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The impact of structural policies on external accounts in infinite-horizon and finite-horizon models

By Lukas Vogel

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Abstract:

The paper uses the European Commission's QUEST III model to compare the impact of product market reform, labour market re-form and fiscal devaluation on economic activity and external accounts in infinite-horizon and finite-horizon versions of the model for a small open economy in monetary union with tradable and non-tradable sectors. The impact of structural policies on external positions tends to be stronger and more persistent, but also more diverse in the finite-horizon specification because of the impact of structural reforms on financial wealth and its transmission to consumption demand in the finite-horizon setting. The improvement in the net foreign asset position tends to be stronger if structural reforms are accompanied by fiscal consolidation and if countries start with high pre-reform levels of net foreign debt.

JEL classification: F30, F41, F42

Keywords: external accounts, model comparison, planning horizon, structural reforms

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1. Introduction

The impact of structural reforms, notably in labour and product markets, on current account (CA) and net foreign asset (NFA) positions has received particular attention in the context of the large and persistent external imbalances inside the euro area. Blanchard and Milesi-Ferretti (2012) and Obstfeld (2012) summarise the arguments for promoting orderly CA rebalancing, and recent empirical research has analysed the impact of structural policies on CA and NFA positions in this context. Several empirical studies find a positive short- and medium-term link between (some) structural reforms on external positions (Berger and Nitsch, 2010; Biroli et al. 2010; Zemanek et al., 2010), whereas long-term effects appear more muted (Kerdrain et al., 2010). Macroeconomic models relate the positive short- and medium-term impact of structural reforms to improving trade competitiveness and explain the muted long-term response by the positive income effect that strengthens domestic and import demand over time (Vogel, 2012).

The value of model simulations for policy analysis depends on the robustness of results especially with respect to elements not easily tested empirically. In this spirit, the paper investigates the robustness of the impact of structural policies on external accounts with respect to the planning horizon of agents as one important model dimension. To this aim, the paper compares otherwise identical infinite-horizon and finite-horizon small open economy versions of the QUEST III model (Ratto et al., 2009).

Kumhof and Laxton (2009) demonstrate the importance of the planning horizon for the effects of fiscal policy on external accounts. Structural reform simulations in finite-horizon DSGE models (Gavilán et al., 2011), on the other hand, find effects that are similar to the effects in the infinite-horizon version of QUEST III. The similarity of the results does not show the irrelevance of planning horizons for the transmission of structural reforms, however, as the models in the existing literature also differ with respect to other elements and with respect to the reform scenarios.

The paper analyses the impact of product market reform in the form of price mark-up reduction, labour market reform in the form of wage moderation and fiscal devaluation as tax shift from labour to consumption on the economy's external position. It also discusses second-round effects of budgetary policy, which matter particularly in the finite-horizon framework.

2. Model

This comparison of the macroeconomic impact of structural policies in infinite-horizon versus finite-horizon environments uses the QUEST III model of DG ECFIN (Ratto et al., 2009). QUEST III is a quarterly macroeconomic model and a member of the class of New-Keynesian Dynamic Stochastic General Equilibrium (DSGE) models. The model has rigorous microeconomic foundations derived from utility and profit optimisation and

includes frictions in goods, labour and financial markets.

The model version used in this paper is a small open economy setup with two production sector, which respectively produce tradable (T) and non-tradable (NT) goods. Households invest into domestic productive capital, domestic government bonds and a foreign bond. There is no cross-border mobility of labour. The exchange rate of the small economy is fixed in the simulations and monetary policy is exogenous to proxy the situation of a small open economy in monetary union. The model is calibrated to key characteristics of an average EMU member country.

Given the paper's focus on medium- and long-term differences between models with infinite and finite planning horizons, the model abstracts from the presence of liquidity-constrained households and consumption habits that impact primarily on the short-term dynamics. All households are intertemporal optimising, have full access to financial markets, supply labour, own the firms and obtain the firms' profits.

2.1 Production

The economy is home to firms *j* operating in the tradable (T) and non-tradable (NT) sectors. Individual firms in the T and NT sectors are indexed by the superscript *j=(t,nt)*. Each firm produces a variety of the T or NT good that is an imperfect substitute for varieties produced by other firms. Sectoral output (O_t^J), which is indexed by the superscript *J=(T,NT)* is a CES aggregate of the varieties O_t^j in each sector:

$$(1) \qquad O_t^J \circ \left[\int_0^1 (O_t^j)^{(\sigma_j - 1)/\sigma_j} dj \right]^{\sigma_j/(\sigma_j - 1)}$$

where σ_j is the elasticity of substitution between varieties *j* in sector *J*. The elasticity value may differ for T and NT output, implying different price mark-ups in the T and NT sectors. The firms are owned by the intertemporally optimising households, who receive the firm profits.

Given the imperfect substitutability, firms are monopolistically competitive in the goods market and face a demand function for their output:

$$(2) \qquad O_t^j = (P_t^j / P_t^J)^{-\sigma_j} O_t^J$$

The firms in sector T sell consumption and investment goods and intermediate inputs to the domestic and foreign private households and firms and consumption and investment goods to domestic and foreign governments. The NT sector sells consumption goods to domestic households, consumption and investment goods to the domestic government, and intermediate inputs to domestic firms. Hence, all private investment in physical capital consists of T goods.

Output is produced with a CES technology that combines value-added (Y_t^j) and intermediate inputs (INT_t^j) and nests a Cobb-Douglas technology with capital (K_t^j), production workers ($L_t^j - LO_t^j$) and public infrastructure (KG_t) for the production of Y_t^j:

$$(3) \qquad O_t^j = [(1 - \sin^j)^{1/\sigma_{in}} (Y_t^j)^{(\sigma_{in}-1)/\sigma_{in}} + (\sin^j)^{1/\sigma_{in}} (INT_t^j)^{(\sigma_{in}-1)/\sigma_{in}}]^{\sigma_{in}/(\sigma_{in}-1)}$$

$$(4) \qquad Y_t^j = A_t^j (ucap_t^j K_t^j)^{1-\alpha} (L_t^j - LO_t^j)^{\alpha} KG_t^{\alpha_g} - FCY_t^j$$

where $\sin^j$ and σ_{in} are the steady-state share of intermediates in output and the elasticity of substitution between intermediates and value-added. The variables A_t^j, $ucap_t^j$, LO_t^j and FCY_t^j are total factor productivity (TFP), capacity utilisation, overhead labour and fixed costs of producing.[1] Firm-level employment L_t^j is a CES aggregate of the labour services supplied by individual households *i*:

$$(5) \qquad L_t^j \equiv \left[\int_0^1 L_t^{i,j\,(\theta-1)/\theta} di\right]^{\theta/(\theta-1)}$$

where θ indicates the degree of substitutability between the different types of labour *i*.

The objective of the firm is to maximise real profits (Pr_t^j):

$$(6) \qquad \mathrm{Pr}_t^j = p_t^j O_t^j - p_t^{INT,j} INT_t^j - (1+ssc_t^J) w_t L_t^j - p_t^I I_t^j - (adj_t^{P,j} + adj_t^{L,j} + adj_t^{ucap,j})$$

where ssc_t^J, w_t, i_t^J and p_t^I are the employer social security contributions, the real wage, the rental rate of capital and the price of capital.

The firms face technology and regulatory constraints that restrict their capacity to adjust, which are modelled as adjustment costs with the following convex functional forms:

$$(7a) \qquad adj_t^{L,j} \equiv \gamma_L w_t (\Delta L_t^j)^2 / 2$$

$$(7b) \qquad adj_t^{P,j} \equiv \gamma_P (p_t^j)^2 Y_t^j / 2 \qquad \text{with } p_t^j \equiv P_t^j / P_{t-1}^j - 1$$

$$(7c) \qquad adj_t^{ucap,j} \equiv p_t^I K_t^j [\gamma_{ucap,1} (ucap_t^j - 1) + \gamma_{ucap,2} (ucap_t^j - 1)^2] / 2$$

[1] Lower case letters denote ratios and rates. In particular, $p_t^j \equiv P_t^j / P_t$ is the price of good *j* relative to the GDP deflator, $w_t \equiv W_t / P_t$ is the real wage, $ucap_t^j$ is actual relative to steady-state (full) capital utilisation, and e_t is the nominal exchange rate defined as the price of foreign in domestic currency.

The firms choose labour input, capital services, capacity utilisation, the price and the level of output *j* given the demand function (2), the production technology (3) and (4) and the adjustment costs. The first-order conditions (FOC) are:

(8a) $$\frac{\partial \mathrm{Pr}_t^j}{\partial L_t^j} = 0 \Rightarrow \frac{\partial O_t^j}{\partial L_t^j} h_t^j - \gamma_L w_t \Delta L_t^j + \gamma_L \beta (1-\rho) E_t(\lambda_{t+1} / \lambda_t w_{t+1} \Delta L_{t+1}^j) = (1+ssc_t^J) w_t$$

(8b) $$\frac{\partial \mathrm{Pr}_t^j}{\partial K_t^j} = 0 \Rightarrow \frac{\partial O_t^j}{\partial K_t^j} h_t^j = i_t^J p_t^I$$

(8c) $$\frac{\partial \mathrm{Pr}_t^j}{\partial ucap_t^j} = 0 \Rightarrow \frac{\partial O_t^j}{\partial ucap_t^j} h_t^j = p_t^I K_t^j [\gamma_{ucap,1} + \gamma_{ucap,2}(ucap_t^j - 1)]$$

(8d) $$\frac{\partial \mathrm{Pr}_t^j}{\partial O_t^j} = 0 \Rightarrow h_t^j = 1 - 1/\sigma^j - \varepsilon_t^J - \gamma_P [\beta (1-\rho) E_t(\lambda_{t+1} / \lambda_t p_{t+1}^j) - p_t^j]$$

where h_t^j is the Lagrange multiplier associated with the production technology, $1-\rho$ is the probability of survival, λ_t the marginal value of wealth in consumption terms as defined in equation (17), and ε_t^J is a sector-specific shock to the price mark-up.

Equation (8a) implies that optimising firms equate the marginal product of labour net of adjustment costs to wage costs. Equations (8b-c) jointly determine the optimal capital stock and capacity utilisation by equating the marginal value product of capital to the rental price and the marginal product of capital services to the marginal cost of increasing capacity. Equation (8d) defines the price mark-up factor as function of the elasticity of substitution and price adjustment costs. QUEST follows the empirical literature and allows for additional backward-looking elements in price setting by assuming that the fraction *1-sfp* of firms indexes prices to past inflation, which leads to the specification:

(8d') $$h_t^j = 1 - 1/\sigma^j - \varepsilon_t^J - \gamma_P E_t(\beta[1-\rho] E_t[\lambda_{t+1} / \lambda_t][sfp\, p_{t+1}^j + (1-sfp) p_{t-1}^j] - p_t^j) \quad 0 \le sfp \le 1$$

for the inverse of the price mark-up in the T and NT sectors.

The value of the firm *j* in real terms (v_t^j) is the discounted sum of future after-tax profits:

(9) $$v_t^j = (1-\tau_t^k)[p_t^j O_t^j - p_t^{INT,J} INT_t^j - (1+ssc_t) w_t L_t^j] + \tau_t^k \delta^J p_t^I K_t^j - p_t^I I_t^j + E_t\left(\frac{P_{t+1}}{P_t} \frac{v_{t+1}^j}{1+i_t^J}\right)$$

where τ_t^k and δ^J are the corporate income tax and the rate of capital depreciation. Given the symmetry of objectives and constraints across firms *j* in sector *J*, the superscript *j* can be dropped to obtain aggregate sectoral equations for T and NT.

2.2 Households

The household sector consists of households *i* making optimal intertemporal choices. The comparison in this paper models households along the overlapping generations (OLG) framework with perpetual youth (Blanchard, 1985). This approach has been integrated into New Keynesian DSGE models previously by, e.g., Annicchiarico et al. (2012) and Kumhof et al. (2010). The otherwise standard setting of infinitely-lived (INF) households in DSGE models corresponds to the OLG model with zero probability of death.

The households supply differentiated labour services to unions that maximise utility for each type of labour *i*. It is assumed that types of labour are distributed equally between age cohorts. Nominal wage rigidity is introduced in the form of wage adjustment costs borne by the households.

The households are forward-looking and face a constant probability of death $0 \leq \gamma \leq 1$ in each period of time, which is assumed to be independent of the age of the household in a given period. The expected life time is 1/ρ. A new cohort of size ρ of households is born and a fraction of equal size dies in each period. At time *t*, the age cohort born at time $a \leq t$ has the size $\gamma(1-\gamma)^{t-a}$ in the population.

The period utility of the representative household of cohort *a* is additive in consumption ($C_{a,t}$) and leisure ($1-L_{a,t}$) utility. The representative household born at $a \leq 0$ maximises the expected lifetime utility:

$$(10) \qquad E_0 \sum_{t=0}^{\infty} \beta^t (1-\gamma)^t [\ln C_{a,t} + (1+\varepsilon_t^l) w / (1-\kappa)(1-L_{a,t}^i)^{1-\kappa}]$$

where β is the subjective discount factor, ω is the weight of leisure in total utility, ε_t^l is a shock to labour supply, and κ is the inverse of the elasticity of labour supply.

Households invest in domestic government bonds ($B_{a,t}$), foreign assets ($B_{a,t}^*$) in zero net supply and physical capital ($I_{a,t}^J$). The different types of assets are subject to specific risks. Domestic government bonds yield the nominal return i_t, foreign bonds yield $i_t^* + \chi_t^*$ including a state-dependent country risk premium χ_t^*, and the rental rate of capital $i_t^J = i_t + \chi^J$ includes the risk premium χ^J.

Households receive wage ($W_t L_{a,t}^i$) and profit income ($\mathrm{Pr}_{a,t}^J$) besides the return to financial investment. The wage income, the corporate income (net of depreciation allowances) and consumption are taxed, respectively, at the rates t_t^w, t_t^k and t_t^c. In addition, the government levies lump-sum taxes (T_t^{ls}) and pays benefits BEN_t to the non-employed part of the labour force ($1-NPART_t-L_t$) and lump-sum transfers TR_t.

A perfect insurance market inherits the financial wealth of households of cohort *a* dying in a given period and redistributes it as insurance premia to the surviving households of cohort *a*. The flow budget constraint of the representative household born at time *a* expressed in real terms reads:

$$\frac{1}{1-r}\left[(1+i_{t-1})\frac{B_{a,t-1}}{P_t}+(1+i^*_{t-1}+x^*_{t-1})e_t\frac{B^*_{a,t-1}}{P_t}+\sum_J\left[(1-t^k_t)i^J_{t-1}+t^k_t\delta^J\right]p^I_{t-1}K^J_{a,t-1}\right]$$

$$+(1-t^w_t)w_tL^i_{a,t}+BEN_t(1-NPART_t-L^i_{a,t})+\sum_J \Pr^J_{a,t}+\frac{TR_t}{P_t}=(1+t^c_t)p^C_tC_{a,t} \tag{11}$$

$$+\sum_J p^I_tI^J_{a,t}+\frac{B_{a,t}}{P_t}+e_t\frac{B^*_{a,t}}{P_t}+\frac{T^{LS}_t}{P_t}+\sum_J adj^{K,J}_t+\sum_J adj^{I,J}_t+adj^W_t$$

where the adjustment costs have the functional forms:

$$adj^{K,J}_t=\gamma_{K,J}(I^J_t/K^J_{t-1}-\delta^J)^2K^J_{t-1}/2 \tag{12a}$$

$$adj^{I,J}_t=\gamma_{I,J}(\Delta I^J_t)^2/2 \tag{12b}$$

$$adj^W_t=\gamma_W(p^W_t)^2L_t/2 \tag{12c}$$

The law of motion for the amount of physical capital owned by cohort *a* is:

$$K^J_{a,t}=I^J_{a,t}+(1-\delta^J)K^J_{a,t-1} \tag{13}$$

Taking the FOCs for consumption and investment and aggregating the cohort-specific variables into aggregate variables by $N_t=\sum_{a=-\infty}^{t} r(1-r)^{t-a}N_{a,t}$, where $r(1-r)^{t-a}$ corresponds to the average size of cohort *a* at time *t*, provides the equations for consumption, investment in physical capital and investment in foreign bonds:[2]

$$C_t=\frac{1}{\beta}\frac{1}{1+i_t}\left[E_t\left(\frac{1+t^c_{t+1}}{1+t^c_t}\frac{P^C_{t+1}}{P^C_t}C_{t+1}\right)+\frac{r[1-\beta(1-r)]}{1-r}\frac{P_t}{(1+t^c_t)P^C_t}f_t\right] \tag{14}$$

where real financial wealth f_t of the households is:

$$f_t=B_t/P_t+e_tB^*_t/P_t+\sum_J v^J_t \tag{15}$$

[2] Detailed derivations of the OLG model and the aggregate consumption equation with finite lifetime can be found in, e.g. Annicchiarico et al. (2012), Ernst and Charpe (2009), Nistico (2012), Piergallini (2006), and Smets and Wouters (2002). Fagan and Gaspar (2007) and Velculescu (2011) present extensions of the model to include (different forms of) habit formation in consumption.

(16) $$\gamma_{K,J}\left(\frac{I_t^J}{K_{t-1}^J}-\delta^J\right)+\gamma_{I,J}\Delta I_t^J-\gamma_{I,J}\beta(1-\rho)E_t\left(\frac{\lambda_{t+1}}{\lambda_t}\frac{P_{t+1}^I}{P_t^I}\frac{P_t^J}{P_{t+1}^J}\Delta I_{t+1}^J\right)=q_t^J-1$$

where λ_t is the marginal utility of income in consumption terms:

(17) $$\lambda_t=1/[(1+t_t^c)p_t^C C_t]$$

and q_t^J corresponds to the present discounted value of the rental income from physical capital:

(18) $$\begin{aligned}q_t^J &= (1-\sin)(O_t^J/Y_t^J)^{1/\sigma_{in}}h_t^J P_t^J/P_t^I(1-t_t^K)(1-\alpha)(Y_t^J-A_t^J FCY_t^J)/K_t^J\\ &+t_t^k\delta^J-\gamma_{ucap1,J}(ucap_t-1)-\gamma_{ucap2,J}(ucap_t-1)^2/2+(1-i_t^J-\delta^J)E_t q_{t+1}^J\end{aligned}$$

(19) $$1+i_t=(1+i_t^*+x_t^*)E_t(e_{t+1}/e_t)$$

The law of motion for the aggregate capital stock in each sector is given by aggregating (13) across cohorts:

(20) $$K_t^J=I_t^J+(1-\delta^J)K_{t-1}^J$$

If $\rho=0$, equation (14) reduces to the standard Euler equation of infinitely-lived consumers, where the ratio of the marginal utility of consumption between periods *t* and *t+1* is equated to the real interest rate adjusted for the rate of time preference. As the paper focuses on a small economy with fixed nominal exchange rate, $E_t(e_{t+1}/e_t)=1$ and $i_t^*=\overline{i^*}$.

A trade union maximises utility for each type of labour *i*. The wage rule follows from equating the marginal utility of leisure to the marginal utility of consumption times the real consumption wage corrected for benefits as the reservation wage and adjusted for the wage mark-up ($1/\eta_t^W$):

(21) $$\frac{U_{1-L,t}}{U_{c,t}}=\frac{(1-t_t^w)W_t-BEN_t}{(1+t_t^c)P_t^C}\eta_t^W$$

Fluctuations in the wage mark-up can arise from a shock to the wage mark-up (ε_t^w), wage adjustment costs and the fact that a fraction *1-sfw* of workers ($0\le sfw\le 1$) indexes wage growth ρ_t^W to wage inflation in the previous period:

(22) $$\eta_t^W=1-1/\theta-\varepsilon_t^w-\gamma_W/\theta[\beta(1-\rho)E_t(\lambda_{t+1}/\lambda_t)sfw\rho_{t+1}^W+(1-sfw)\rho_{t-1}^W]$$

The (semi-)elasticity of wage inflation with respect to employment is given by k / g_W, i.e. it is positively related to the inverse of the elasticity of labour supply and inversely related to wage adjustment costs.

2.3 Fiscal policy

In the scenarios in this paper, real government purchases (G_t) and investment (IG_t) are kept constant in real terms at their baseline values. The stock of public infrastructure that enters the production function (4) develops according to:

$$KG_t = IG_t + (1 - \delta^g) KG_{t-1} \tag{23}$$

Nominal transfers (TR_t) are indexed to consumer prices:

$$TR_t = \overline{tr} P_t^C \tag{24}$$

The nominal benefits paid to the non-employed part of the labour force correspond to the exogenous replacement rate (*benr*) times the nominal wage:

$$BEN_t = \overline{benr} W_t \tag{25}$$

The government receives consumption, wage, corporate and lump-sum tax revenue and the social security contributions.

Nominal government debt (B_t) evolves according to:

$$\begin{aligned} B_t = {} & (1 + i_{t-1}) B_{t-1} + P_t^C (G_t + IG_t) + TR_t + BEN_t (1 - NPART_t - L_t) - T_t^{LS} - t_t^c P_t^C C_t \\ & - \sum_J (t_t^w + ssc_t^J) W_t L_t^J - \sum_J t_t^k [P_t^J O_t^J - P_t^{INT,J} INT_t^J - (1 + ssc_t^J) W_t L_t^J - \delta^J P_t^I K_{t-1}^J] \end{aligned} \tag{26}$$

The labour tax is used to stabilise the debt-to-GDP ratio:

$$\Delta t_t^w = t^b (B_t / (4 P_t Y_t) - \overline{btar}) + t^{def} \Delta (B_t / P_t) \tag{27}$$

with *btar* being the target level of government debt. The consumption and corporate income tax rates, the rate of social security contributions and the amount of lump-sum taxes are exogenous.

2.4 Trade and the current account

So far, aggregate domestic consumption, investment and government expenditure have been determined, but not the allocation of demand between T versus NT goods and domestically produced versus imported T goods. In order to facilitate aggregation, private households and the government are assumed to have identical preferences across goods used for private and government consumption and public investment.

Let $Z \in (C, G, IG)$ be the demand of private households and the government and their preferences for T and NT goods given by the CES functions:

$$(28) \qquad Z_t = \left[(1 - s_{tnt})^{\frac{1}{s_{tnt}}} Z_t^{NT \frac{s_{tnt}-1}{s_{tnt}}} + s_{tnt}^{\frac{1}{s_{tnt}}} Z_t^{TT \frac{s_{tnt}-1}{s_{tnt}}} \right]^{\frac{s_{tnt}}{s_{tnt}-1}}$$

with Z^{NT} as an index of demand across the continuum of NT output as defined in (1) and Z^{TT} as bundle of domestically produced (Z^T) and imported (Z^M) T goods:

$$(29) \qquad Z_t^{TT} = \left[(1 - s_m)^{\frac{1}{s_x}} Z_t^{T \frac{s_x-1}{s_x}} + s_m^{\frac{1}{s_x}} Z_t^{M \frac{s_x-1}{s_x}} \right]^{\frac{s_x}{s_x-1}}$$

which are analogously defined by the sectoral output aggregator (1). The elasticity of substitution between bundles of NT and T goods is s_{tnt}; the elasticity of substitution between bundles of domestically produced versus imported T goods is s_x; the steady-state shares of T goods and imports are s_{tnt} and s_m respectively.

The CES aggregate for T and NT goods (28) gives the following demand functions:

$$(30a) \qquad Z_t^T = s_{tnt} (P_t^T / P_t^C)^{-s_{tnt}} (C_t + G_t + IG_t)$$

$$(30b) \qquad Z_t^{NT} = (1 - s_{tnt}) (P_t^{NT} / P_t^C)^{-s_{tnt}} (C_t + G_t + IG_t)$$

Intermediate inputs are also aggregates of T and NT goods with T goods either domestically produced or imported analogously to equations (28) and (29):

$$(31) \qquad INT_t^J = \left[(1 - \sin_{tnt}^J)^{\frac{1}{s_{tnt}}} (INT_t^{NT,J})^{\frac{s_{tnt}-1}{s_{tnt}}} + (\sin_{tnt}^J)^{\frac{1}{s_{tnt}}} (INT_t^{T,J})^{\frac{s_{tnt}-1}{s_{tnt}}} \right]^{\frac{s_{tnt}}{s_{tnt}-1}}$$

$$(32) \qquad INT_t^{TT,J} = \left[(1 - s_m)^{\frac{1}{s_x}} (INT_t^{T,J})^{\frac{s_x-1}{s_x}} + (s_m)^{\frac{1}{s_x}} (INT_t^{M,J})^{\frac{s_x-1}{s_x}} \right]^{\frac{s_x}{s_x-1}}$$

which gives demand functions for T and NT intermediates analogously to (30):

$$(33a) \qquad INT_t^{T,J} = \sin_{tnt}^J (P_t^T / P_t^{INT,J})^{-s_{tnt}} INT_t^J$$

$$(33b) \qquad INT_t^{NT,J} = (1 - \sin_{tnt}^J) (P_t^{NT} / P_t^{INT,J})^{-s_{tnt}} INT_t^J$$

All investment in physical capital in the T and NT sectors consists of T goods.

Combining the demand functions corresponding to (29) and (32) gives import demand:

$$(34) \qquad M_t = s_m \left(\frac{e_t P_t^M}{P_t^T} \right)^{-s_x} (Z_t^T + \sum_J I_t^J + \sum_J INT_t^{T,J})$$

With symmetric foreign demand functions, export demand is given by:

$$(35) \qquad X_t = s_m^F \left(\frac{P_t^T}{e_t P_t^M} \right)^{-s_x} (Z_t^{T*} + \sum_J I_t^{J*} + \sum_J INT_t^{T,J*})$$

The trade balance of the domestic economy is the net trade in value terms:

$$(36) \qquad TB_t \equiv P_t^T X_t - e_t P_t^M M_t$$

Adding interest income on the net foreign asset (NFA) position gives the current account:

$$(37) \qquad CA_t \equiv i_{t-1}^* e_t B_{t-1}^* + P_t^T X_t - e_t P_t^M M_t$$

The law of motion for the NFA position is:

$$(38) \qquad e_t B_t^* = (1 + i_{t-1}^*) e_t B_{t-1}^* + P_t^T X_t - e_t P_t^M M_t$$

The focus on the NFA position abstracts from valuation effects on the gross asset or liability side.

The set-up with infinite planning horizon of the households ($r = 0$) requires an external closure to rule out explosive NFA dynamics. The model uses a closure rule that makes the risk premium in (19) depend on the actual NFA position relative to the baseline (target) position *bwytar* (Schmitt-Grohé and Uribe, 2003):

$$(39) \qquad x_t^* = -risk(B_t^* / (4 P_t Y_t) - \overline{bwytar})$$

The closure (39) is not needed in the model version with finite planning horizons (OLG), where long-term NFA stability is ensured by the feedback from financial wealth to consumption demand. A decline in financial wealth (15) due to rising net external debt lowers consumption demand (14) in the OLG model, which stabilises the NFA position through lower domestic demand and an improvement in the trade balance.

2.5 Parameterisation

The parametrisation of the model is summarised in Table 2.1. The demand and factor shares, sector size (T and NT), fiscal parameters and trade openness of the domestic economy correspond to values for an average euro area (EA) country and are based on data from input-output tables and the AMECO database. The parameter values governing the dynamics of the model in the short and medium term correspond to the estimates by

Ratto et al. (2009), i.e. parameter values from the QUEST model estimated on EA data.

Table 2.1: Model parameters and ratios

Parameters and ratios	Values
Frictions:	
Average price duration (quarters)	4.00
Average wage duration (quarters)	5.00
Labour adjustment cost (γ_L)	25.0
Capital adjustment cost (γ_K)	20.0
Investment adjustment cost (γ_I)	75.0
Linear capacity-utilisation adjustment cost ($\gamma_{ucap,1}$)	0.04
Quadratic capacity-utilisation adjustment cost ($\gamma_{ucap,2}$)	0.05
Preferences:	
Inverse of elasticity of labour supply (κ)	-5.00
Utility weight of leisure (ω)	0.001
Elasticity of substitution T varieties (σ^T)	8.33
Elasticity of substitution NT varieties (σ^{NT})	4.17
Elasticity of substitution T-NT (σ_{tnt})	0.50
Elasticity of substitution in trade (σ_x)	1.10
Steady-state consumption share of T (s_{tnt})	0.31
Steady-state consumption share of imports (s_m)	0.38
Production:	
Cobb-Douglas labour parameter (α)	0.65
Cobb-Douglas public capital stock parameter (α_g)	0.09
Elasticity of substitution between value added and intermediates (σ_{in})	0.50
Steady-state intermediate share T (sin^T)	0.73
Steady-state intermediate share NT (sin^{NT})	0.46
Steady-state T intermediate share in T (sin_{tnt}^T)	0.67
Steady-state T intermediate share in NT (sin_{tnt}^{NT})	0.47
Elasticity of substitution between types of labour (θ)	6.00
Depreciation rate private capital stock (δ)	0.015
Depreciation rate public capital stock (δ^g)	0.013
Fiscal policy:	
Corporate profit tax (t^k)	0.28
Consumption tax (t^c)	0.17
Labour income tax (t^w)	0.30
Social security contributions (ssc)	0.15
Transfer share (try)	0.16
Government debt target (btar)	0.62
Parameter debt (τ^b)	0.01
Parameter deficit (τ^{def})	0.10
Risk premium *(*risk)	0.0025
NFA target (bwytar)	0.00
National accounts (% of GDP):	
Private consumption	67
Investment T	5
Investment NT	6
Government purchases	19
Government investment	4
Imports	41

The expected lifetime of households in the OLG specification of the model is 50 years in the benchmark model to illustrate differences between the INF and OLG versions of the model even at long planning horizons. The differences between INF and OLG versions become more pronounced if the planning horizon of OLG households is reduced to less than 50 years as shown in the robustness checks.

3. Results

This section compares simulation results for product market reform (PMR), labour market reform (LMR) and fiscal devaluation for infinite and finite planning horizons. The scenarios are simple and purely illustrative. PMR is an economy-wide 1 percentage-point reduction in the long-run price mark-up, implemented as permanent shock to ε_t^J in (8d).[3] The stylised LMR is a labour-supply expansion that reduces the equilibrium real wage by 1% within one decade, implemented as permanent shock to ε_t^l in (10).[4] The fiscal devaluation scenario is a permanent shift in government revenue from employer social security contributions to consumption taxes of ex-ante 1% of GDP. Assumingly, the reforms are fully credible. Private sector expectations adjust to the new environment and anticipate the reforms' impact on output, income, factor costs and profits over the planning horizon.

As positive output and employment effects of PMR, LMR and fiscal devaluation generate higher government revenue at given tax rates, the impact on economy-wide savings and external positions also depends on the use of such additional tax revenue, i.e. whether additional tax revenue is saved for debt reduction or used to increase expenditure/cut taxes. The section illustrates the difference between scenarios in which the labour tax rate is reduced in response to higher tax revenue (no consolidation) and scenarios in which additional tax revenue is dedicated to government debt reduction (consolidation).

3.1 Product market reform

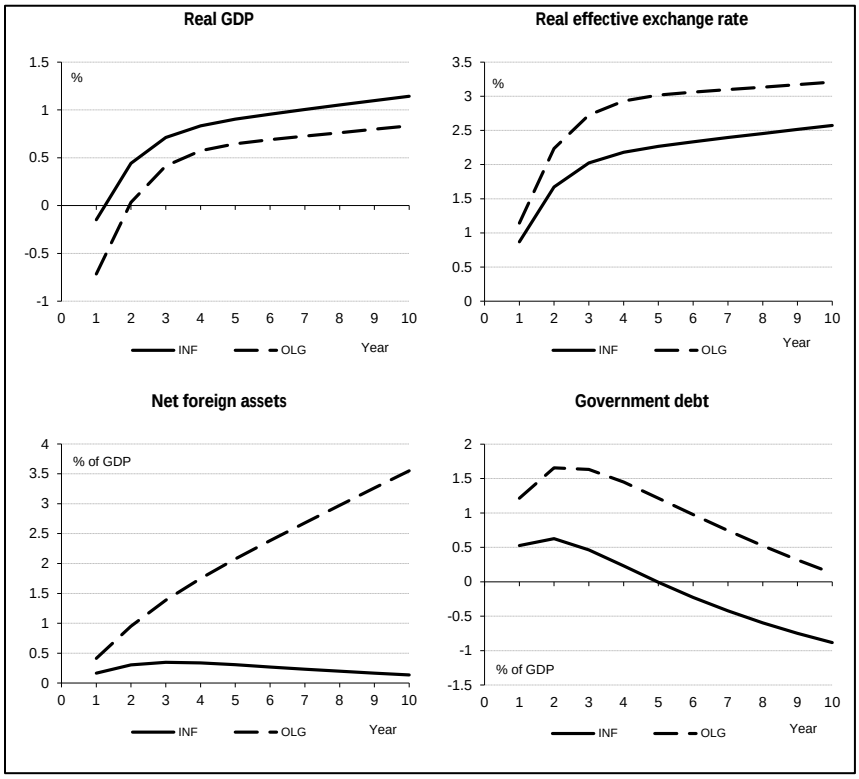
Figure 3.1 and Table 3.1 illustrates the impact of a product market reform that reduces the long-run price mark-up of domestic T and NT firms by 1 percentage point. Given the nominal and real frictions in the model, the new equilibrium mark-up value is reached after 5 years.

The mark-up reduction lowers the price of domestic goods and increases output and employment levels in the medium term. The price competitiveness of domestic goods in domestic and foreign markets improves as illustrated by the real effective exchange rate (REER) depreciation.

[3] The 1 percentage-point mark-up reduction seems to reflect rather modest reforms. Estimates by Badinger (2007) suggest that manufacturing price mark-ups in EU member states have fallen by around 10 percentage points on average in the context of the internal market program, while actual mark-up sizes are still around 20%.

[4] This approach of using the shocks to proxy for certain events or missing channels in the model is similar to the "wedges" approach in Chari et al. (2007). The price mark-up, e.g., is a decreasing function of the number of firms in an industry which in turn is a proxy for the degree of competition as illustrated by Jaimovich and Floetotto (2008). Chari et al. (2009) show that the labour supply shock ε_t^l as source of wage moderation in the simulations is equivalent to an appropriately scaled wage mark-up shock ε_t^w with respect to the model dynamics as would be a shock to the exogenous benefit replacement rate that enters wage setting (21) as reservation wage.

Figure 3.1: Price mark-up reduction without fiscal consolidation



Note: An increase in the REER corresponds to REER depreciation.

The macroeconomic response in the INF model is standard, i.e. the rise in long-term economic activity and employment stimulates domestic consumption and investment which is initially muted by the temporary increase in real interest rates associated with falling domestic price levels and exogenous nominal interest rates. In the OLG model, domestic demand and real GDP decline initially because of the real interest rate effect and the response of consumption to falling financial wealth (2). Government debt to GDP rises above its baseline value in the OLG model during the first year in reaction to lower tax revenues and the denominator effect from lower GDP.

The reform-related dampening of domestic demand leads to long-lasting and significant CA and NFA improvement in the OLG model. REER depreciation is stronger in the OLG compared to the INF version, allowing for stronger net export growth to fill the gap between domestic output and domestic demand. The significant and persistent NFA improvement in the OLG version contrasts the INF version where NFA positions increase only slightly and temporarily in the context of growing domestic demand. As the positive impact of PMR on external accounts in the OLG model depends on its negative impact on corporate profits and financial wealth, it is conditional on domestic firms being owned by domestic households. Domestic firms being in foreign ownership would reverse the CA and NFA effects.

Table 3.1: Price mark-up reduction

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.15	0.44	0.71	0.83	0.90	1.14	1.57
EMPLOYMENT_PCER	-0.15	0.11	0.22	0.23	0.24	0.30	0.44
FINAL.DOMESTIC. DEMAND_PCER	-0.39	0.35	0.69	0.85	0.94	1.17	1.58
CONSUMPTION_PCER	-1.14	-0.63	-0.41	-0.32	-0.27	-0.07	0.31
INVESTMENT_PCER	0.62	1.68	2.42	2.81	2.98	3.03	2.94
EXPORTS_PCER	0.71	1.50	1.86	2.03	2.12	2.37	2.80
IMPORTS_PCER	-0.57	-0.13	0.10	0.22	0.26	0.27	0.26
WAGE.COSTS.REAL_PCER	0.84	2.06	2.88	3.30	3.48	3.62	3.78
CONSUMPTION.WAGE.REAL_PCER	0.32	0.98	1.63	2.06	2.30	2.87	3.78
FIRM.VALUE.REAL_PCER	-5.77	-5.12	-4.80	-4.64	-4.55	-4.20	-3.58
FINANCIAL.WEALTH.REAL_PCER	-5.03	-4.34	-4.05	-3.94	-3.90	-3.75	-3.21
REER_PCER	0.87	1.67	2.02	2.18	2.27	2.57	3.12
INTEREST.RATE.REAL_ER	1.05	0.46	0.20	0.10	0.07	0.05	0.02
PRICE.MARKUP.AVERAGE_ER	-0.15	-0.66	-0.88	-0.99	-1.03	-1.04	-1.04
LABOUR.TAX_ER	0.18	0.39	0.41	0.36	0.29	-0.10	-0.76
GOVERNMENT.DEBT.GDP_ER	0.53	0.63	0.46	0.23	-0.01	-0.88	-1.02
TRADE.BALANCE.GDP_ER	0.24	0.10	0.02	-0.02	-0.03	-0.03	-0.01
CURRENT.ACCOUNT.GDP_ER	0.24	0.10	0.02	-0.01	-0.03	-0.02	-0.01
NFA.GDP_ER	0.17	0.30	0.35	0.34	0.31	0.14	-0.06

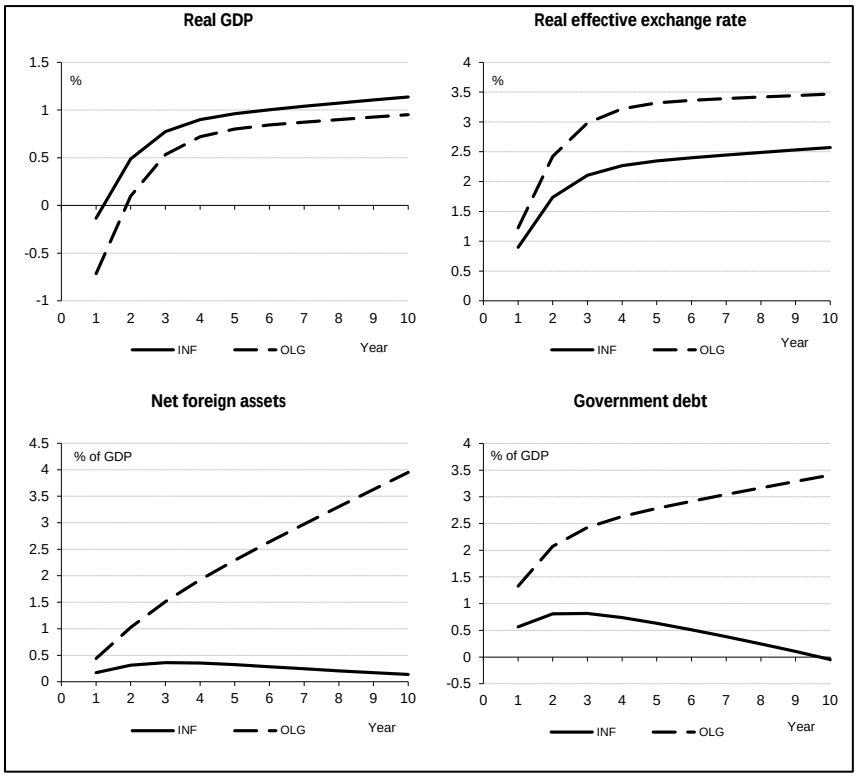
B. Model version finite planning horizon (OLG)

YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.71	0.03	0.41	0.57	0.65	0.83	1.25
EMPLOYMENT_PCER	-0.47	-0.08	0.12	0.16	0.15	0.18	0.34
FINAL.DOMESTIC. DEMAND_PCER	-1.35	-0.47	0.00	0.21	0.31	0.52	0.95
CONSUMPTION_PCER	-2.62	-1.90	-1.58	-1.44	-1.38	-1.19	-0.75
INVESTMENT_PCER	-0.06	0.67	1.44	1.93	2.18	2.36	2.43
EXPORTS_PCER	0.87	1.87	2.36	2.57	2.66	2.84	3.18
IMPORTS_PCER	-1.51	-1.07	-0.79	-0.63	-0.55	-0.48	-0.40
WAGE.COSTS.REAL_PCER	0.40	1.42	2.40	2.99	3.27	3.48	3.59
CONSUMPTION.WAGE.REAL_PCER	-0.35	-0.24	0.36	0.82	1.09	1.57	2.61
FIRM.VALUE.REAL_PCER	-6.35	-5.46	-5.02	-4.82	-4.73	-4.46	-3.91
FINANCIAL.WEALTH.REAL_PCER	-5.44	-4.40	-3.88	-3.66	-3.55	-3.22	-2.18
REER_PCER	1.14	2.23	2.73	2.93	3.02	3.21	3.61
INTEREST.RATE.REAL_ER	1.40	0.64	0.27	0.11	0.05	0.04	0.01
PRICE.MARKUP.AVERAGE_ER	0.10	-0.54	-0.81	-0.96	-1.03	-1.06	-1.06
LABOUR.TAX_ER	0.32	0.74	0.89	0.92	0.90	0.64	-0.12
GOVERNMENT.DEBT.GDP_ER	1.21	1.66	1.63	1.45	1.22	0.13	-1.00
TRADE.BALANCE.GDP_ER	0.64	0.50	0.41	0.36	0.33	0.31	0.29
CURRENT.ACCOUNT.GDP_ER	0.64	0.51	0.43	0.38	0.35	0.35	0.36
NFA.GDP_ER	0.41	0.95	1.38	1.75	2.08	3.55	7.46

Note: An increase in the REER corresponds to REER depreciation.

The impact of the price mark-up reduction on external accounts is very similar to the impact of fiscal consolidation in the OLG model. Lower mark-ups reduce the profits and the value of firms, which lowers financial wealth and consumption. Similarly, fiscal consolidation lowers the volume of outstanding government debt, which also reduces financial wealth and private consumption in the OLG framework. Hence, given the qualitatively similar impact of PMR and fiscal consolidation on financial wealth and external positions in the OLG setting, joint implementation would strengthen the positive CA and NFA response. The PMR in Figure 3.1 does not create itself space for fiscal consolidation in the short term in the OLG version, however. In Figure 3.1, the government adjusts the labour tax rate in response to the budgetary position. The government debt-to-GDP increases due to lower corporate and consumption tax revenue and the inverse denominator effect of falling GDP in the OLG setting, which implies a labour tax increase. Hence, keeping tax rates constant in the first 25 years after the reform in the scenario in Figure 3.2 and Table 3.2, so that the labour tax does not respond to the budgetary situation, increases government debt to GDP further in the OLG setting. In Figure 3.2 and Table 3.2 there is no additional government sector saving to strengthen the CA and NFA improvement in response to the PMR during the first decade, but rather a deterioration of the government balance and issuance of new government debt.

Figure 3.2: Price mark-up reduction with unchanged tax rates



Note: An increase in the REER corresponds to REER depreciation.

Table 3.2: Price mark-up reduction with fiscal consolidation

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.13	0.49	0.77	0.90	0.96	1.14	1.43
EMPLOYMENT_PCER	-0.12	0.18	0.30	0.32	0.30	0.28	0.24
FINAL.DOMESTIC. DEMAND_PCER	-0.38	0.38	0.75	0.92	1.00	1.17	1.44
CONSUMPTION_PCER	-1.14	-0.60	-0.38	-0.28	-0.24	-0.09	0.15
INVESTMENT_PCER	0.63	1.72	2.50	2.92	3.11	3.15	3.20
EXPORTS_PCER	0.72	1.54	1.92	2.09	2.17	2.37	2.65
IMPORTS_PCER	-0.58	-0.14	0.10	0.22	0.27	0.28	0.28
WAGE.COSTS.REAL_PCER	0.79	1.95	2.78	3.22	3.43	3.64	3.83
CONSUMPTION.WAGE.REAL_PCER	0.50	1.38	2.07	2.45	2.62	2.76	2.85
FIRM.VALUE.REAL_PCER	-5.81	-5.14	-4.80	-4.65	-4.56	-4.30	-3.84
FINANCIAL.WEALTH.REAL_PCER	-5.05	-4.32	-3.98	-3.84	-3.79	-3.68	-3.86
REER_PCER	0.90	1.74	2.10	2.27	2.35	2.57	2.92
INTEREST.RATE.REAL_ER	1.09	0.48	0.20	0.09	0.05	0.04	-0.02
PRICE.MARKUP.AVERAGE_ER	-0.14	-0.65	-0.87	-0.98	-1.02	-1.04	-1.03
LABOUR.TAX_ER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOVERNMENT.DEBT.GDP_ER	0.57	0.81	0.82	0.74	0.63	-0.05	-3.19
TRADE.BALANCE.GDP_ER	0.25	0.10	0.02	-0.02	-0.03	-0.03	-0.02
CURRENT.ACCOUNT.GDP_ER	0.25	0.11	0.03	-0.01	-0.03	-0.03	-0.02
NFA.GDP_ER	0.17	0.31	0.36	0.35	0.32	0.14	-0.18

B. Model version finite planning horizon (OLG)

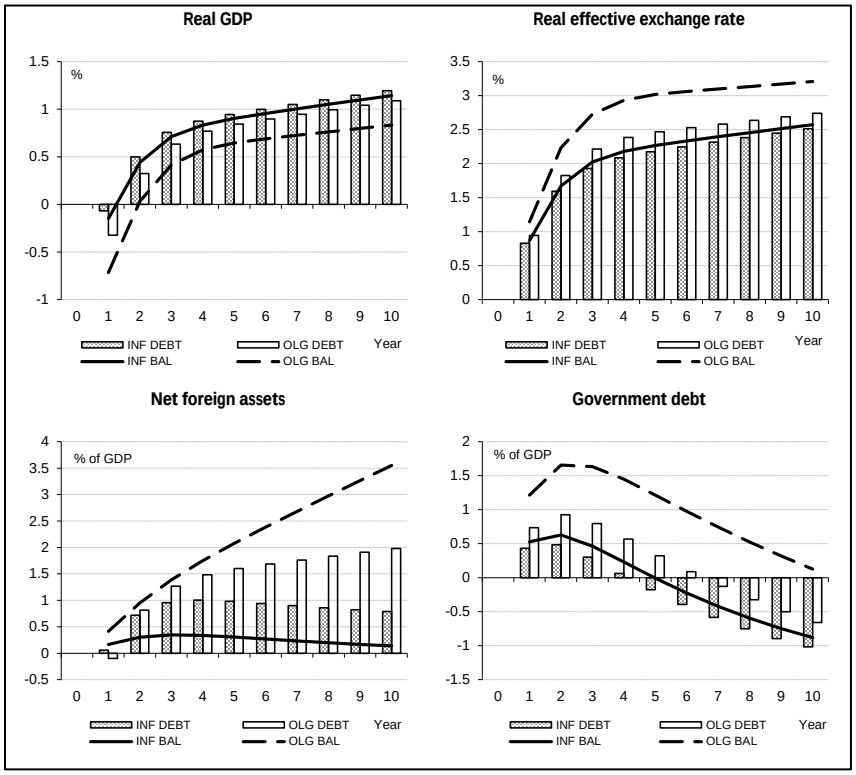
YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.72	0.10	0.53	0.72	0.80	0.95	1.20
EMPLOYMENT_PCER	-0.43	0.05	0.31	0.37	0.37	0.34	0.30
FINAL.DOMESTIC. DEMAND_PCER	-1.39	-0.46	0.06	0.31	0.42	0.60	0.87
CONSUMPTION_PCER	-2.73	-1.93	-1.56	-1.40	-1.33	-1.19	-0.93
INVESTMENT_PCER	-0.20	0.48	1.30	1.85	2.15	2.39	2.60
EXPORTS_PCER	0.92	2.01	2.55	2.79	2.89	3.04	3.24
IMPORTS_PCER	-1.61	-1.19	-0.90	-0.72	-0.63	-0.55	-0.49
WAGE.COSTS.REAL_PCER	0.28	1.18	2.15	2.78	3.10	3.38	3.54
CONSUMPTION.WAGE.REAL_PCER	-0.06	0.46	1.24	1.78	2.06	2.28	2.37
FIRM.VALUE.REAL_PCER	-6.38	-5.41	-4.91	-4.70	-4.60	-4.40	-4.06
FINANCIAL.WEALTH.REAL_PCER	-5.45	-4.26	-3.61	-3.29	-3.10	-2.50	-1.13
REER_PCER	1.22	2.42	2.98	3.22	3.32	3.47	3.69
INTEREST.RATE.REAL_ER	1.51	0.72	0.31	0.13	0.05	0.02	-0.02
PRICE.MARKUP.AVERAGE_ER	0.13	-0.50	-0.79	-0.94	-1.02	-1.06	-1.05
LABOUR.TAX_ER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOVERNMENT.DEBT.GDP_ER	1.33	2.07	2.43	2.63	2.79	3.41	4.76
TRADE.BALANCE.GDP_ER	0.68	0.56	0.47	0.41	0.37	0.35	0.33
CURRENT.ACCOUNT.GDP_ER	0.68	0.57	0.48	0.42	0.40	0.39	0.41
NFA.GDP_ER	0.44	1.03	1.51	1.92	2.29	3.95	8.37

Note: An increase in the REER corresponds to REER depreciation.

An important consideration is that the need for external rebalancing is typically strongest

in countries that have already accumulated high levels of net foreign debt. Figure 3.3 and Table 3.3 illustrate this situation by showing the impact of PMR in an economy with a pre-reform net foreign debt level of 100% of GDP (DEBT), i.e. the order of magnitude of net foreign debt in several countries in the euro area periphery, and by comparing the results to the same reform under a pre-reform balanced NFA position (BAL), which corresponds to Figure 3.1.

Figure 3.3: Price mark-up reduction with alternative initial NFA positions



Note: An increase in the REER corresponds to REER depreciation.

Reducing price mark-ups lowers the price of domestic goods and the GDP deflator. Starting from net foreign indebtedness, it implies a revaluation of the external debt in real terms. It also implies a revaluation of domestic government debt. However, the output expansion associated with PMR outweighs the price level effect already in the second year in the underlying model version with rather fast adjustment to structural changes (no liquidity constraints, no habit persistence), so that foreign debt and domestic government debt decline in terms of GDP due to the denominator effect. Compared to the BAL scenario, the PMR improves the NFA-to-GDP position in the INF setting more markedly if the economy starts with pre-reform foreign indebtedness (DEBT).

Table 3.3: Price mark-up reduction with initial net foreign debt

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.07	0.50	0.76	0.88	0.94	1.19	1.62
EMPLOYMENT_PCER	-0.10	0.14	0.23	0.24	0.25	0.31	0.45
FINAL.DOMESTIC. DEMAND_PCER	-0.25	0.47	0.80	0.95	1.03	1.27	1.66
CONSUMPTION_PCER	-0.93	-0.45	-0.25	-0.16	-0.11	0.08	0.41
INVESTMENT_PCER	0.75	1.90	2.64	3.02	3.19	3.20	3.04
EXPORTS_PCER	0.68	1.45	1.80	1.96	2.05	2.33	2.81
IMPORTS_PCER	-0.44	0.00	0.22	0.33	0.37	0.36	0.30
WAGE.COSTS.REAL_PCER	0.90	2.14	2.95	3.35	3.51	3.65	3.81
CONSUMPTION.WAGE.REAL_PCER	0.42	1.15	1.81	2.23	2.47	3.05	3.89
FIRM.VALUE.REAL_PCER	-5.66	-5.04	-4.73	-4.58	-4.49	-4.12	-3.50
FINANCIAL.WEALTH.REAL_PCER	-6.05	-5.27	-4.95	-4.84	-4.80	-4.65	-4.09
REER_PCER	0.83	1.59	1.93	2.08	2.18	2.51	3.11
INTEREST.RATE.REAL_ER	1.00	0.43	0.18	0.09	0.06	0.05	0.02
PRICE.MARKUP.AVERAGE_ER	-0.18	-0.68	-0.89	-0.99	-1.03	-1.04	-1.04
LABOUR.TAX_ER	0.16	0.34	0.35	0.29	0.21	-0.20	-0.82
GOVERNMENT.DEBT.GDP_ER	0.43	0.49	0.30	0.06	-0.18	-1.02	-0.99
TRADE.BALANCE.GDP_ER	0.18	0.03	-0.04	-0.08	-0.09	-0.07	-0.03
CURRENT.ACCOUNT.GDP_ER	0.18	0.04	-0.03	-0.07	-0.08	-0.07	-0.03
NFA.GDP_ER	0.06	0.72	0.96	1.00	0.98	0.79	0.42

B. Model version finite planning horizon (OLG)

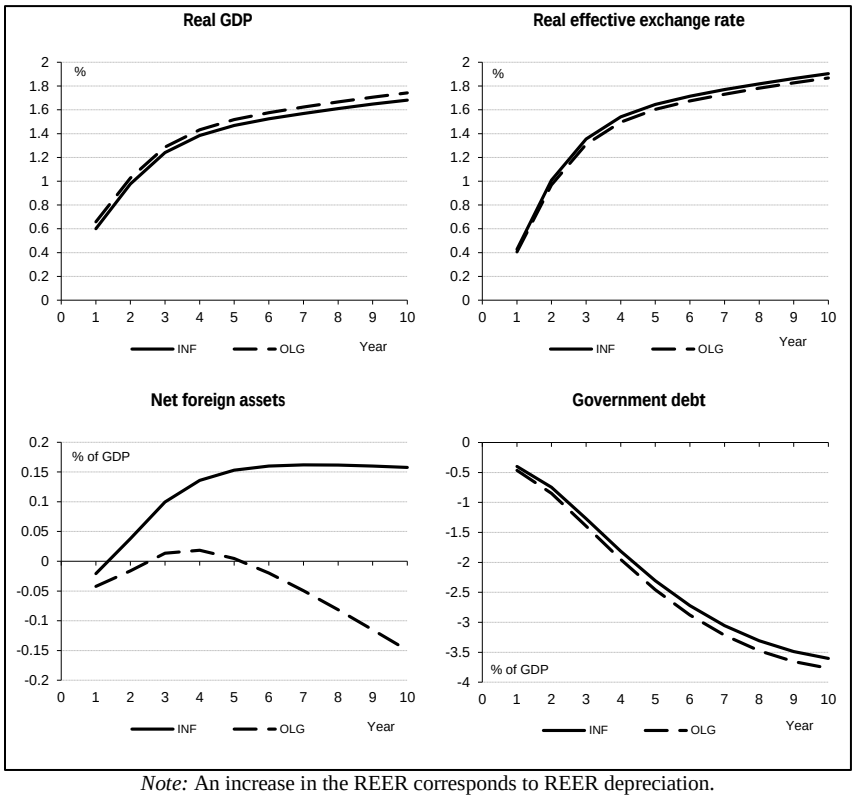
YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.32	0.32	0.63	0.77	0.84	1.09	1.56
EMPLOYMENT_PCER	-0.25	0.06	0.19	0.21	0.21	0.27	0.43
FINAL.DOMESTIC. DEMAND_PCER	-0.67	0.12	0.52	0.70	0.80	1.05	1.53
CONSUMPTION_PCER	-1.56	-0.98	-0.73	-0.61	-0.55	-0.32	0.15
INVESTMENT_PCER	0.48	1.51	2.30	2.74	2.96	3.08	3.09
EXPORTS_PCER	0.75	1.60	2.00	2.18	2.27	2.50	2.92
IMPORTS_PCER	-0.86	-0.40	-0.14	-0.01	0.05	0.10	0.14
WAGE.COSTS.REAL_PCER	0.70	1.86	2.74	3.22	3.43	3.60	3.77
CONSUMPTION.WAGE.REAL_PCER	0.11	0.61	1.27	1.72	1.98	2.57	3.61
FIRM.VALUE.REAL_PCER	-5.79	-5.07	-4.70	-4.53	-4.43	-4.07	-3.39
FINANCIAL.WEALTH.REAL_PCER	-6.14	-5.17	-4.73	-4.56	-4.48	-4.25	-3.48
REER_PCER	0.94	1.83	2.22	2.38	2.47	2.74	3.27
INTEREST.RATE.REAL_ER	1.14	0.51	0.21	0.10	0.06	0.04	0.01
PRICE.MARKUP.AVERAGE_ER	-0.07	-0.62	-0.86	-0.98	-1.03	-1.05	-1.05
LABOUR.TAX_ER	0.22	0.49	0.55	0.52	0.46	0.09	-0.67
GOVERNMENT.DEBT.GDP_ER	0.74	0.93	0.80	0.57	0.32	-0.66	-1.13
TRADE.BALANCE.GDP_ER	0.35	0.20	0.12	0.07	0.05	0.04	0.04
CURRENT.ACCOUNT.GDP_ER	0.35	0.21	0.13	0.08	0.06	0.06	0.06
NFA.GDP_ER	-0.10	0.81	1.27	1.48	1.60	1.98	2.76

Note: An increase in the REER corresponds to REER depreciation.

3.2 Labour market reform

Given that labour cost developments have played an important role in the deterioration of trade competitiveness in the euro area periphery (Schnabl and Zemanek, 2010), wage moderation appears to be an important ingredient of attempts to regain competitiveness and rebalance external accounts. Figure 3.4 and Table 3.4 illustrate the impact of wage moderation, modelled as a permanent shift in the labour supply that reduces real wage costs by 1% within 10 years, on economic activity and external positions in the INF and OLG versions of QUEST.

Figure 3.4: Wage moderation without fiscal consolidation



Note: An increase in the REER corresponds to REER depreciation.

Real wage cost moderation reduces domestic production costs and prices as illustrated by the REER depreciation, which translates into growing export demand. The labour supply shift also raises domestic output and income as the employment gain outweighs the dampening impact on real wages. Households are frontloading consumption by borrowing against the higher stream of future wage and profit income. Domestic investment also increases in the medium term with its growing profitability and after an initial decline in investment in the context of temporarily higher real interest rates and substitution from capital to labour.

Table 3.4: Wage moderation

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.60	0.98	1.24	1.39	1.47	1.68	1.86
EMPLOYMENT_PCER	0.79	1.39	1.65	1.77	1.84	2.07	2.24
FINAL.DOMESTIC. DEMAND_PCER	0.61	0.90	1.19	1.36	1.45	1.68	1.87
CONSUMPTION_PCER	0.61	1.05	1.30	1.44	1.51	1.69	1.84
INVESTMENT_PCER	-0.68	-0.89	-0.68	-0.45	-0.29	0.00	0.22
EXPORTS_PCER	0.30	0.74	1.02	1.17	1.25	1.46	1.63
IMPORTS_PCER	0.02	-0.13	-0.05	0.03	0.08	0.13	0.16
WAGE.COSTS.REAL_PCER	-1.17	-1.61	-1.37	-1.13	-1.00	-1.01	-1.05
CONSUMPTION.WAGE.REAL_PCER	-1.25	-1.74	-1.35	-0.84	-0.40	0.94	1.82
FIRM.VALUE.REAL_PCER	1.49	2.01	2.34	2.53	2.63	2.88	3.09
FINANCIAL.WEALTH.REAL_PCER	1.31	1.77	2.01	2.10	2.11	2.13	2.72
REER_PCER	0.43	1.01	1.35	1.54	1.65	1.90	2.13
INTEREST.RATE.REAL_ER	0.66	0.42	0.23	0.12	0.08	0.04	0.00
PRICE.MARKUP.AVERAGE_ER	0.11	0.23	0.14	0.07	0.03	0.00	0.00
LABOUR.TAX_ER	-0.02	-0.09	-0.28	-0.52	-0.78	-1.87	-2.62
GOVERNMENT.DEBT.GDP_ER	-0.40	-0.75	-1.27	-1.82	-2.31	-3.60	-1.36
TRADE.BALANCE.GDP_ER	-0.01	0.07	0.05	0.03	0.01	0.00	0.00
CURRENT.ACCOUNT.GDP_ER	-0.01	0.07	0.05	0.03	0.01	0.00	0.00
NFA.GDP_ER	-0.02	0.04	0.10	0.14	0.15	0.16	0.08

B. Model version finite planning horizon (OLG)

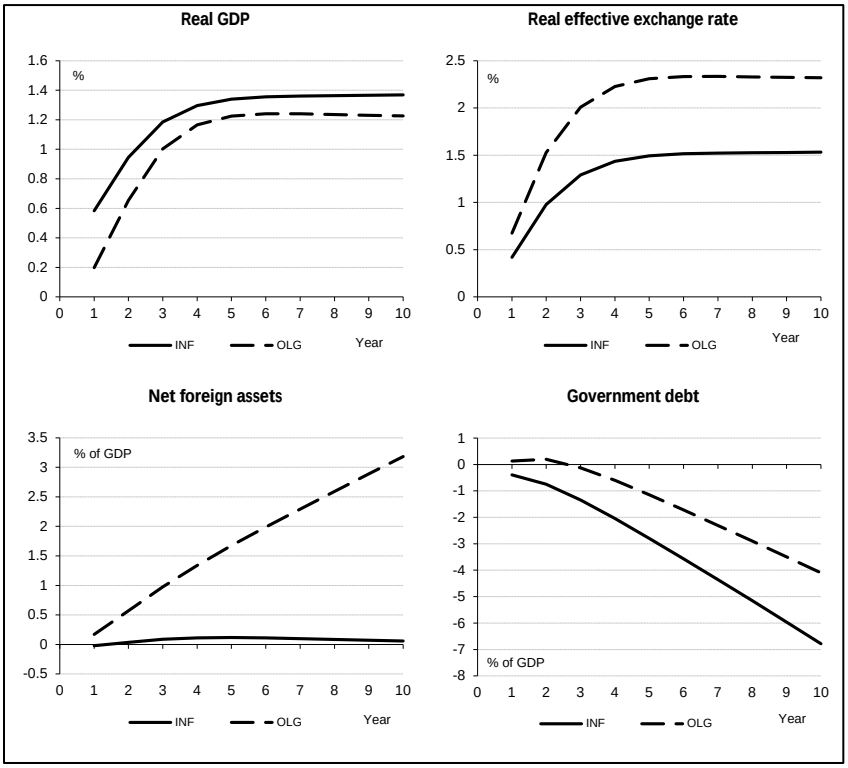
YEAR	1	2	3	4	5	10	25
GDP_PCER	0.66	1.03	1.29	1.43	1.52	1.74	1.94
EMPLOYMENT_PCER	0.83	1.43	1.69	1.81	1.88	2.12	2.29
FINAL.DOMESTIC. DEMAND_PCER	0.70	0.99	1.27	1.44	1.54	1.78	1.98
CONSUMPTION_PCER	0.76	1.18	1.43	1.57	1.65	1.84	2.01
INVESTMENT_PCER	-0.65	-0.83	-0.63	-0.40	-0.24	0.06	0.29
EXPORTS_PCER	0.28	0.71	0.98	1.14	1.22	1.43	1.61
IMPORTS_PCER	0.10	-0.05	0.03	0.10	0.15	0.21	0.25
WAGE.COSTS.REAL_PCER	-1.16	-1.60	-1.37	-1.13	-1.01	-1.02	-1.05
CONSUMPTION.WAGE.REAL_PCER	-1.22	-1.68	-1.28	-0.76	-0.31	1.07	2.00
FIRM.VALUE.REAL_PCER	1.57	2.08	2.41	2.59	2.70	2.96	3.18
FINANCIAL.WEALTH.REAL_PCER	1.38	1.81	2.04	2.12	2.13	2.12	2.66
REER_PCER	0.41	0.97	1.31	1.50	1.60	1.87	2.09
INTEREST.RATE.REAL_ER	0.64	0.41	0.23	0.13	0.08	0.04	0.00
PRICE.MARKUP.AVERAGE_ER	0.09	0.23	0.15	0.07	0.03	0.00	0.00
LABOUR.TAX_ER	-0.03	-0.12	-0.32	-0.58	-0.85	-1.97	-2.75
GOVERNMENT.DEBT.GDP_ER	-0.47	-0.85	-1.40	-1.95	-2.46	-3.77	-1.42
TRADE.BALANCE.GDP_ER	-0.04	0.04	0.02	0.00	-0.02	-0.04	-0.05
CURRENT.ACCOUNT.GDP_ER	-0.04	0.04	0.02	0.00	-0.02	-0.04	-0.05
NFA.GDP_ER	-0.04	-0.02	0.01	0.02	0.00	-0.15	-0.73

Note: An increase in the REER corresponds to REER depreciation.

Despite the lasting REER depreciation, the current account and NFA positions respond (moderately) negatively to the wage cost decline in the OLG model in the medium and long term. In the INF model, the competitiveness gain dominates the frontloading of consumption by households against the background of increasing labour and profit income in the short and medium term, which improves the trade balance. The positive domestic demand effect is strengthened in the OLG model by the increase in financial wealth (2) given higher firm profits (5) in response to lower wage costs, because the consumption demand by OLG households increases with rising financial wealth. As a consequence, the NFA position deteriorates in the medium and long term.

The mechanism behind the stronger negative impact of wage moderation on the NFA position in the OLG compared to the INF setting in Figure 3.4 and Table 3.4 is the same that causes the stronger NFA improvement in response to PMR in Figure 3.1. There, the decline of price mark-ups reduces firm profits, the value of firms and financial wealth, which dampens consumption demand by OLG households; here, wage moderation raises firm profits, the value of firms and financial wealth and, hence, strengthens OLG consumption demand. As in the case of PMR, this OLG effect requires that the domestic firms are owned by the domestic households. If domestic firms were owned by foreigners, the qualitative impact on external accounts would reverse.

Figure 3.5: Wage moderation with unchanged tax rates



Note: An increase in the REER corresponds to REER depreciation.

Table 3.5: Wage moderation with fiscal consolidation

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.58	0.94	1.19	1.30	1.34	1.37	1.37
EMPLOYMENT_PCER	0.78	1.35	1.58	1.65	1.66	1.65	1.63
FINAL.DOMESTIC. DEMAND_PCER	0.59	0.88	1.14	1.28	1.34	1.38	1.39
CONSUMPTION_PCER	0.57	0.98	1.22	1.32	1.36	1.38	1.38
INVESTMENT_PCER	-0.54	-0.62	-0.37	-0.14	0.01	0.14	0.22
EXPORTS_PCER	0.29	0.72	0.97	1.09	1.14	1.18	1.17
IMPORTS_PCER	0.02	-0.12	-0.03	0.05	0.10	0.14	0.14
WAGE.COSTS.REAL_PCER	-1.19	-1.63	-1.36	-1.08	-0.91	-0.78	-0.81
CONSUMPTION.WAGE.REAL_PCER	-1.29	-1.87	-1.68	-1.44	-1.28	-1.17	-1.20
FIRM.VALUE.REAL_PCER	1.31	1.80	2.11	2.25	2.30	2.35	2.43
FINANCIAL.WEALTH.REAL_PCER	1.15	1.58	1.78	1.79	1.72	1.04	-1.39
REER_PCER	0.42	0.98	1.29	1.44	1.49	1.53	1.52
INTEREST.RATE.REAL_ER	0.64	0.39	0.19	0.08	0.03	0.00	-0.03
PRICE.MARKUP.AVERAGE_ER	0.12	0.24	0.15	0.07	0.03	0.00	0.01
LABOUR.TAX_ER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOVERNMENT.DEBT.GDP_ER	-0.39	-0.75	-1.34	-2.04	-2.79	-6.78	-20.48
TRADE.BALANCE.GDP_ER	-0.01	0.07	0.04	0.02	0.00	-0.01	-0.01
CURRENT.ACCOUNT.GDP_ER	-0.01	0.07	0.04	0.02	0.00	-0.01	-0.02
NFA.GDP_ER	-0.02	0.03	0.09	0.11	0.12	0.06	-0.15

B. Model version finite planning horizon (OLG)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.20	0.65	1.00	1.17	1.23	1.23	1.18
EMPLOYMENT_PCER	0.58	1.27	1.61	1.72	1.75	1.74	1.73
FINAL.DOMESTIC. DEMAND_PCER	-0.11	0.23	0.60	0.80	0.88	0.91	0.86
CONSUMPTION_PCER	-0.69	-0.06	0.28	0.43	0.48	0.46	0.38
INVESTMENT_PCER	-1.23	-1.68	-1.41	-1.08	-0.86	-0.58	-0.42
EXPORTS_PCER	0.44	1.09	1.48	1.66	1.74	1.77	1.74
IMPORTS_PCER	-0.73	-0.95	-0.84	-0.72	-0.65	-0.59	-0.59
WAGE.COSTS.REAL_PCER	-1.57	-2.23	-1.87	-1.46	-1.20	-1.02	-1.08
CONSUMPTION.WAGE.REAL_PCER	-1.72	-2.59	-2.35	-1.99	-1.76	-1.60	-1.65
FIRM.VALUE.REAL_PCER	0.77	1.53	1.98	2.19	2.26	2.27	2.27
FINANCIAL.WEALTH.REAL_PCER	0.77	1.57	2.03	2.21	2.24	1.99	0.96
REER_PCER	0.67	1.53	2.01	2.23	2.31	2.32	2.26
INTEREST.RATE.REAL_ER	0.99	0.60	0.29	0.12	0.04	0.00	-0.02
PRICE.MARKUP.AVERAGE_ER	0.30	0.36	0.22	0.10	0.03	-0.02	-0.01
LABOUR.TAX_ER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOVERNMENT.DEBT.GDP_ER	0.13	0.19	-0.12	-0.60	-1.15	-4.10	-14.00
TRADE.BALANCE.GDP_ER	0.31	0.43	0.40	0.36	0.34	0.31	0.31
CURRENT.ACCOUNT.GDP_ER	0.31	0.43	0.41	0.37	0.35	0.35	0.39
NFA.GDP_ER	0.17	0.57	0.97	1.34	1.67	3.18	7.34

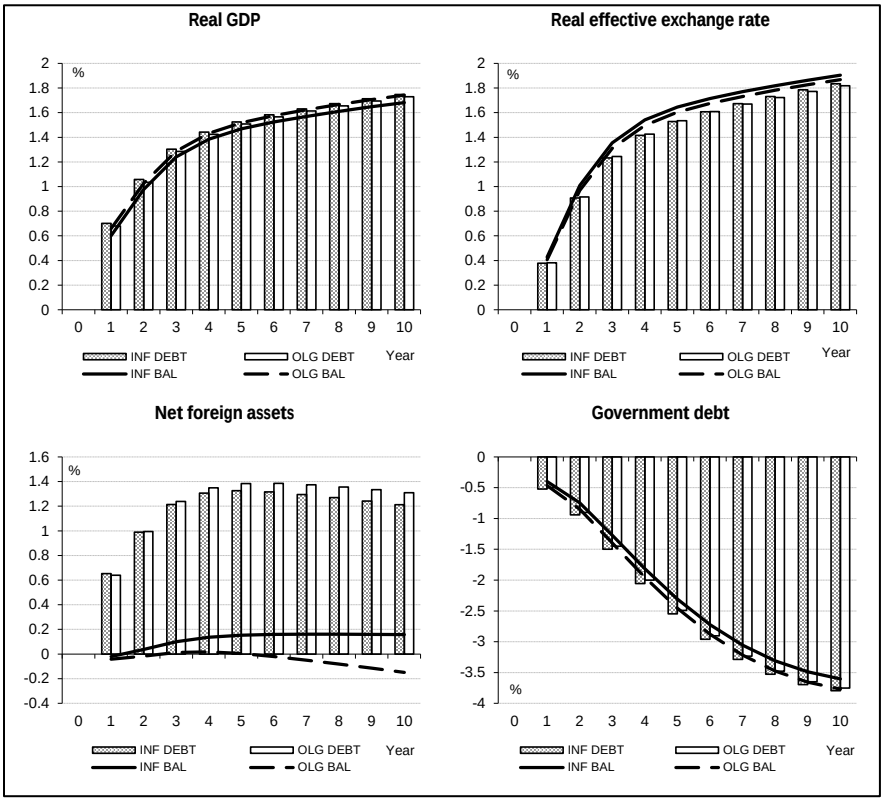
Note: An increase in the REER corresponds to REER depreciation.

The qualitative response of the NFA position in the OLG setting changes if wage moderation is combined with fiscal consolidation, i.e. if the additional tax revenue from out-

put expansion is used to reduce government debt rather than tax rates. This is displayed in Figure 3.5 and Table 3.5, where the labour tax rate is kept constant in the first 25 years after the reform. Output and domestic demand expand less in the absence of labour tax cuts. Additionally, the decumulation of government debt reduces the financial wealth of OLG households, translating into lower domestic consumption demand compared to the no-consolidation case and a trade balance improvement in the OLG setting. Hence, the second-round effects from the budgetary closure rule are important for the impact of structural reforms especially in models with finite planning horizon where government debt is part of household wealth.

As in the case of PMR in Figure 3.3, LMR in the form of wage moderation has a positive impact on the NFA position in both the INF and OLG settings if the pre-reform level of net foreign debt is high. Comparing the LMR under initially balanced NFA position (BAL) and initial net foreign debt of 100% of GDP (DEBT) in Figure 3.6 and Table 3.6 shows a strong positive reaction of the NFA-to-GDP ratio in the latter case. The positive response is due to the denominator effect associated with output expansion, i.e. the decline of net foreign debt in GDP terms. The trade and current account balances remain (moderately) negative as in the case of NFA deterioration in the BAL scenario, however.

Figure 3.6: Wage moderation with alternative initial NFA positions



Note: An increase in the REER corresponds to REER depreciation.

Table 3.6: Wage moderation with initial net foreign debt

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.70	1.06	1.30	1.44	1.52	1.75	1.92
EMPLOYMENT_PCER	0.85	1.43	1.67	1.78	1.85	2.09	2.25
FINAL.DOMESTIC. DEMAND_PCER	0.78	1.07	1.33	1.49	1.58	1.80	1.95
CONSUMPTION_PCER	0.89	1.28	1.51	1.63	1.70	1.86	1.93
INVESTMENT_PCER	-0.49	-0.57	-0.35	-0.14	0.00	0.22	0.30
EXPORTS_PCER	0.27	0.67	0.93	1.08	1.17	1.41	1.64
IMPORTS_PCER	0.20	0.06	0.13	0.20	0.24	0.26	0.21
WAGE.COSTS.REAL_PCER	-1.10	-1.49	-1.28	-1.07	-0.96	-0.98	-1.01
CONSUMPTION.WAGE.REAL_PCER	-1.13	-1.52	-1.11	-0.61	-0.18	1.16	1.94
FIRM.VALUE.REAL_PCER	1.66	2.13	2.45	2.62	2.72	2.99	3.18
FINANCIAL.WEALTH.REAL_PCER	1.78	2.24	2.49	2.56	2.56	2.54	3.15
REER_PCER	0.38	0.91	1.23	1.42	1.53	1.84	2.13
INTEREST.RATE.REAL_ER	0.59	0.38	0.21	0.11	0.07	0.03	-0.01
PRICE.MARKUP.AVERAGE_ER	0.07	0.21	0.13	0.07	0.03	0.00	0.00
LABOUR.TAX_ER	-0.05	-0.16	-0.37	-0.63	-0.90	-2.01	-2.70
GOVERNMENT.DEBT.GDP_ER	-0.52	-0.94	-1.50	-2.05	-2.55	-3.79	-1.30
TRADE.BALANCE.GDP_ER	-0.08	-0.01	-0.03	-0.05	-0.06	-0.06	-0.03
CURRENT.ACCOUNT.GDP_ER	-0.07	0.00	-0.01	-0.03	-0.04	-0.04	-0.02
NFA.GDP_ER	0.65	0.99	1.21	1.31	1.33	1.21	0.67

B. Model version finite planning horizon (OLG)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.68	1.04	1.29	1.42	1.51	1.73	1.91
EMPLOYMENT_PCER	0.84	1.41	1.66	1.78	1.85	2.09	2.25
FINAL.DOMESTIC. DEMAND_PCER	0.74	1.03	1.29	1.45	1.55	1.78	1.95
CONSUMPTION_PCER	0.84	1.23	1.47	1.60	1.67	1.85	1.96
INVESTMENT_PCER	-0.56	-0.70	-0.49	-0.28	-0.13	0.14	0.28
EXPORTS_PCER	0.27	0.68	0.94	1.09	1.17	1.40	1.60
IMPORTS_PCER	0.16	0.02	0.09	0.16	0.20	0.24	0.23
WAGE.COSTS.REAL_PCER	-1.11	-1.53	-1.31	-1.09	-0.97	-0.99	-1.02
CONSUMPTION.WAGE.REAL_PCER	-1.15	-1.57	-1.17	-0.66	-0.23	1.12	1.95
FIRM.VALUE.REAL_PCER	1.60	2.07	2.39	2.56	2.67	2.93	3.12
FINANCIAL.WEALTH.REAL_PCER	1.71	2.18	2.44	2.52	2.53	2.50	3.09
REER_PCER	0.38	0.92	1.24	1.43	1.53	1.82	2.08
INTEREST.RATE.REAL_ER	0.60	0.39	0.22	0.12	0.08	0.04	0.00
PRICE.MARKUP.AVERAGE_ER	0.08	0.22	0.14	0.07	0.03	0.01	0.00
LABOUR.TAX_ER	-0.04	-0.14	-0.35	-0.61	-0.87	-1.98	-2.70
GOVERNMENT.DEBT.GDP_ER	-0.50	-0.90	-1.45	-2.00	-2.49	-3.75	-1.34
TRADE.BALANCE.GDP_ER	-0.06	0.01	-0.01	-0.03	-0.04	-0.05	-0.04
CURRENT.ACCOUNT.GDP_ER	-0.06	0.02	0.00	-0.02	-0.03	-0.04	-0.03
NFA.GDP_ER	0.64	0.99	1.24	1.35	1.38	1.31	0.70

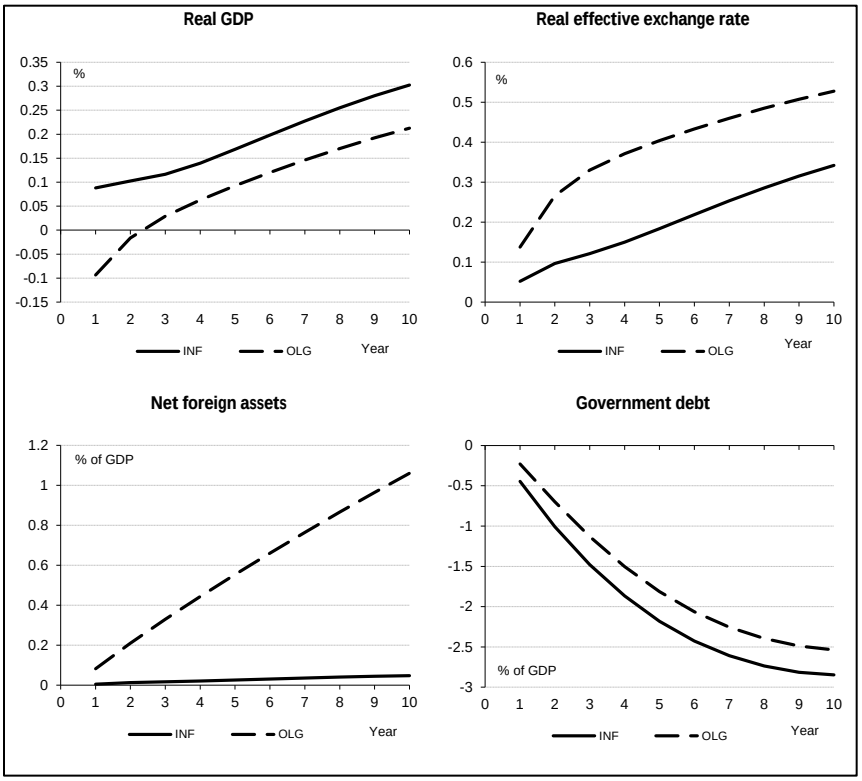
Note: An increase in the REER corresponds to REER depreciation.

3.3 Fiscal devaluation

Fiscal devaluation is an (additional) policy option to achieve REER depreciation when nominal exchange rates are fixed because of adherence to monetary union or an exchange rate peg. The standard example of fiscal devaluation is the (revenue-neutral) shift of the tax burden from labour to consumption, which implicitly reduces the tax burden on exports and increases the tax burden on imports. This tax shift mimics the expenditure-switching effects of nominal exchange rate depreciation and strengthens the price competitiveness of domestically produced goods.

Figure 3.7 and Table 3.7 illustrate the impact of an ex-ante budgetary neutral shift from employer social security contributions (SSC) to consumption taxation (VAT) of 1% of baseline GDP. The positive employment and output effects of reducing the labour cost wedge improves the fiscal position endogenously, however. In the scenario in Figure 3.7 and Table 3.7, the labour tax rate is reduced to stabilise government debt at the pre-reform level in the medium term. This endogenous labour tax reduction adds an expansionary effect and makes the reform ex-post budgetary neutral in the long run.

Figure 3.7: Revenue-neutral fiscal devaluation



Note: An increase in the REER corresponds to REER depreciation.

Table 3.7: Fiscal devaluation

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.09	0.10	0.12	0.14	0.17	0.30	0.40
EMPLOYMENT_PCER	0.15	0.14	0.14	0.17	0.21	0.39	0.48
FINAL.DOMESTIC. DEMAND_PCER	0.08	0.10	0.11	0.14	0.16	0.30	0.40
CONSUMPTION_PCER	0.10	0.13	0.15	0.17	0.20	0.31	0.39
INVESTMENT_PCER	-0.12	-0.19	-0.21	-0.21	-0.20	-0.07	0.09
EXPORTS_PCER	0.04	0.07	0.09	0.11	0.14	0.26	0.35
IMPORTS_PCER	-0.02	-0.01	0.00	0.00	0.00	0.01	0.04
WAGE.COSTS.REAL_PCER	-0.46	-0.10	-0.04	-0.07	-0.11	-0.21	-0.23
CONSUMPTION.WAGE.REAL_PCER	-0.60	0.07	0.43	0.67	0.89	1.73	2.22
FIRM.VALUE.REAL_PCER	0.26	0.29	0.32	0.35	0.38	0.54	0.63
FINANCIAL.WEALTH.REAL_PCER	0.16	0.10	0.04	0.00	-0.02	0.01	0.46
REER_PCER	0.05	0.10	0.12	0.15	0.18	0.34	0.46
INTEREST.RATE.REAL_ER	0.06	0.03	0.03	0.03	0.03	0.02	0.00
PRICE.MARKUP.AVERAGE_ER	0.06	0.01	0.00	0.00	0.00	0.00	0.00
SOC.SEC.CONTR_ER	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07
VAT_ER	1.50	1.50	1.50	1.50	1.50	1.50	1.50
GOVERNMENT.DEBT.GDP_ER	-0.44	-1.01	-1.48	-1.87	-2.18	-2.85	-0.85
TRADE.BALANCE.GDP_ER	0.01	0.01	0.00	0.00	0.01	0.00	0.00
CURRENT.ACCOUNT.GDP_ER	0.01	0.01	0.00	0.00	0.01	0.00	0.00
NFA.GDP_ER	0.00	0.01	0.02	0.02	0.03	0.05	0.04

B. Model version finite planning horizon (OLG)

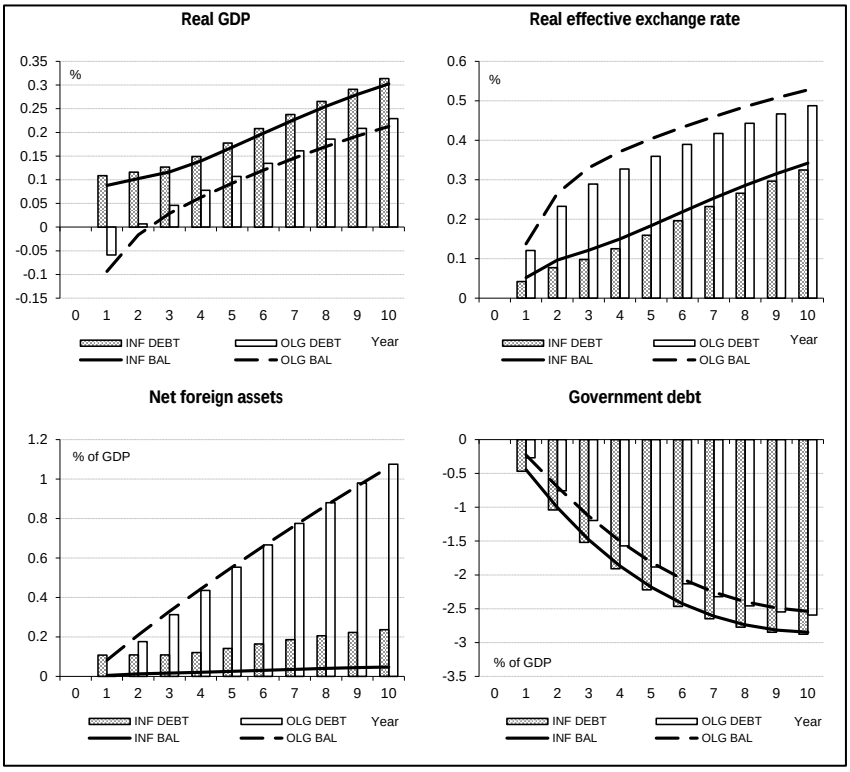
YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.09	-0.02	0.03	0.06	0.09	0.21	0.31
EMPLOYMENT_PCER	0.05	0.08	0.11	0.15	0.19	0.35	0.45
FINAL.DOMESTIC. DEMAND_PCER	-0.23	-0.14	-0.09	-0.05	-0.02	0.11	0.23
CONSUMPTION_PCER	-0.35	-0.25	-0.20	-0.16	-0.13	-0.02	0.09
INVESTMENT_PCER	-0.31	-0.48	-0.49	-0.46	-0.43	-0.27	-0.06
EXPORTS_PCER	0.09	0.19	0.24	0.28	0.30	0.40	0.46
IMPORTS_PCER	-0.32	-0.29	-0.27	-0.25	-0.25	-0.21	-0.15
WAGE.COSTS.REAL_PCER	-0.60	-0.29	-0.18	-0.16	-0.17	-0.25	-0.28
CONSUMPTION.WAGE.REAL_PCER	-0.81	-0.30	0.05	0.31	0.53	1.35	1.88
FIRM.VALUE.REAL_PCER	0.08	0.20	0.26	0.30	0.34	0.46	0.53
FINANCIAL.WEALTH.REAL_PCER	0.04	0.09	0.09	0.09	0.09	0.17	0.75
REER_PCER	0.14	0.27	0.33	0.37	0.40	0.53	0.59
INTEREST.RATE.REAL_ER	0.17	0.08	0.05	0.03	0.03	0.02	-0.01
PRICE.MARKUP.AVERAGE_ER	0.14	0.05	0.02	0.00	0.00	0.00	0.00
SOC.SEC.CONTR_ER	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07
VAT_ER	1.50	1.50	1.50	1.50	1.50	1.50	1.50
GOVERNMENT.DEBT.GDP_ER	-0.23	-0.70	-1.13	-1.50	-1.81	-2.54	-0.85
TRADE.BALANCE.GDP_ER	0.13	0.13	0.12	0.12	0.11	0.10	0.08
CURRENT.ACCOUNT.GDP_ER	0.13	0.13	0.12	0.12	0.12	0.11	0.10
NFA.GDP_ER	0.08	0.21	0.33	0.44	0.55	1.06	2.23

Note: An increase in the REER corresponds to REER depreciation.

The reduction of the labour tax wedge by fiscal devaluation lowers production costs and increases labour demand and employment in the domestic economy in the medium and long term. The reduction in the producer price strengthens export demand, while higher consumption taxes offset the price reduction for domestic consumers and increase import prices for consumers similar to nominal exchange rate depreciation. Domestic demand falls initially below the pre-reform baseline in the OLG model. The reduction in employer SSC increases firm profits and the value of firms, but the VAT increase reduces the consumption value of financial wealth at the same time as illustrated by equation (1). The decline of the consumption value of wealth is complemented by the temporary decline in government debt as part of household wealth. Consumption demand falls below baseline during the first decade, and investment demand also falls below baseline as cheaper labour substitutes for capital in the production. The impact of fiscal devaluation on external accounts is positive in the OLG model as exports increase, imports decline and the trade, CA and NFA balances improve.

The negative impact of the falling consumption value of financial wealth in the context of the VAT increase on domestic demand in the OLG model is absent in the INF specification. Domestic demand increases on impact against the prospect of higher future income and further reductions in the labour tax given the budgetary closure that stabilises government debt at pre-reform levels. Export demand increases with improved trade competitiveness, but import demand also increases with increasing domestic demand. The impact on the trade balance, the CA and the NFA position is close to balance.

Figure 3.8: Revenue-neutral fiscal devaluation with alternative initial NFA positions



Note: An increase in the REER corresponds to REER depreciation.

Table 3.8: Fiscal devaluation with initial net foreign debt

A. Model version infinite planning horizon (INF)

YEAR	1	2	3	4	5	10	25
GDP_PCER	0.11	0.12	0.13	0.15	0.18	0.31	0.41
EMPLOYMENT_PCER	0.16	0.14	0.14	0.18	0.22	0.39	0.48
FINAL.DOMESTIC. DEMAND_PCER	0.11	0.12	0.14	0.16	0.19	0.32	0.42
CONSUMPTION_PCER	0.15	0.17	0.19	0.21	0.23	0.34	0.41
INVESTMENT_PCER	-0.08	-0.14	-0.16	-0.16	-0.15	-0.02	0.11
EXPORTS_PCER	0.03	0.06	0.08	0.10	0.12	0.25	0.35
IMPORTS_PCER	0.01	0.03	0.03	0.03	0.03	0.04	0.05
WAGE.COSTS.REAL_PCER	-0.45	-0.08	-0.03	-0.06	-0.10	-0.20	-0.22
CONSUMPTION.WAGE.REAL_PCER	-0.56	0.12	0.48	0.72	0.94	1.78	2.24
FIRM.VALUE.REAL_PCER	0.29	0.31	0.34	0.36	0.40	0.56	0.65
FINANCIAL.WEALTH.REAL_PCER	0.22	0.13	0.05	0.00	-0.03	0.00	0.53
REER_PCER	0.04	0.08	0.10	0.13	0.16	0.32	0.46
INTEREST.RATE.REAL_ER	0.05	0.02	0.02	0.03	0.03	0.02	-0.01
PRICE.MARKUP.AVERAGE_ER	0.05	0.01	-0.01	0.00	0.00	0.00	0.00
SOC.SEC.CONTR_ER	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07
VAT_ER	1.48	1.48	1.48	1.48	1.48	1.48	1.48
GOVERNMENT.DEBT.GDP_ER	-0.47	-1.04	-1.52	-1.91	-2.22	-2.88	-0.83
TRADE.BALANCE.GDP_ER	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
CURRENT.ACCOUNT.GDP_ER	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	0.00
NFA.GDP_ER	0.11	0.11	0.11	0.12	0.14	0.24	0.19

B. Model version finite planning horizon (OLG)

YEAR	1	2	3	4	5	10	25
GDP_PCER	-0.06	0.01	0.05	0.08	0.11	0.23	0.32
EMPLOYMENT_PCER	0.07	0.09	0.12	0.15	0.19	0.36	0.46
FINAL.DOMESTIC. DEMAND_PCER	-0.16	-0.09	-0.05	-0.01	0.02	0.15	0.26
CONSUMPTION_PCER	-0.26	-0.17	-0.13	-0.09	-0.07	0.05	0.15
INVESTMENT_PCER	-0.27	-0.42	-0.43	-0.41	-0.38	-0.22	-0.03
EXPORTS_PCER	0.08	0.17	0.21	0.24	0.27	0.37	0.43
IMPORTS_PCER	-0.26	-0.24	-0.22	-0.21	-0.20	-0.17	-0.11
WAGE.COSTS.REAL_PCER	-0.57	-0.26	-0.16	-0.14	-0.15	-0.24	-0.27
CONSUMPTION.WAGE.REAL_PCER	-0.76	-0.22	0.13	0.39	0.61	1.43	1.95
FIRM.VALUE.REAL_PCER	0.12	0.21	0.27	0.31	0.34	0.48	0.55
FINANCIAL.WEALTH.REAL_PCER	0.07	0.11	0.10	0.09	0.08	0.17	0.83
REER_PCER	0.12	0.23	0.29	0.33	0.36	0.49	0.56
INTEREST.RATE.REAL_ER	0.15	0.07	0.04	0.03	0.03	0.02	-0.01
PRICE.MARKUP.AVERAGE_ER	0.12	0.04	0.01	0.00	0.00	0.00	0.00
SOC.SEC.CONTR_ER	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07	-1.07
VAT_ER	1.48	1.48	1.48	1.48	1.48	1.48	1.48
GOVERNMENT.DEBT.GDP_ER	-0.27	-0.76	-1.20	-1.57	-1.88	-2.59	-0.84
TRADE.BALANCE.GDP_ER	0.11	0.10	0.10	0.09	0.09	0.08	0.06
CURRENT.ACCOUNT.GDP_ER	0.11	0.10	0.10	0.10	0.10	0.09	0.08
NFA.GDP_ER	0.01	0.18	0.31	0.44	0.55	1.07	2.04

Note: An increase in the REER corresponds to REER depreciation.

As in the previous scenarios of PMR and LMR, starting from high levels of net foreign debt will reinforce the positive impact of fiscal devaluation on the NFA-to-GDP ratio relative to baseline due to the favourable denominator effect in the medium and long term as shown in Figure 3.8 and Table 3.8 for initial net foreign debt of 100% of GDP.

4. Robustness checks

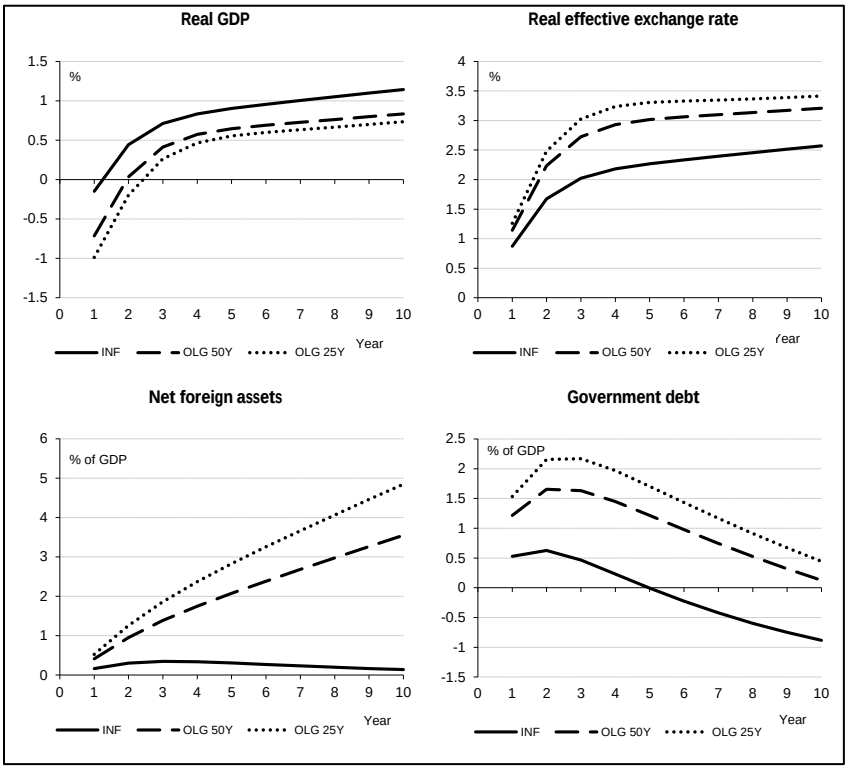
This section presents a series of robustness checks to assess the sensitivity of the previous results of the INF-OLG comparison with respect to modelling assumptions and parameters that might be particularly relevant for the determination of external accounts and/or surrounded by particularly high uncertainty.

Length of planning horizon

Kumhof and Laxton (2009) show that the differences between OLG and INF models with respect to the impact of fiscal policy on external balances depend inversely on the length of the planning horizon in the former. The shorter the planning horizon of OLG households, the higher is the elasticity of current consumption with respect to financial wealth. Because of to the higher elasticity of domestic consumption with respect to financial wealth, the impact of structural reforms on the trade balance, the CA and the NFA position increases as the planning horizon shortens.

Figure 4.1 illustrates the impact of the planning horizon by showing the impact of price mark-up reduction of 1 percentage point in the long term on economic activity, the REER, the NFA position and government debt in the INF model, the OLG model with 50-year planning horizon, i.e. the benchmark calibration, and a version of the OLG model with 25-year planning horizon. Impulse responses for INF and the OLG with 50-year planning horizon in Figure 4.1 correspond to Figure 3.1. The OLG model with 25-year planning horizon shows a stronger initial decline in economic activity due to a stronger initial decline in domestic consumption demand, stronger REER depreciation for stronger trade balance improvement and a stronger improvement in the NFA position. It also shows a stronger initial increase in government debt to GDP due to the unfavourable denominator effect. Hence, the impact of structural policies on external accounts increases with declining planning horizon, i.e. increasing deviation from the INF scenario.

Figure 4.1: Price mark-up reduction with alternative planning horizons



Note: An increase in the REER corresponds to REER depreciation.

A very important factor for the difference between the INF and OLG dynamics besides the length of the planning horizon is the fact that the OLG model does not require the external closure (42). Within the INF model, the external closure forces the NFA position back to its (unchanged) steady-state value in the long run. OLG models in the tradition of Blanchard (1985) avoid explosive NFA dynamics by the dependence of domestic demand on net financial wealth, which includes the NFA position. Contrary to the closure rule (42), the OLG model does not force the NFA position back to its initial steady state, however. To the contrary, Blanchard (1985) shows that permanent shocks to, e.g., fiscal policy (and in analogy: structural reforms) shift the steady-state NFA position in the OLG model. The endogenous stabilisation of the NFA position through financial wealth and consumption demand in the OLG model then applies to the stabilisation of the NFA position around its new steady-state value. This can be shown by simulating the OLG model with 50-year planning horizon with the same external closure (42) as in the INF model, which makes the OLG model dynamics much more and very similar to the INF dynamics.

If the OLG model is augmented by a closure rule of type (42), the improvement of the NFA position relative to the initial steady-state value will reduce domestic interest rates. The value of firms and financial assets (which is inversely related to the interest rate) increases and domestic consumption and investment demand strengthens due to lower financing costs and the positive wealth effect. The expansion of domestic demand strengthens imports and deteriorates external balances compared to the standard OLG setup, which leads to dynamics closer to the INF model responses.

Price elasticity of trade

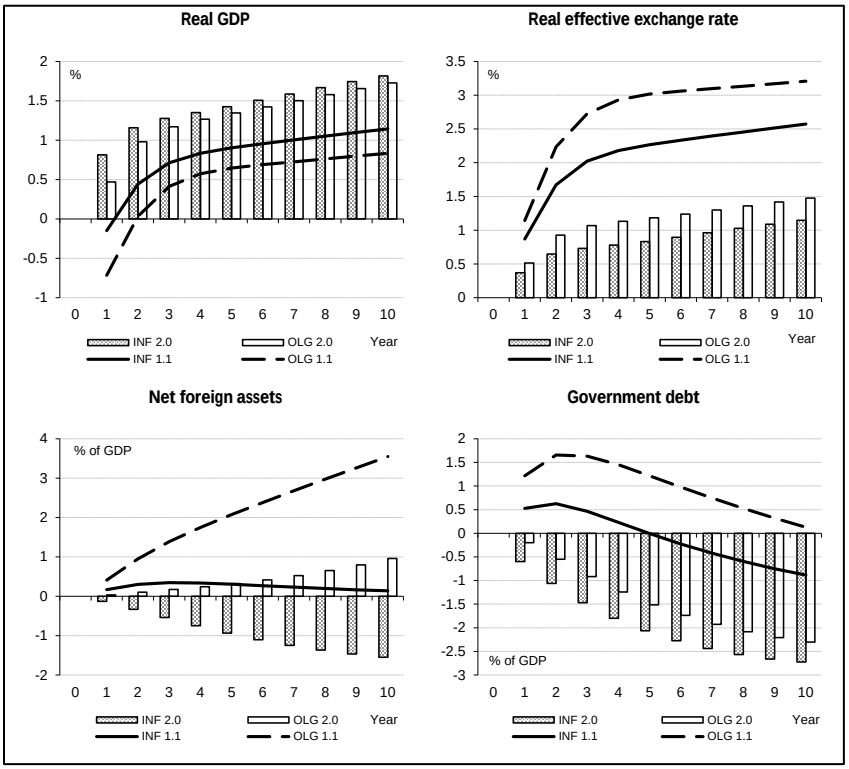
A second robustness check considers different values for the price elasticity of trade. Namely, the benchmark value of σ_x=1.1 is first increased to σ_x=2.0 and then reduced σ_x=0.9. The value of σ_x=1.1 is compatible with estimates of the QUEST model on euro area data (Ratto et al., 2009), whereas the estimates of Imbs and Méjean (2010) suggest higher values for the aggregate price elasticity of euro area trade. Higher (lower) elasticity values imply given price adjustments to have larger (smaller) volume effects, or given volume adjustment to require less (more) relative price adjustment.

Figure 4.2 shows impulse responses for the 1 percentage-point long-run price mark-up reduction for σ_x=2.0 and σ_x=1.1. Figure 4.2 adds an equivalent comparison for the lower elasticity value σ_x=0.9.

Increasing the price elasticity of trade increases the elasticity of net exports with respect to the improving price competitiveness of domestic goods. The associated expansion of domestic economic activity also strengthens domestic demand, however, which increases the demand for imports. The aggregate impact on the trade balance, the CA and the NFA position is less positive than under the benchmark calibration of the model.

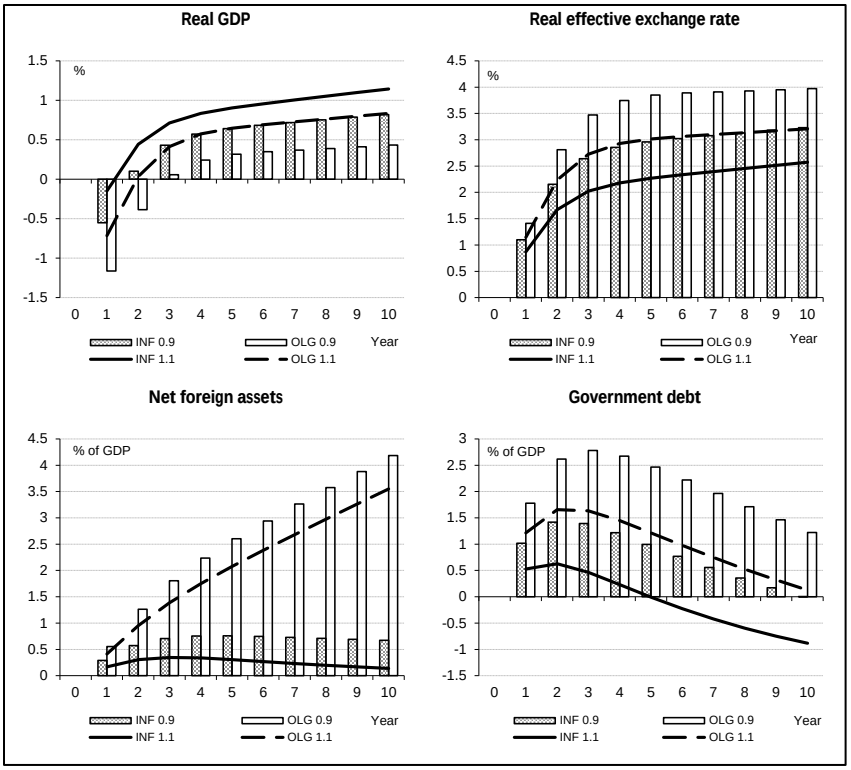
The REER adjustment is smaller (stronger) with higher (lower) σ_x in the INF and OLG model versions. Less (more) REER depreciation under the higher (lower) trade price elasticity translates into a smaller (larger) negative wealth effect of real effective depreciation, i.e. less (more) reduction in the purchasing power of financial wealth. It also contains (amplifies) the temporary increase in the real interest rate associated with REER depreciation and fixed nominal interest rates. The consequence of the smaller (larger) negative wealth and real interest rate effects is less (more) contraction of domestic demand and less (more) external balance improvement in the OLG model.

Figure 4.2: Price mark-up reduction with higher trade elasticity values



Note: An increase in the REER corresponds to REER depreciation.

Figure 4.3: Price mark-up reduction with lower trade elasticity values

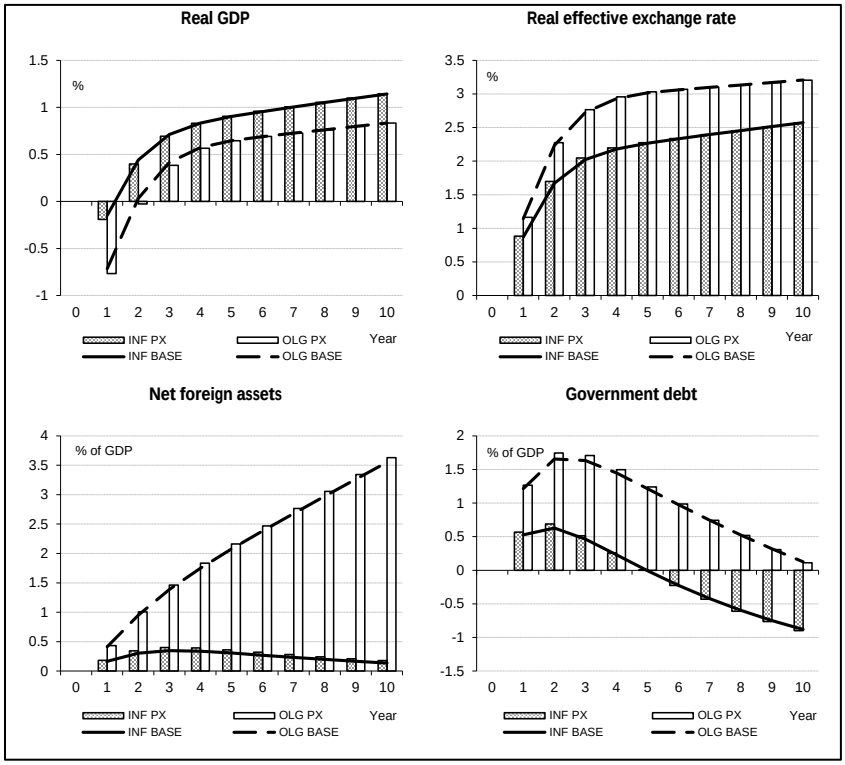


Note: An increase in the REER corresponds to REER depreciation.

Sticky export prices

Export prices correspond to the price of domestic tradable goods in the benchmark model (BASE), i.e. they are already subject to nominal price stickiness in tradable prices. Adding the same degree of stickiness at the level of exporters to obtain a sluggish adjustment of export prices to changes in the domestic price of tradable goods (PX) affects the short-term dynamics of trade, but has no decisive impact on the medium- and long-run adjustment to structural reforms as shown in Figure 4.4. Long-run effects would differ only if export prices were perfectly rigid, i.e. if they would not adjust to changes in domestic tradable prices, e.g., in the context of structural reforms.

Figure 4.4: Price mark-up reduction with additional export price stickiness



Note: An increase in the REER corresponds to REER depreciation.

5. Conclusions

This paper has compared the impact of PMR (price mark-up reduction), LMR (wage moderation) and fiscal devaluation on economic activity and external accounts in infinite-horizon (INF) and finite-horizon (OLG) versions of QUEST III with tradable and non-tradable sectors. The model setup is for a small open economy in monetary union. The two model versions are otherwise identical in structure and calibration to isolate the impact of the planning horizon on the effect of structural policies and the potential contribution of structural reforms to external imbalance correction. The main difference between the INF specification and the OLG framework is that the latter introduces a positive link

from financial wealth as the net value of firm equity and debt assets owned by domestic households to current consumption. Structural and budgetary policies affect the value of corporate equity and outstanding government debt.

The comparison between the INF and OLG specifications across the price mark-up reduction, wage moderation and fiscal devaluation scenarios suggests the following conclusions:

The INF and OLG model versions imply qualitatively similar responses of domestic activity to structural reforms, but differ in the qualitative and quantitative response of external positions. Structural policies tend to have stronger and more persistent effects on external positions in the OLG model due to their impact on financial wealth, which affects consumption in the OLG model.

The OLG model's wealth channel suggests at the same time a more differentiated assessment of the impact of structural policies on external positions as different reforms affect financial wealth in different ways. Falling product mark-ups reduce future profits and the value of firms, which lowers domestic consumption and strengthens the CA and NFA improvement in the OLG model; wage moderation increases firm profits and the value of firms, which strengthens consumption demand and deteriorates the OLG response of external positions compared to the INF model; fiscal devaluation has a more positive impact on external accounts in the OLG framework as the decline in the purchasing power of wealth associated with VAT increases outweighs the impact of increasing firm value associated with higher firm profits in the model.

The improvement of trade balance, CA and NFA positions tends to be stronger if structural policies are accompanied by fiscal consolidation, i.e. potential budgetary savings from positive output effects are not reimbursed by tax cuts but used to decrease the level of government debt, and if the economy starts with high pre-reform levels of net foreign debt, so that the growth of the denominator improves the NFA-to-GDP position in the sense of growing out of debt. The assumptions about second-round budgetary effects of structural policies are particularly relevant in the OLG framework where government debt is part of the household wealth. Government debt reduction lowers private consumption in the OLG model due to the reduction in financial wealth, but tends to increase consumption in the INF model given the reduction in future tax liabilities.

The effects of structural policies on the NFA-to-GDP position in INF and OLG model versions become more similar if the reforming economy faces high levels of net foreign debt. The greater similarity between INF and OLG results with higher foreign debt is due to importance of the denominator effect. Output gains associated with structural reforms reduce foreign debt to GDP in both models in the medium and longer term.

A further implication of the results is the relevance of the geographical distribution of financial assets for the effects of structural policies. In particular, the distribution of corporate as-sets between domestic and foreign household affects the results in the OLG framework. If domestic firms were owned by foreign households, changes in the value of firms would affect foreign rather than domestic consumption demand. The importance of

wealth effects also implies that the portfolio structure of wealth (assets and liabilities) matters for domestic demand and external accounts in the OLG framework beyond the impact of the aggregate net position.

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