Market Reforms in the Time of Imbalance: Online Appendix

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A Individual Demand for Non-Tradable Varieties

Recall the translog unit-expenditure function, equation (1) in the main text:

$$\ln P_t^N = \left[\frac{1}{2\sigma}\left(\frac{1}{N_t} - \frac{1}{\tilde{N}}\right)\right]^{\upsilon} + \frac{1}{N_t}\int_{\omega\in\Omega_t} \ln p_{\omega t} d\omega + \frac{\sigma}{2N_t}\int_{\omega\in\Omega_t}\int_{\omega'\in\Omega_t} \ln p_{\omega t}(\ln p_{\omega t} - \ln p_{\omega' t}) d\omega d\omega'.$$

Taking the derivative of equation (1) with respect to $\ln p_{\omega t}$—the Shephard's lemma—we get that the share of good ω in the expenditure of the representative household is given by

$$s_t^{Y^N}(w) \equiv \sigma \ln\left(\frac{\bar{p}_t^N}{p_t(\omega)}\right),$$

where

$$\ln \bar{p}_t^N \equiv (1/\sigma N_t) + (1/N_t)\int_{\omega\in\Omega_t} \ln p_t^N(\omega)\, d\omega$$

is the maximum price that a domestic producer can charge while still having a positive market share. The Home household's demand for good ω is then $y_t^N(\omega) = s_t^{Y^N}(w)\, I_t^{Y^N}/p_t(\omega)$, where $I_t^{Y^N} \equiv P_t^N Y_t^N$ is the nominal income spent on non-tradable differentiated goods. Therefore, the

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demand for variety ω can be written as:

$$y_t^N(\omega) = \sigma \ln\left(\frac{\bar{p}_t^N}{p_t^N(\omega)}\right)\frac{P_t^N Y_t^N}{p_t^N(\omega)}.$$

B Wage Determination

Consider a worker with idiosyncratic productivity z. The sharing rule implies:

$$\eta\Delta_t^F(z) = (1-\eta)\Delta_t^W(z), \tag{A-1}$$

where $\Delta_t^W(z)$ and $\Delta_t^F(z)$ denote, respectively, worker's and firm's real surplus, and η is the worker's bargaining weight. The worker's surplus is given by

$$\Delta_t^W(z) = w_t(z) - \varpi_t + E_t\tilde{\beta}_{t,t+1}\left(1 - G\left(z_{t+1}^c\right)\right)\tilde{\Delta}_{t+1}^W, \tag{A-2}$$

where $\tilde{\beta}_{t,t+1} \equiv (1-\lambda)\,\beta_{t,t+1}$, and

$$\tilde{\Delta}_t^W \equiv \left[1 - G\left(z_t^c\right)\right]^{-1}\int_{z_t^c}^{\infty}\Delta_t^W(z)g(z)dz$$

represents the average surplus accruing to the worker when employed in firm . The term ϖ_t is the worker's outside option, defined in the text:

$$\varpi_t \equiv h_p + b_t + \iota_t E_t\left[\tilde{\beta}_{t,t+1}\left(1 - G\left(z_{t+1}^c\right)\right)\tilde{\Delta}_{t+1}^W\right].$$

The firm surplus corresponds to the value of the job to the firm, $J_t(z)$, plus savings from firing costs F, i.e., $\Delta_t^F(z) = J_t(z) + F_t$—as pointed out by Mortensen and Pissarides (2002), the outside option for the firm in wage negotiations is firing the worker, paying firing costs. The value of the job to the firm corresponds to the revenue generated by the match, plus its expected discounted continuation value, net of the cost of production (the wage bill and the rental cost of capital):

$$J_t(z) = \varphi_t Z_t z k_t^{\alpha}(z) - w_t(z) - r_t^K k_t(z) + E_t\tilde{\beta}_{t,t+1}\left[\left(1 - G\left(z_{t+1}^c\right)\right)\tilde{\Delta}_{t+1}^F - G\left(z_{t+1}^c\right)F_{t+1}\right],$$

where $\tilde{\Delta}_t^F \equiv \left[1 - G\left(z_t^c\right)\right]^{-1}\int_{z_t^c}^{\infty}\Delta_t^F(z)g(z)dz$ corresponds to the Lagrange multiplier ψ_t in the firm profit maximization.

For each job, the producer equates the marginal revenue product of capital to its rental cost:

$$\alpha\varphi_{\omega t}Z_t z k_{\omega t}^{\alpha-1}(z) = r_t^K. \tag{A-3}$$

Let $\tilde{k}_{\omega t} \equiv \left[1 - G\left(z_{\omega t}^c\right)\right]^{-1}\int_{z_{\omega t}^c}^{\infty}k_{\omega t}(z)\,g(z)dz$ be the average capital stock per worker. Equation (A-3) implies:

$$\tilde{k}_{\omega t} = \left(\frac{r_t^K}{\alpha \varphi_{\omega t} Z_t}\right)^{\frac{1}{\alpha-1}} \tilde{z}_{\omega t}^{\frac{1}{1-\alpha}}, \tag{A-4}$$

where $\tilde{z}_{\omega t}$ is defined as in the main text: $\tilde{z}_{\omega t} \equiv \left[\int_{z_{\omega t}^c}^{\infty} z^{1/(1-\alpha)} \frac{g(z)}{1-G(z_{\omega t}^c)} dz\right]^{1-\alpha}$. Let $\psi_{\omega t}$ be the Lagrange multiplier on the constraint $l_{\omega t} = (1-\lambda_{\omega t})(l_{\omega t-1} + q_{t-1} v_{\omega t-1})$, corresponding to the average marginal revenue product of a job. The first-order condition for $v_{\omega t}$ and $l_{\omega t}$ imply, respectively:

$$\frac{\kappa}{q_t} = E_t \left\{ \tilde{\beta}_{t,t+1} \left[(1 - G(z_{\omega t+1}^c)) \psi_{\omega t+1} - G(z_{\omega t+1}^c) F_{t+1} \right] \right\}, \tag{A-5}$$

$$\psi_{\omega t} = \varphi_{\omega t} \frac{y_{\omega t}}{l_{\omega t}} - \tilde{w}_{\omega t} - r_t^K \tilde{k}_{\omega t} + \frac{\kappa}{q_t}, \tag{A-6}$$

By combining equations (A-3) and (A-4), we obtain

$$k_{\omega t}(z) = \tilde{k}_{\omega t} \left(\frac{z}{\tilde{z}_{\omega t}}\right)^{\frac{1}{1-\alpha}}. \tag{A-7}$$

Using equations (A-3), (A-7), and (A-6), $J_t(z)$ can then be written as

$$J_t(z) = \pi_t(z) - w_t(z) + \frac{k}{q_t}. \tag{A-8}$$

where

$$\pi_t(z) \equiv (1-\alpha) \varphi_t \frac{y_t}{l_t} \left(\frac{z}{\tilde{z}_t}\right)^{1/(1-\alpha)}$$

denotes the marginal revenue product of the worker. Therefore, the firm surplus is equal to

$$\Delta_t^F(z) = \pi_t(z) - w_t(z) + \frac{k}{q_t} + F_t. \tag{A-9}$$

Since the sharing rule in (A-1) implies that $\tilde{\Delta}_t^W = \tilde{\Delta}_t^F \eta/(1-\eta)$, the worker surplus can be written as:

$$\Delta_t^W(z) = w_t(z) - \varpi_t + \frac{\eta}{1-\eta} E_t \left\{ \tilde{\beta}_{t,t+1} \left[1 - G(z_{t+1}^c)\right] \left(\tilde{J}_{t+1}(z) + F_{t+1} \right) \right\}.$$

Using equation (A-5), we obtain:

$$\Delta_t^W(z) = w_t(z) - \varpi_t + \frac{\eta}{1-\eta} \left[\frac{\kappa}{q_t} + E_t \left(\tilde{\beta}_{t,t+1} F_{t+1} \right) \right]. \tag{A-10}$$

Inserting equations (A-9) and (A-10) into the sharing rule (A-1), we finally obtain:

$$w_t(z) = \eta \left[\pi_t(z) + F_t - (1-\lambda) E_t \left(\beta_{t,t+1} F_{t+1} \right) \right] + (1-\eta) \varpi_t,$$

which corresponds to equation (6) in the main text. The average wage $\tilde{w}_t$ is then given by

$$\tilde{w}_t = \eta \left[\tilde{\pi}_t + F_t - (1-\lambda) E_t \left(\beta_{t,t+1} F_{t+1}\right)\right] + (1-\eta) \varpi_t. \quad \text{(A-11)}$$

Finally, notice that in the symmetric equilibrium the worker outside option reduces to:

$$\varpi_t \equiv h_p + b_t + \frac{\eta}{1-\eta} \left[\kappa \vartheta_t + \iota_t E_t \left(\tilde{\beta}_{t,t+1} F_{t+1}\right)\right].$$

Therefore, in equilibrium, the average wage is given by:

$$\tilde{w}_t = \eta \left[\tilde{\pi}_t + \kappa \vartheta_t + F_t - (1-\lambda)(1-\iota_t) E_t \left(\beta_{t,t+1} F_{t+1}\right)\right] + (1-\eta)\left(h_p + b_t\right).$$

C First-Order Conditions for Household Intertemporal Behavior and Capital Utilization

The Euler equation for share holdings is: $e_t^N = E_t \left[\beta_{t,t+1} \left(d_{t+1}^N + e_{t+1}^N\right)\right]$; the Euler equation for capital accumulation requires: $\zeta_{K,t} = E_t \left\{\beta_{t,t+1} \left[r_{t+1}^K u_{K,t+1} + (1-\delta_{K,t+1}) \zeta_{K,t+1}\right]\right\}$, where $\zeta_{K,t}$ denotes the shadow value of capital (in units of consumption), defined by the first-order condition for investment $I_{K,t}$:

$$\begin{aligned} \zeta_{K,t}^{-1} &= \left[1 - \frac{\nu_K}{2} \left(\frac{I_{K,t}}{I_{K,t-1}} - 1\right)^2 - \nu_K \left(\frac{I_{K,t}}{I_{K,t-1}} - 1\right) \left(\frac{I_{K,t}}{I_{K,t-1}}\right)\right] \\ &\quad + \nu_K \beta_{t,t+1} E_t \left[\frac{\zeta_{K,t+1}}{\zeta_{K,t}} \left(\frac{I_{K,t+1}}{I_{K,t}} - 1\right) \left(\frac{I_{K,t+1}}{I_{K,t}}\right)^2\right]. \end{aligned}$$

The optimal condition for capital utilization implies: $r_t^K = \varkappa u_{K,t}^{1+\varsigma} \zeta_{K,t}$. Finally, the Euler equations for bond holdings are:

$$1 + \psi a_{t+1} = (1 + r_{t+1}) E_t \left(\beta_{t,t+1}\right),$$

$$1 + \psi a_{*t+1} = \left(1 + r_{t+1}^*\right) E_t \left(\beta_{t,t+1} \frac{Q_{t+1}}{Q_t}\right).$$

D Equilibrium and Model Summary

In equilibrium, 57 equations determine 57 endogenous variables: C_t, C_t^N, C_t^T, $C_{D,t}^T$, $C_{X,t}^T$, φ_t, ρ_t^N, $\rho_{\omega,t}^N$, ρ_t^T, $\rho_{D,t}^T$, $Y_{T,t}^I$, $Y_{T,t}^N$, Y_t^C, Y_t^T, Y_t^N, N_{t+1}, $N_{E,t}$, L_t, V_t, M_t, z_t^c, $\tilde{K}_{t+1}$, $u_{K,t}$, $I_{K,t}$, $\zeta_{K,t}$, a_{t+1}, a_{*t+1}, r_t, their Foreign counterparts, and Q_t. Additionally, the model features eight exogenous variables: the aggregate productivity processes, Z_t and Z_t^*, red-tape costs of entry, f_{Rt} and f_{Rt}^*, unemployment benefits, b_t and b_t^*, and firing costs, F_t and F_t^*. Table A.1 summarizes the key equilibrium conditions of the model. For brevity, the Foreign counterparts of the first 28 equations are omitted. The variables ι_t, q_t, $\tilde{z}_t$, μ_t^N, and $\rho_{X,t}^T$ that appear in the table depend on the variables listed above as described in the main text.

E Sunk Entry Costs in Units of Intermediate Input

For robustness, we consider an alternative version of the model in which the sunk entry cost is denominated in units of final the intermediate input, Y_t^I. Relative to the benchmark model, three equations are affected. First, the free entry condition now implies $e_t^N = \varphi_t f_{E,t}$, where φ_t is the price of the intermediate input. Second, aggregate demand of the consumption basket no longer includes expenditures on product creation, i.e., Y_t^C is now equal to the sum of market consumption, investment in physical capital, and the costs associated to job creation and destruction:

$$Y_t^C = C_t + I_{K,t} + \kappa V_t + \frac{G\left(z_t^c\right) L_t}{1 - G\left(z_t^c\right)} F_t.$$

Finally, since the intermediate input is now used also to produce new products, labor market clearing requires:

$$Z_t \tilde{z}_t K_t^{\alpha} L_t^{1-\alpha} = \exp\left\{\frac{\tilde{N} - N_t}{2\sigma \tilde{N} N_t}\right\} Y_t^N + Y_{T,t}^I + N_{E,t} f_{E,t}.$$

None of our results is significantly affected by changing the denomination of the entry cost. Results are available upon request.

F Market Regulation

Regulation in the Euro Area: Core and Periphery

Table A.2 presents data on product and labor market regulation in core and periphery euro area countries.

Calibration of Red Tape Costs

Ebell and Haefke (2009) estimate the regulation cost of market entry for 17 advanced countries in the year 1997. They measure the average number of months of output lost due to administrative delays and fees. Data about administrative delays are taken from the Logotech S.A dataset, as reported by the OECD's 1998 "Fostering Entrepreneurship" Report and Pissarides (2003). Data on entry fees come from Djankov, Porta, Lopez-De-Silanes, and Shleifer (2002).

In the absence of more recent estimates, and in order to capture various product market reforms carried out in most advanced economies since 1997, we update the Ebell and Haefke's measure for 2013 by making use of the OECD's barriers to entrepreneurship indicators, which are available for the years 1998 and 2013 (see Koske, Wanner, Bitetti, and Barbiero, 2014 for details). The index, measured on a 0-6 scale, measures "administrative burdens on start-ups", capturing both delays and fees.

Our procedure is the following. First, for the year 1997, we regress the log of total entry costs in Ebell and Haefke (2009) on the OECD indicator of administrative burdens on start-up. The implied coefficient is 0.854 with a $t - stat$ of 4.87 corresponding to a correlation coefficient of 0.78.

The constant term is -1.345. Not surprisingly, there is a very strong correlation between Ebell and Haefke's quantitative estimate of total entry costs and the OECD indicator.[1] Next, we then plug the numerical value of the OECD's indicator for 2013 into this regression, obtaining an updated estimate of Ebell and Haefke's total entry costs for each country in 2013.

Finally, we compute the relevant cross-country averages to calibrate the average value of regulatory entry costs. We consider a weighted average of the index values across euro area member countries, with weights equal to the contributions of individual countries' GDPs to euro area total GDP.

G Data-Consistent Variables

First, recall that the welfare-based price indexes imply:

$$P_t = \left[(1-\alpha_N)\left(P_t^T\right)^{1-\phi_N} + \alpha_N\left(P_t^N\right)^{1-\phi_N}\right]^{\frac{1}{1-\phi_N}},$$

$$P_t^T = \left[(1-\alpha_X)\left(P_{D,t}^T\right)^{1-\phi_T} + \alpha_X\left(P_{X,t}^{T*}\right)^{1-\phi_T}\right]^{\frac{1}{1-\phi_T}}.$$

Next, define the variety effect as

$$\Delta_t^N \equiv \exp\left\{\frac{\tilde{N}-N_t}{2\sigma\tilde{N}N_t}\right\}.$$

Therefore

$$\begin{aligned} P_t^N &= \Delta_t^N \tilde{P}_t^N, \\ P_{D,t}^T &= \left(\Delta_t^N\right)^{\xi-1}\tilde{P}_{D,t}^T, \\ P_{X,t}^{T*} &= \left(\Delta_t^{N*}\right)^{\xi-1}\tilde{P}_{X,t}^{T*}. \end{aligned}$$

Therefore

$$P_t = \left[(1-\alpha_N)\left(P_t^T\right)^{1-\phi_N} + \alpha_N\left(\Delta_t^N\tilde{P}_t^N\right)^{1-\phi_N}\right]^{\frac{1}{1-\phi_N}}$$

and

$$P_t^T = \left[(1-\alpha_X)\left[\left(\Delta_t^N\right)^{\xi-1}\tilde{P}_{D,t}^T\right]^{1-\phi_T} + \alpha_X\left[\left(\Delta_t^{N*}\right)^{\xi-1}\tilde{P}_{X,t}^{T*}\right]^{1-\phi_T}\right]^{\frac{1}{1-\phi_T}}.$$

By combining the above results, we obtain:

$$P_t^{1-\phi_N} = (1-\alpha_N)\left[(1-\alpha_X)\left(\left(\Delta_t^N\right)^{\xi-1}\tilde{P}_{D,t}^T\right)^{1-\phi_T} + \alpha_X\left(\left(\Delta_t^{N*}\right)^{\xi-1}\tilde{P}_{X,t}^{T*}\right)^{1-\phi_T}\right]^{\frac{1-\phi_N}{1-\phi_T}} + \alpha_N\left(\Delta_t^N\tilde{P}_t^N\right)^{1-\phi_N}.$$

[1] Interestingly, there is no statistically significant cross-country correlation between Ebell and Haefke's estimate and the other components of the OECD's barriers to entrepreneurship indicators, such as "complexity of regulatory procedures" and "regulatory protection of incumbents". This clearly indicates that the "administrative burdens on start-ups" component does indeed capture firm entry costs.

The deflator is then given by

$$\Omega_t \equiv (1-\alpha_N)\left\{(1-\alpha_X)\left[\left(\Delta_t^N\right)^{\xi-1}\right]^{1-\phi_T} + \alpha_X\left(\left(\Delta_t^{N*}\right)^{\xi-1}\right)^{1-\phi_T}\right\}^{\frac{1-\phi_N}{1-\phi_T}} + \alpha_N\left(\Delta_t^N\right)^{1-\phi_N}.$$

As discussed in the main text, we construct an average price index as

$$\tilde{P}_t = \Omega_t^{\frac{1}{\phi_N-1}} P_t.$$

In turn, given any variable X_t in units of consumption, its data-consistent counterpart is:

$$X_{R,t} \equiv \frac{P_t X_t}{\tilde{P}_t} = X_t \Omega_t^{\frac{1}{(1-\phi_N)}}.$$

H Welfare Calculations

Welfare Calculations

When reforms are undertaken at the steady state, we compute the percentage increase of steady-state consumption Δ that would make the household indifferent between not implementing a given reform (consuming C, constant, in each period) and deregulating (consuming C_t, time varying until the economy reaches the new steady state):

$$\left[C\left(1+\frac{\Delta}{100}\right)\right]^{1-\gamma} = (1-\beta)\sum_{t=0}^{\infty}\beta^t C_t^{1-\gamma}$$

When the economy is out-of the steady state, we compute the welfare effects of deregulating markets as the difference

$$\Delta = \Delta^{SR} - \Delta^{R}.$$

The term Δ^{SR} is the the percentage of steady-state consumption that would leave the household indifferent between facing market deregulation at time $t=0$ when aggregate productivity is in state S (consuming C_t^{SR}, time varying until the economy reaches the new steady state) and consuming the pre-deregulation steady-state level, C, constant, in each period:

$$\left[C\left(1+\frac{\Delta^{SR}}{100}\right)\right]^{1-\gamma} = (1-\beta)\sum_{t=0}^{\infty}\beta^t\left(C_t^{SR}\right)^{1-\gamma}$$

The term Δ^{S} is the the percentage of steady-state consumption that would leave the household indifferent between facing the same temporary productivity realization that brings the economy in state S at time $t=0$ (consuming C_t^{S}, time varying until the economy returns to the initial steady state) and consuming the pre-deregulation steady-state level, C, constant, in each period:

$$\left[C\left(1+\frac{\Delta^S}{100}\right)\right]^{1-\gamma}=(1-\beta)\sum_{t=0}^{\infty}\beta^t\left(C_t^R\right)^{1-\gamma}.$$

I Productivity Shocks with and without Reforms

See Figures A.1-A.4.

J Home Production Reforms: Normal Times versus Recession

See Figures A.5 and A.6.

K Labor Market Reforms under Financial Autarky

See Figures A.7-A.9.

L The Role of Sectoral Spillovers

The model makes it possible to quantify the importance of input-output linkages for the consequences of lowering barriers to entry in the non-tradable sector. The key parameter governing sectoral interdependence is the share of non-tradables in production of tradables, $1-\xi$. When $0<1-\xi\leqslant 1$, input-output linkages affect the consequences of service-sector liberalization through three channels. First, the increase in the number of producers in the non-tradable sector lowers markups, reducing, other things equal, the marginal cost of production in the tradable sector. Second, variety effects associated with higher N_t reduce the price of the non-tradable basket, akin to an endogenous increase in the productivity of the tradable sector. Finally, input-output linkages increase total demand for non-tradable producers, expanding the market size.

To address the importance of input-output linkages, we study the effects of product market deregulation when $1-\xi=0$, i.e., in the absence of sectoral spillovers. In the long-run, product market deregulation results in a smaller output gain for the Home economy (1.74 percent instead of 2.21 percent), and in a smaller increase in the number of Home producers (7.1 percent instead of 7.4 percent). During the dynamic adjustment, the Home economy runs a smaller current account deficit relative to the benchmark scenario, and it experiences a smaller drop in aggregate consumption and slower producer entry. These results reflect the combined effect of the three channels discussed above. First, a smaller market for non-tradable varieties dampens, other things equal, the increase in the present discounted value of product creation, reducing the need to borrow from abroad. Second, as markups fall by less and productivity gains are muted, aggregate demand is lower, ultimately reducing the expansion of the deregulating economy.

Home's terms of trade continue to improve in the first phase of the transition following deregulation, although the effect is smaller in the absence of input-output linkages. In the long run, Home's terms of trade deteriorate by less relative to baseline scenario. Such dynamics reflect two opposing forces induced by the absence of sectoral spillovers. On one side, lower demand for the intermediate input by new entrants result, indirectly, in lower real marginal costs for tradable producers (and thus lower export prices). On the other side, higher markups and lower productivity in the tradable sector contribute to increase the price of Home tradables relative to Foreign. In the first phase of the transition, the first effect dominates, with a positive effect on the external competitiveness of the Home economy. By contrast, in the long-run, the negative effect of smaller product creation on markups and productivity prevails.

Finally, as shown in Figures A.10 and A.11, the strength of input-output linkages does not affect the conclusion that product market deregulation has rather similar implications in normal and crisis times. That is, even when $1-\xi=0$, the dynamics of a product market reform implemented during a recession remain rather similar to those observed in normal times, since the tradeoffs discussed in previous section remain substantially unaffected.

TABLE A.1: MODEL SUMMARY

$$L_t = (1-\lambda)\left(1-G\left(z_t^c\right)\right)\left(L_{t-1}+M_{t-1}\right)$$
$$\tilde{K}_{t+1} = (1-\delta_{Kt})\tilde{K}_t + I_{K,t}\left[1-\frac{\nu_K}{2}\left(\frac{I_{K,t}}{I_{K,t-1}}-1\right)^2\right]$$
$$N_{t+1} = (1-\delta)\left(N_t+N_{E,t}\right)$$
$$M_t = \chi\left(1-L_t\right)_t^{\varepsilon}V_t^{1-\varepsilon}$$
$$1 = (1-\alpha_N)\left(\rho_t^T\right)^{1-\phi_N} + \alpha_N\left(\rho_t^N\right)^{1-\phi_N}$$
$$1 = (1-\alpha_X)\left(\frac{\rho_{D,t}^T}{\rho_t^T}\right)^{1-\phi_T} + \alpha_X\left(\frac{\rho_{X,t}^{T^*}}{\rho_t^T}\right)^{1-\phi_T}$$
$$\rho_{\omega t}^N = \exp\left\{-\frac{\tilde{N}-N_t}{2\sigma\tilde{N}N_t}\right\}\rho_t^N$$
$$Z_t\tilde{z}_t\left(u_{K,t}\tilde{K}_t\right)^{\alpha}L_t^{1-\alpha} = \exp\left\{\frac{\tilde{N}-N_t}{2\sigma\tilde{N}N_t}\right\}Y_t^N + Y_{T,t}^I$$
$$Y_t^N = C_t^N + Y_{T,t}^N$$
$$Y_t^T = C_{D,t}^T + \tau_t C_{X,t}^T$$
$$Y_t^T = \left(Y_{T,t}^I\right)^{\xi}\left(Y_{T,t}^N\right)^{1-\xi}$$
$$Y_t^C = C_t + I_{K,t} + N_{E,t}f_{E,t} + \kappa V_t + \frac{G(z_t^c)}{1-G(z_t^c)}F_tL_t$$
$$\frac{\kappa}{q_t} = E_t\left\{\tilde{\beta}_{t,t+1}\left[(1-\eta)(1-\alpha)\left(1-G\left(z_{t+1}^c\right)\right)\varphi_{t+1}Z_{t+1}\tilde{z}_{t+1}\left(\frac{u_{Kt+1}K_{t+1}}{L_{t+1}}\right)^{\alpha}\left(1-\left(\frac{z_{t+1}^c}{\tilde{z}_{t+1}}\right)^{\frac{1}{1-\alpha}}\right)-F_{t+1}\right]\right\}$$
$$\frac{\kappa(q_t\eta\vartheta_t-1)}{q_t} = (1-\eta)\left[(1-\alpha)\varphi_tZ_t\tilde{z}_t\left(\frac{u_{Kt}K_t}{L_t}\right)^{\alpha}\left(\frac{z_t^c}{\tilde{z}_t}\right)^{\frac{1}{1-\alpha}}-(h_p+b_t)\right] + (1-\eta)F_t + \eta(1-\iota_t)E_t\left(\tilde{\beta}_{t,t+1}F_{t+1}\right)$$
$$\xi\rho_{D,t}^TY_t^T = \varphi_tY_{T,t}^I,$$
$$(1-\xi)\rho_{D,t}^TY_t^T = \rho_t^NY_{T,t}^N$$
$$\rho_{\omega,t}^N = \mu_t^N\varphi_t$$
$$\zeta_{K,t}^{-1} = \left[1-\frac{\nu_K}{2}\left(\frac{I_{K,t}}{I_{K,t-1}}-1\right)^2-\nu_K\left(\frac{I_{K,t}}{I_{K,t-1}}-1\right)\left(\frac{I_{K,t}}{I_{K,t-1}}\right)\right]+\nu_K\beta_{t,t+1}E_t\left[\frac{\zeta_{K,t+1}}{\zeta_{K,t}}\left(\frac{I_{K,t+1}}{I_{K,t}}-1\right)\left(\frac{I_{K,t+1}}{I_{K,t}}\right)^2\right]$$
$$\zeta_{K,t} = E_t\left\{\beta_{t,t+1}\left[\alpha\varphi_{t+1}Z_{t+1}\tilde{z}_{t+1}\left(\frac{u_{K,t+1}K_{t+1}}{L_{t+1}}\right)^{\alpha-1}+\left(1-\delta_{K,t+1}\right)\zeta_{K,t+1}\right]\right\}$$
$$\alpha\varphi_tZ_t\tilde{z}_t\left(\frac{u_{Kt}K_t}{L_t}\right)^{\alpha-1} = \varkappa u_{K,t}^{1+\varsigma}\zeta_{K,t}$$
$$\varphi_tf_{Et} = (1-\delta)E_t\left\{\beta_{t,t+1}\left[\varphi_{t+1}f_{Et+1}+\left(1-\frac{1}{\mu_{t+1}}\right)\frac{\rho_{t+1}^N\left(C_{t+1}^N+Y_{Tt+1}^N\right)}{N_{t+1}}\right]\right\}$$
$$1+\psi a_{t+1} = (1+r_{t+1})E_t\left(\beta_{t,t+1}\right)$$
$$1+\psi a_{*t+1} = \left(1+r_{t+1}^*\right)E_t\left(\beta_{t,t+1}\frac{Q_{t+1}}{Q_t}\right)$$
$$C_t^N = \alpha_N\left(\rho_t^N\right)^{-\phi_N}Y_t^C$$
$$C_t^T = (1-\alpha_N)\left(\rho_t^T\right)^{-\phi_N}Y_t^C$$
$$C_{D,t}^T = (1-\alpha_X)\left(\frac{\rho_{D,t}^T}{\rho_t^T}\right)^{-\phi_T}C_t^T$$
$$C_{X,t}^T = \alpha_X\left(\frac{\rho_{X,t}^T}{\rho_t^{T^*}}\right)^{-\phi_T}C_t^{T^*}$$
$$a_{t+1}+a_{t+1}^* = 0$$
$$a_{*t+1}^*+a_{*t+1} = 0$$
$$a_{t+1}+Q_ta_{*t+1} = (1+r_t)a_t + Q_t(1+r_t^*)a_{*t} + Q_t\rho_{X,t}^TC_{X,t}^T - \rho_{X,t}^{T^*}C_{X,t}^{T^*}$$

TABLE A.2: REGULATION IN THE EURO AREA

	Core	Periphery
Product Market Regulation, OECD Regulation Index Retail Industry, 2013	2.58	2.94
Unemployment Benefits, Gross Replacement Rate, 2013	29.4	34.9
Employment Protection Legislation, OECD Index, 2013	2.59	2.34

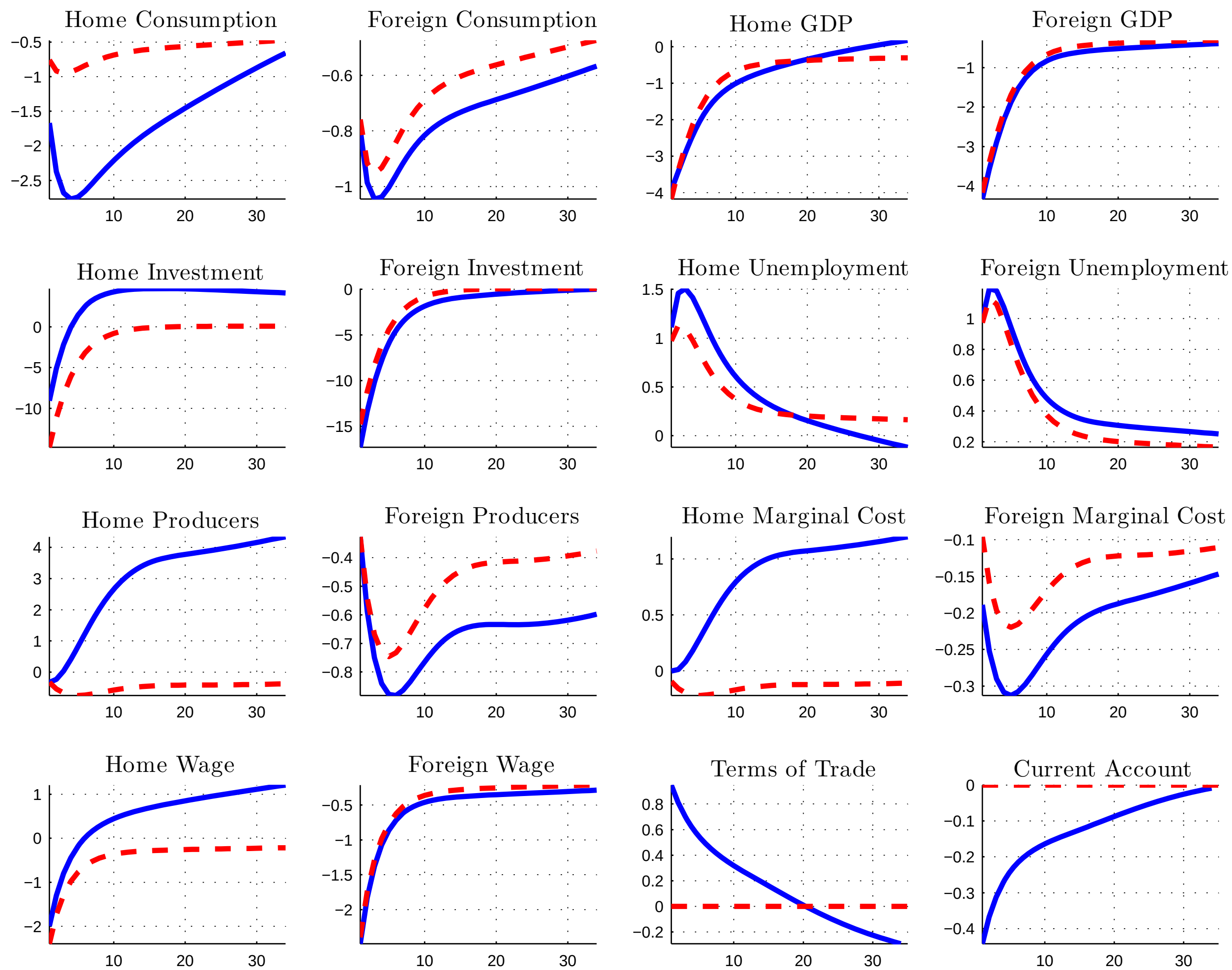

Figure A.1. Home and Foreign productivity shock followed by Home product market reform (continuous lines) versus Home and Foreign productivity shock in the absence of Home product market reform (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state

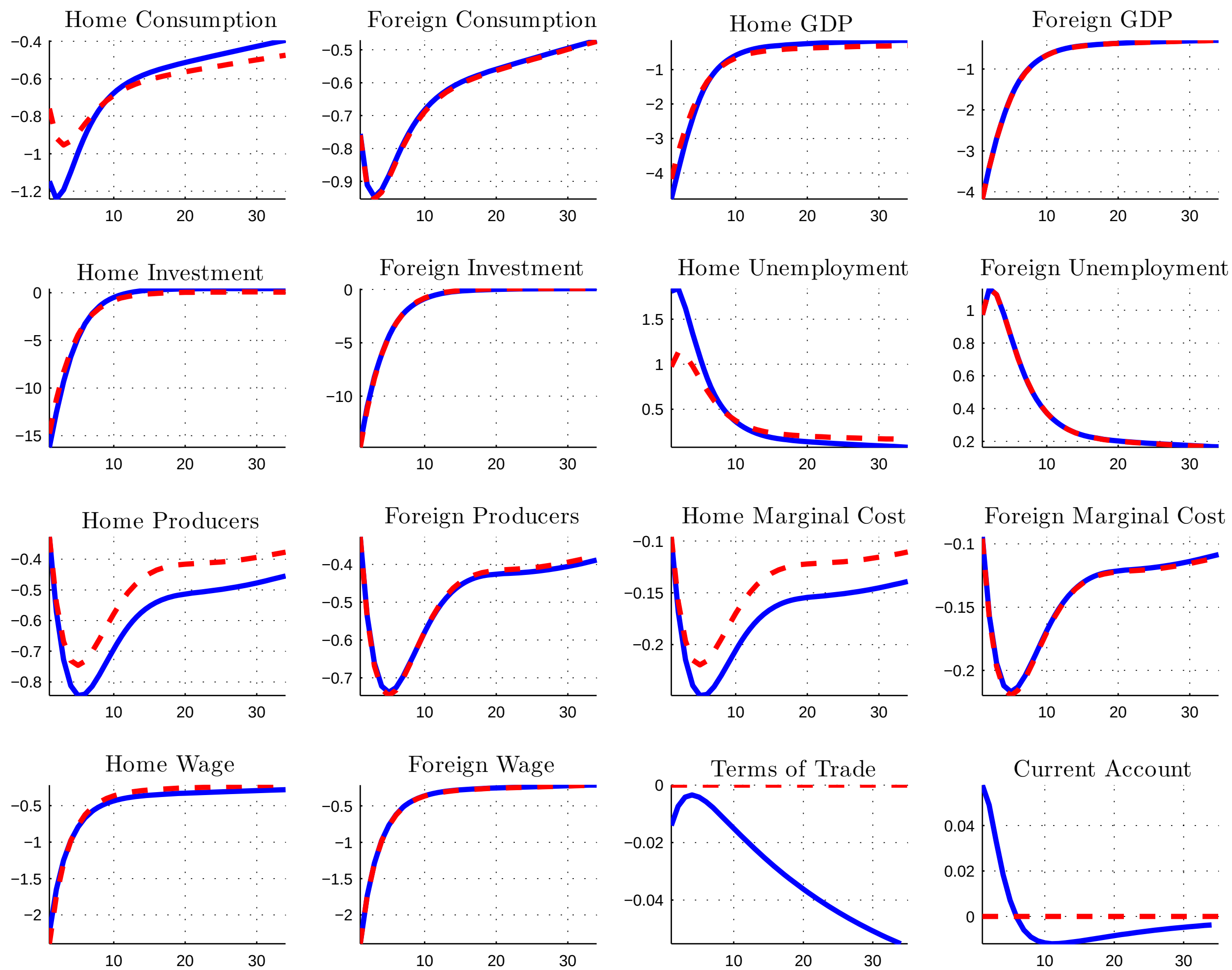

Figure A.2. Home and Foreign productivity shock followed by Home firing costs reform (continuous lines) versus Home and Foreign productivity shock in the absence of Home labor market reform (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

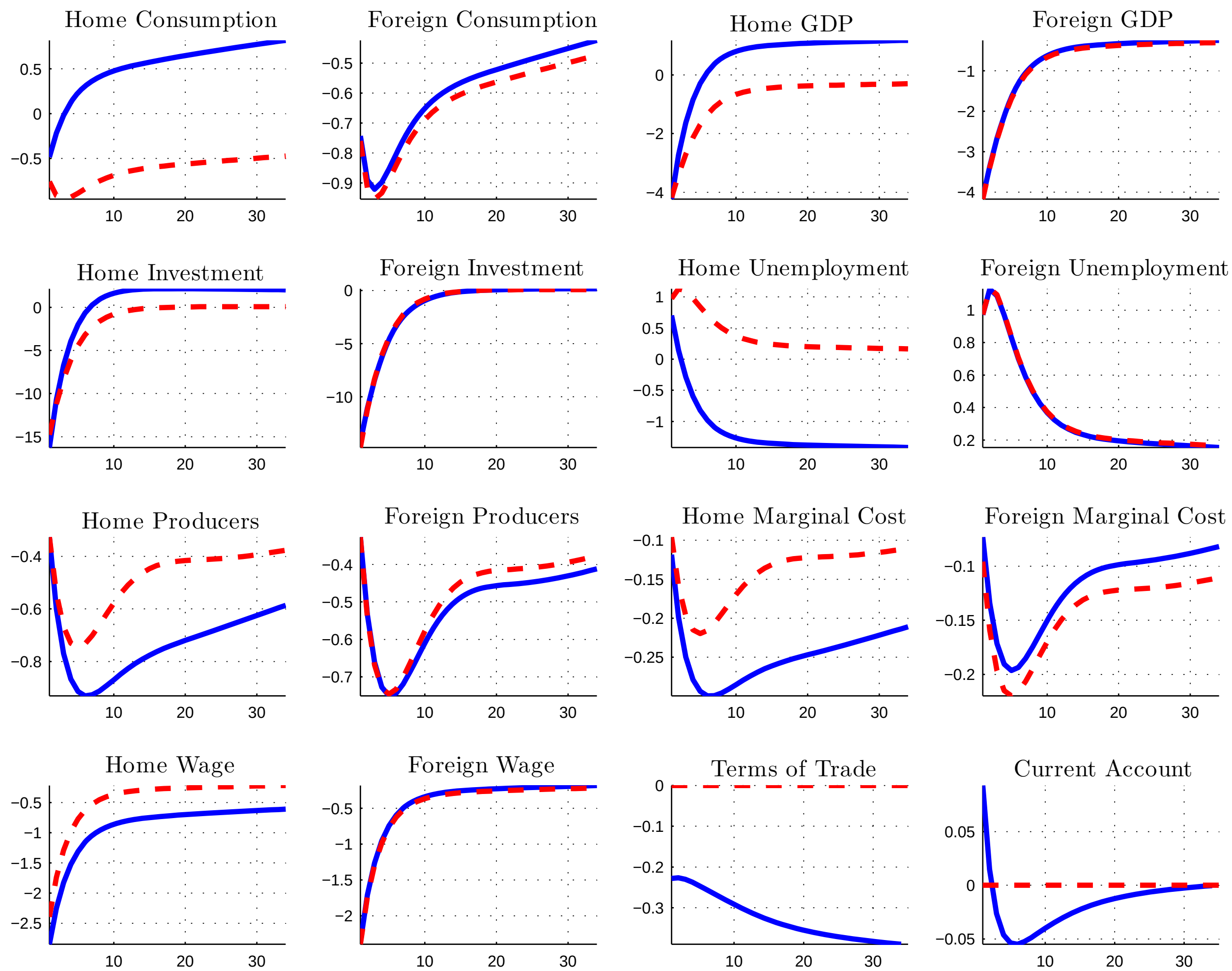

Figure A.3. Home and Foreign productivity shock followed by Home unemployment benefits reform (continuous lines) versus Home and Foreign productivity shock in the absence of Home labor market reform (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

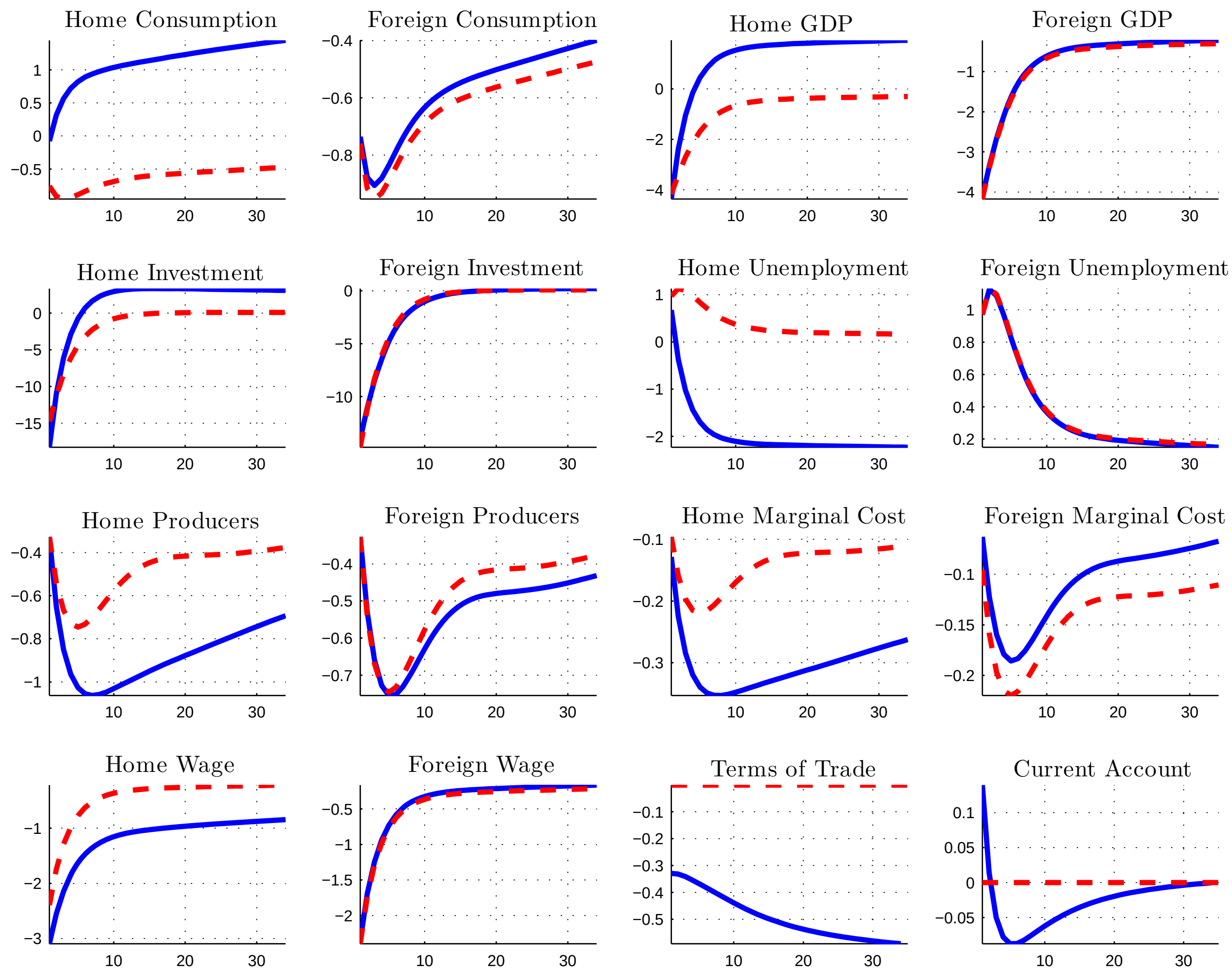

Figure A.4. Home and Foreign productivity shock followed by reduction in home production value at Home (continuous lines) versus Home and Foreign productivity shock in the absence of Home labor market reform (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

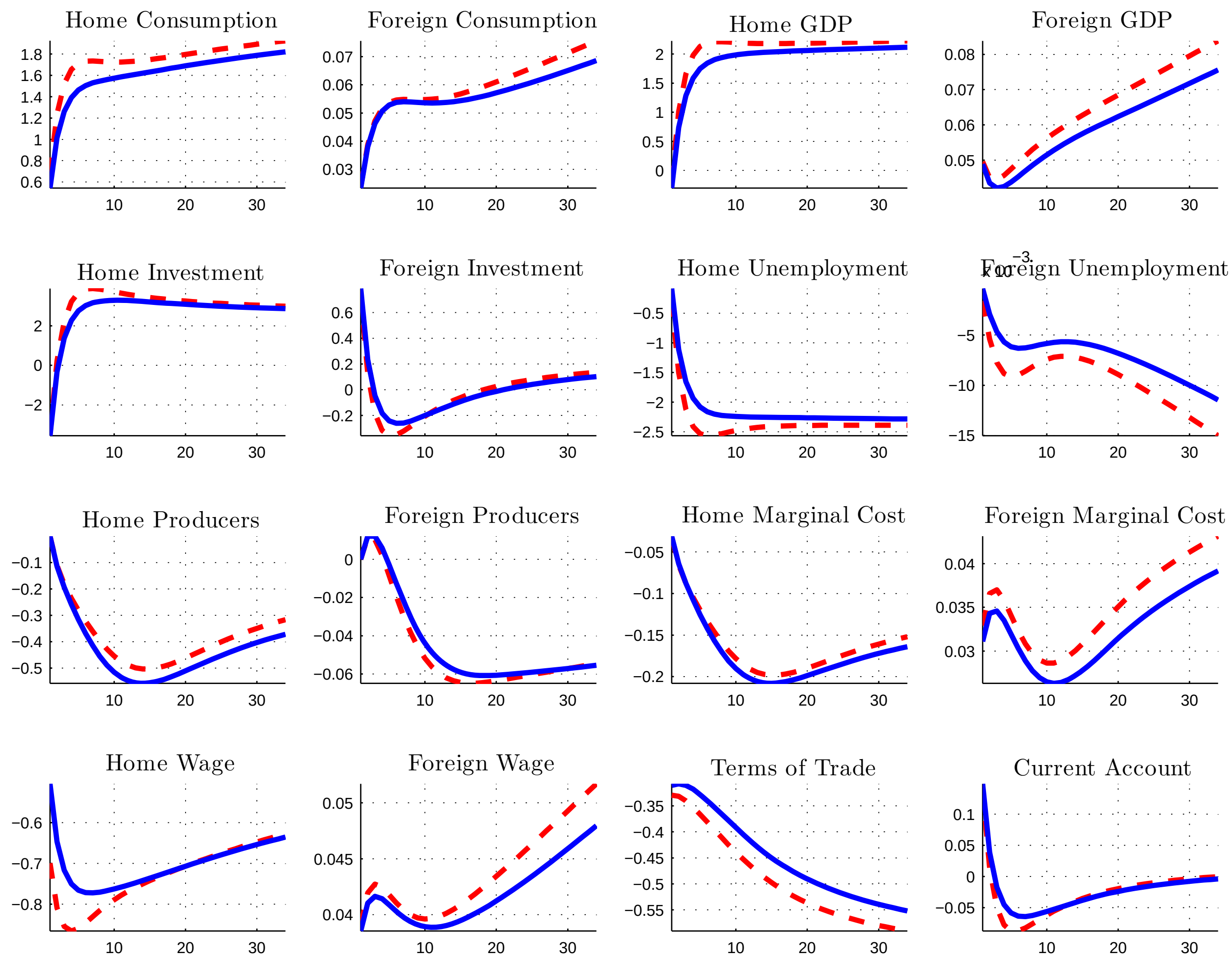

Figure A.5. Reduction in home production value at Home, normal times (continuous lines) versus recession (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

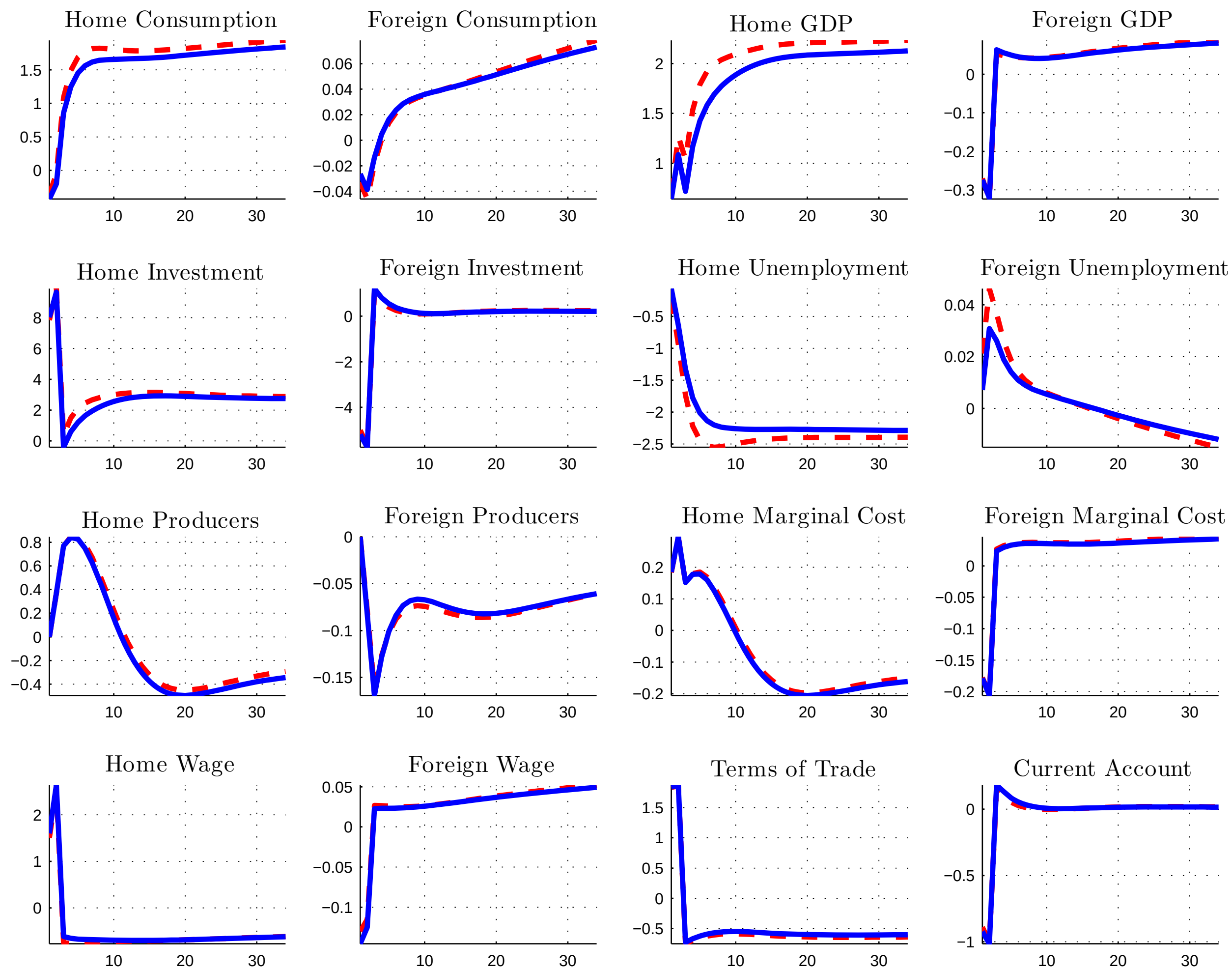

Figure A.6. Anticipated reduction in home production value at Home, normal times (continuous lines) versus recession (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

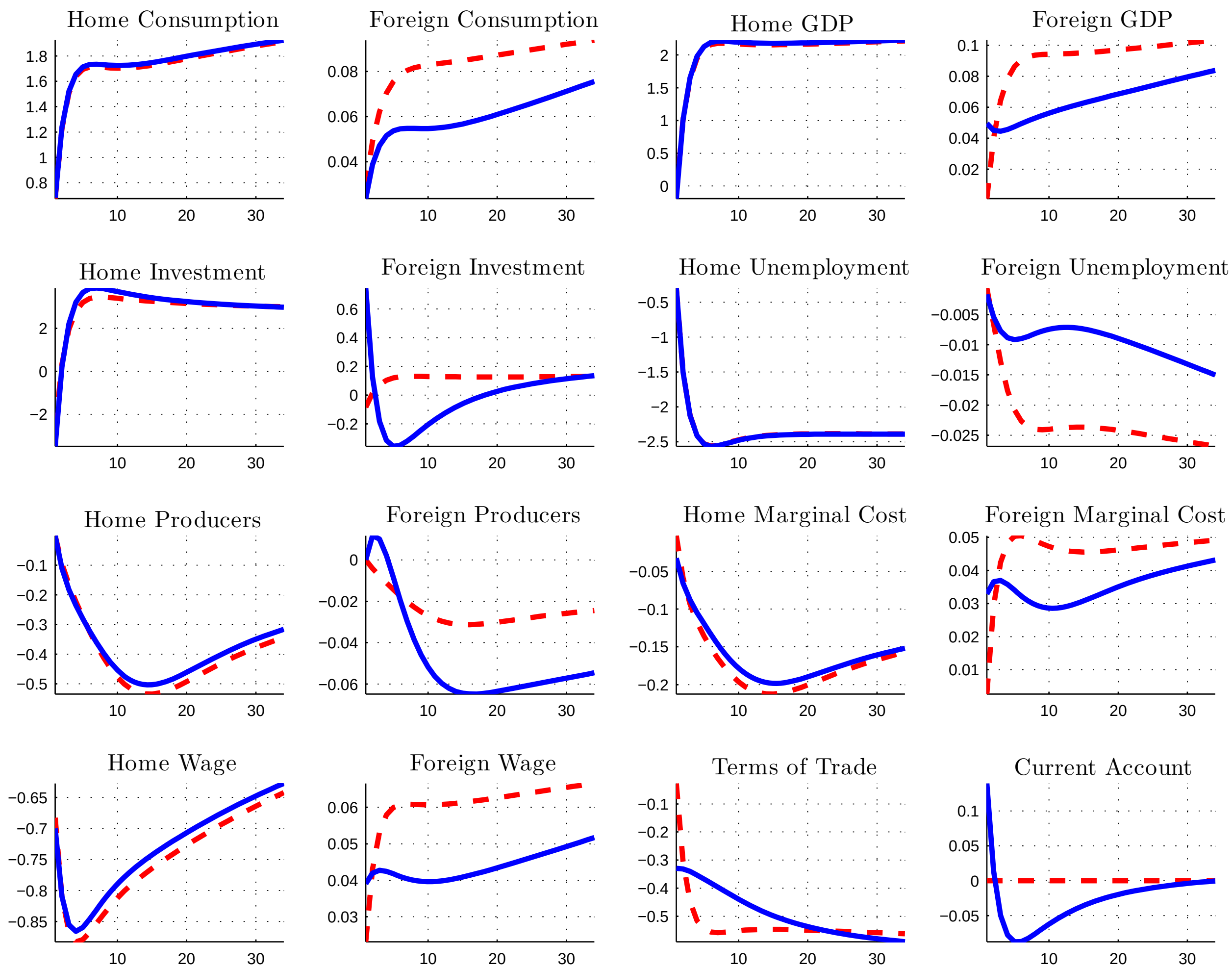

Figure A.7. Home firing costs reform in a recession, open capital account (continuous lines) versus financial autarky (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

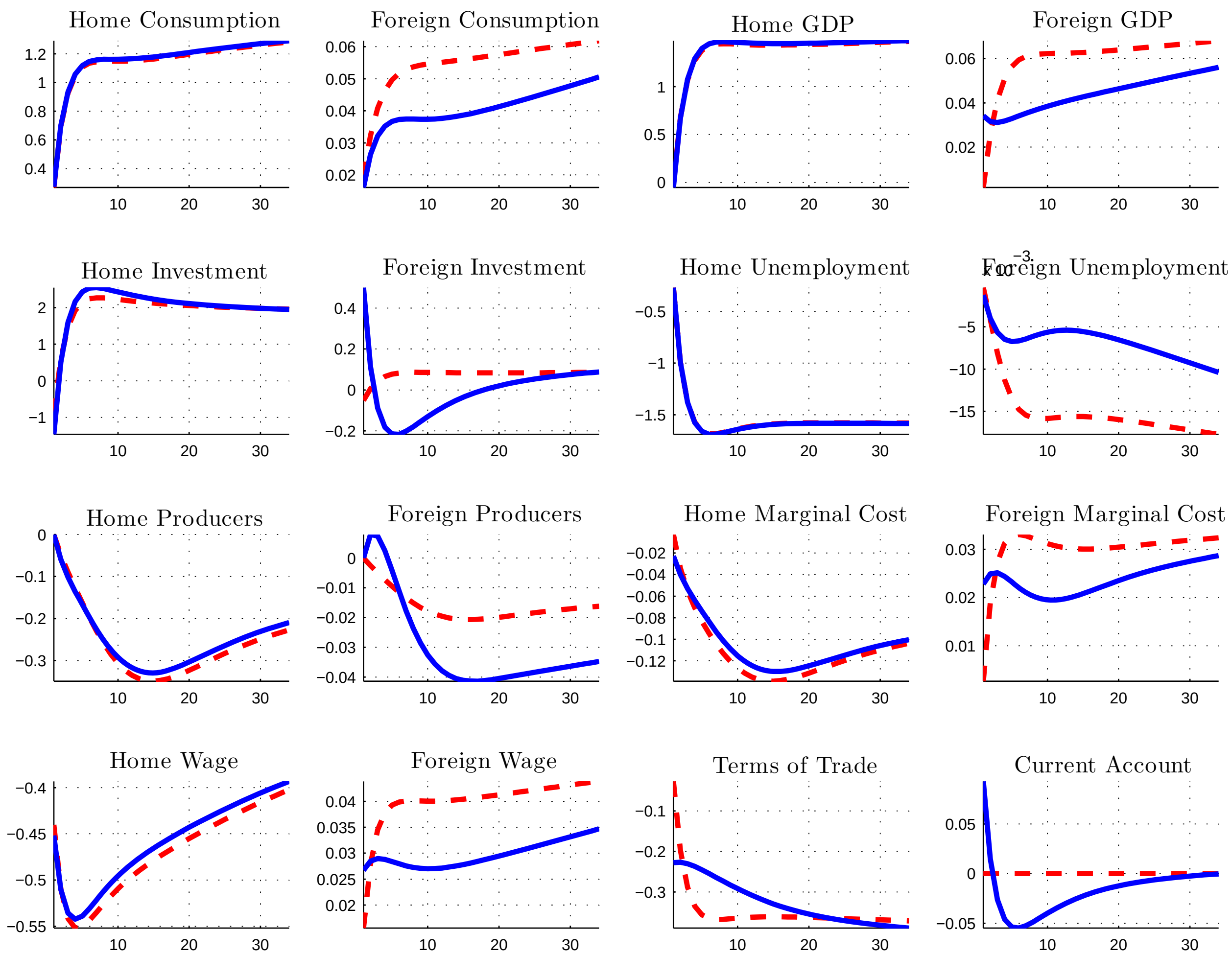

Figure A.8. Home unemployment benefits reform in a recession, open capital account (continuous lines) versus financial autarky (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

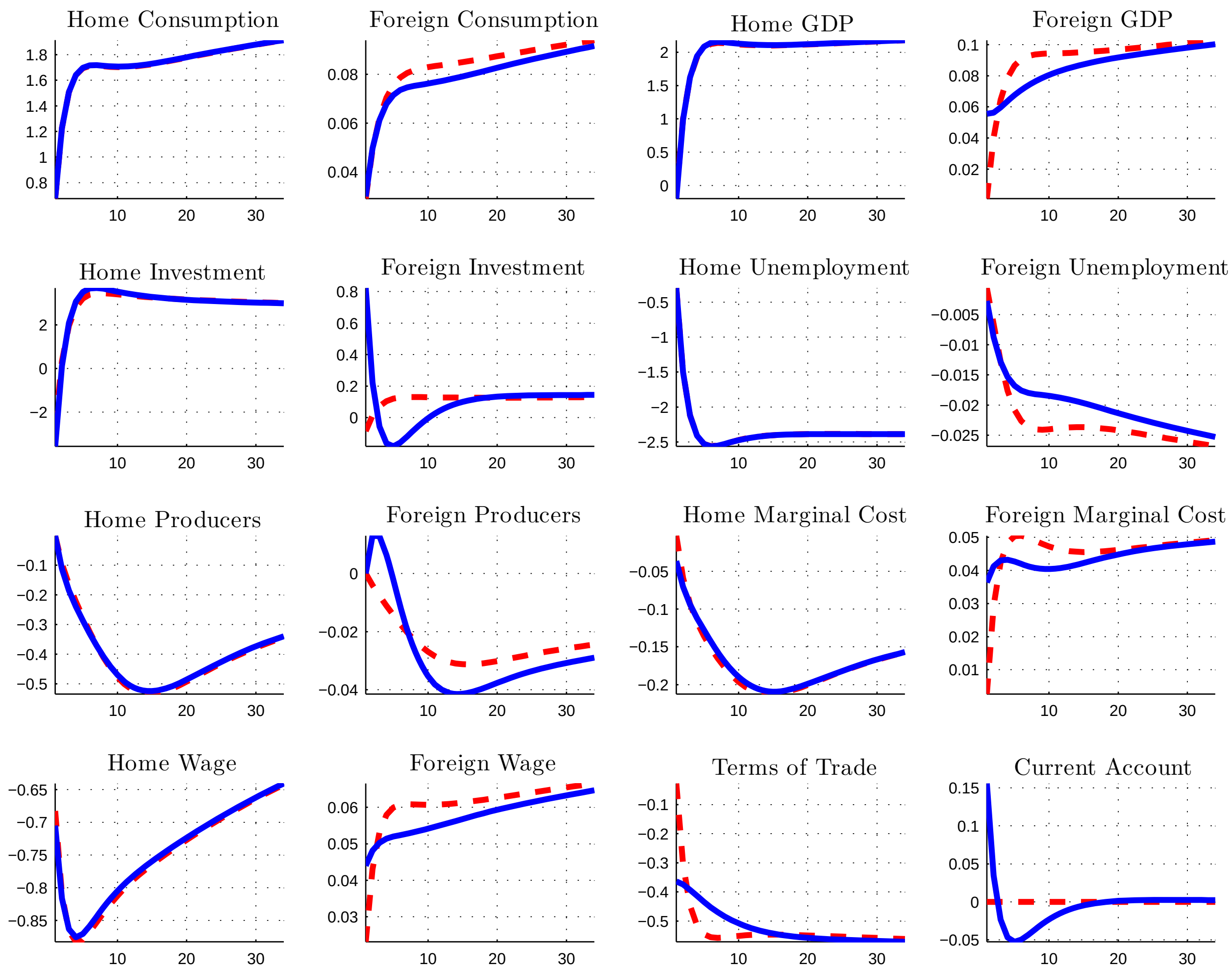

Figure A.9. Reduction in home production value at Home in a recession, open capital account (continuous lines) versus financial autarky (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

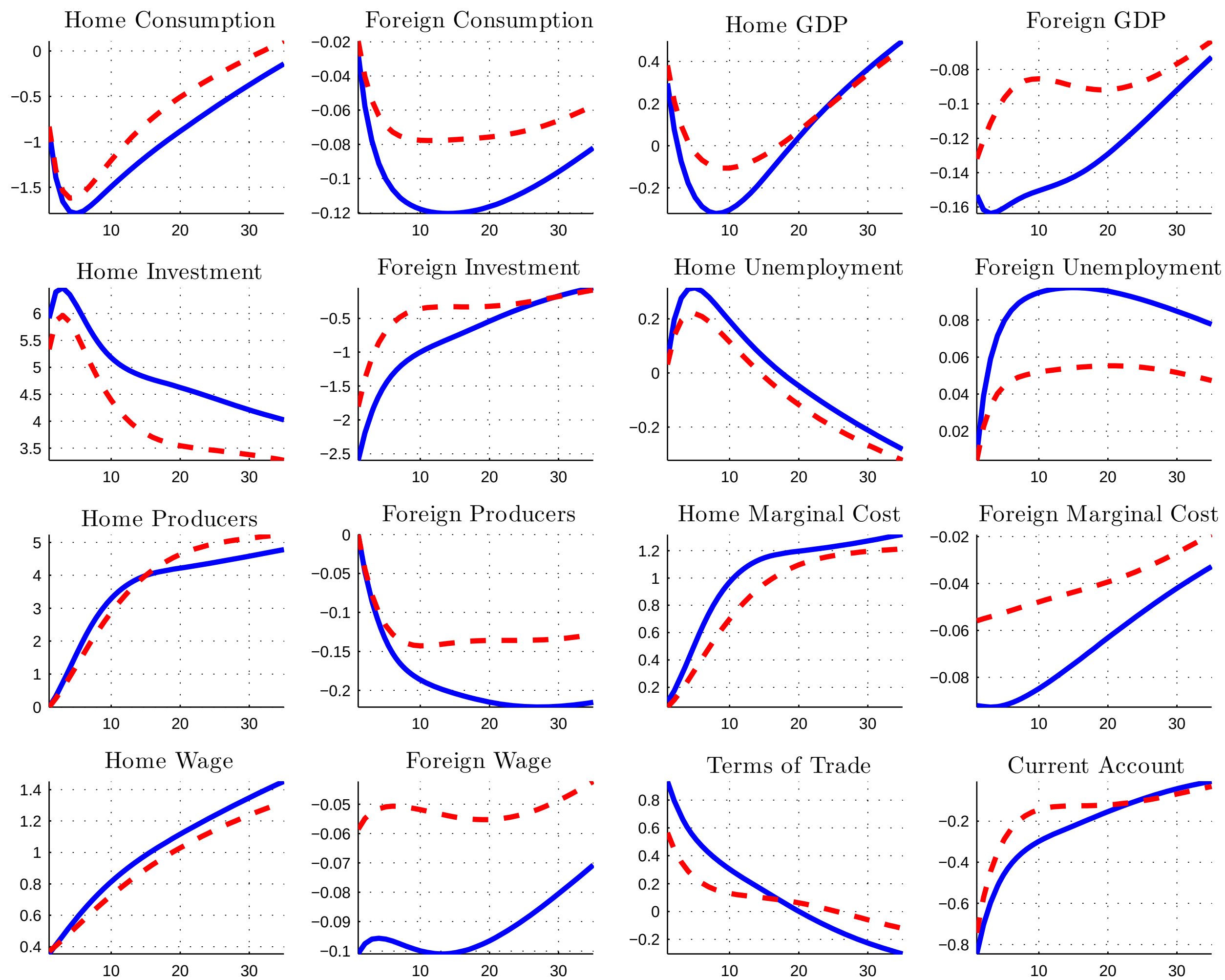

Figure A.10. Home product market reform, normal times, with $\xi = 0.6$ (continuous lines) versus Home product market reform, normal times, with $\xi = 1$ (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.

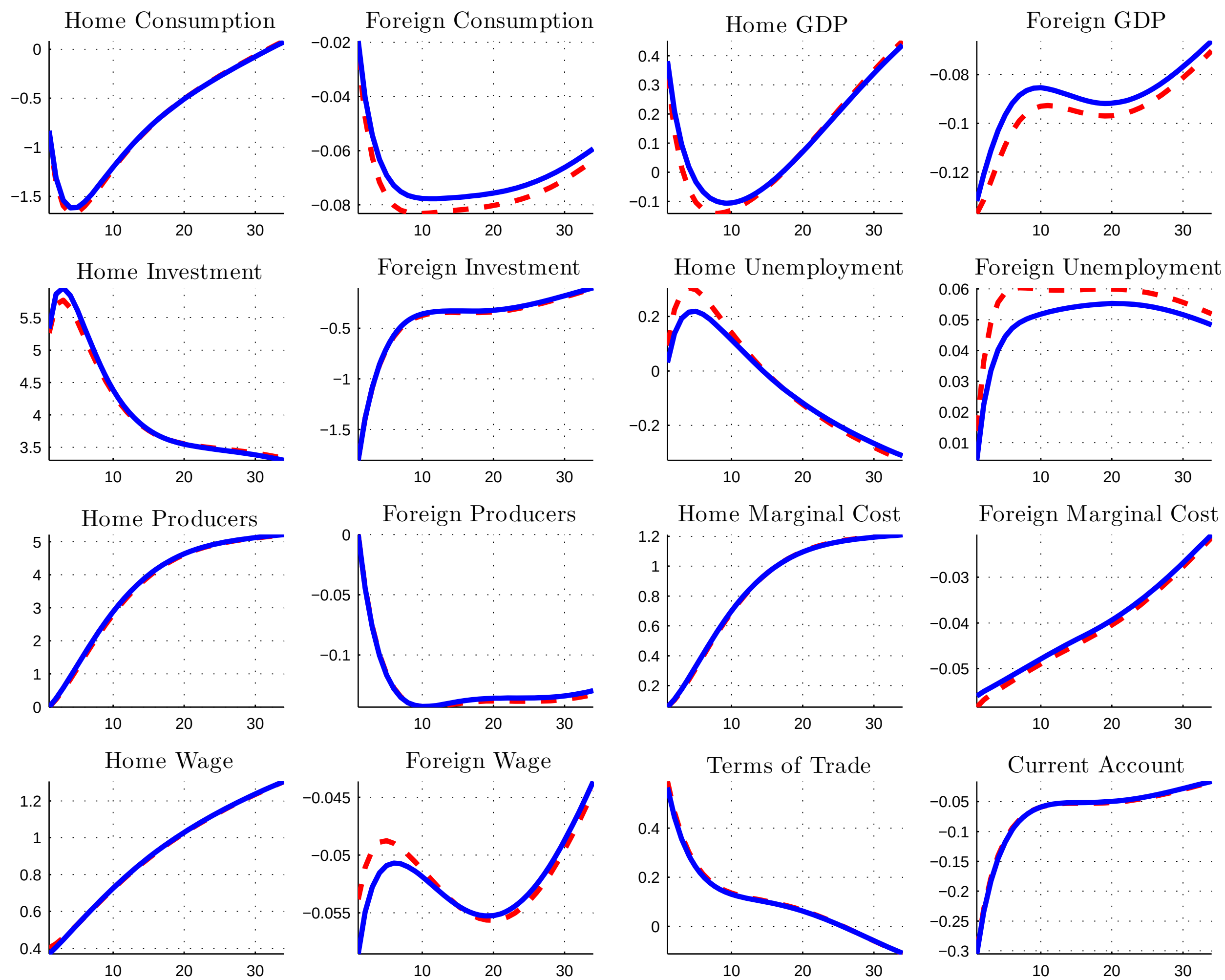

Figure A.11. Home product market reform, recession, with $\xi = 0.6$ (continuous lines) versus Home product market reform, recession, with $\xi = 1$ (dashed lines). Responses show percentage deviations from the initial steady state. Unemployment is in deviations from the initial steady state.