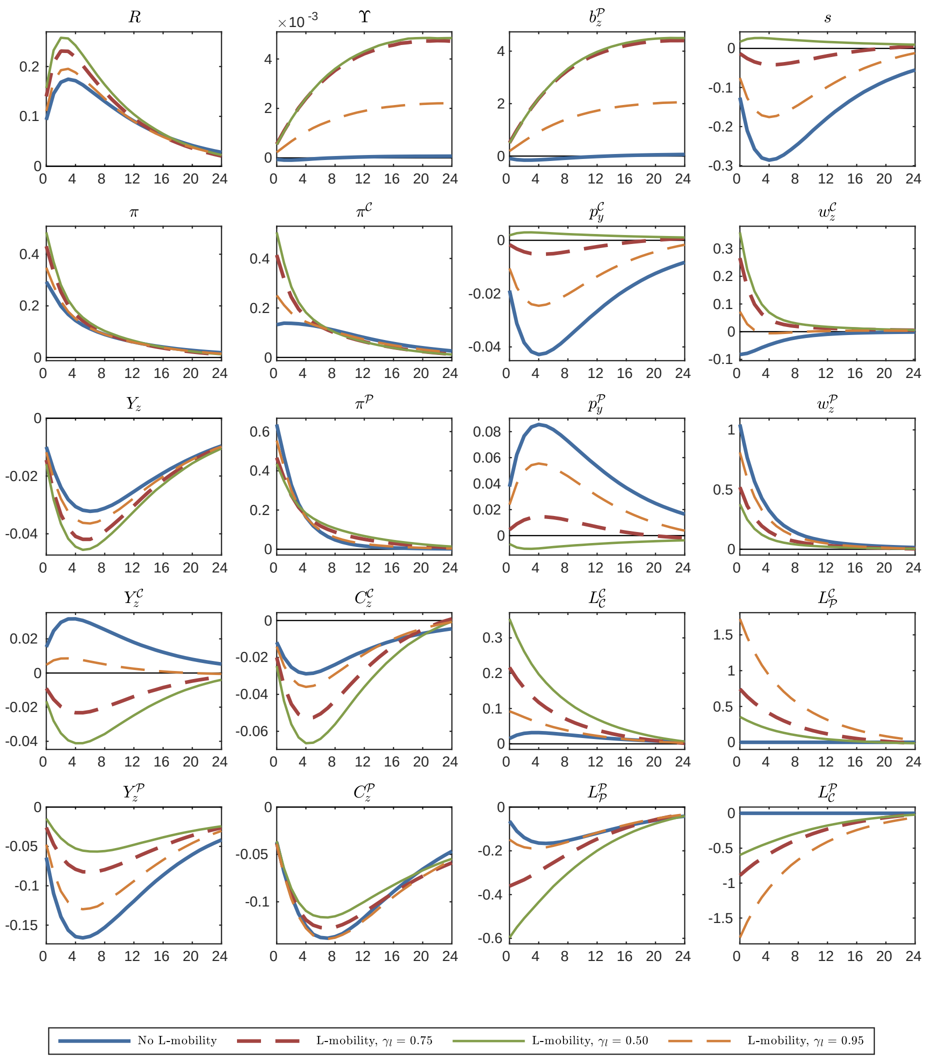

Figure L.7: Responses to one standard deviation periphery labor disutility shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.8 Core Government Spending Shock

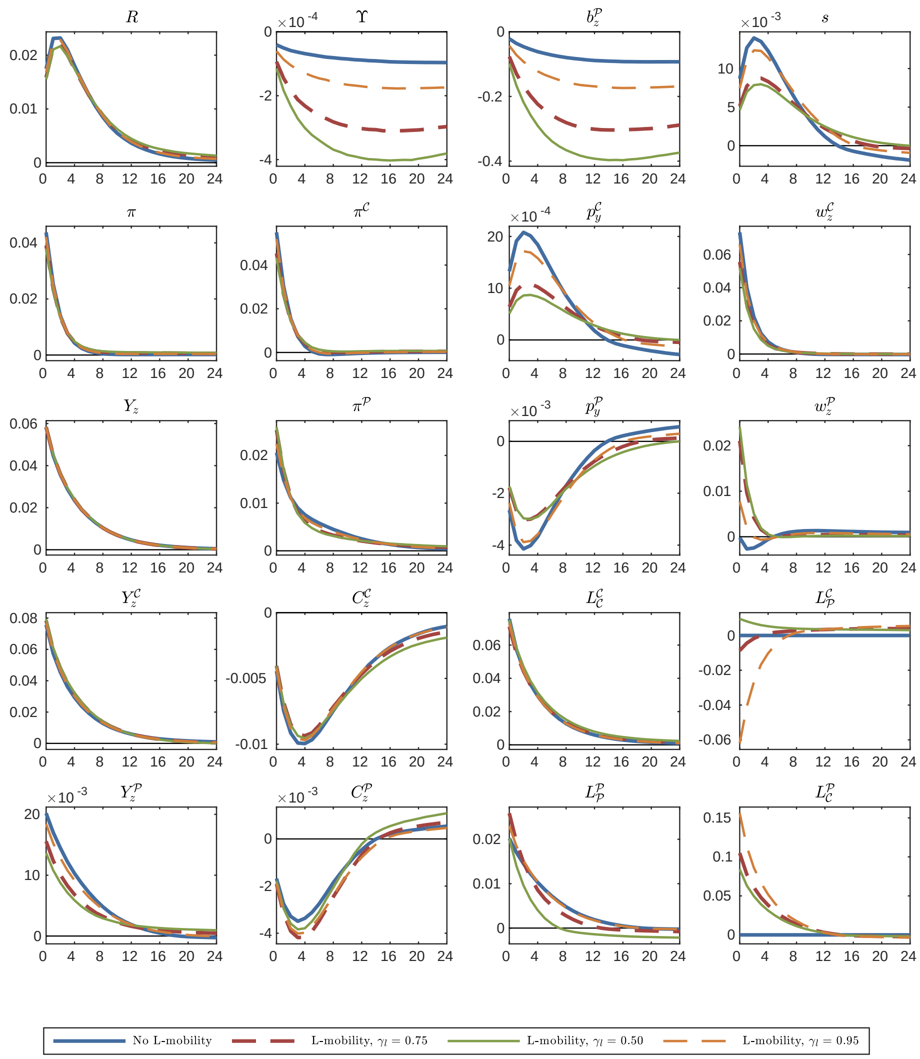

Figure L.8: Responses to one standard deviation core government spending shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.9 Periphery Government Spending Shock

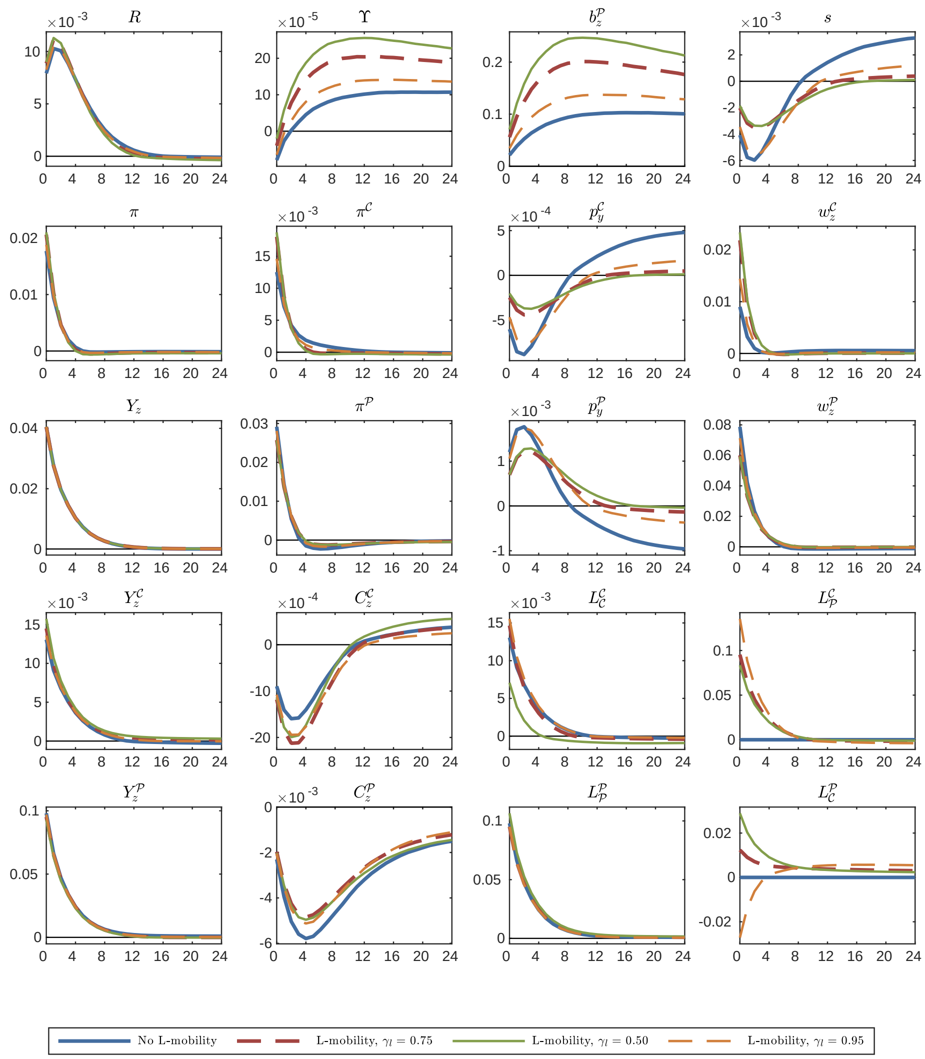

Figure L.9: Responses to one standard deviation periphery government spending shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.10 Core Price Markup Shock

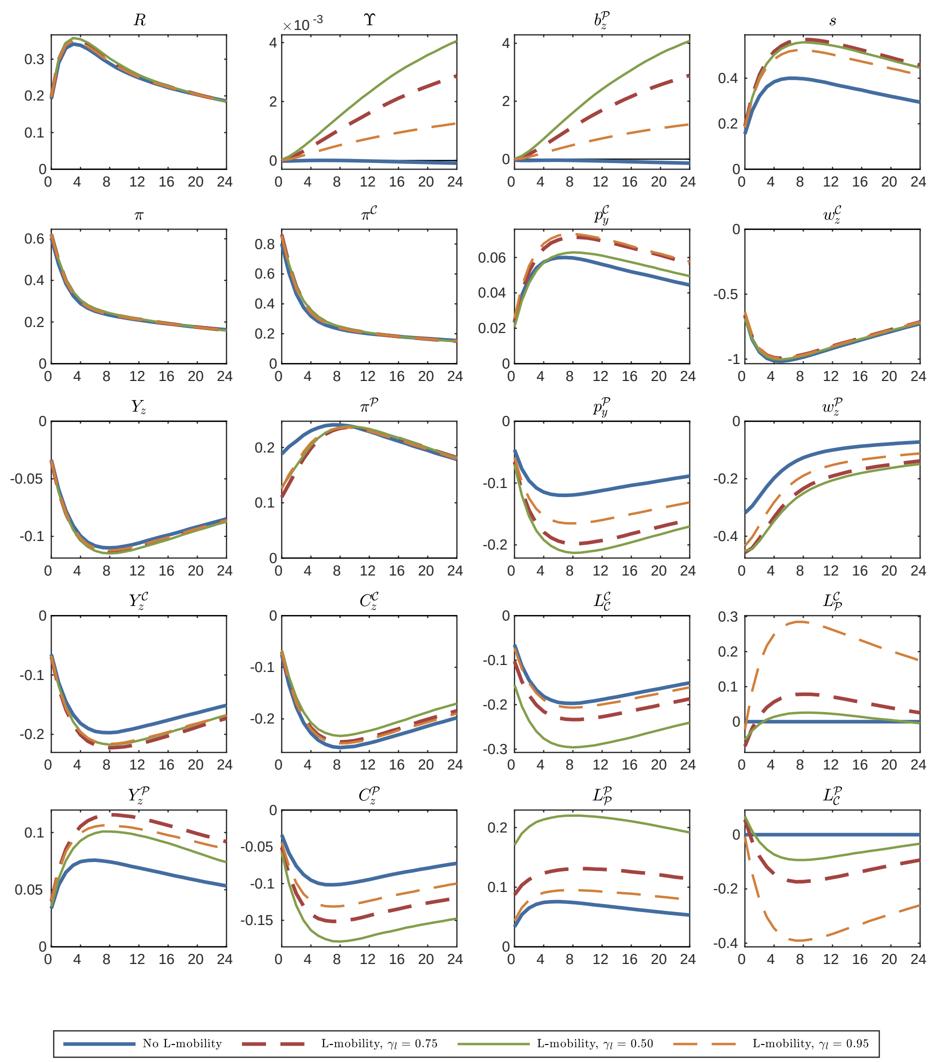

Figure L.10: Responses to one standard deviation core price markup shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.11 Periphery Price Markup Shock

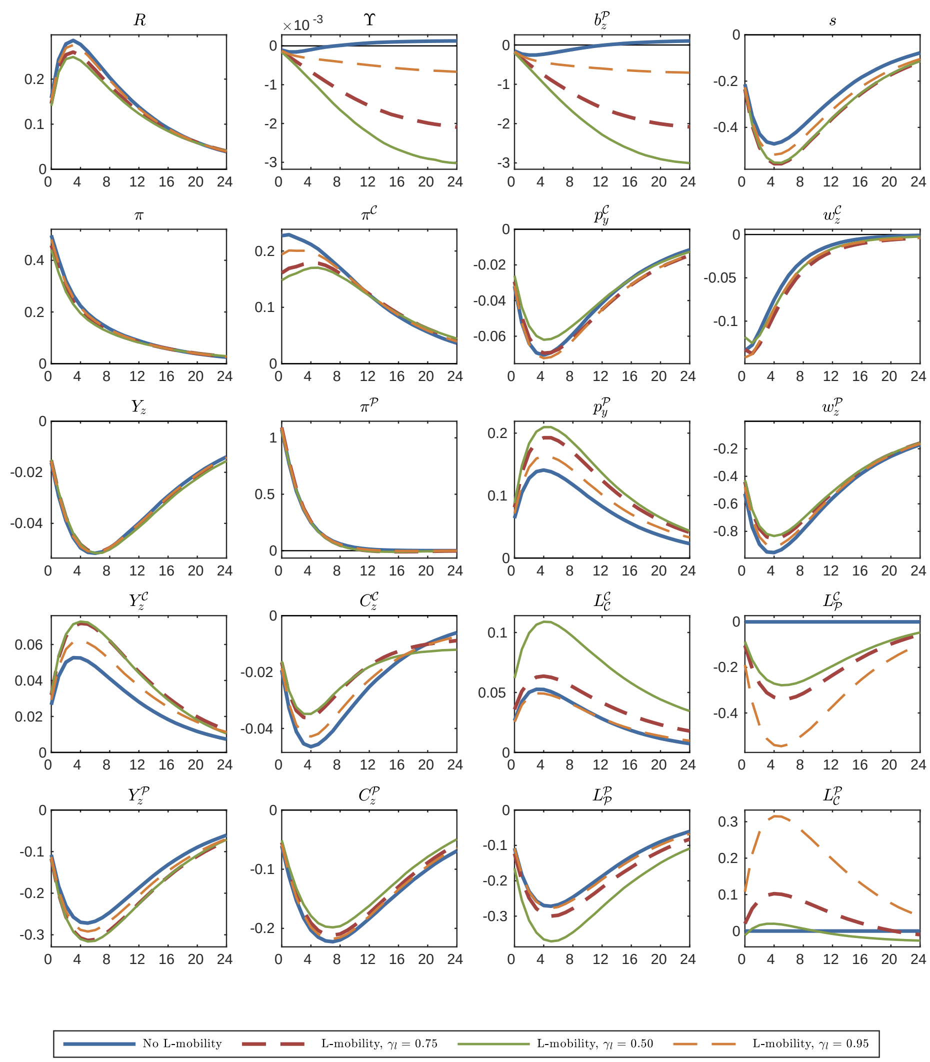

Figure L.11: Responses to one standard deviation periphery price markup shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.

L.12 Periphery Risk Premium Shock

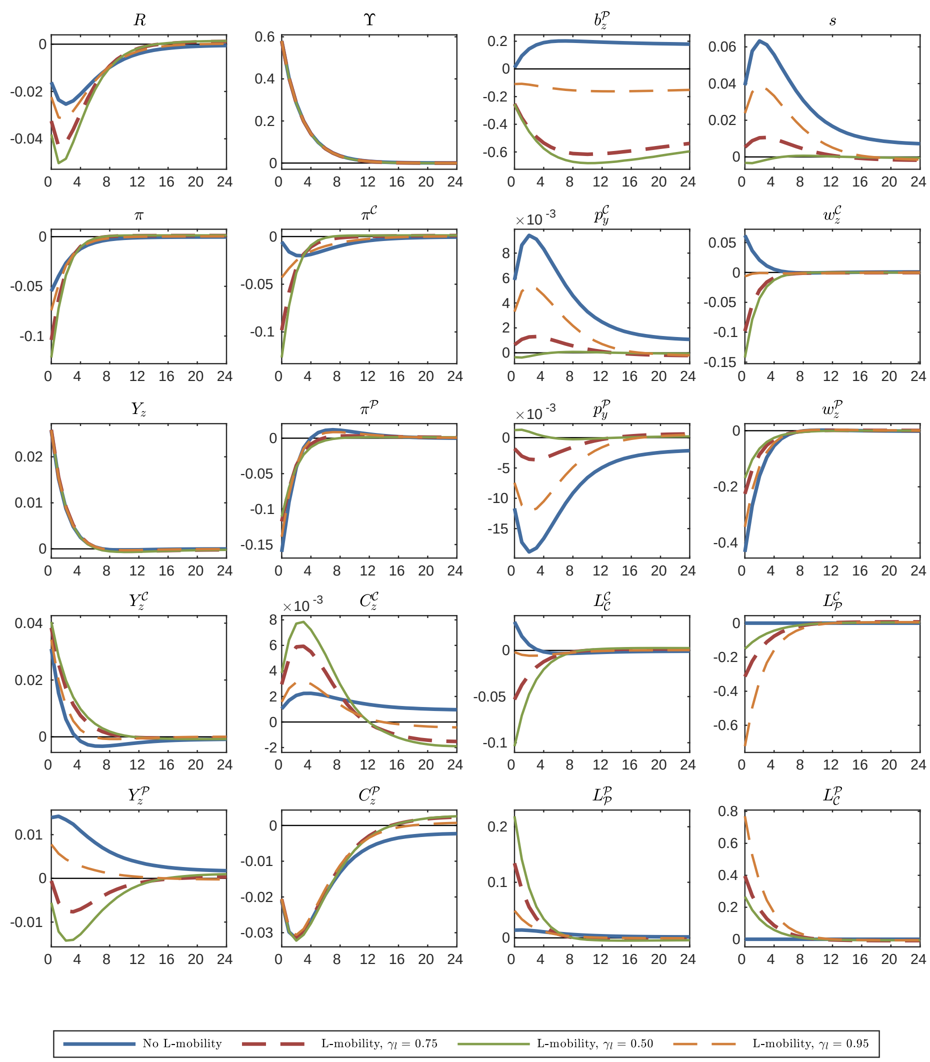

Figure L.12: Responses to one standard deviation periphery risk premium shock for alternative elasticities of substitution of labor supply across the two regions, γ_l.