Appendix - Not for Publication

Asymmetries in the Response of Economic Activity to Oil Price Increases and Decreases?

Appendix A: Impulse response function based test

We compute the impulse response function based test in the following manner:

(i) We estimate the two equations in the system (4) by OLS and keep the estimated coefficients, the standard deviations, and the residuals from the two equations. Let us denote these by $\widehat{B}_1$, $\widehat{B}_2$, $\widehat{s}_1$, $\widehat{s}_2$, $\widehat{\varepsilon}_1$,and $\widehat{\varepsilon}_2$, respectively.

(ii) Given a history $\{x_{t-1}, \ \ldots, \ x_{t-p}, \ y_{t-1}, \ \ldots, \ y_{t-p}\} \equiv \{X_t, Y_t\} \in \Omega^t$, we generate two paths of x_t such that

$$
\begin{aligned}
x_t^1 &= B_1 [1, X_t, Y_t] + \delta \\
x_t^2 &= B_1 [1, X_t, Y_t] + \varepsilon_{1t}
\end{aligned}
$$

where ε_{1t} is drawn from the empirical distribution of ε_{1t} (i.e., resampled from the residual $\widehat{\varepsilon}_1$ in (4a)) and δ equals two standard deviations, $2\widehat{s}_1$.

(iii) The updated information sets, together with the censored variables, are given by $\mathcal{I}_t^1 = \{1,$ x_t^1, X_t, Y_t, $x_t^{1\#}$, $X_t^{1\#}\}$ and $\mathcal{I}_t^2 = \{1,$ x_t^2, X_t, Y_t, $x_t^{2\#}$, $X_t^{2\#}\}$. Given these two histories, two paths for y_t are generated as:

$$
\begin{aligned}
y_{1t} &= B_2 \mathcal{I}_t^1 + \varepsilon_{2t} \\
y_{2t} &= B_2 \mathcal{I}_t^2 + \varepsilon_{2t}
\end{aligned}
$$

where ε_{2t} is drawn from the empirical distribution of ε_{2t}. (Notice that the same value is used as ε_{2t} to generate y_{1t} and y_{2t}).

(iv) We repeat (ii) and (iii) $t+H$ times and generate new information sets $\Omega_{t+1,1}^t = \{1,$ x_t^1, x_{t-1}, $\ldots$, x_{t-p+1}, y_t^1, y_{t-1}, $\ldots$, $y_{t-p+1}\}$ and $\Omega_{t+1,2}^t = \{1,$ x_t^2, x_{t-1}, $\ldots$, x_{t-p+1}, y_t^2, y_{t-1}, $\ldots$, $y_{t-p+1}\}$; the two paths for x_{t+1} are given by

$$\begin{aligned} x_{t+1}^1 &= B_1 \Omega_{t+1,1}^t + \varepsilon_{1t+1} \\ x_{t+1}^2 &= B_1 \Omega_{t+1,2}^t + \varepsilon_{1t+1}. \end{aligned}$$

(v) After R repetitions of steps (ii)-(iv) we generate the conditional IRF as

$$I_y\left(h, \delta, \Omega^t\right) = \frac{1}{R}\sum_{r=1}^{R} y_{t,r}^1 - \frac{1}{R}\sum_{r=1}^{R} y_{t,r}^2 \text{ for } h = 0, 1, \ldots, H$$

where $I_y\left(h, \delta, \Omega^t\right) \xrightarrow{p} E\left[y_{t+h}|\delta, \Omega^t\right] - E\left[y_{t+h}|\Omega^t\right]$ as $R \to \infty$. In our computation we set $R = 1000$.

(vi) The unconditional IRF is generated by repeating (iii) to (v) for all possible Ω^t, $t = 1:T$ and then taking the mean over all the histories:

$$I_y\left(h, \delta\right) = \frac{1}{T}\sum_{t=1}^{T} I_y\left(h, \delta, \Omega^t\right).$$

We set $T = 100$ to compute the unconditional IRF.

(vii) The variance-covariance matrix for $\left[I_y\left(h, \delta\right), I_y\left(h, -\delta\right)\right]$ is computed as follows. Since we need to find the variance-covariance of the unconditional $IRFs$ under the null hypothesis of symmetric responses, first, given the estimated parameters $\widehat{B}_1$, $\widehat{B}_2$, $\widehat{s}_1$, $\widehat{s}_2$, the residuals, and an arbitrary chosen history Ω^m, the system in (4) is used to generate pseudo-series of the same length of our data. Second, for each of the newly generated pseudo-series, (X^m, Y^m), we repeat steps (i) through (vi) to get the unconditional $IRFs$. Finally, for M unconditional $IRFs$, both for δ and $-\delta$, the variance covariance matrix is computed. The matrix has a size of $2\left(H+1\right) \times 2\left(H+1\right)$.

(viii) The (joint) null hypothesis of symmetric responses to positive and negative (and censored in the case of the net oil price increase) shocks, from $h = 0$ to $h = j$, where $j \in \{0, 1, \ldots, H\}$, is defined as

$$I_y(h,\delta) = -I_y(h,-\delta) \text{ for } h = 0,...,j.$$

Then, the test statistic is computed as follows:

$$W = \left(R\widehat{\beta}\right)' \left(R\widehat{\Xi}R'\right)^{-1} \left(R\widehat{\beta}\right) \sim \chi^2_{j+1}$$

where

$$\underset{2(H+1)\times 1}{\widehat{\beta}} = \begin{bmatrix} I_y(0,\delta) \\ \vdots \\ I_y(j,\delta) \\ I_y(0,-\delta) \\ \vdots \\ I_y(j,-\delta) \end{bmatrix}; \quad \underset{(j+1)\times 2(H+1)}{R} = \begin{bmatrix} 1 & \dots & 0 & 1 & \dots & 0 \\ \vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & 1 & 0 & \dots & 1 \end{bmatrix};$$

$$\underset{2(H+1)\times 2(H+1)}{\Xi} = E\left[\left(\widehat{\beta}-\beta\right)\left(\widehat{\beta}-\beta\right)'\right].$$

Note that $\widehat{\beta}$ is computed in (vi), and $\widehat{\Xi}$ is computed in (vii).

As we mention in the paper, a data mining concern arises when repeating the impulse response based test for 21 industrial price indices (18 countries plus 3 country groups). That is, the expected number of rejections will increase as the number of series to be tested increases. To avoid this potential problem we compute data-mining robust critical values obtained by the bootstrap procedure under the null hypothesis of symmetric responses. More precisely, given the estimated parameters $\widehat{B}_1$, $\widehat{B}_2$, $\widehat{s}_1$, $\widehat{s}_2$, the estimated residuals in (4) and letting $g_{21,0} = g_{21,1} = \cdots = g_{21,12} = 0$, we generate 100 pseudo-data (X^{*m}, Y^{*m}). Notice that setting $g_{21,0} = g_{21,1} = \cdots = g_{21,12} = 0$ is equivalent to simulating the distribution under the null of symmetry. We then compute the test statistic each of the pseudo data (X^{*m}, Y^{*m}) by Monte Carlo integration following steps (i) through (viii), with $T = 100$, and $R = 1000$.

Appendix B: Additional Test Results

Table A.1. Slope based test of nonlinearity

	Forecasting Equation			Structural Equation		
	$x_t^{\#} = x_t^1$	$x_t^{\#} = x_t^{12}$	$x_t^{\#} = x_t^{36}$	$x_t^{\#} = x_t^1$	$x_t^{\#} = x_t^{12}$	$x_t^{\#} = x_t^{36}$
Net Exporters						
Canada	0.13	0.10	0.63	**0.04**	**0.05**	0.49
Denmark	*0.08*	0.48	0.44	*0.07*	0.43	0.45
Norway	*0.05*	0.48	0.49	**0.03**	0.47	0.50
UK	0.54	0.18	0.14	0.44	0.16	0.11
Net Importers						
Austria	0.25	0.40	0.12	0.20	0.38	0.12
Belgium	0.58	0.28	0.54	0.44	0.28	0.44
Finland	0.22	0.20	*0.10*	0.15	**0.02**	*0.06*
France	0.14	*0.06*	**0.02**	*0.10*	**0.03**	**0.01**
Germany	0.27	0.45	0.23	0.23	0.51	0.21
Greece	**0.02**	0.94	0.64	**0.01**	**0.04**	**0.02**
Italy	0.29	0.41	0.29	0.15	0.26	0.29
Japan	**0.02**	0.35	*0.05*	**0.01**	0.36	*0.05*
Luxembourg	0.75	0.29	**0.04**	0.78	0.26	**0.02**
Netherlands	0.22	0.69	0.38	0.21	0.72	0.40
Portugal	0.80	0.68	0.62	0.75	0.75	0.68
Spain	0.52	0.74	0.45	0.35	0.79	0.48
Sweden	0.56	0.83	0.10	0.54	0.80	*0.08*
US	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.00**
G7	**0.00**	*0.07*	**0.04**	**0.00**	**0.04**	**0.03**
OECD-Europe	0.62	0.40	*0.07*	0.50	0.44	**0.05**
OECD-Total	**0.03**	0.19	0.13	**0.01**	0.13	*0.07*

Notes: Bold and italics denote significance at the 5% and 10% level, respectively. The first panel reports results for the null hypothesis $\gamma_1 = \gamma_2 = ...\gamma_p = 0$ from the reduced-form equation $y_{i,t} = \alpha + \sum_{j=1}^{p} \phi_j y_{i,t-j} + \sum_{j=1}^{p} \gamma_j x_{t-j}^{\#} + u_{i,t}$ where y_t denotes economic activity growth $x_t^{\#}$ is a non-linear measures of real oil prices (e.g., $x_t^1, x_t^{12}, x_t^{36}$), u_t is the residual, and p the number of lags is set to 12 months. The second panel reports results from the structural equation containing the contemporaneous values of the real oil price change $y_{i,t} = a_{20} + \sum_{j=0}^{12} a_{21,j} x_{t-j} + \sum_{j=1}^{12} a_{22,j} y_{i,t-j} + \sum_{j=0}^{12} g_{21,j} x_{t-j}^{\#} + \varepsilon_{i,t}$ where one would test the null hypothesis $g_{21,0} = g_{21,1} = ... = g_{21,p} = 0$.

Table A.2 IRF based test of symmetry to the real oil price at $H = 12$ for the 1961-2010 sample.

	1 s.d. shock			2 s.d. shock		
	$x_t^{\#} = x_t^1$	$x_t^{\#} = x_t^{12}$	$x_t^{\#} = x_t^{36}$	$x_t^{\#} = x_t^1$	$x_t^{\#} = x_t^{12}$	$x_t^{\#} = x_t^{36}$
Net Exporters						
Canada	*0.08***	0.21**	0.86	**0.01**	**0.00****	**0.01****
Denmark						
Norway	**0.04****	0.89	1.00	**0.00**	0.39	0.91
UK	*0.09***	0.56	0.97	*0.06*	**0.00****	**0.03****
Net Importers						
Austria	0.19**	0.86	0.99	*0.06*	*0.09*	*0.08***
Belgium	0.39	0.62	0.98	0.21	**0.00****	*0.09*
Finland	0.11**	0.70	1.00	**0.00**	**0.01**	0.37
France	0.60	0.94	0.99	0.45	0.28	0.29
Germany	0.15**	0.58	0.99	**0.02**	**0.02**	*0.08***
Greece	**0.03****	*0.07***	0.76	**0.00**	**0.00****	*0.06***
Italy	0.09**	0.85	0.97	**0.05**	**0.01**	**0.02****
Japan	**0.00****	0.68	0.96	**0.00****	**0.00****	**0.02****
Luxembourg	0.65	0.97	0.95	0.44	0.26	0.74
Netherlands	0.16**	0.90	1.00	**0.02**	**0.00**	*0.09*
Portugal	0.86	0.92	0.98	0.66	0.23	0.28
Spain	0.63	0.78	0.99	0.21	**0.01**	0.22
Sweden	0.43	0.96	0.89	0.19	0.30	0.43
US	**0.01****	0.17**	0.15**	**0.00**	**0.00****	**0.00****
G7	**0.01****	0.22**	*0.10***	**0.00****	**0.00****	**0.00****
OECD-Europe	*0.09***	0.52	0.38**	**0.03**	**0.00****	**0.00****
OECD-Total						

Notes: Tests are based on 1000 simulations of model (4). p-values are based on the χ^2_{H+1}. Bold and italics denote significance at the 5% and 10% level, respectively. ** and * denote significance after accounting for data mining at the 5% and 10% level, respectively.

Table A.3 Non-cumulative distance between IRFs: 1 s.d. shock to the real oil price, $x_t^{\#} = x_t^1$

	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.07	0.05	0.04	0.03	0.01	0.02	0.01	0.06	0.06	0.02	0.01	0.03	0.02
Denmark	0.00	0.10	0.11	0.07	0.03	0.05	0.22	0.14	0.02	0.09	0.19	0.11	0.08
Norway	0.14	0.20	0.41	0.41	0.05	0.02	0.12	0.32	0.15	0.08	0.04	0.15	0.08
UK	0.04	0.03	0.08	0.02	0.03	0.05	0.07	0.06	0.01	0.01	0.03	0.01	0.01
Net Importers													
Austria	0.04	0.04	0.09	0.05	0.02	0.09	0.02	0.00	0.06	0.17	0.15	0.02	0.01
Belgium	0.12	0.12	0.19	0.10	0.03	0.05	0.05	0.14	0.04	0.12	0.01	0.05	0.10
Finland	0.08	0.08	0.03	0.02	0.03	0.11	0.13	0.01	0.03	0.05	0.12	0.12	0.04
France	0.04	0.01	0.03	0.03	0.04	0.06	0.00	0.07	0.11	0.03	0.03	0.02	0.03
Germany	0.04	0.02	0.14	0.11	0.09	0.07	0.02	0.03	0.03	0.03	0.03	0.04	0.05
Greece	0.12	0.18	0.26	0.07	0.09	0.15	0.12	0.13	0.10	0.02	0.08	0.06	0.08
Italy	0.09	0.01	0.09	0.07	0.05	0.00	0.01	0.01	0.10	0.07	0.07	0.10	0.07
Japan	0.03	0.08	0.06	0.06	0.10	0.10	0.00	0.04	0.00	0.02	0.02	0.02	0.01
Luxembourg	0.02	0.23	0.06	0.02	0.13	0.02	0.08	0.07	0.11	0.11	0.03	0.03	0.01
Netherlands	0.04	0.14	0.04	0.12	0.13	0.04	0.02	0.05	0.05	0.09	0.15	0.26	0.21
Portugal	0.05	0.07	0.10	0.12	0.05	0.01	0.03	0.15	0.05	0.04	0.01	0.04	0.03
Spain	0.08	0.01	0.04	0.04	0.03	0.01	0.03	0.05	0.16	0.09	0.04	0.05	0.09
Sweden	0.02	0.03	0.12	0.05	0.02	0.00	0.04	0.08	0.09	0.07	0.01	0.04	0.07
U.S.	0.01	0.05	0.01	0.04	0.03	0.00	0.04	0.02	0.03	0.00	0.03	0.01	0.01
G7	0.03	0.05	0.03	0.04	0.02	0.02	0.01	0.01	0.03	0.01	0.01	0.01	0.00
OECD-Europe	0.03	0.01	0.04	0.00	0.01	0.00	0.00	0.02	0.02	0.02	0.01	0.02	0.03
OECD-Total	0.03	0.03	0.03	0.02	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.00	0.02

Table A.4: Non-cumulative distance between IRFs: 1 s.d. shock to the real oil price, $x_t^{\#} = x_t^{12}$

	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.03	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.04	0.02	0.00	0.01	0.01
Denmark	0.02	0.01	0.02	0.02	0.06	0.01	0.08	0.06	0.01	0.02	0.03	0.01	0.00
Norway	0.00	0.00	0.00	0.02	0.03	0.02	0.03	0.08	0.06	0.04	0.00	0.05	0.01
UK	0.01	0.01	0.02	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00
Net Importers													
Austria	0.01	0.03	0.03	0.04	0.02	0.00	0.01	0.01	0.02	0.01	0.02	0.00	0.00
Belgium	0.02	0.02	0.04	0.04	0.04	0.03	0.05	0.01	0.03	0.07	0.04	0.02	0.03
Finland	0.07	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.02	0.08	0.04	0.03	0.02
France	0.02	0.01	0.00	0.01	0.01	0.04	0.03	0.01	0.01	0.01	0.01	0.02	0.01
Germany	0.01	0.02	0.01	0.01	0.01	0.03	0.01	0.03	0.02	0.00	0.01	0.00	0.01
Greece	0.11	0.12	0.01	0.04	0.01	0.01	0.01	0.00	0.03	0.04	0.01	0.02	0.00
Italy	0.02	0.03	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.00	0.01	0.01	0.01
Japan	0.01	0.01	0.03	0.00	0.00	0.02	0.00	0.01	0.01	0.03	0.01	0.00	0.00
Luxembourg	0.03	0.02	0.02	0.06	0.05	0.01	0.01	0.07	0.00	0.06	0.02	0.02	0.00
Netherlands	0.01	0.03	0.01	0.02	0.02	0.02	0.01	0.01	0.03	0.01	0.02	0.00	0.02
Portugal	0.00	0.02	0.02	0.01	0.02	0.01	0.00	0.05	0.01	0.00	0.01	0.00	0.02
Spain	0.00	0.05	0.03	0.00	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.02
Sweden	0.01	0.01	0.04	0.00	0.01	0.00	0.03	0.02	0.04	0.02	0.01	0.01	0.00
U.S.	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00
G7	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00
OECD-Europe	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
OECD-Total	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00

Table A.5: Non-cumulative distance between IRFs: 1 s.d. shock to the real oil price, $x_t^{\#} = x_t^{36}$

	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01
Denmark	0.00	0.01	0.02	0.00	0.01	0.02	0.04	0.05	0.00	0.01	0.01	0.01	0.02
Norway	0.00	0.00	0.02	0.01	0.02	0.01	0.02	0.05	0.04	0.02	0.01	0.02	0.01
UK	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Net Importers													
Austria	0.01	0.04	0.01	0.03	0.04	0.02	0.02	0.00	0.00	0.01	0.02	0.00	0.01
Belgium	0.01	0.01	0.02	0.02	0.03	0.06	0.03	0.03	0.02	0.02	0.01	0.02	0.01
Finland	0.03	0.03	0.01	0.01	0.03	0.03	0.01	0.01	0.02	0.05	0.05	0.01	0.01
France	0.01	0.00	0.02	0.01	0.00	0.01	0.03	0.00	0.01	0.01	0.00	0.02	0.01
Germany	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.00	0.02	0.01	0.01
Greece	0.10	0.17	0.08	0.00	0.01	0.01	0.00	0.01	0.00	0.03	0.05	0.03	0.03
Italy	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.01	0.01	0.01	0.00	0.01	0.02
Japan	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.03	0.00	0.00	0.01
Luxembourg	0.05	0.03	0.00	0.05	0.05	0.02	0.01	0.06	0.00	0.08	0.04	0.01	0.02
Netherlands	0.00	0.02	0.01	0.00	0.01	0.01	0.02	0.00	0.03	0.02	0.01	0.01	0.03
Portugal	0.00	0.00	0.01	0.01	0.03	0.01	0.01	0.06	0.04	0.01	0.01	0.01	0.02
Spain	0.00	0.03	0.00	0.02	0.02	0.01	0.00	0.02	0.00	0.02	0.01	0.02	0.00
Sweden	0.01	0.01	0.04	0.01	0.02	0.03	0.02	0.03	0.04	0.01	0.02	0.01	0.01
U.S.	0.00	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00
G7	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00
OECD-Europe	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.00	0.00
OECD-Total	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00

Table A.6: Non-cumulative distance between IRFs: 2 s.d. shock to the real oil price, $x_t^{\#} = x_t^1$

	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.39	0.32	0.29	0.19	0.08	0.15	0.01	0.33	0.31	0.08	0.05	0.21	0.07
Denmark	0.03	0.56	0.69	0.30	0.16	0.31	1.23	0.67	0.01	0.48	1.15	0.49	0.51
Norway	0.84	1.11	2.31	2.17	0.07	0.10	0.71	1.79	0.66	0.39	0.16	0.89	0.37
UK	0.23	0.14	0.43	0.17	0.15	0.27	0.38	0.29	0.03	0.06	0.17	0.01	0.05
Net Importers													
Austria	0.26	0.19	0.47	0.24	0.15	0.51	0.02	0.00	0.37	0.93	0.77	0.01	0.05
Belgium	0.70	0.62	0.99	0.46	0.24	0.23	0.34	0.76	0.14	0.68	0.13	0.24	0.58
Finland	0.45	0.55	0.27	0.07	0.18	0.66	0.70	0.03	0.19	0.26	0.75	0.64	0.30
France	0.25	0.10	0.21	0.21	0.25	0.30	0.05	0.40	0.55	0.10	0.17	0.15	0.16
Germany	0.22	0.15	0.82	0.54	0.41	0.33	0.06	0.19	0.11	0.12	0.17	0.22	0.25
Greece	0.70	1.17	1.40	0.23	0.49	0.86	0.59	0.68	0.54	0.06	0.46	0.46	0.41
Italy	0.51	0.00	0.49	0.46	0.22	0.05	0.10	0.07	0.55	0.34	0.34	0.53	0.32
Japan	0.19	0.52	0.42	0.46	0.66	0.55	0.08	0.28	0.01	0.11	0.17	0.12	0.03
Luxembourg	0.13	1.36	0.22	0.07	0.77	0.22	0.47	0.32	0.61	0.55	0.11	0.14	0.03
Netherlands	0.22	0.74	0.10	0.64	0.65	0.14	0.11	0.26	0.24	0.50	0.78	1.34	1.02
Portugal	0.27	0.37	0.64	0.62	0.18	0.10	0.19	0.88	0.17	0.26	0.06	0.25	0.13
Spain	0.49	0.00	0.23	0.21	0.13	0.01	0.16	0.33	0.84	0.39	0.14	0.27	0.49
Sweden	0.14	0.18	0.79	0.21	0.05	0.04	0.29	0.46	0.52	0.35	0.03	0.25	0.35
U.S.	0.09	0.32	0.10	0.28	0.21	0.02	0.28	0.08	0.18	0.01	0.15	0.01	0.08
G7	0.16	0.32	0.26	0.29	0.20	0.10	0.08	0.02	0.16	0.07	0.06	0.05	0.02
OECD-Europe	0.18	0.09	0.27	0.05	0.04	0.02	0.03	0.13	0.12	0.13	0.03	0.13	0.20
OECD-Total	0.20	0.25	0.25	0.18	0.11	0.06	0.05	0.02	0.14	0.06	0.05	0.02	0.11

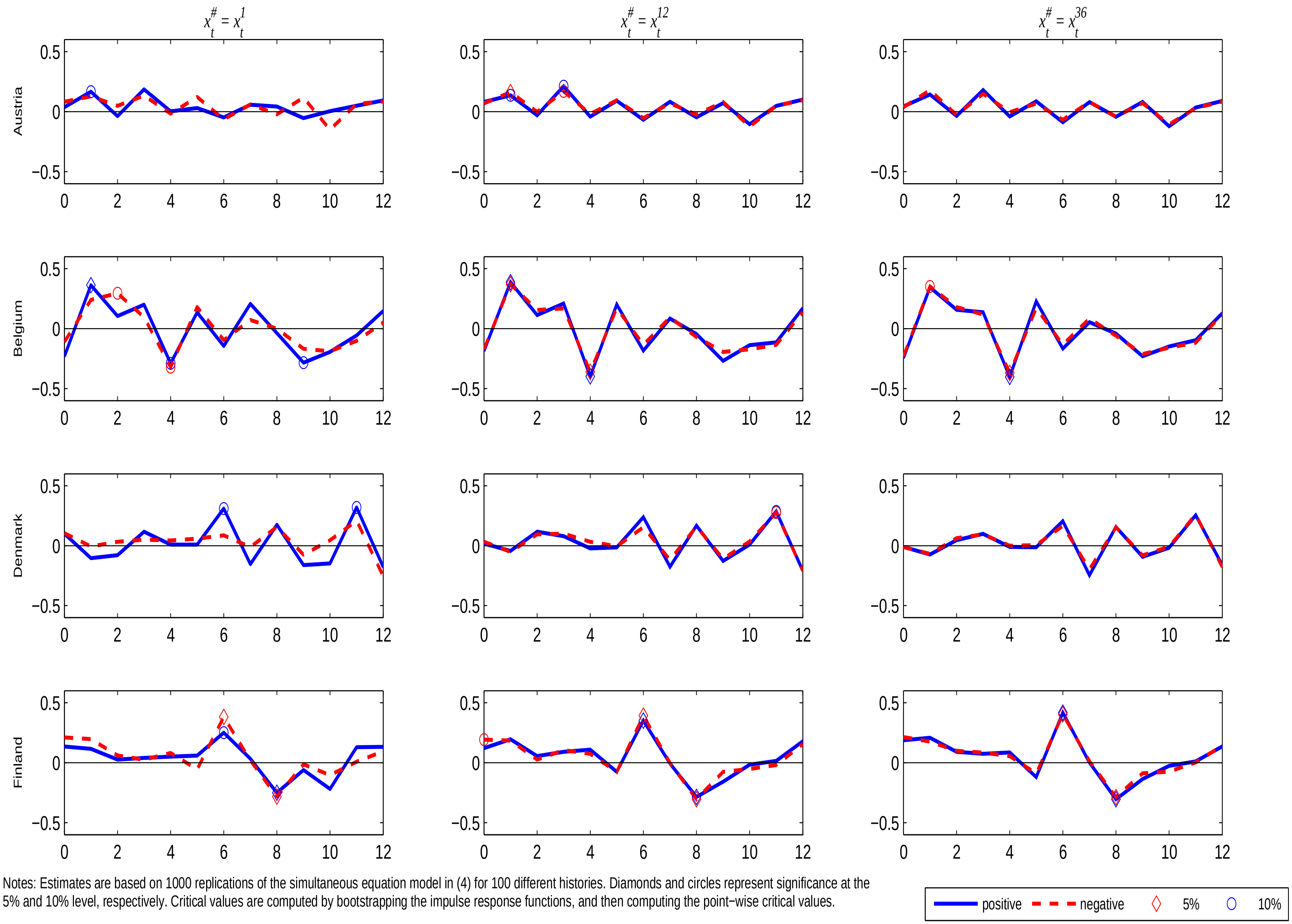
Table A.7: Non-cumulative distance between IRFs: 2 s.d. shock to the real oil price, $x_t^{\#} = x_t^{12}$

	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.22	0.26	0.12	0.12	0.00	0.04	0.03	0.06	0.27	0.07	0.10	0.09	0.14
Denmark	0.14	0.03	0.20	0.13	0.52	0.25	0.64	0.33	0.05	0.18	0.29	0.03	0.05
Norway	0.03	0.04	0.01	0.20	0.31	0.12	0.27	0.67	0.43	0.24	0.12	0.48	0.08
UK	0.08	0.14	0.19	0.03	0.13	0.01	0.02	0.17	0.14	0.03	0.16	0.04	0.07
Net Importers													
Austria	0.11	0.22	0.37	0.31	0.09	0.12	0.18	0.06	0.19	0.19	0.15	0.04	0.00
Belgium	0.14	0.10	0.37	0.26	0.27	0.17	0.39	0.24	0.18	0.67	0.10	0.22	0.35
Finland	0.66	0.10	0.23	0.09	0.26	0.06	0.36	0.17	0.14	0.70	0.06	0.30	0.28
France	0.21	0.11	0.00	0.10	0.13	0.36	0.21	0.16	0.10	0.05	0.12	0.16	0.08
Germany	0.07	0.18	0.14	0.12	0.10	0.20	0.05	0.31	0.06	0.03	0.09	0.08	0.06
Greece	1.03	0.70	0.40	0.31	0.02	0.09	0.08	0.06	0.21	0.25	0.05	0.22	0.04
Italy	0.23	0.31	0.04	0.00	0.02	0.10	0.15	0.21	0.19	0.01	0.12	0.18	0.02
Japan	0.12	0.17	0.35	0.12	0.09	0.13	0.01	0.08	0.07	0.29	0.01	0.01	0.02
Luxembourg	0.27	0.25	0.09	0.58	0.28	0.01	0.12	0.69	0.21	0.54	0.12	0.11	0.01
Netherlands	0.08	0.25	0.22	0.27	0.07	0.23	0.05	0.18	0.22	0.12	0.21	0.08	0.24
Portugal	0.04	0.21	0.18	0.07	0.26	0.06	0.03	0.45	0.03	0.04	0.08	0.01	0.14
Spain	0.02	0.46	0.14	0.07	0.09	0.11	0.25	0.06	0.05	0.09	0.08	0.09	0.20
Sweden	0.07	0.09	0.37	0.10	0.09	0.00	0.31	0.10	0.35	0.02	0.06	0.03	0.00
U.S.	0.07	0.19	0.12	0.22	0.12	0.05	0.13	0.03	0.14	0.03	0.01	0.16	0.09
G7	0.13	0.18	0.13	0.17	0.07	0.05	0.05	0.08	0.08	0.01	0.07	0.09	0.02
OECD-Europe	0.07	0.15	0.05	0.08	0.10	0.04	0.03	0.19	0.02	0.01	0.11	0.05	0.01
OECD-Total	0.12	0.17	0.09	0.12	0.06	0.03	0.05	0.10	0.05	0.02	0.07	0.04	0.00

Table A.8: Non-cumulative distance between IRFs: 2 s.d. shock to the real oil price, $x_t^{\#} = x_t^{36}$

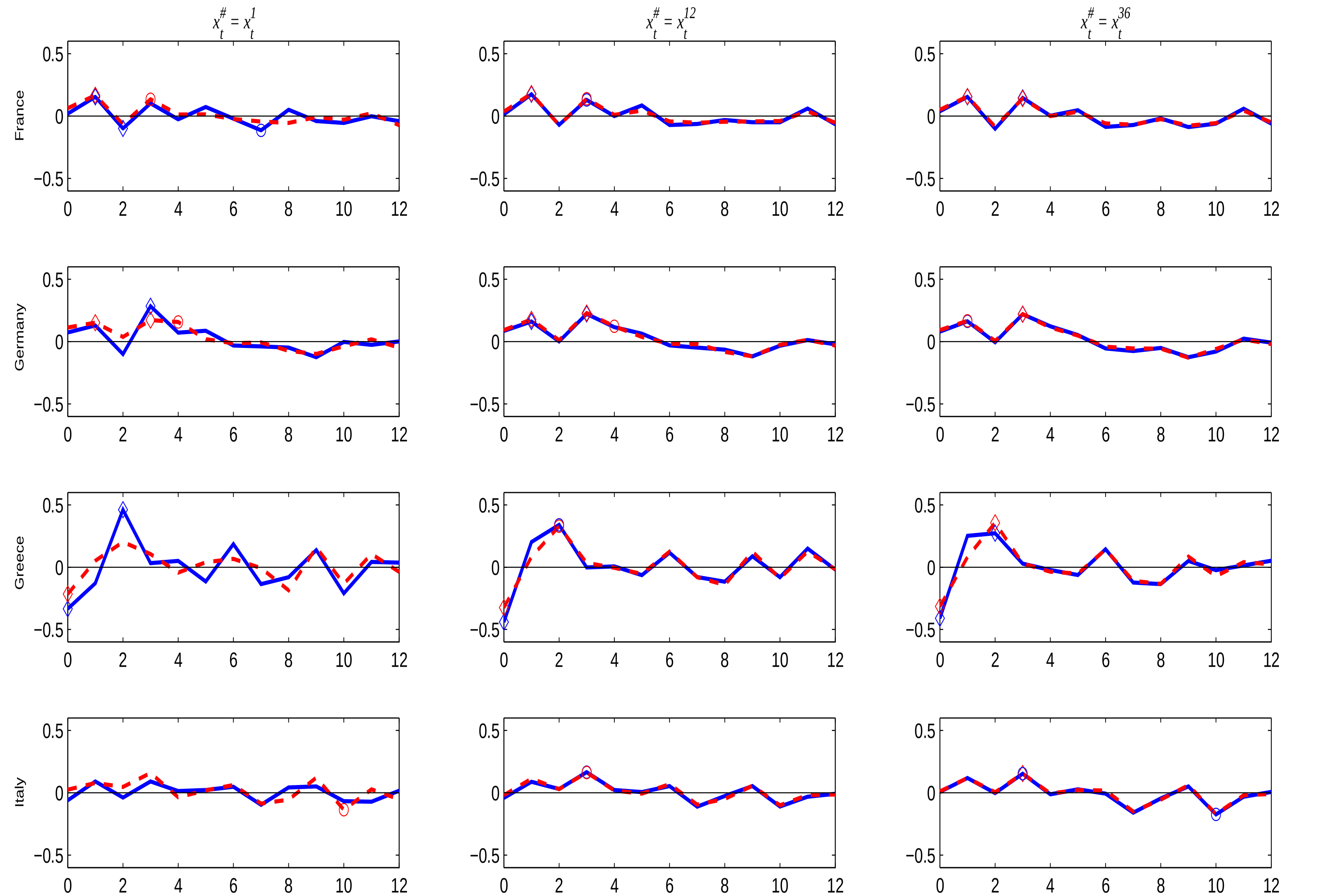
	Horizon												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Net Exporters													
Canada	0.11	0.09	0.08	0.02	0.05	0.10	0.04	0.09	0.03	0.08	0.08	0.08	0.13
Denmark	0.01	0.05	0.19	0.05	0.10	0.23	0.27	0.32	0.18	0.16	0.15	0.14	0.05
Norway	0.00	0.01	0.21	0.17	0.17	0.04	0.26	0.51	0.17	0.03	0.17	0.35	0.02
UK	0.06	0.12	0.11	0.00	0.02	0.06	0.06	0.18	0.12	0.06	0.15	0.07	0.09
Net Importers													
Austria	0.07	0.31	0.27	0.19	0.21	0.03	0.18	0.11	0.08	0.04	0.09	0.08	0.02
Belgium	0.13	0.12	0.26	0.06	0.27	0.41	0.13	0.43	0.02	0.17	0.02	0.18	0.13
Finland	0.23	0.13	0.06	0.07	0.21	0.12	0.03	0.10	0.21	0.54	0.06	0.24	0.08
France	0.13	0.09	0.19	0.03	0.05	0.13	0.23	0.17	0.04	0.11	0.12	0.12	0.03
Germany	0.11	0.10	0.15	0.09	0.05	0.08	0.09	0.26	0.08	0.02	0.19	0.06	0.07
Greece	0.76	0.81	0.05	0.18	0.07	0.13	0.02	0.16	0.06	0.31	0.14	0.00	0.17
Italy	0.05	0.03	0.08	0.07	0.09	0.01	0.24	0.30	0.01	0.04	0.10	0.21	0.08
Japan	0.08	0.07	0.23	0.06	0.07	0.10	0.03	0.15	0.03	0.32	0.11	0.08	0.04
Luxembourg	0.50	0.02	0.04	0.52	0.27	0.04	0.13	0.77	0.32	0.77	0.09	0.24	0.05
Netherlands	0.02	0.14	0.21	0.13	0.02	0.12	0.14	0.09	0.20	0.06	0.14	0.02	0.26
Portugal	0.04	0.01	0.05	0.05	0.26	0.01	0.20	0.53	0.04	0.25	0.05	0.15	0.08
Spain	0.05	0.30	0.06	0.22	0.14	0.17	0.02	0.27	0.13	0.14	0.08	0.18	0.08
Sweden	0.12	0.02	0.39	0.18	0.20	0.12	0.33	0.06	0.22	0.14	0.19	0.18	0.02
U.S.	0.00	0.11	0.06	0.13	0.10	0.05	0.14	0.05	0.02	0.01	0.04	0.13	0.06
G7	0.06	0.07	0.09	0.08	0.05	0.00	0.06	0.08	0.02	0.06	0.09	0.11	0.05
OECD-Europe	0.07	0.02	0.05	0.05	0.02	0.02	0.02	0.18	0.06	0.03	0.13	0.07	0.04
OECD-Total	0.08	0.06	0.08	0.06	0.04	0.01	0.05	0.10	0.03	0.07	0.08	0.08	0.03

Figure A−1a: Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



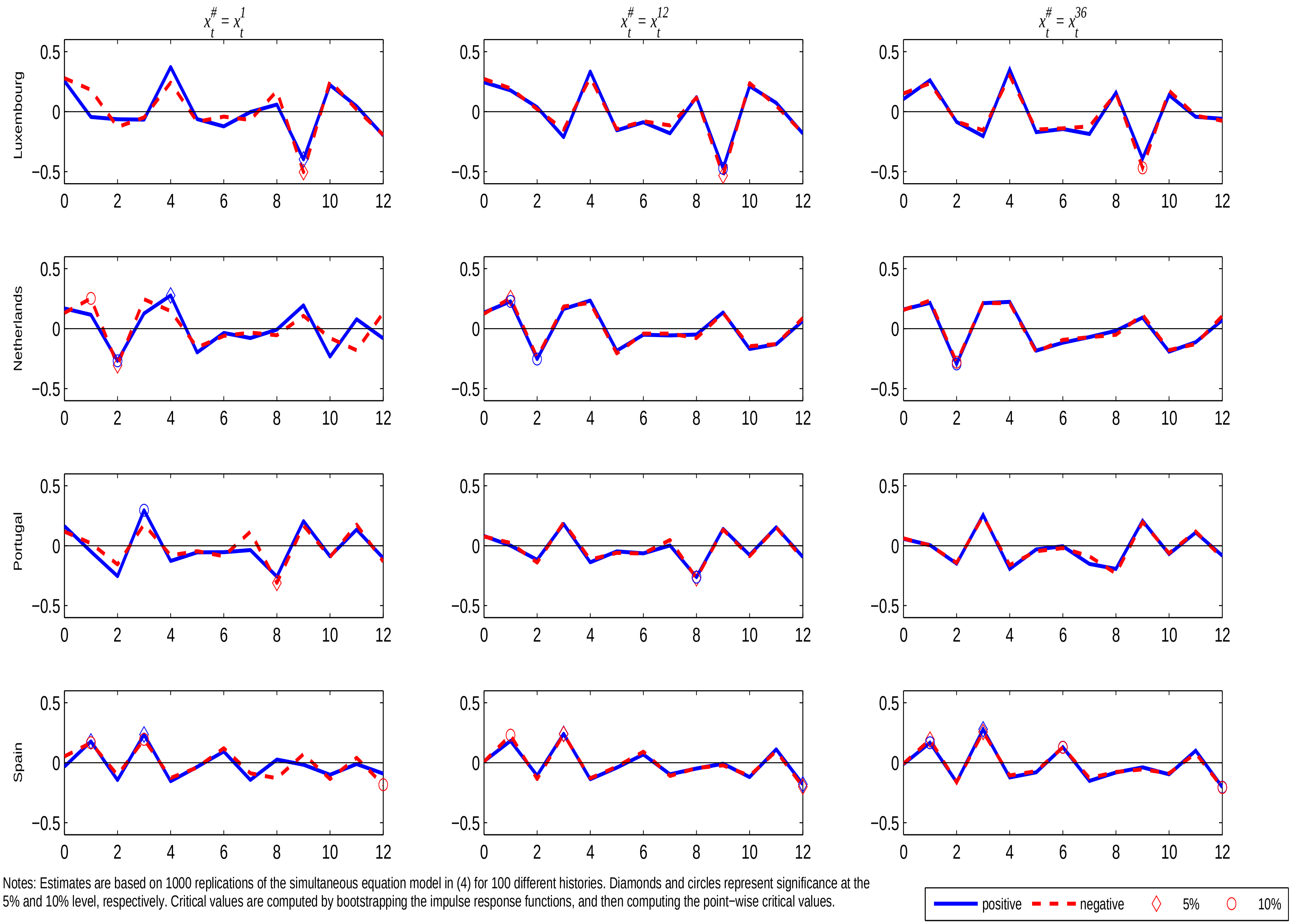
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−1b: Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



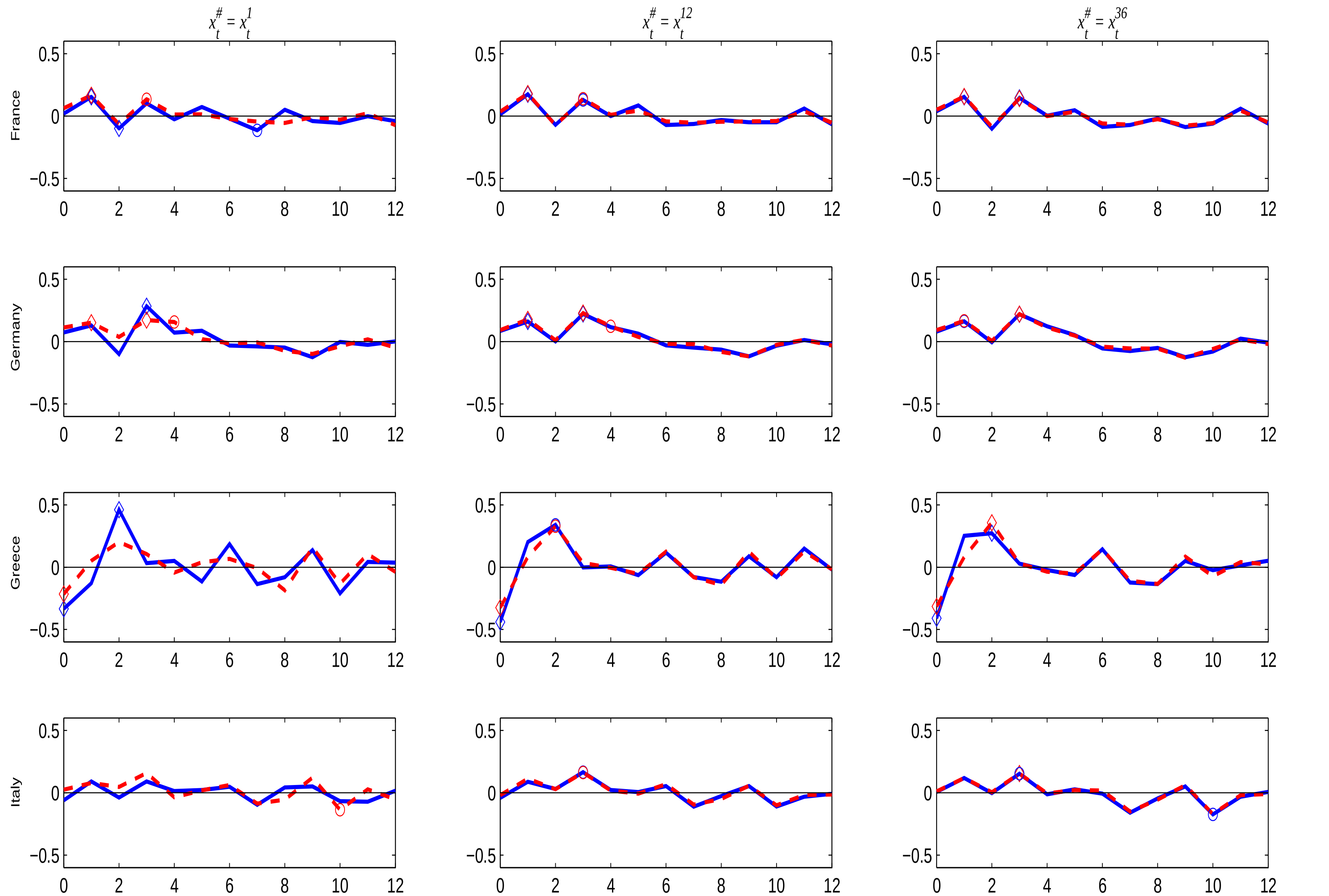
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−1c: Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



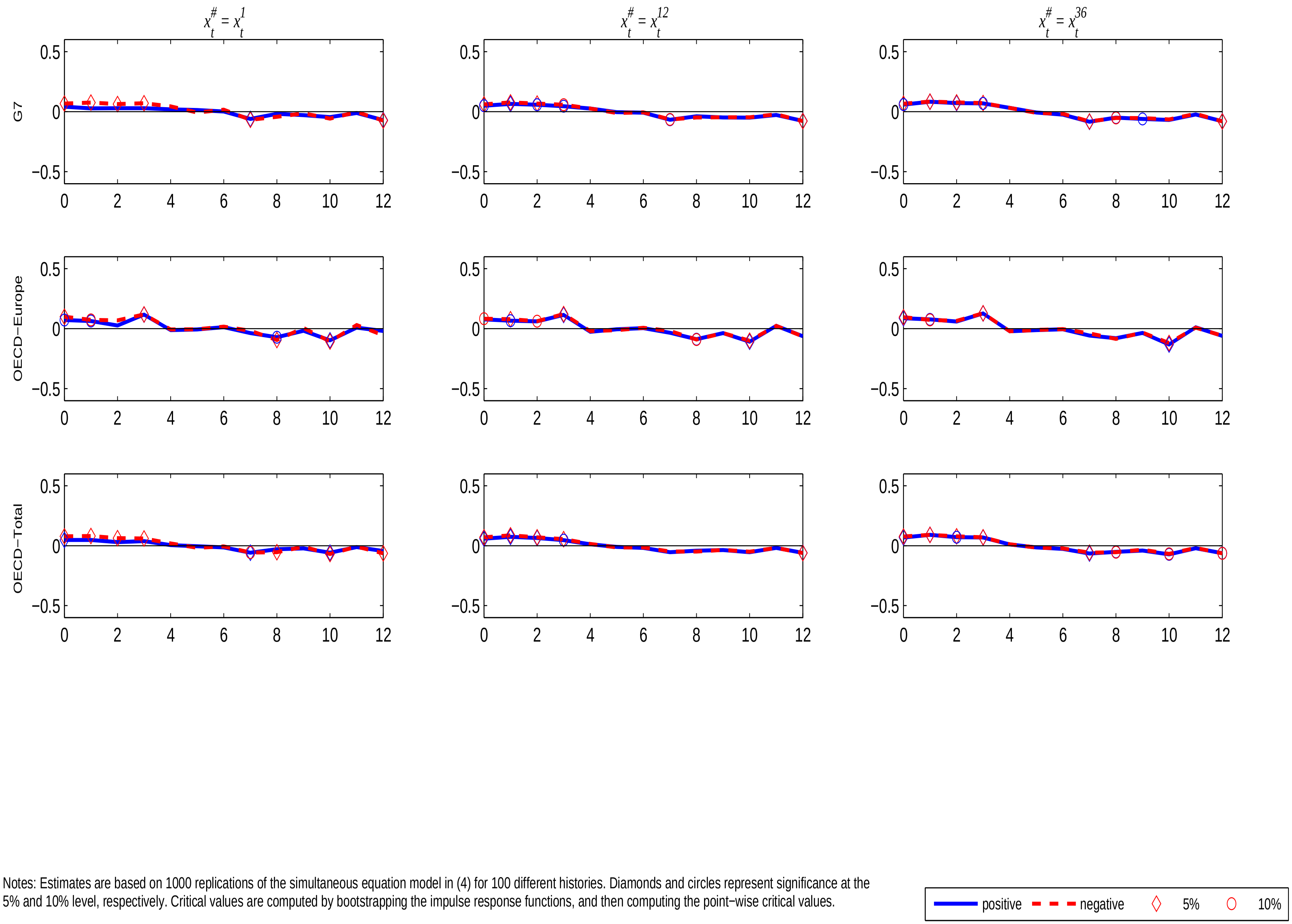
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−1b: Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



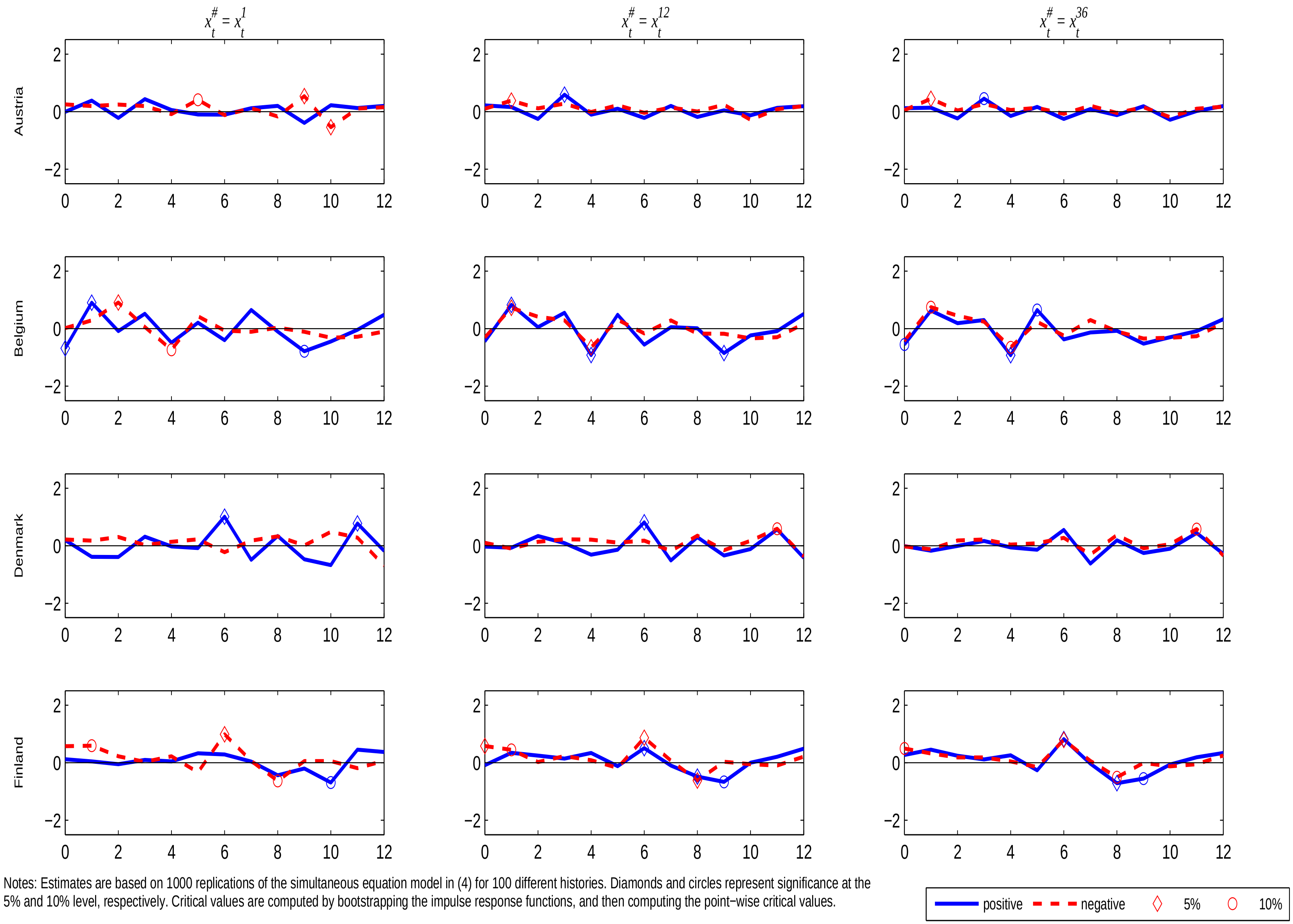
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−1e: Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



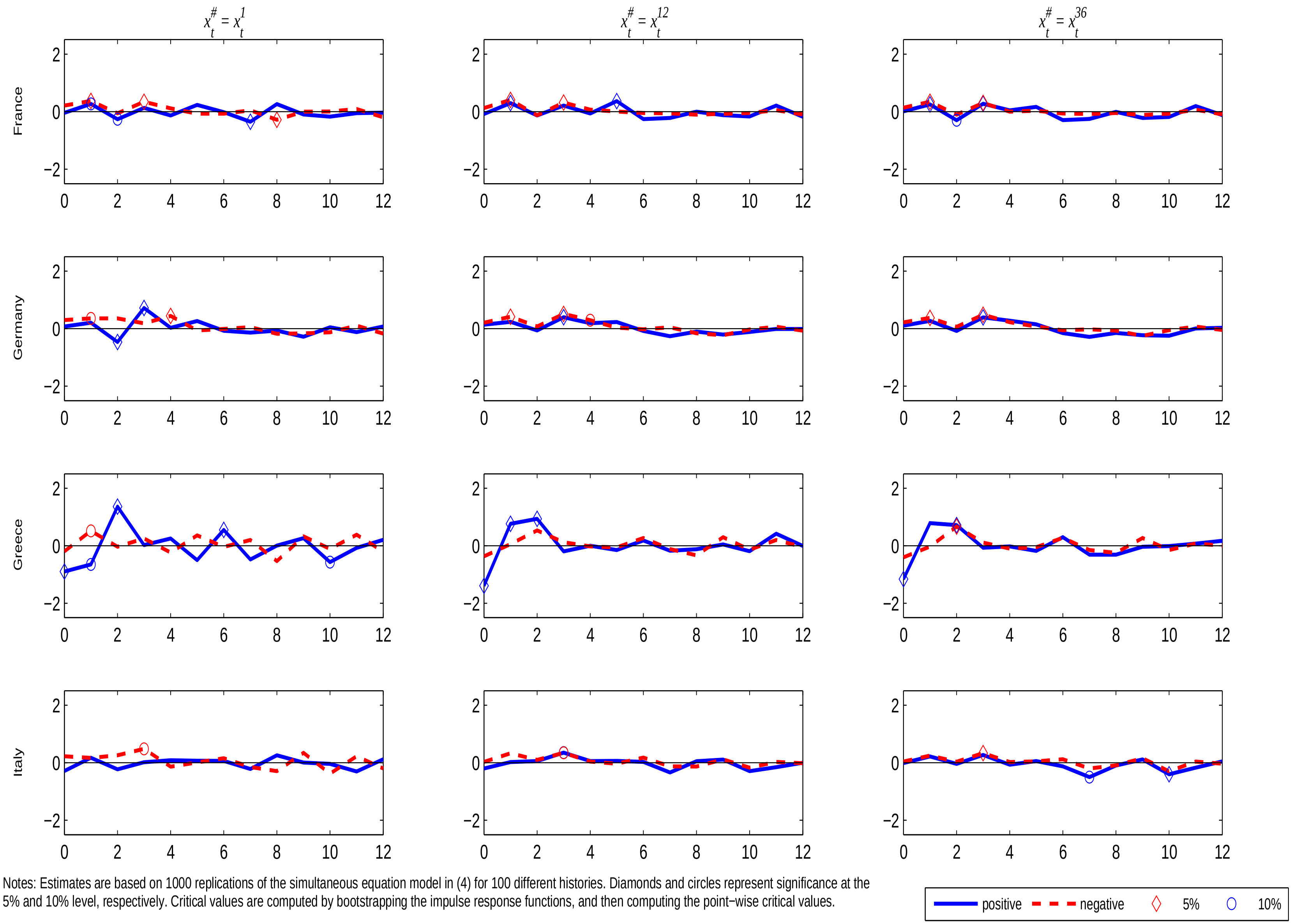
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−2a: Impulse response to two standard deviation positive and negative shocks to the real oil price (percentage)



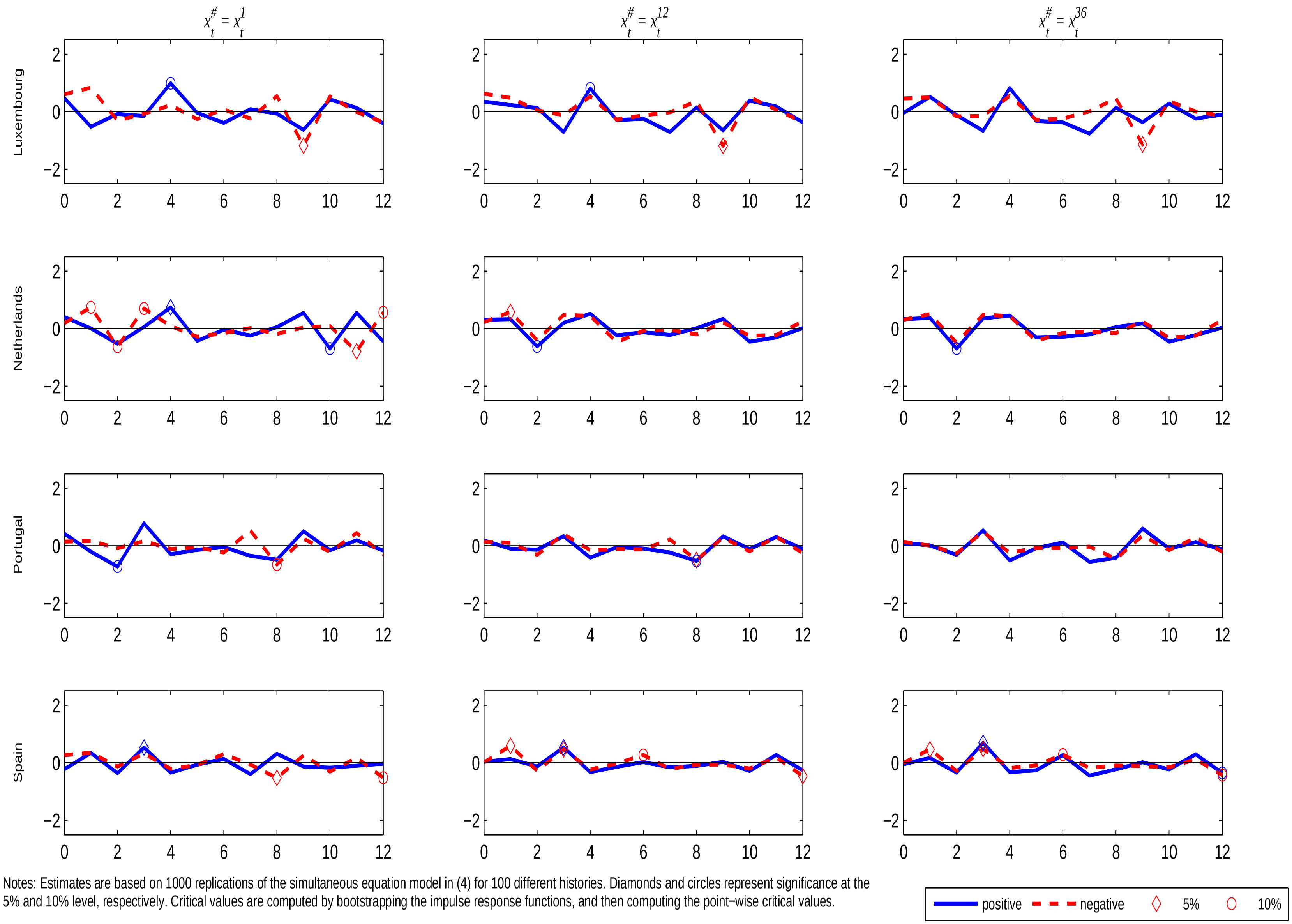
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−2b: Impulse response to two standard deviation positive and negative shocks to the real oil price (percentage)



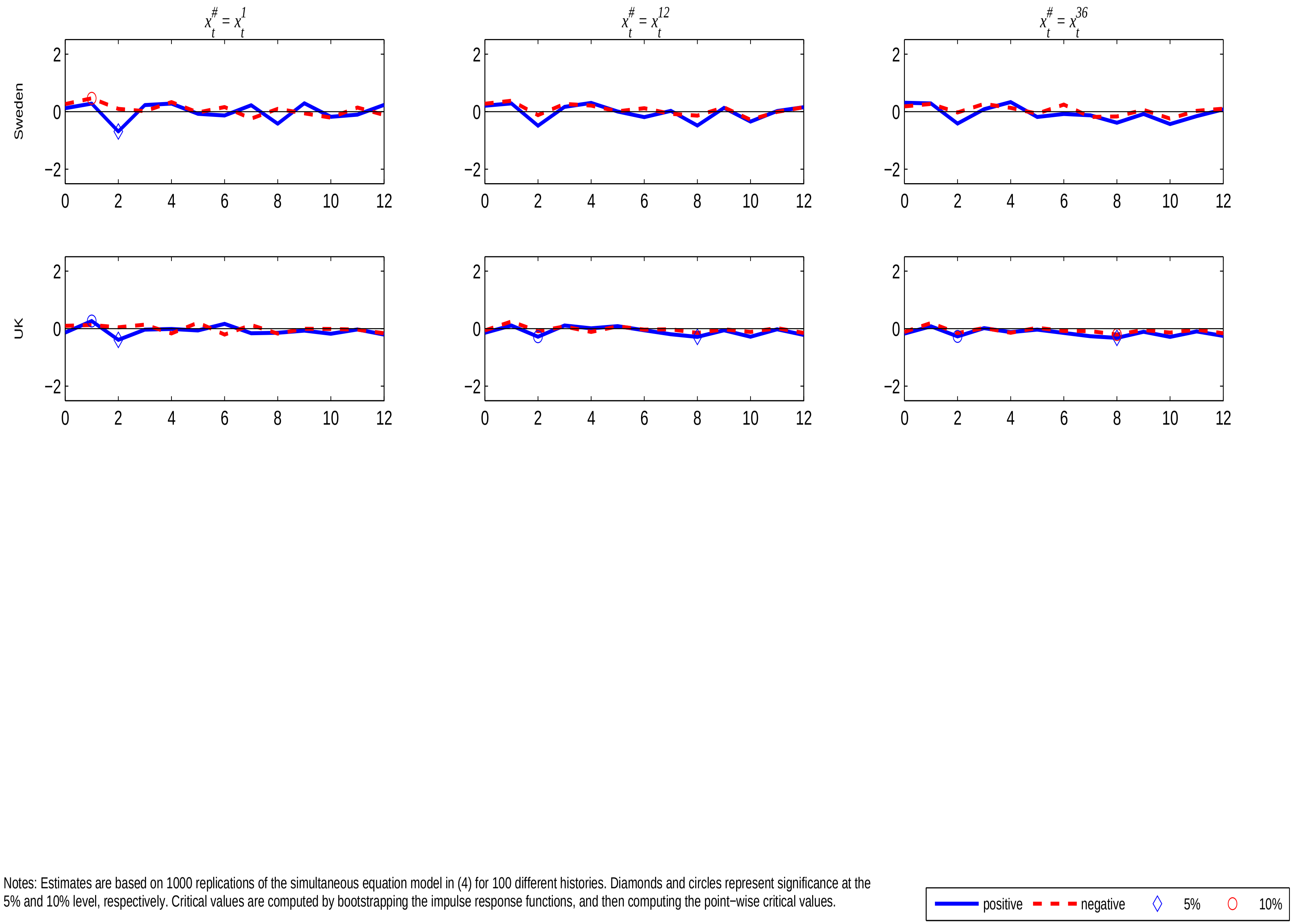
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−2c: Impulse response to two standard deviation positive and negative shocks to the real oil price (percentage)



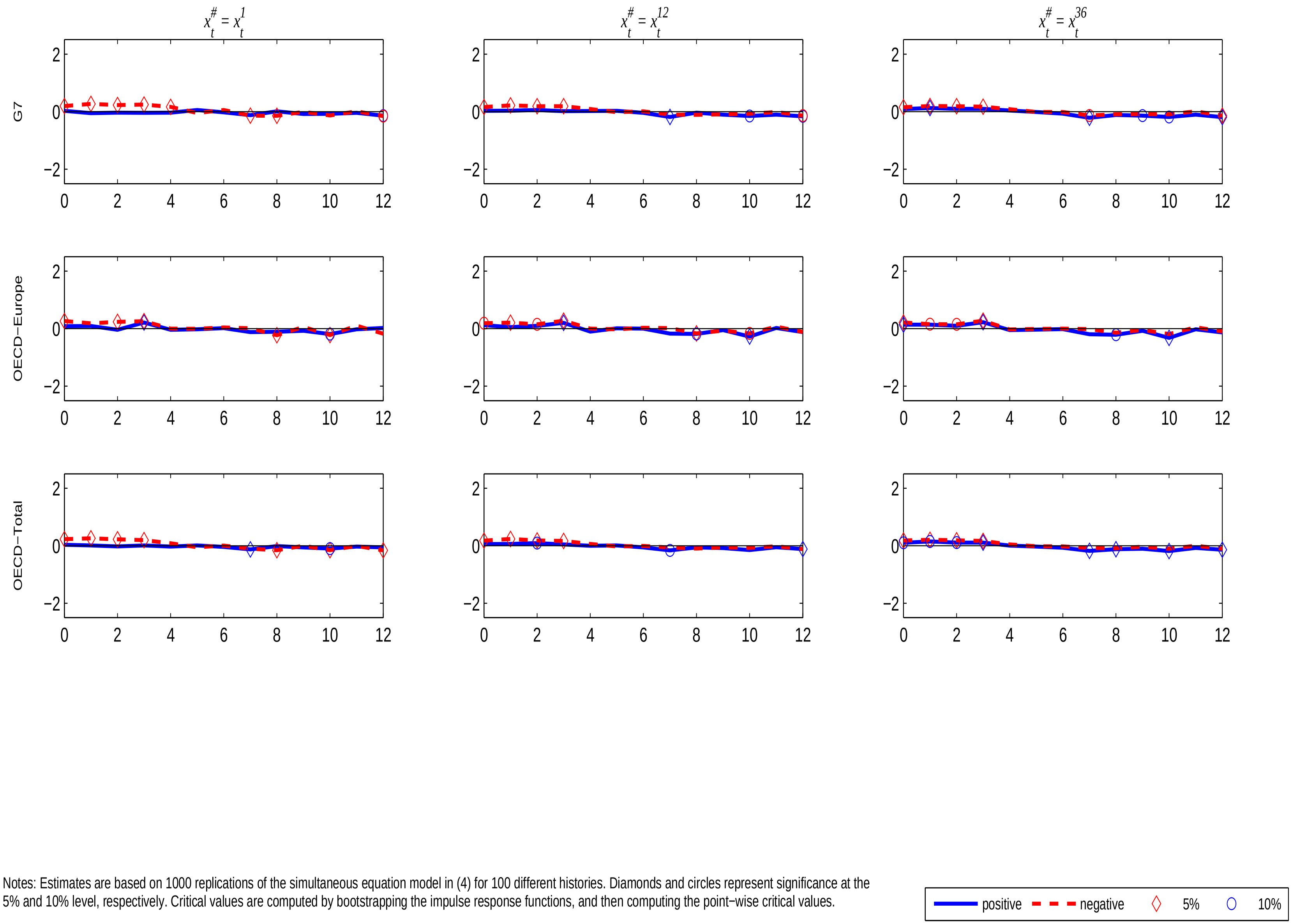
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−2d: Impulse response to two standard deviation positive and negative shocks to the real oil price (percentage)



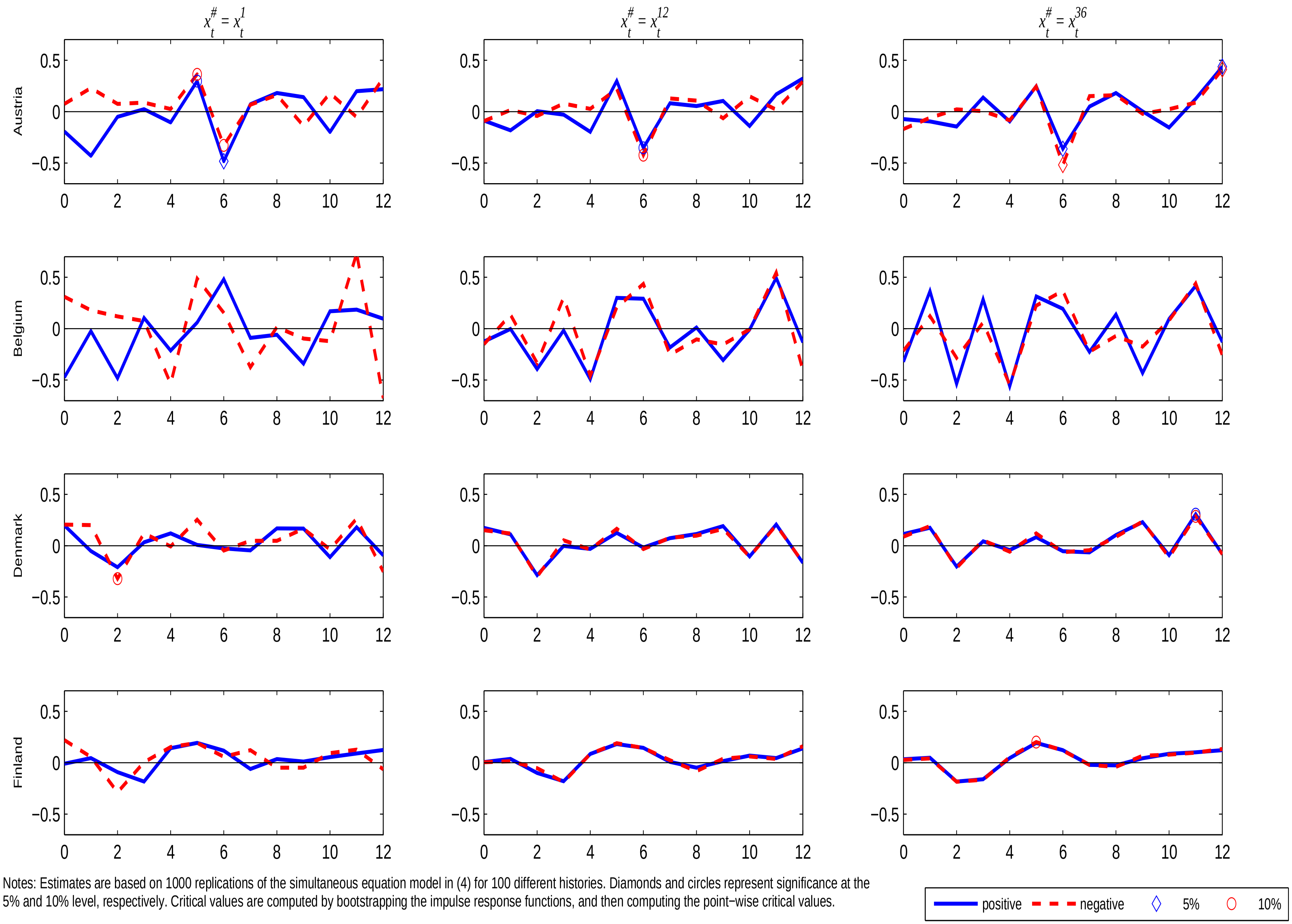
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−2e: Impulse response to two standard deviation positive and negative shocks to the real oil price (percentage)



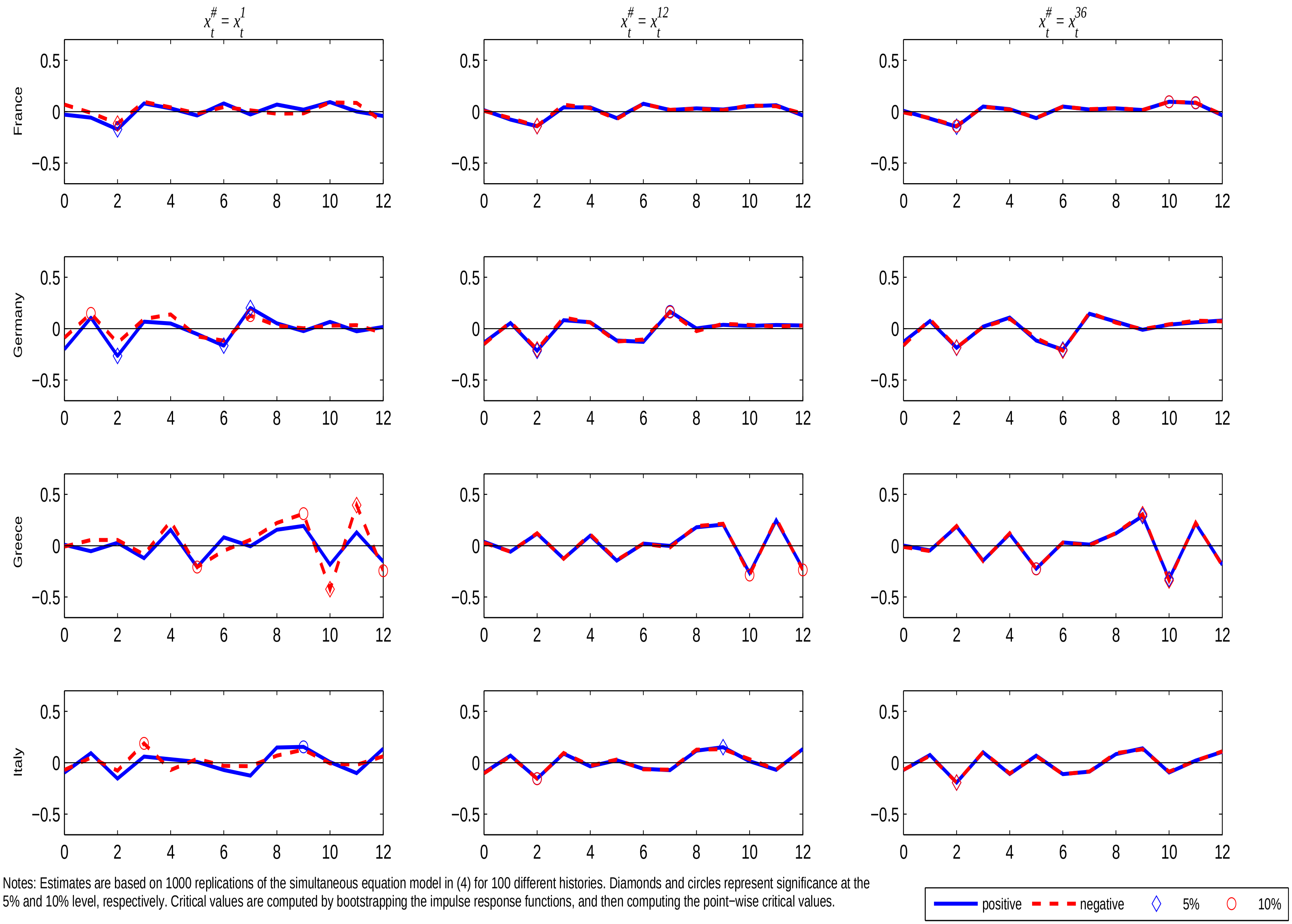
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−3a: Impulse response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



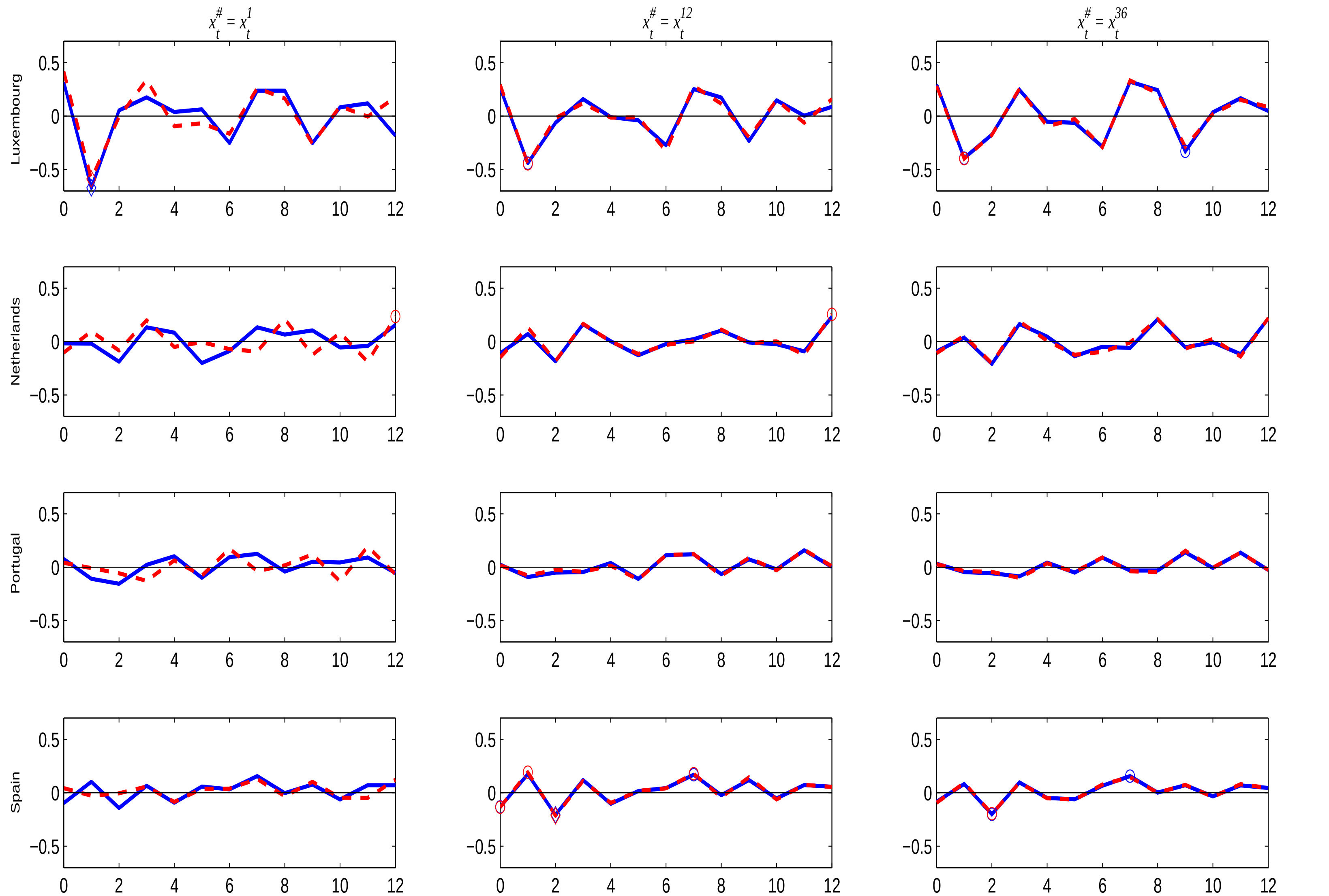
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−3b: Impulse response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



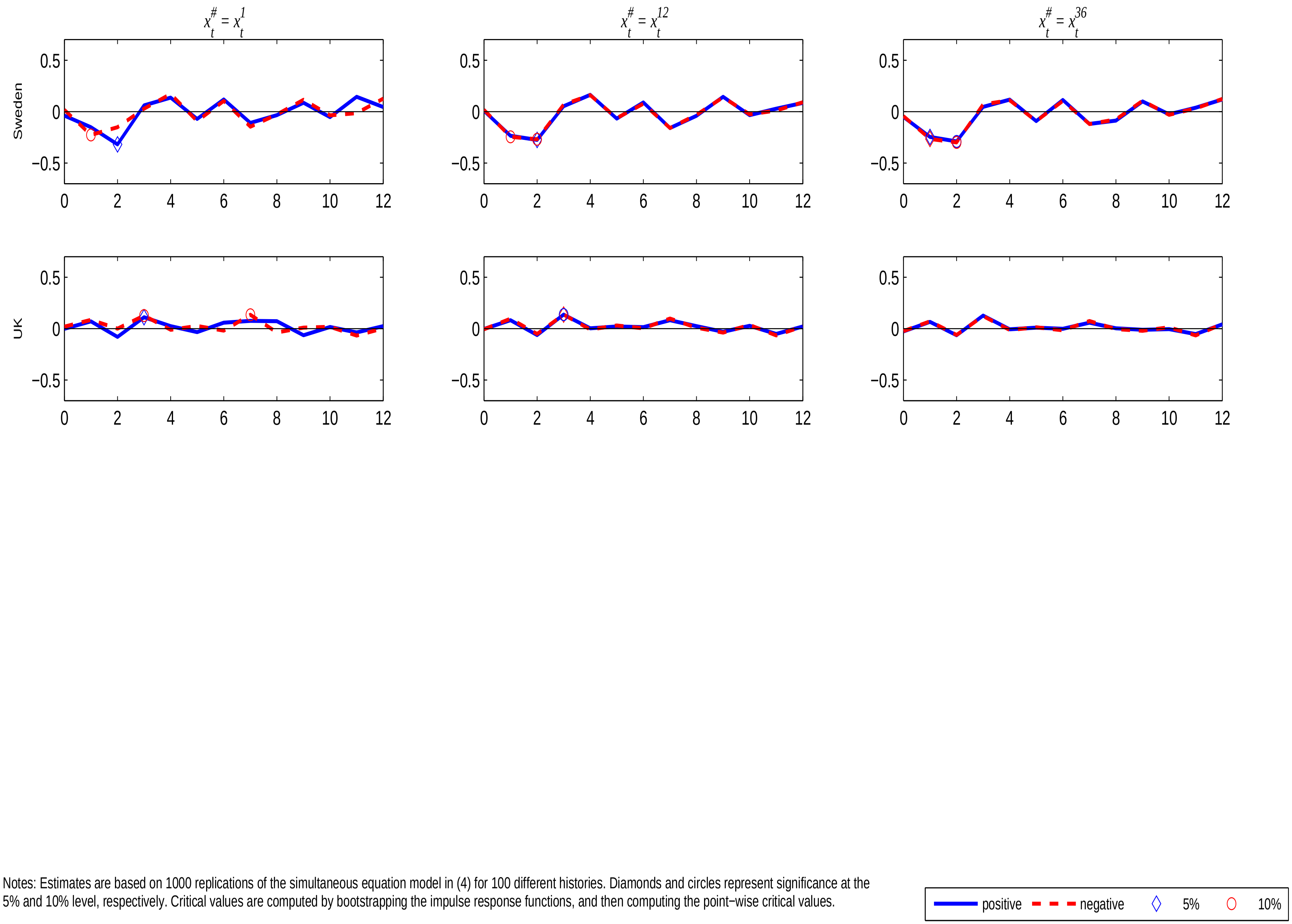
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−3c: Impulse response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



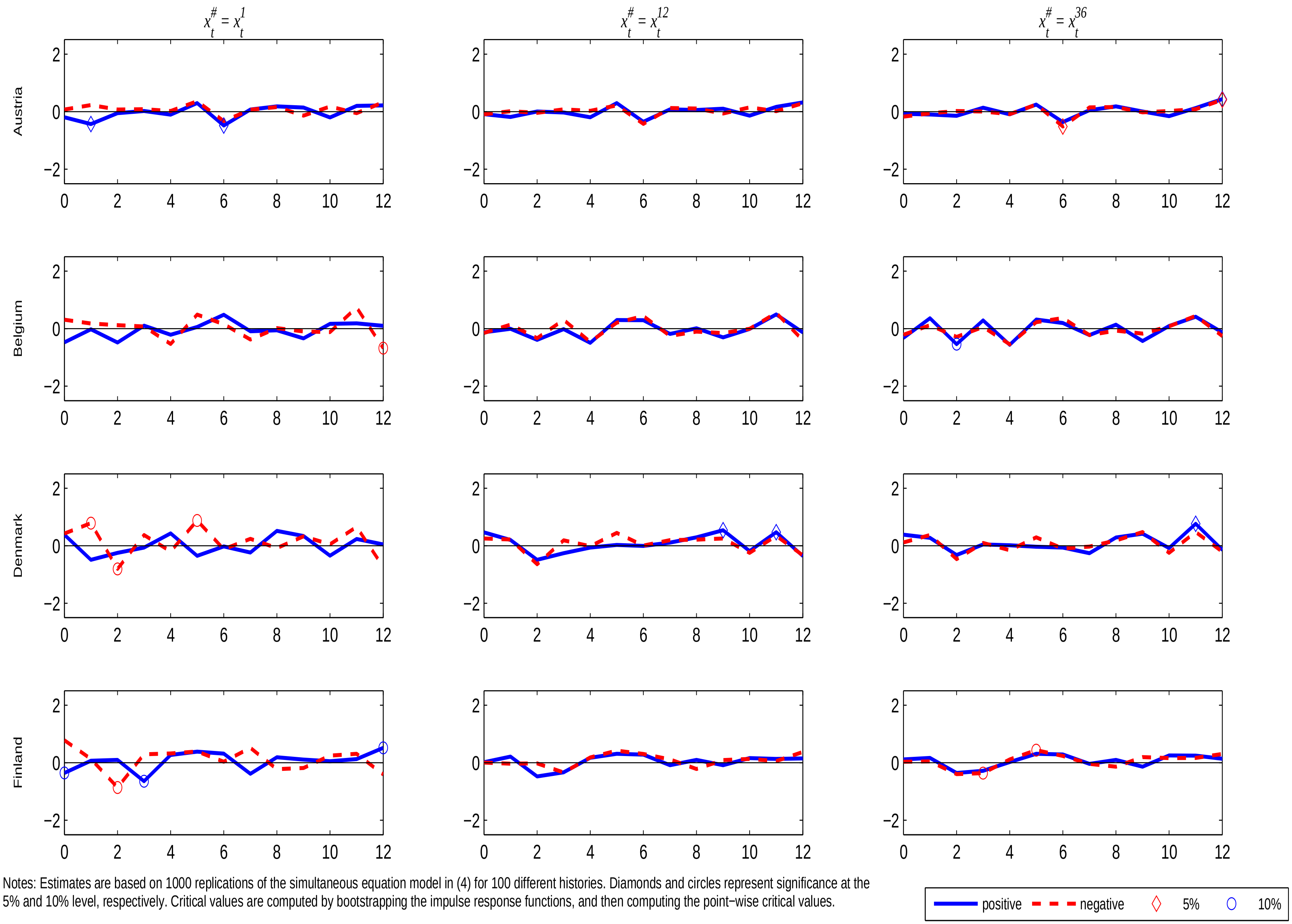
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−3d: Impulse response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



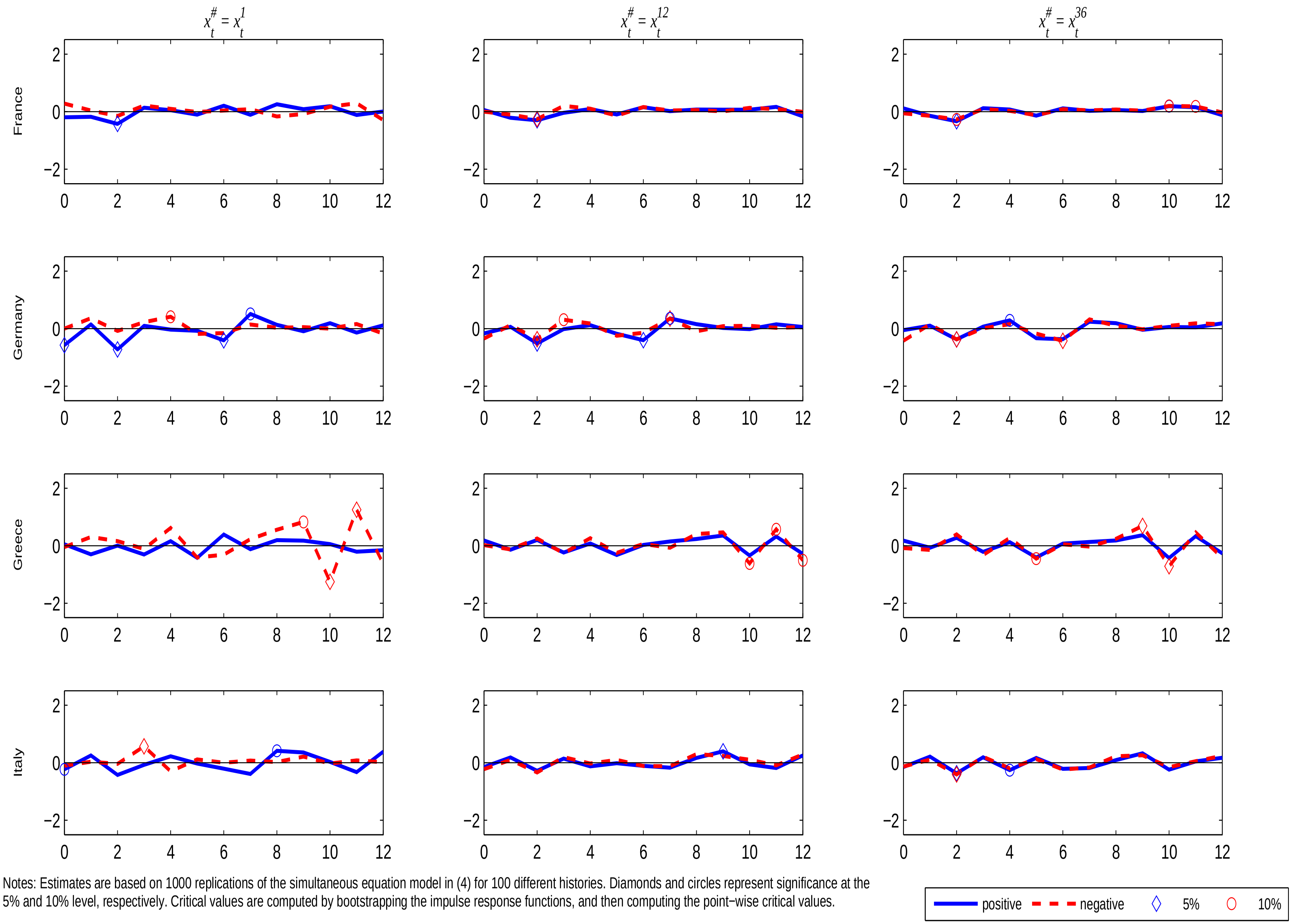
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−4a: Impulse response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



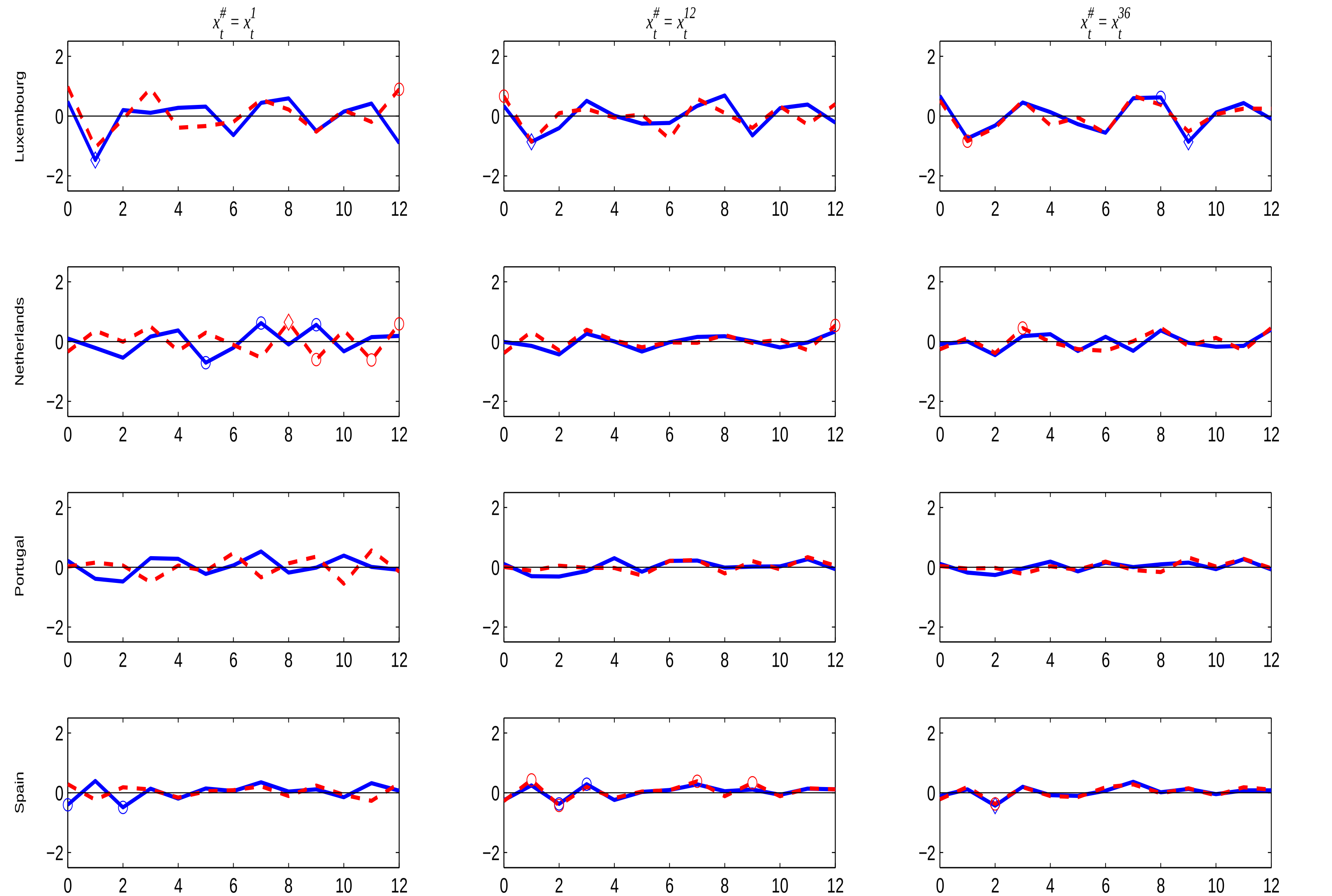
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−4b: Impulse response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



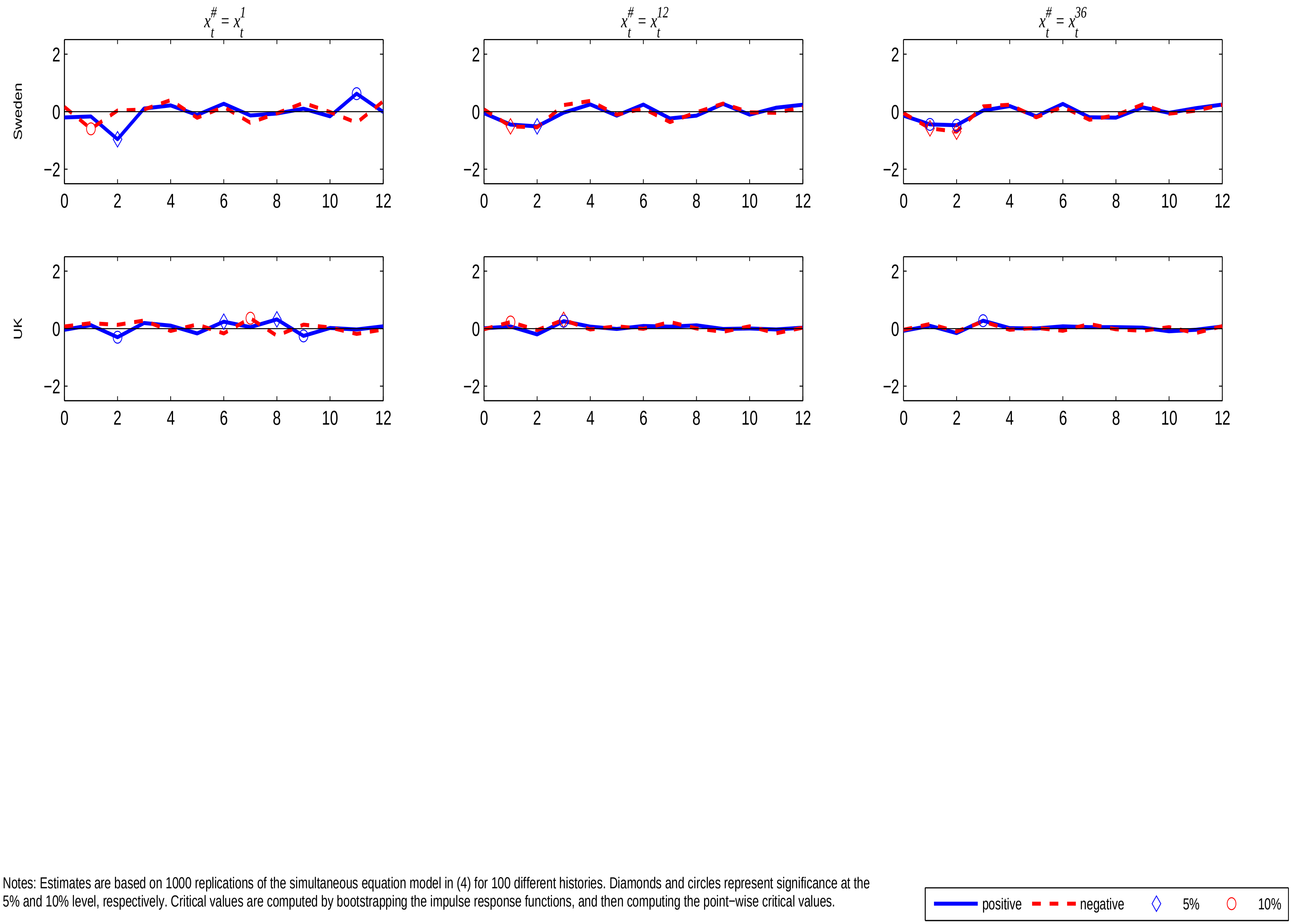
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−4c: Impulse response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



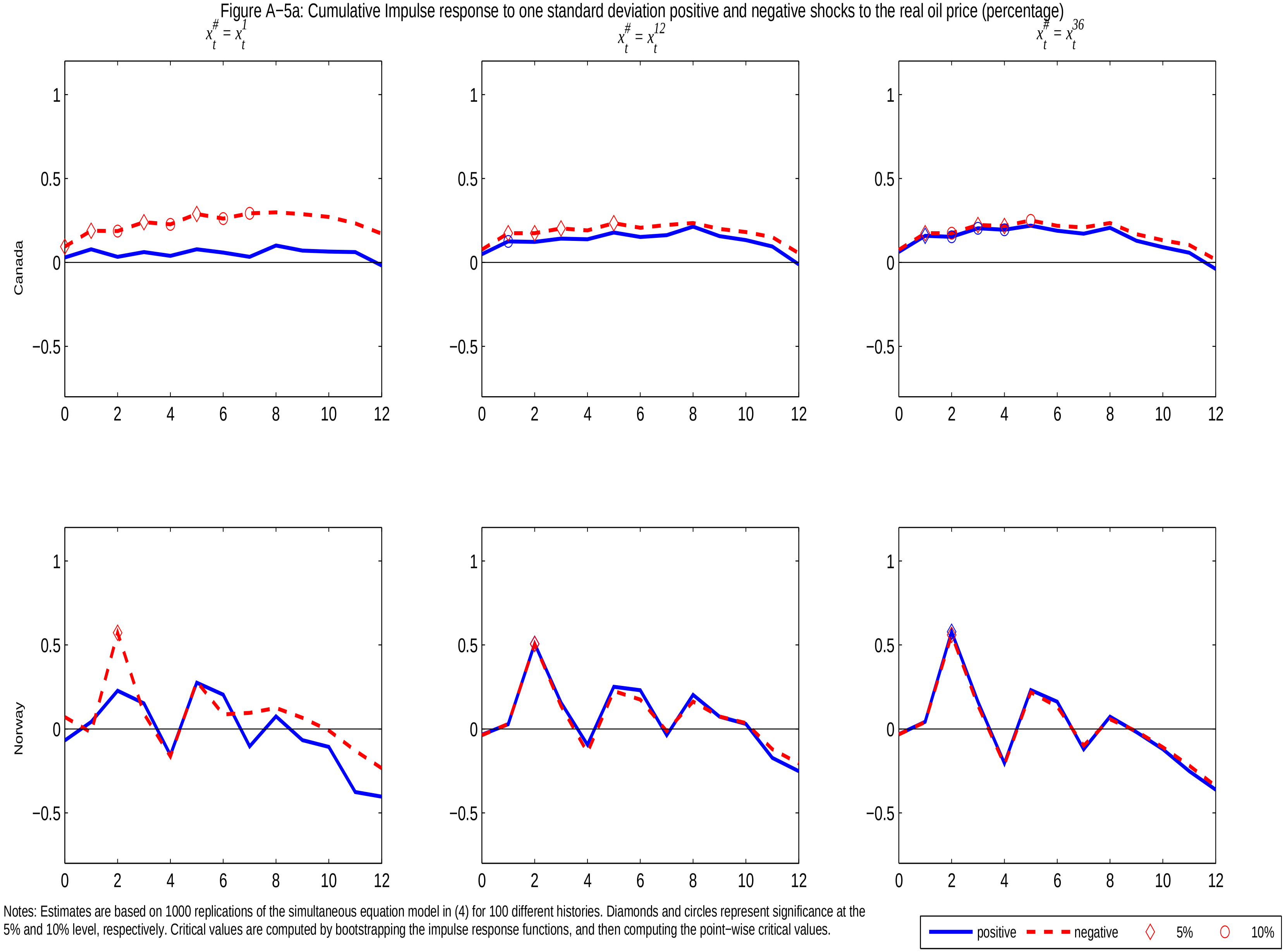
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−4d: Impulse response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



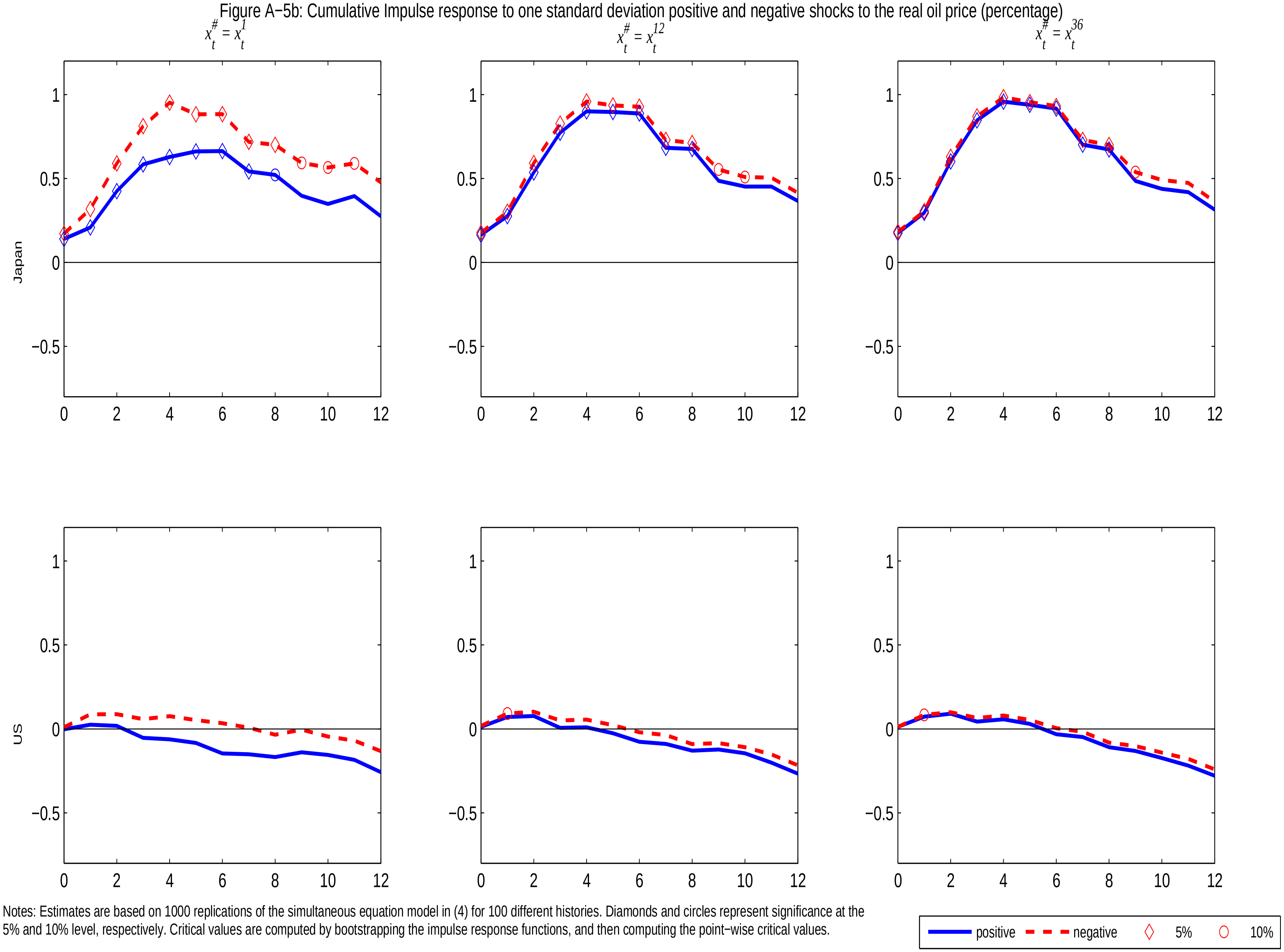
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5a: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



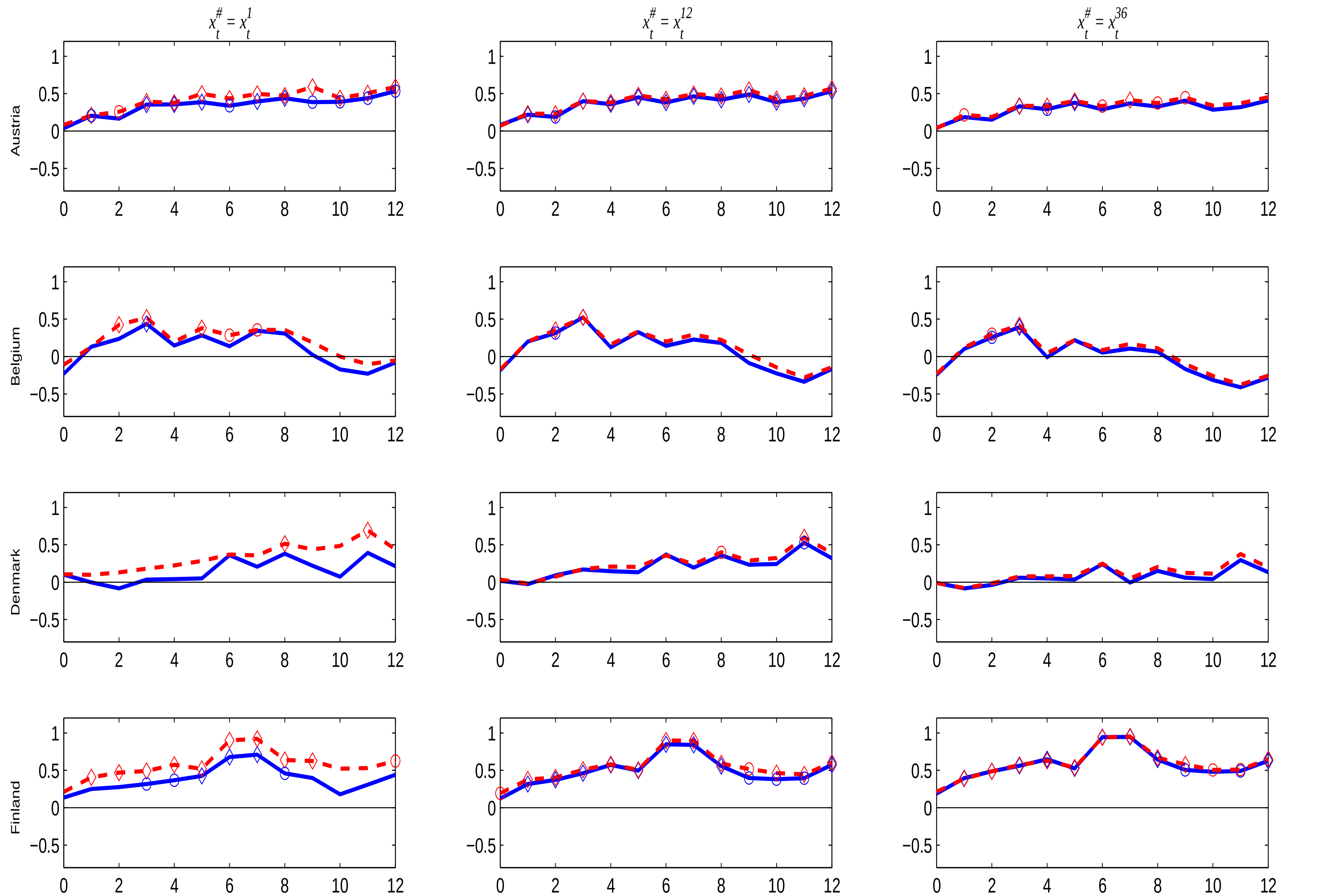
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5b: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



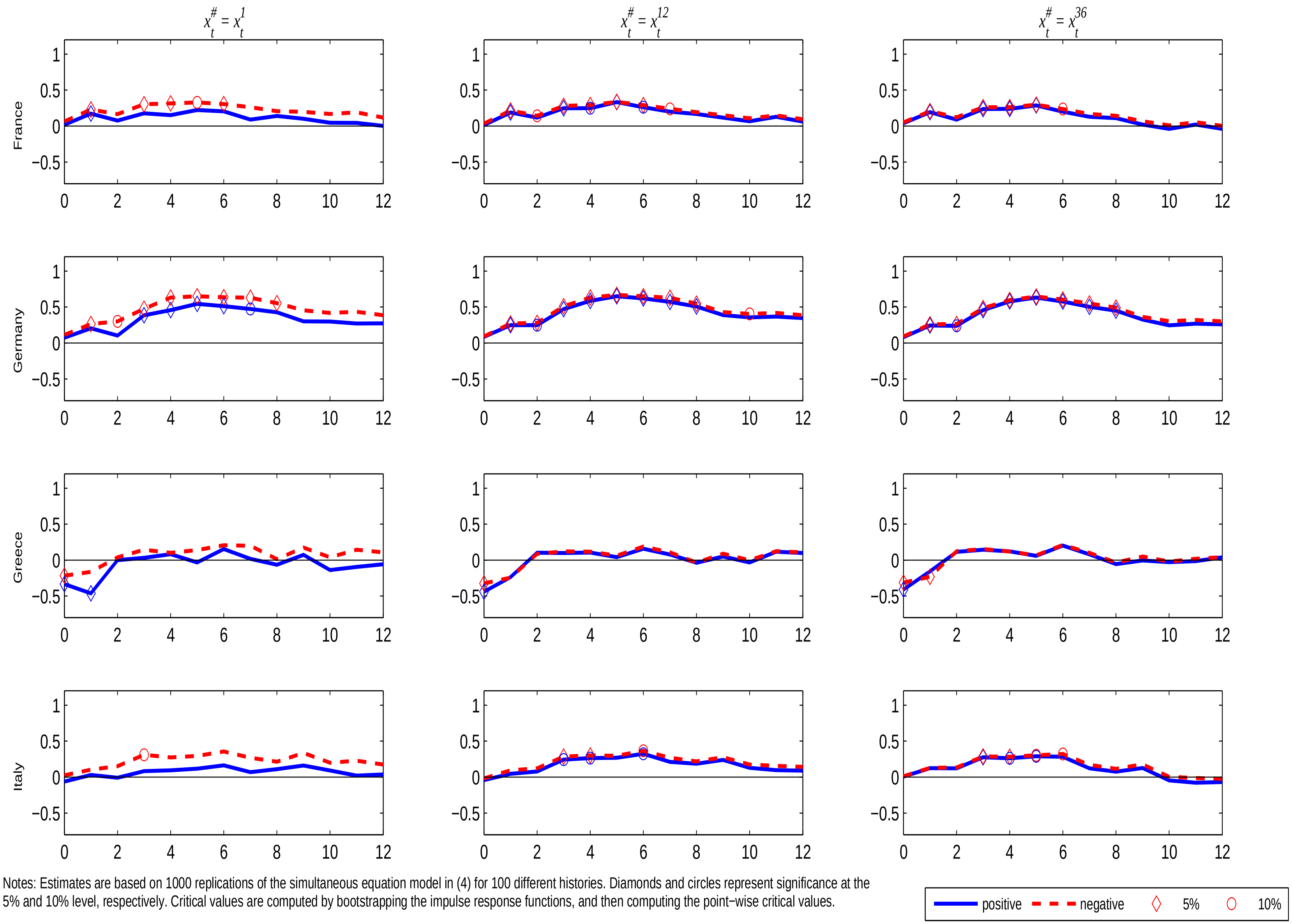
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5c: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



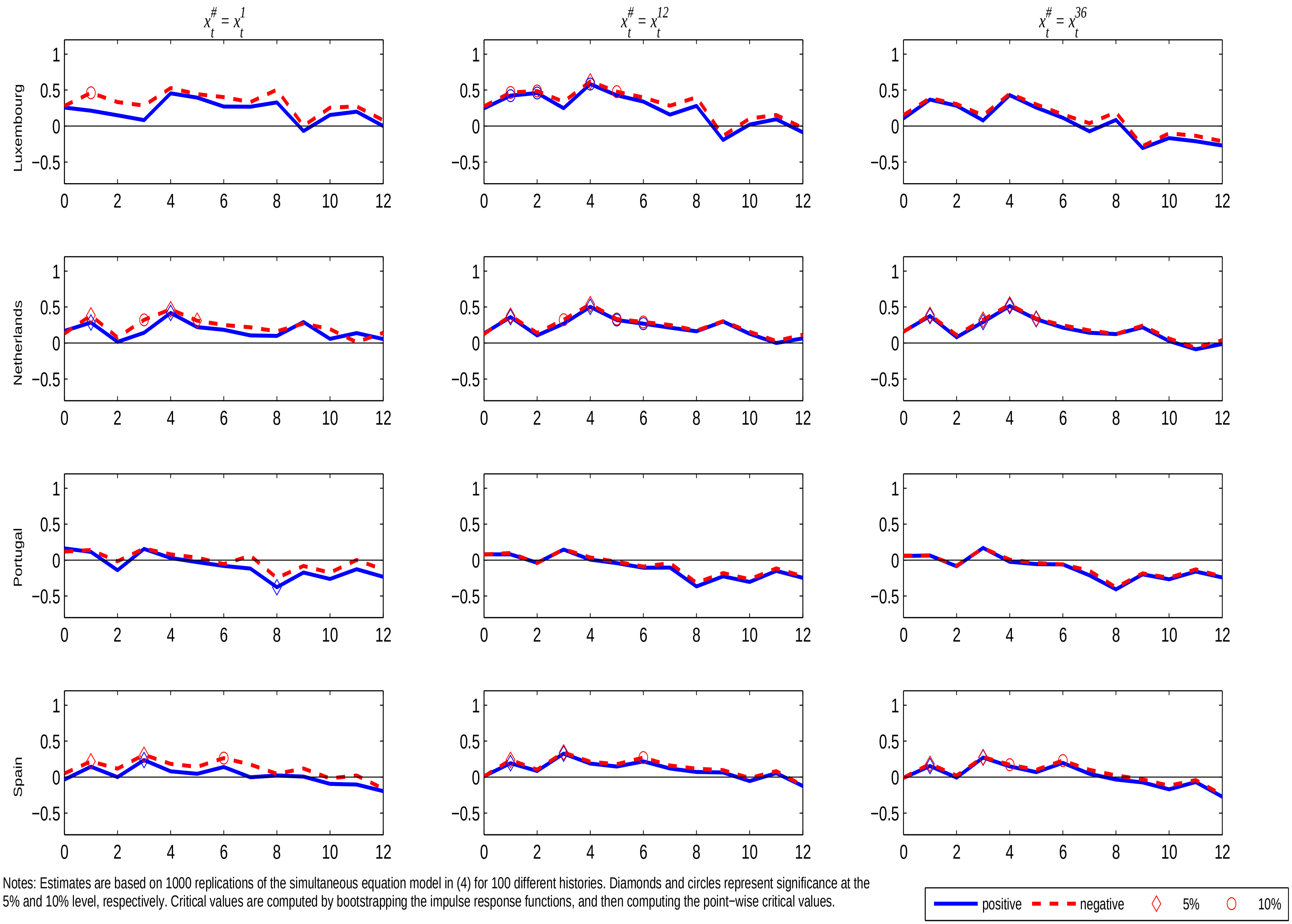
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5d: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



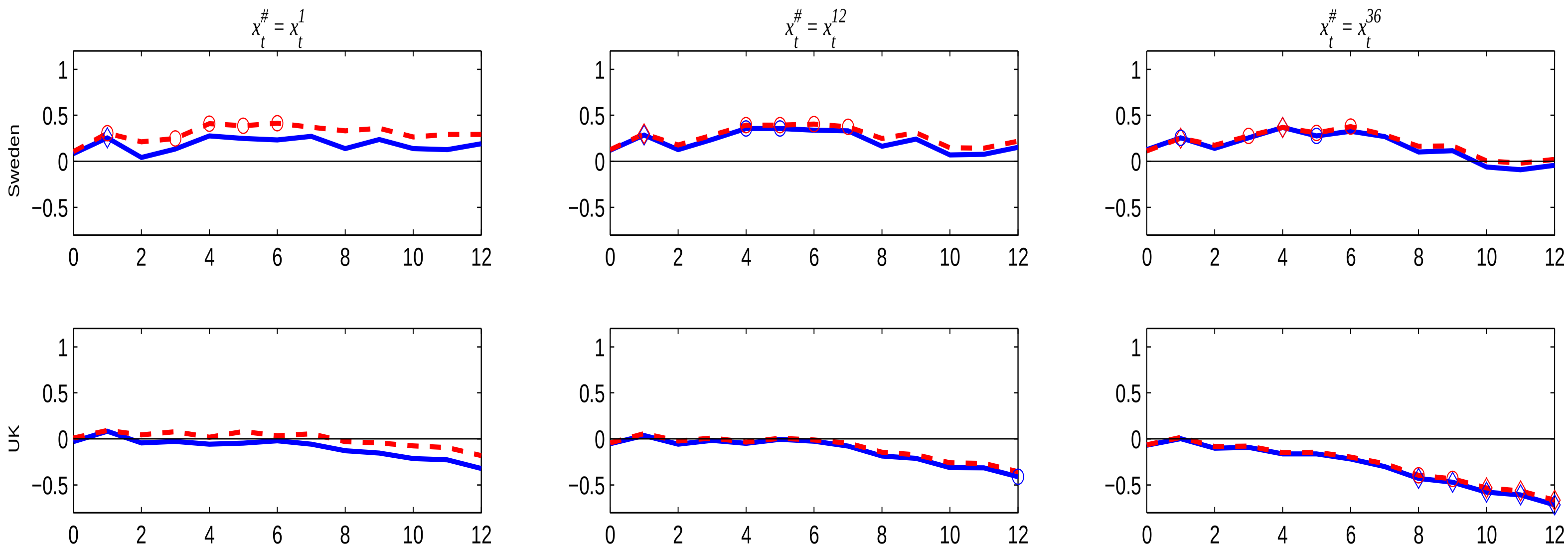
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5e: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−5f: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

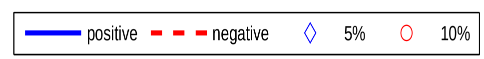
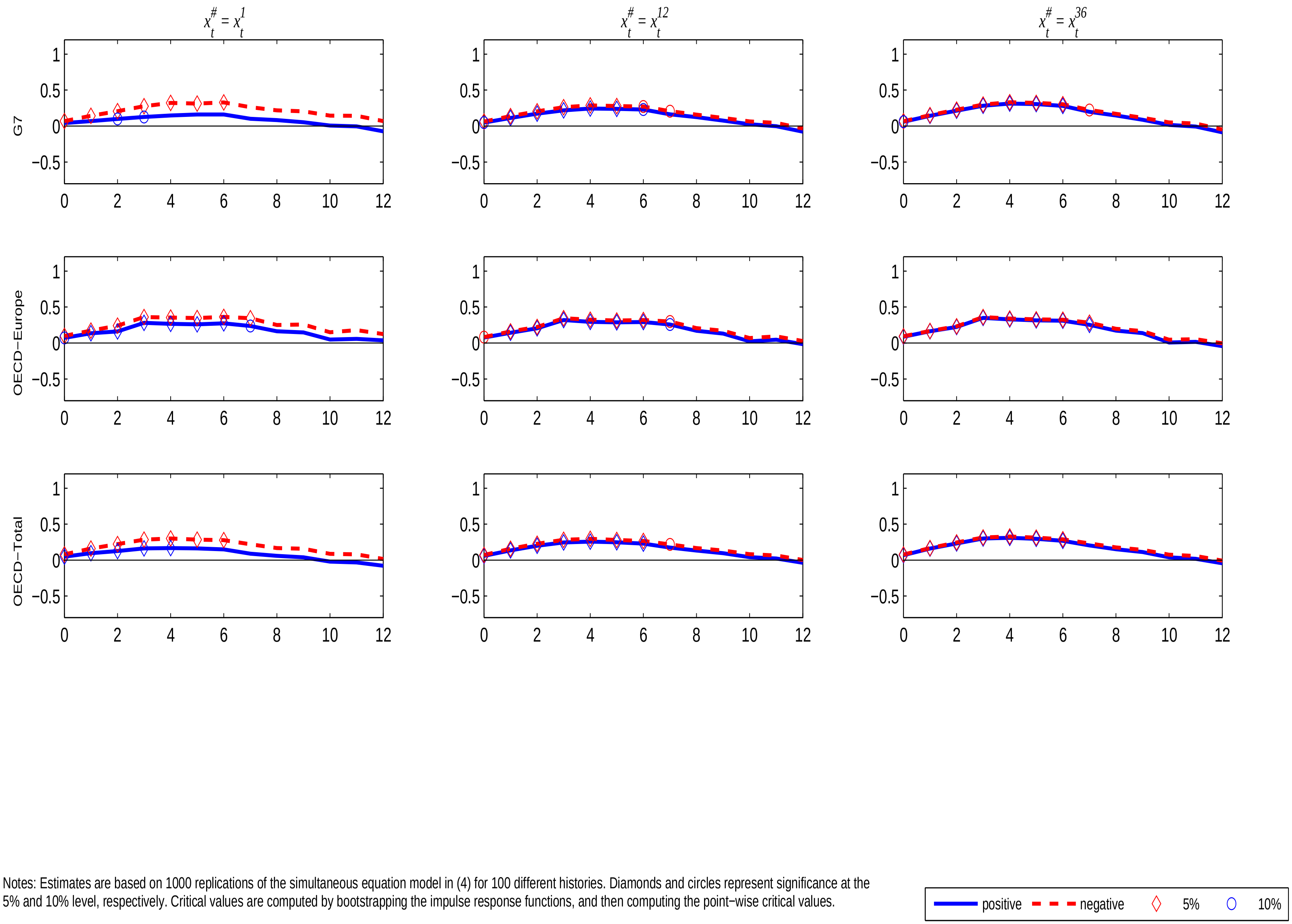
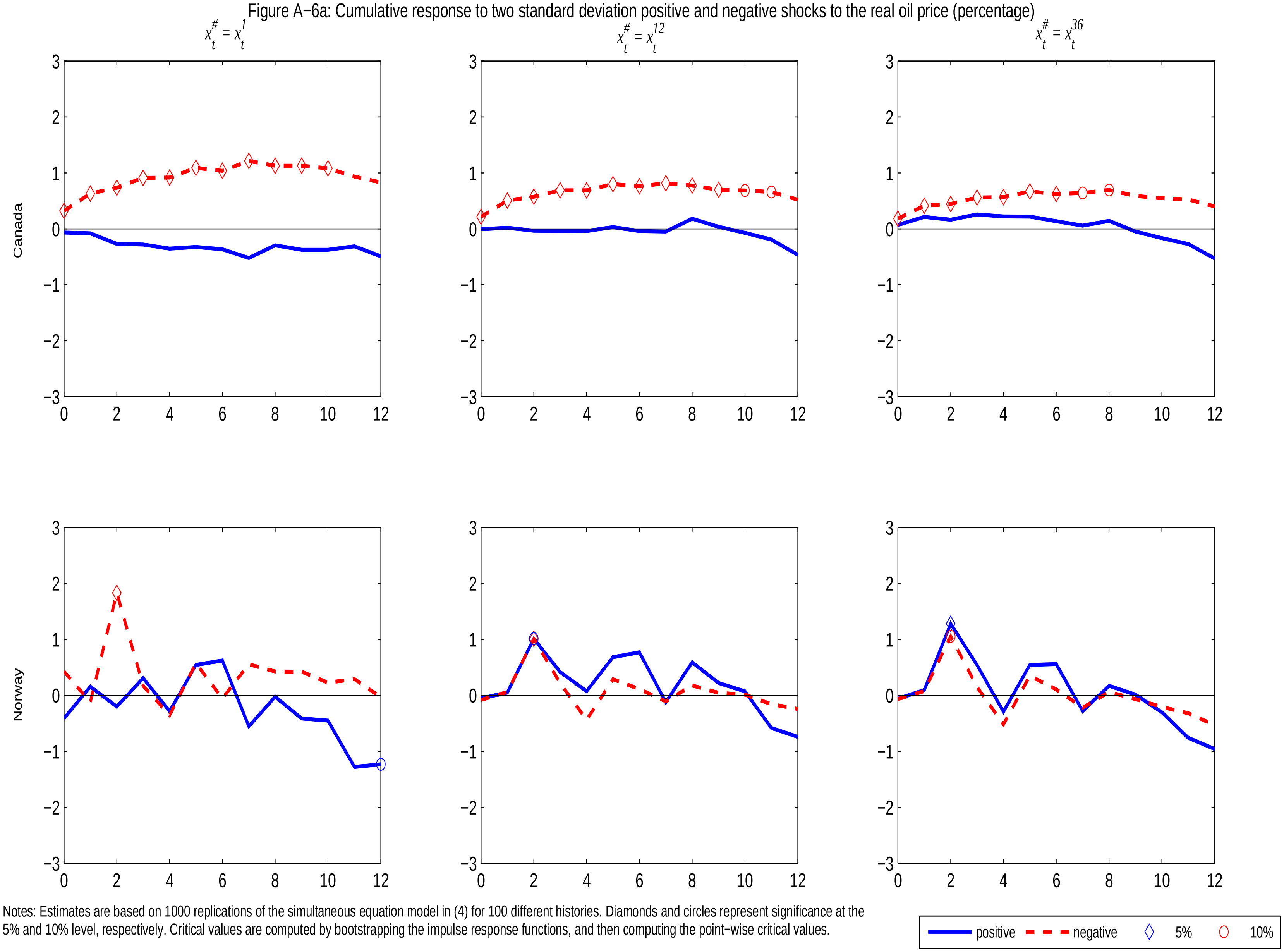


Figure A−5g: Cumulative Impulse response to one standard deviation positive and negative shocks to the real oil price (percentage)



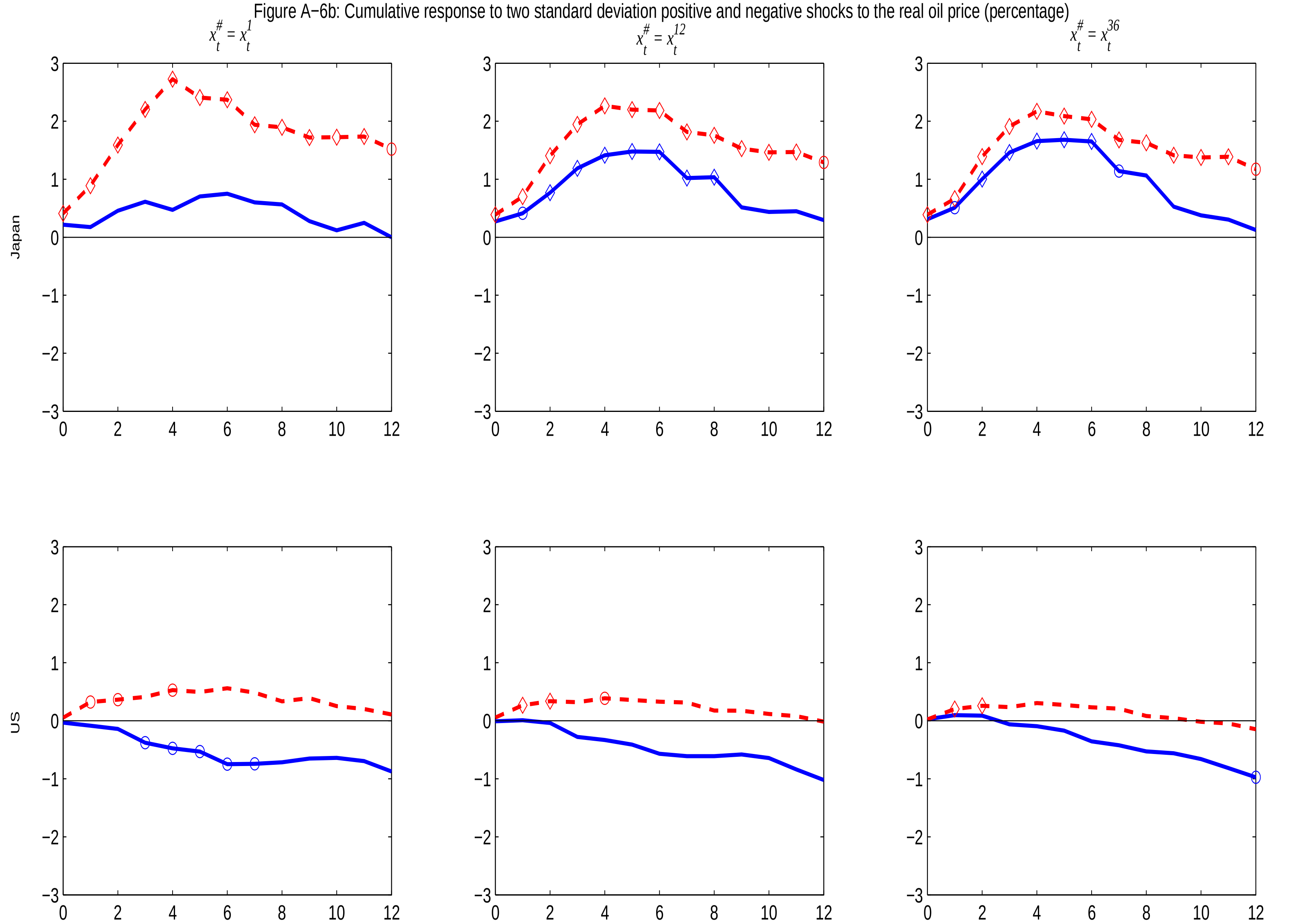
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6a: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



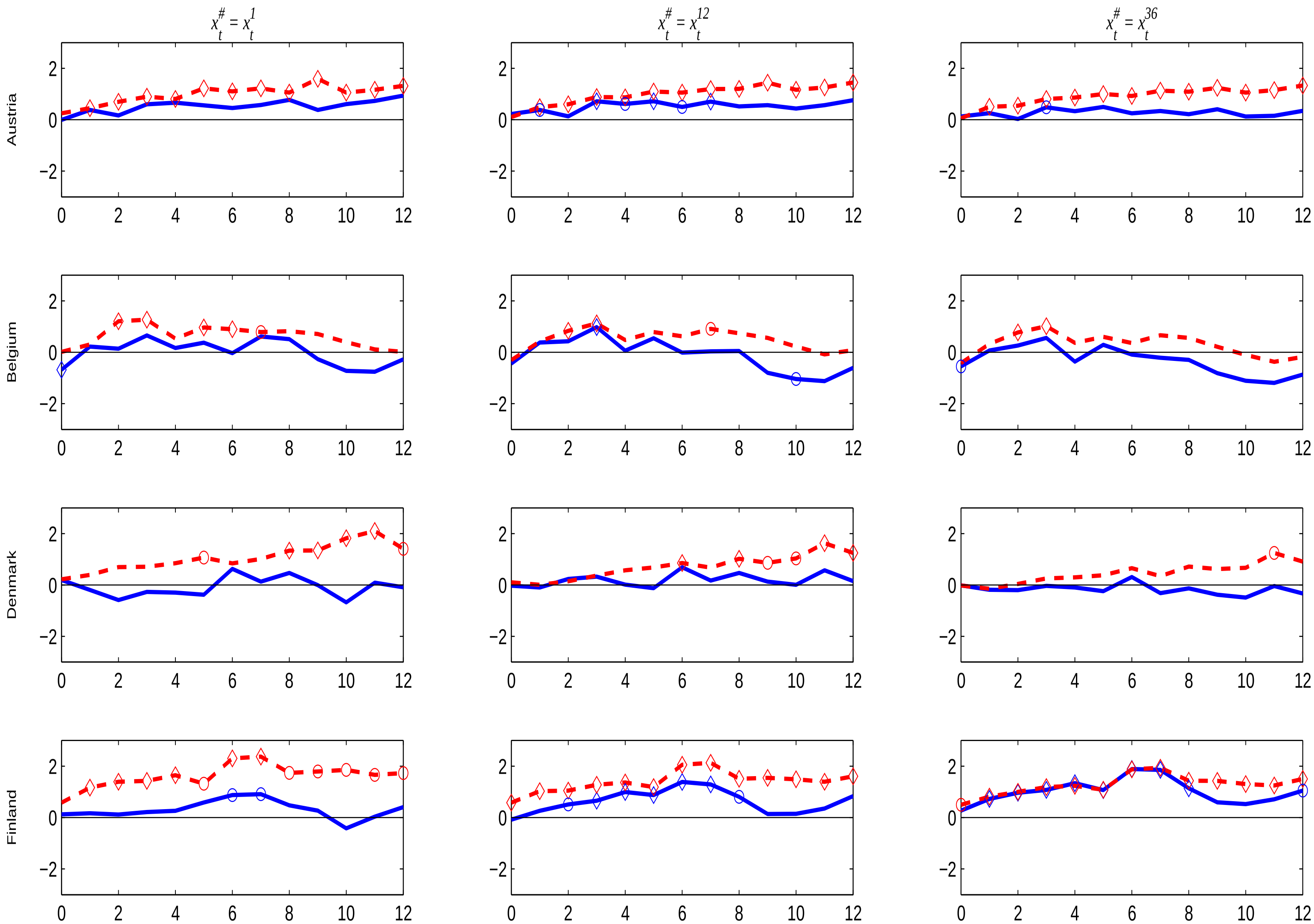
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6b: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



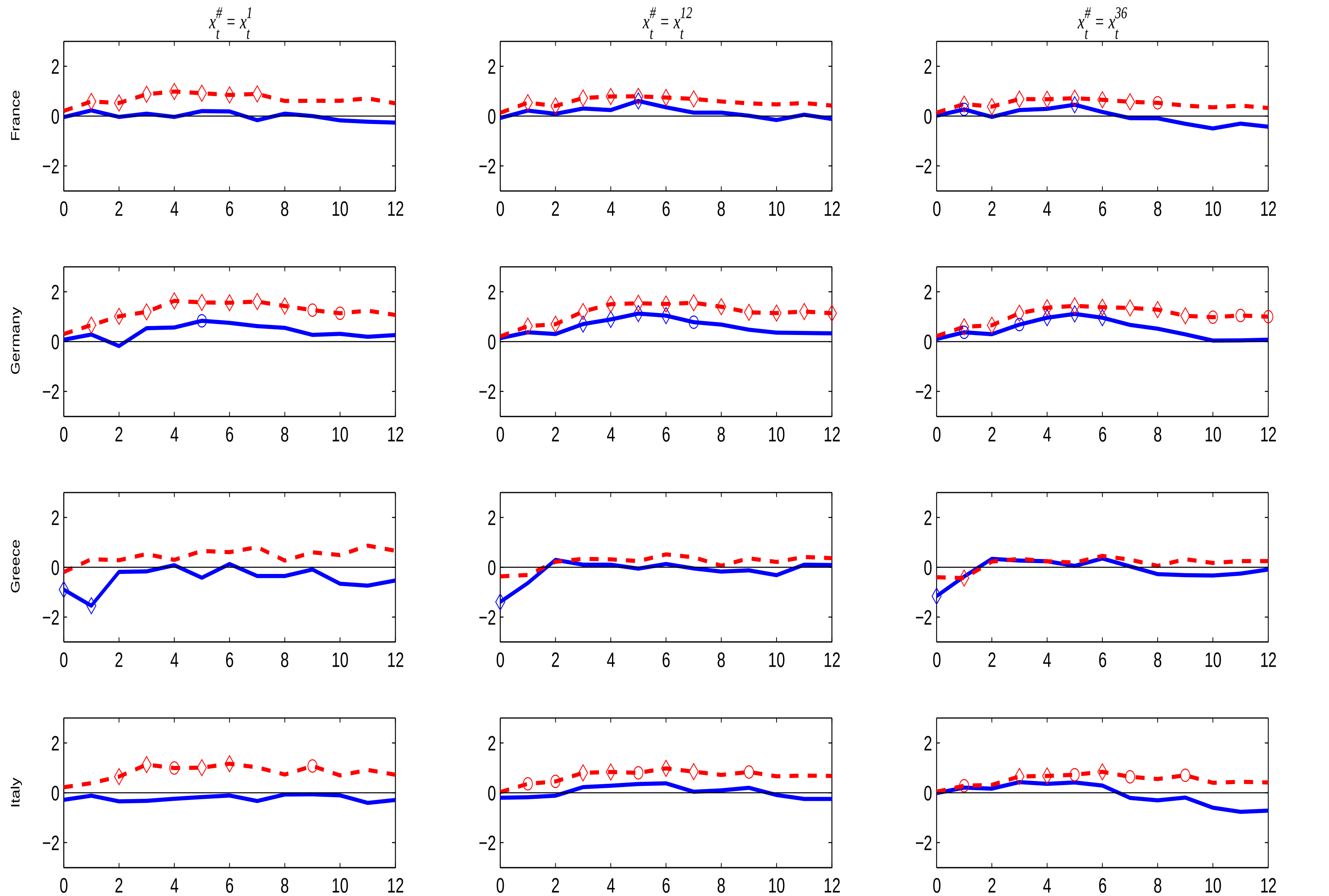
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6c: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



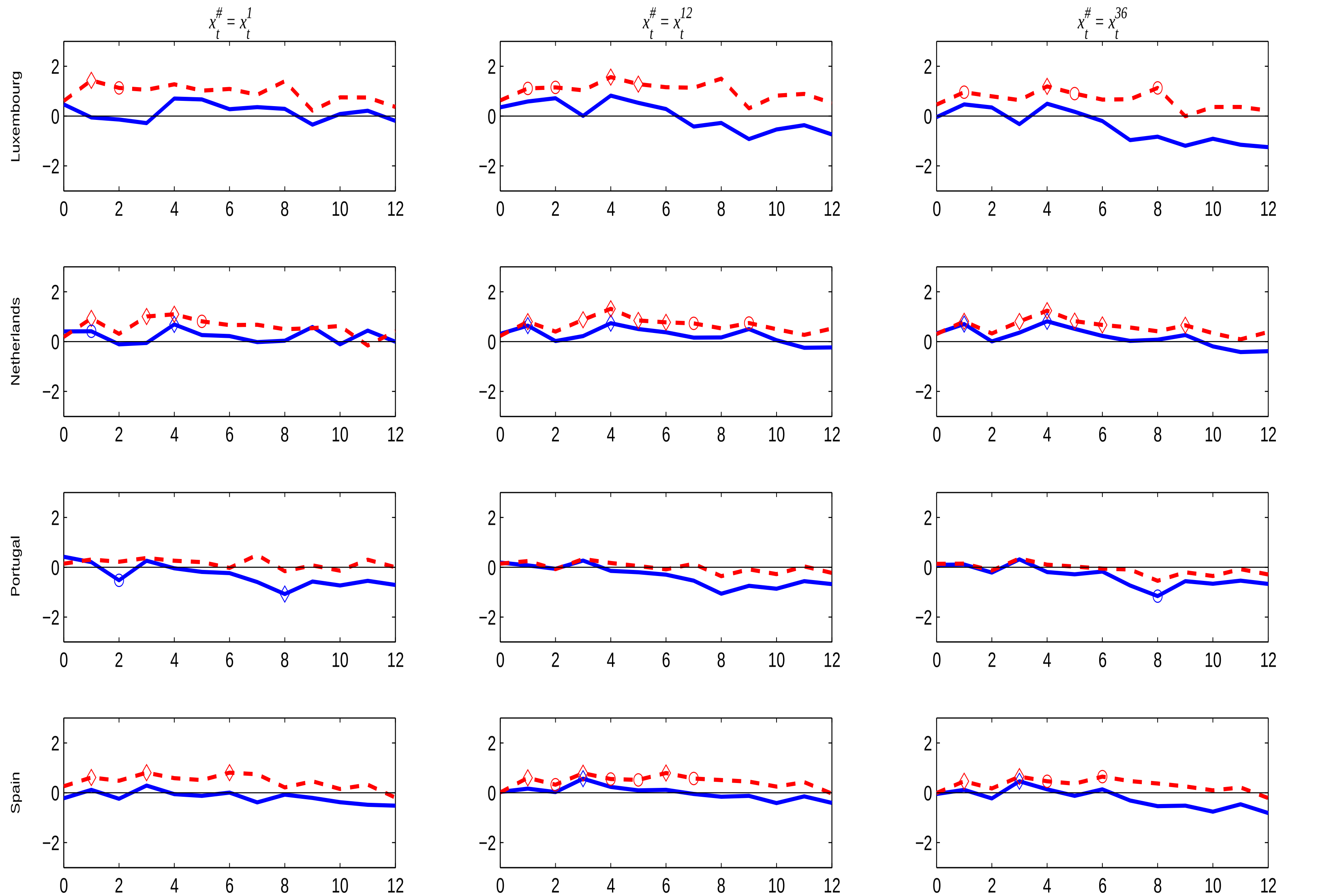
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6d: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



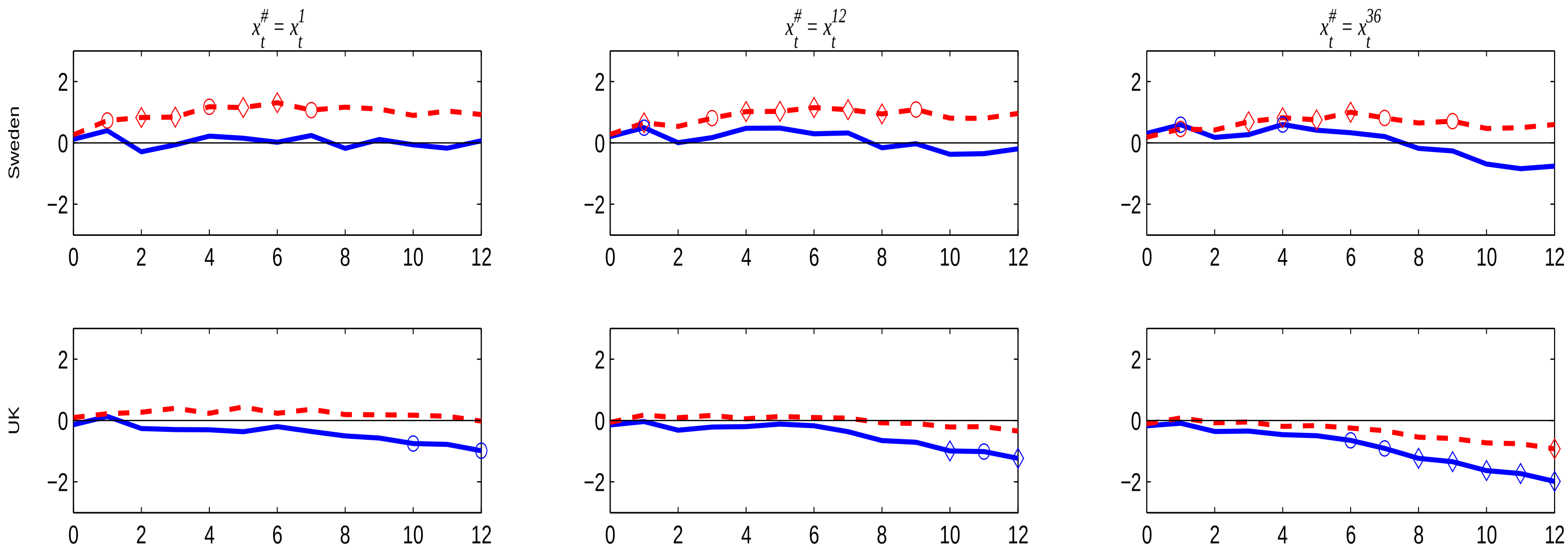
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6e: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−6f: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

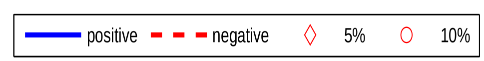
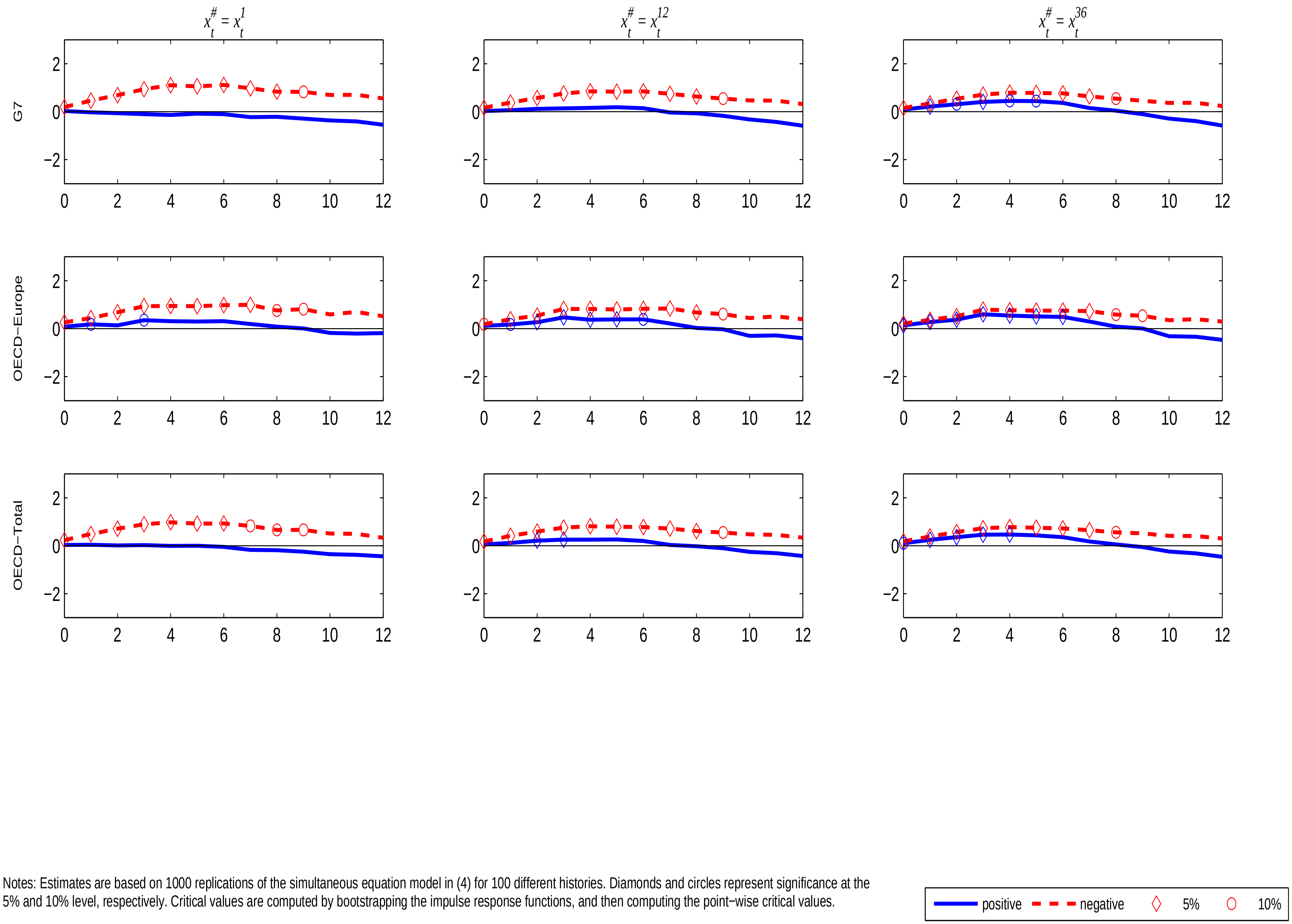
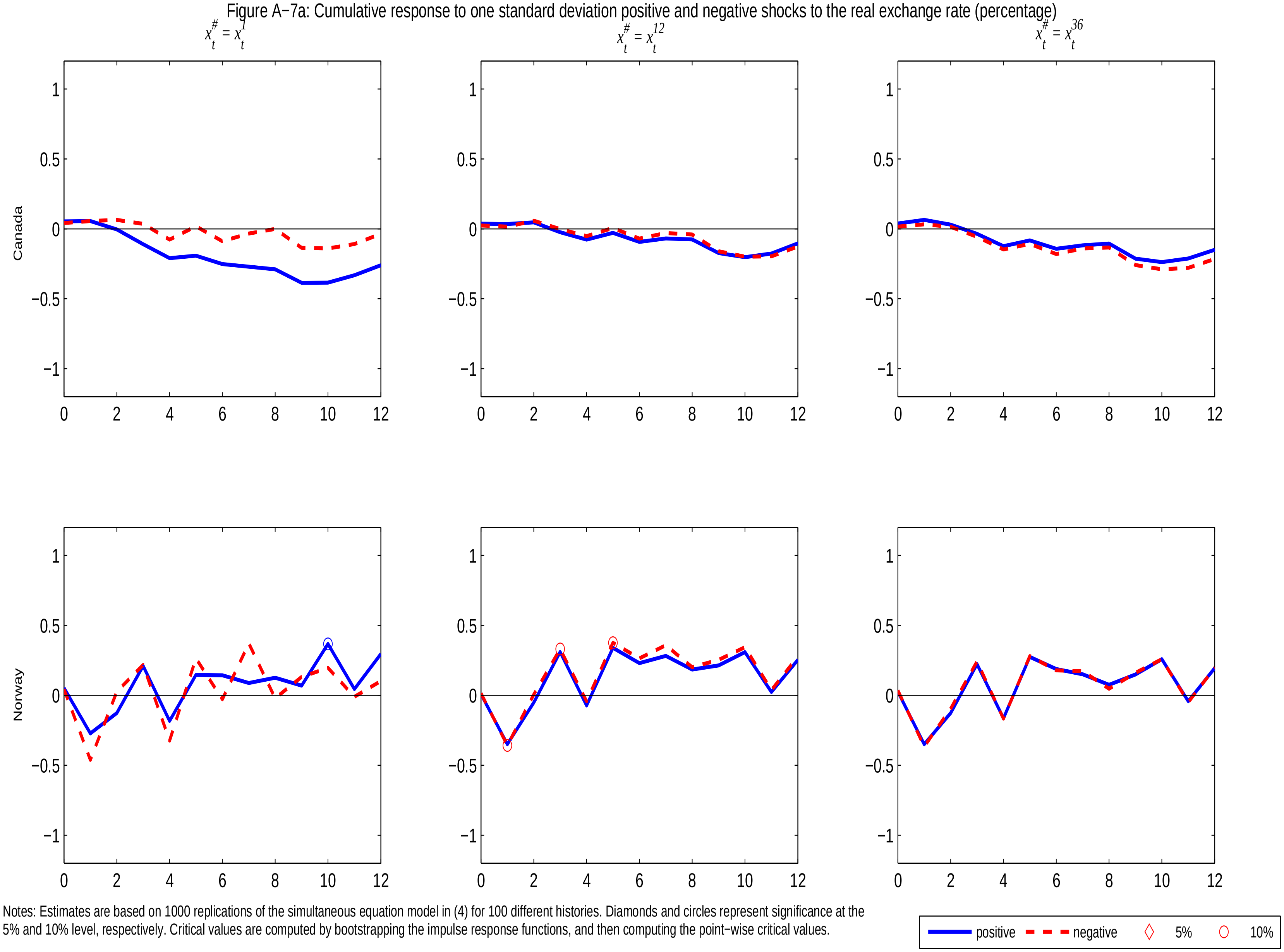


Figure A−6g: Cumulative response to two standard deviation positive and negative shocks to the real oil price (percentage)



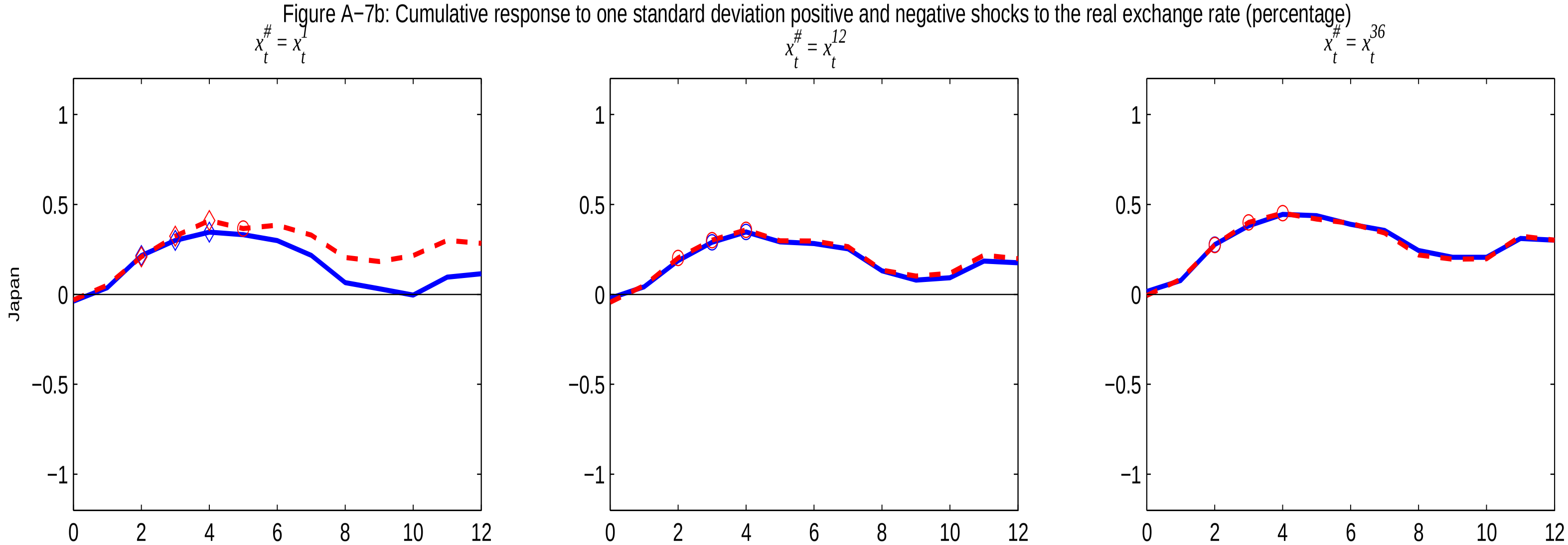
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−7a: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−7b: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

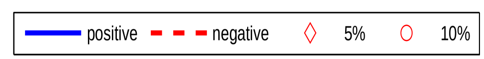
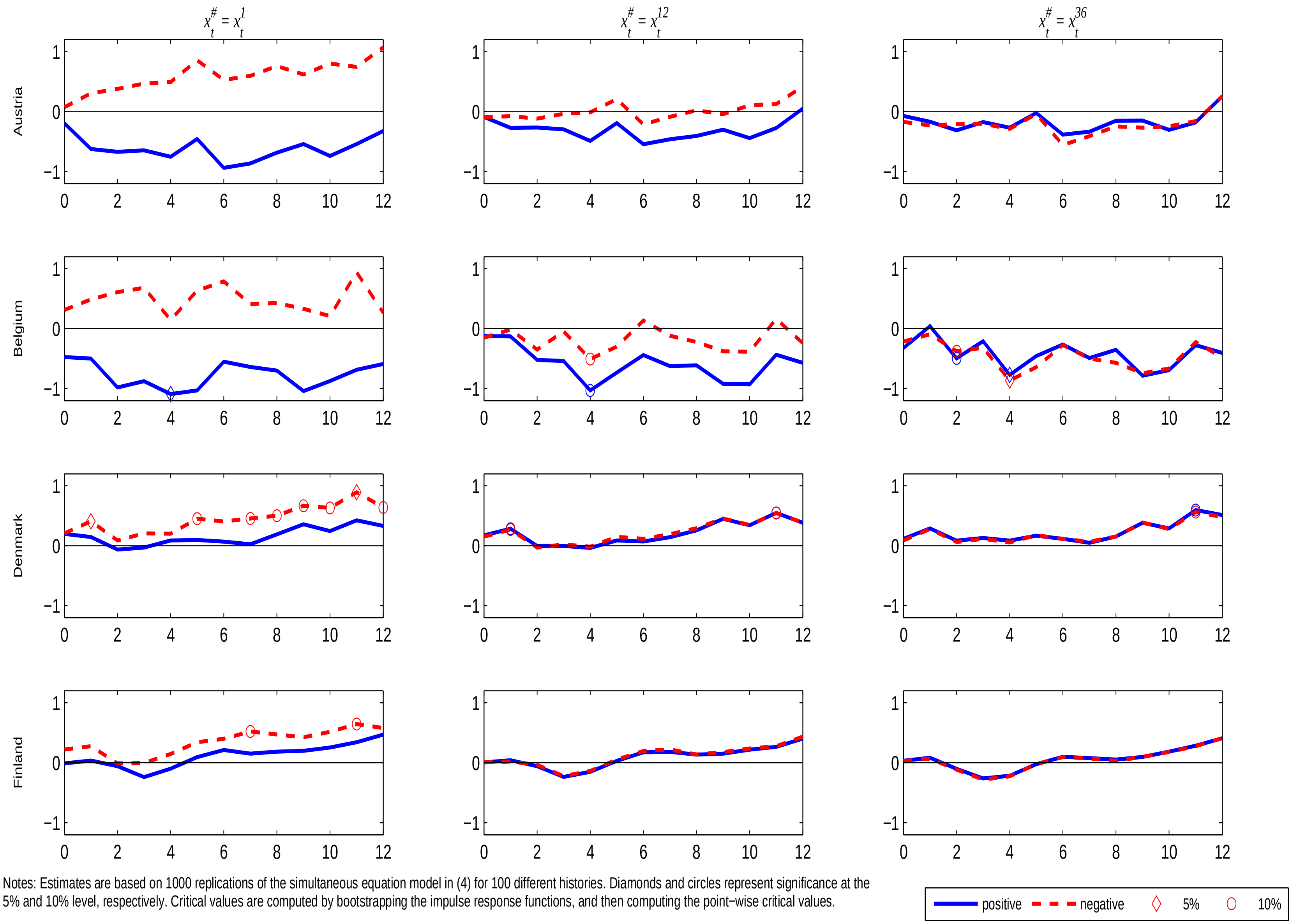
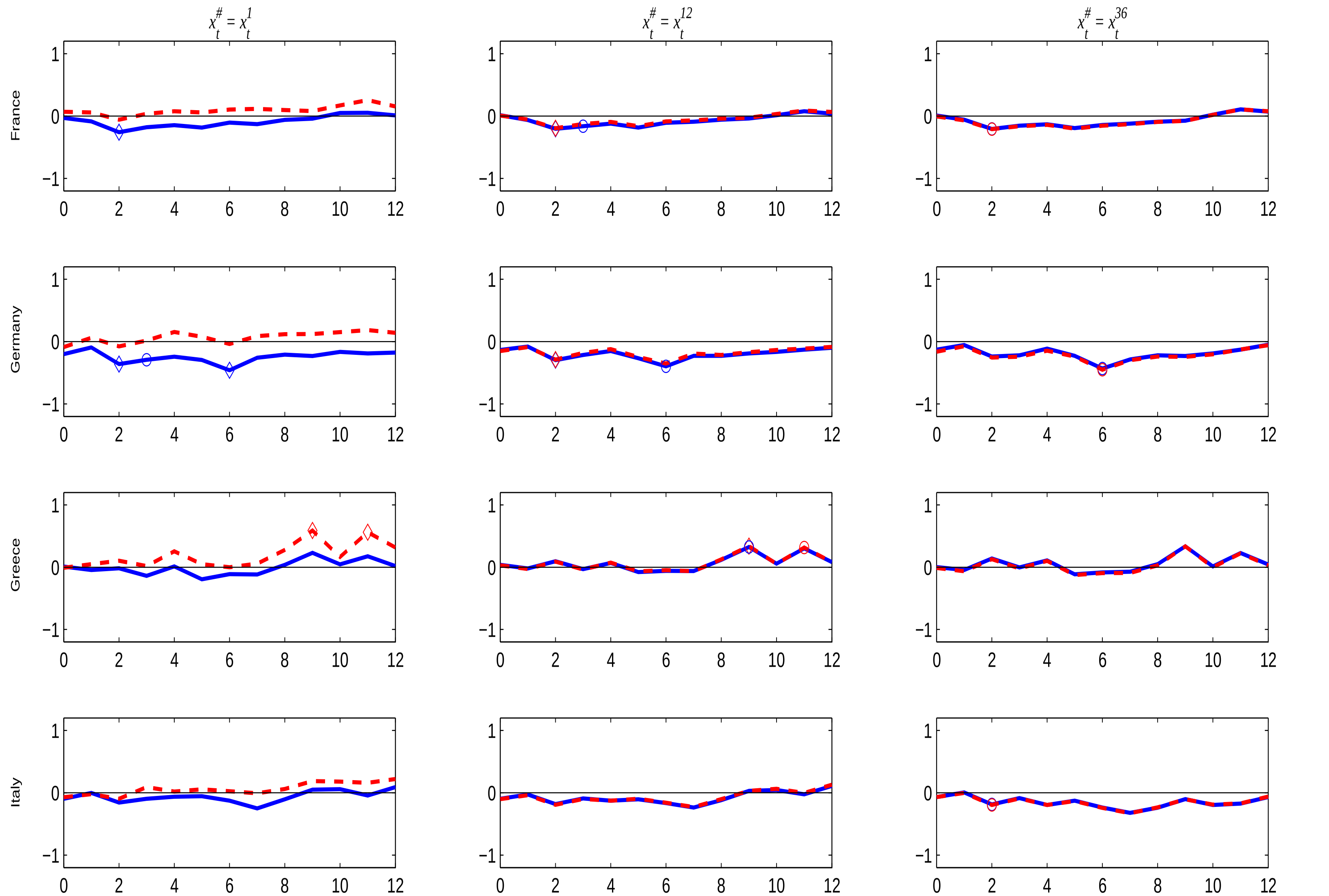


Figure A−7c: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



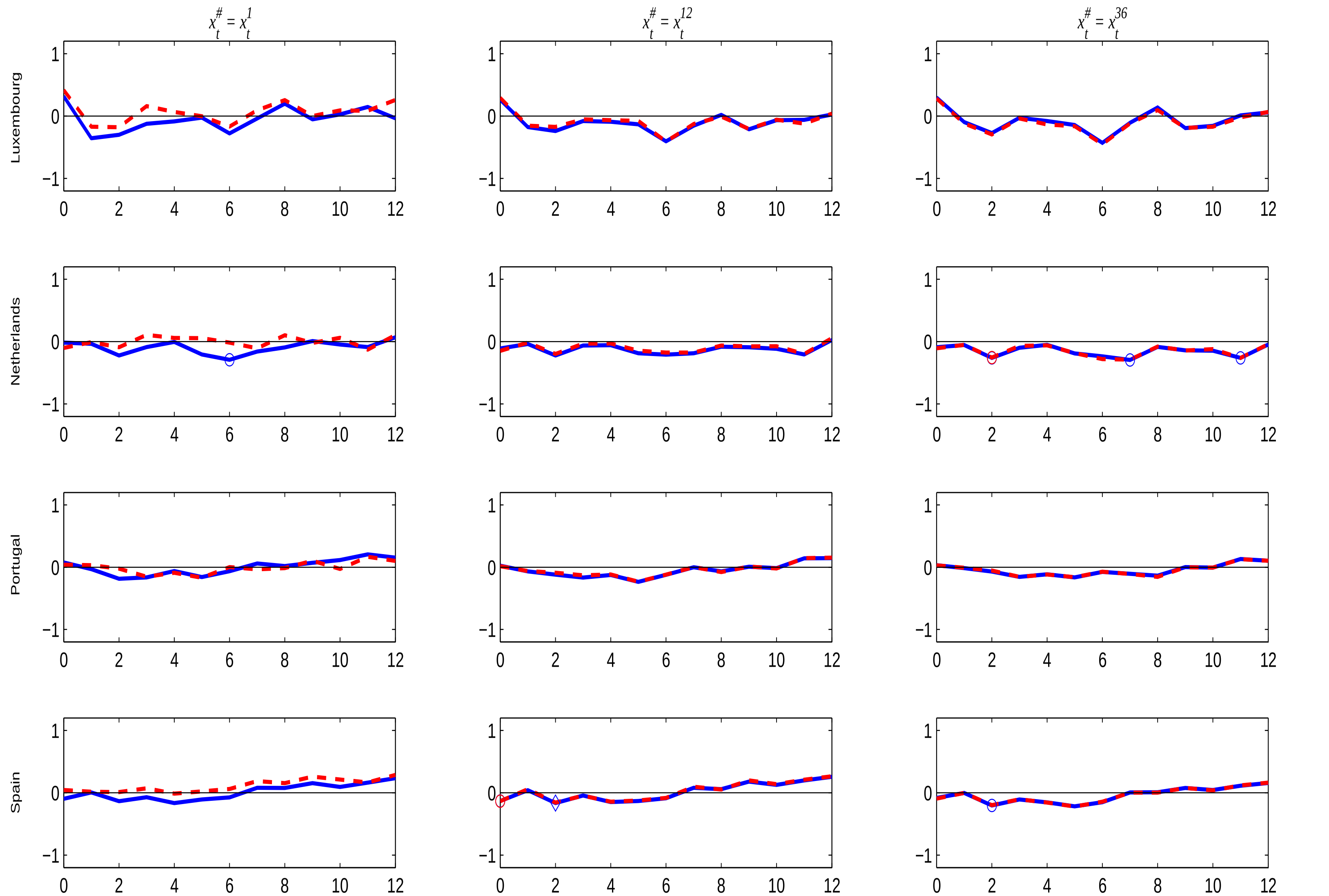
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−7d: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



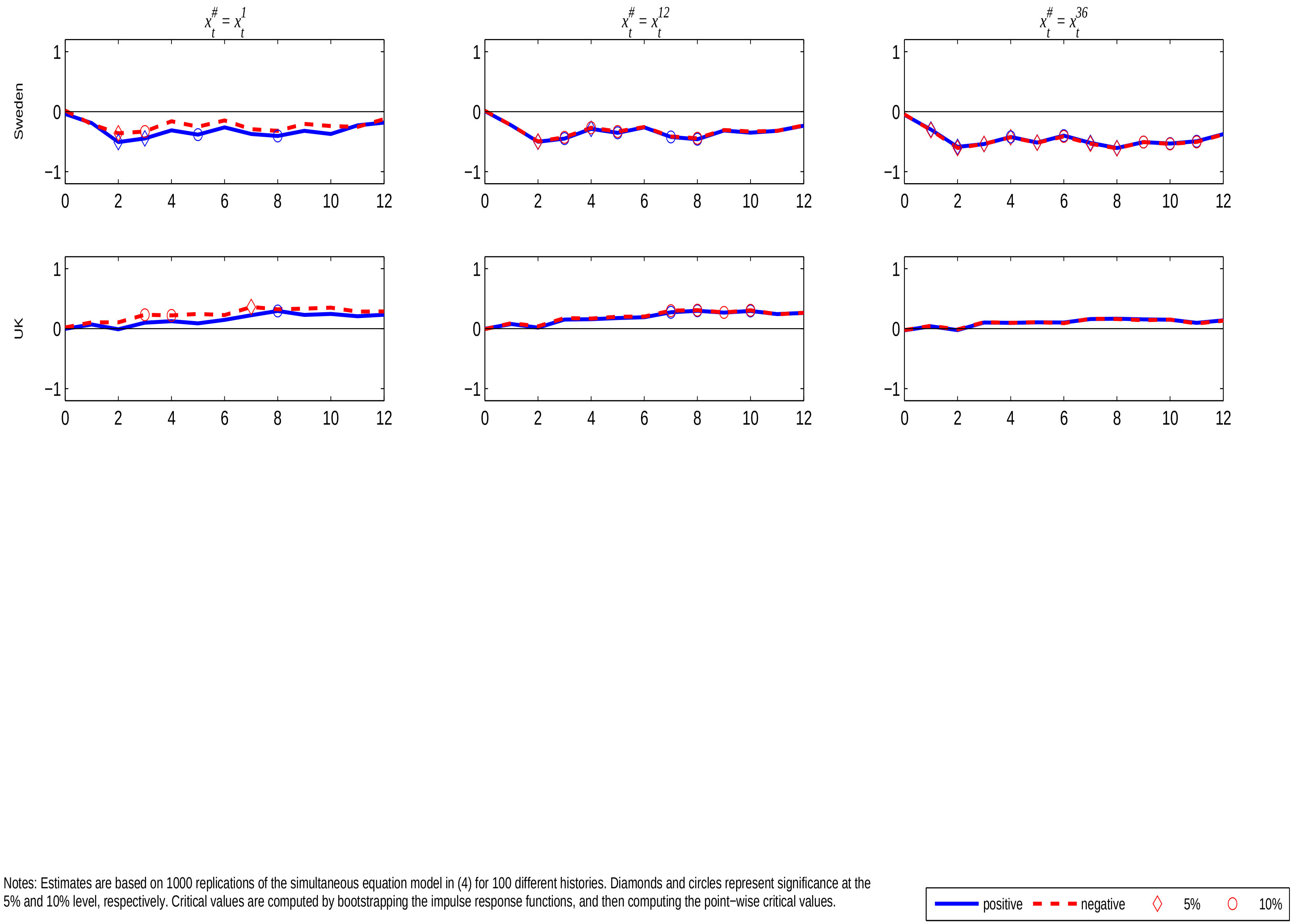
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−7e: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



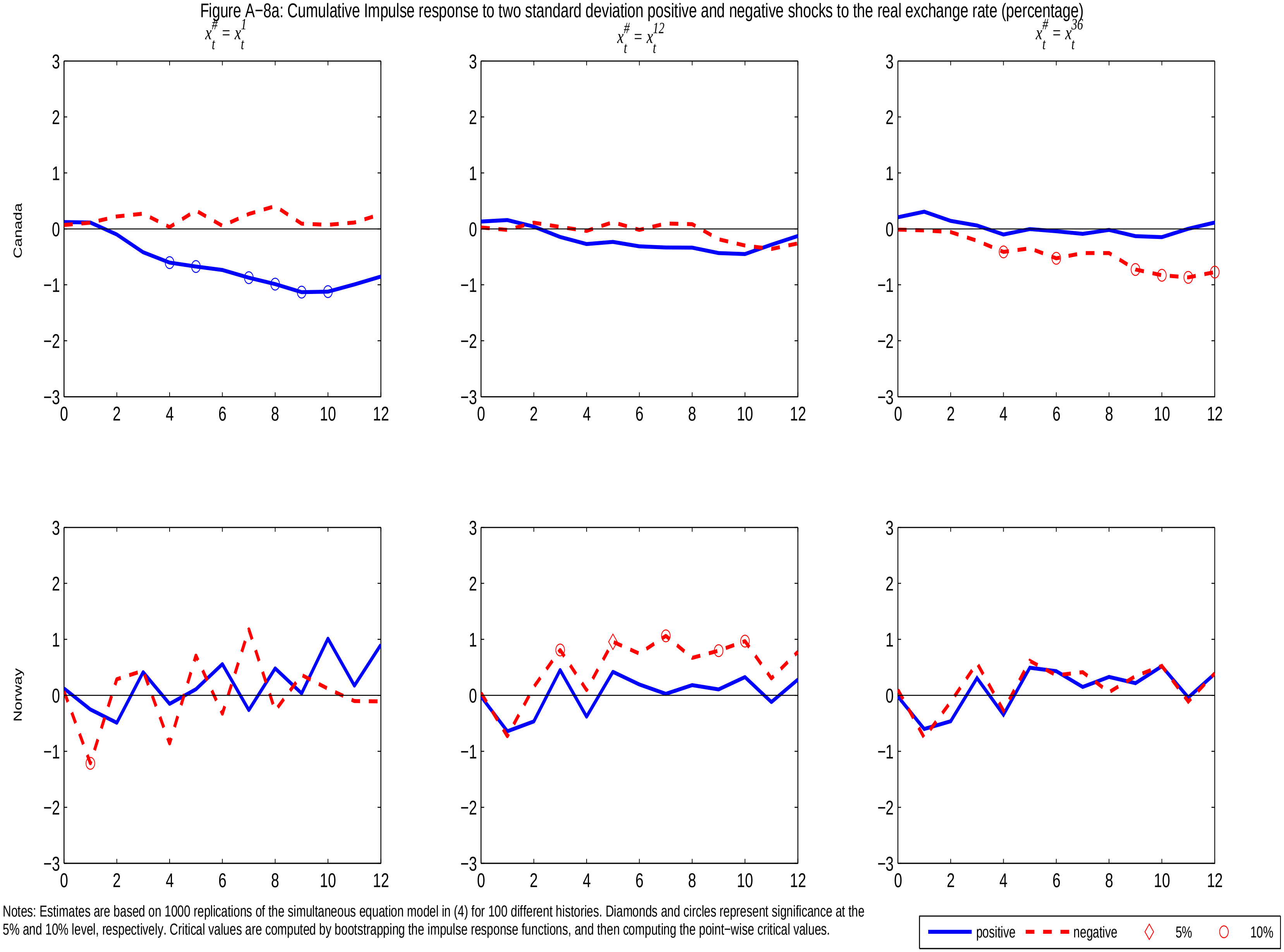
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−7f: Cumulative response to one standard deviation positive and negative shocks to the real exchange rate (percentage)



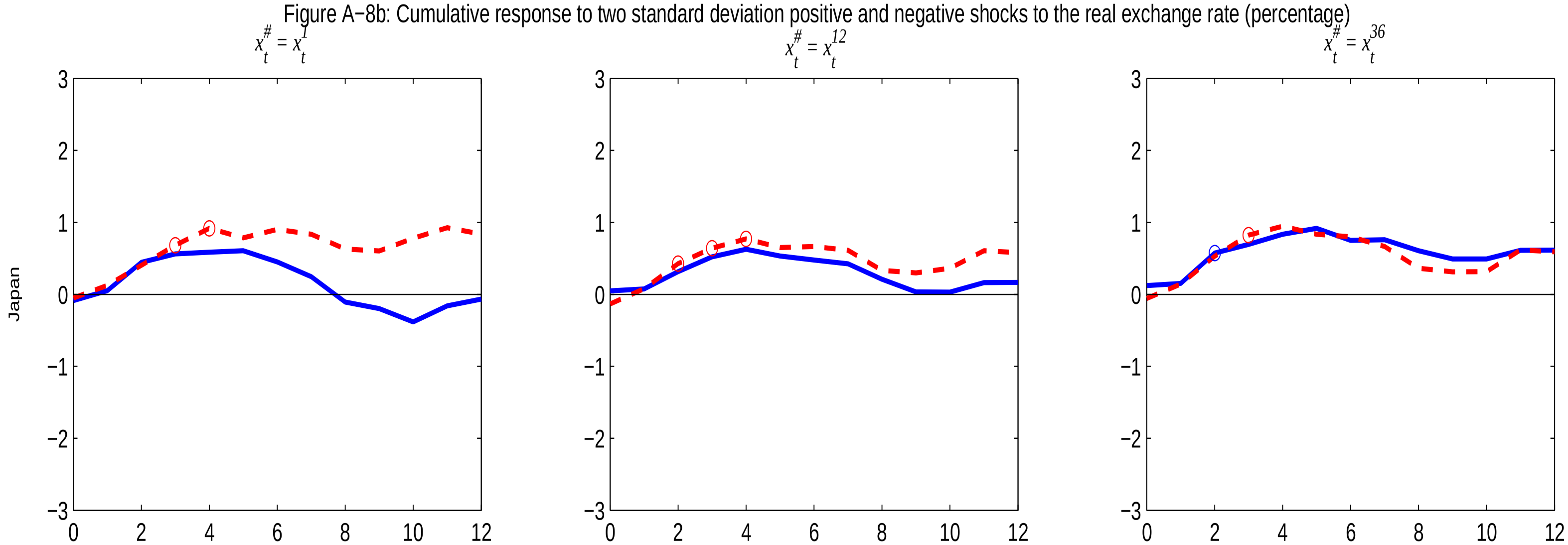
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−8a: Cumulative Impulse response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−8b: Cumulative response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

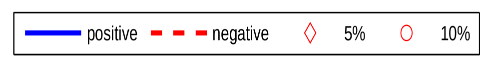
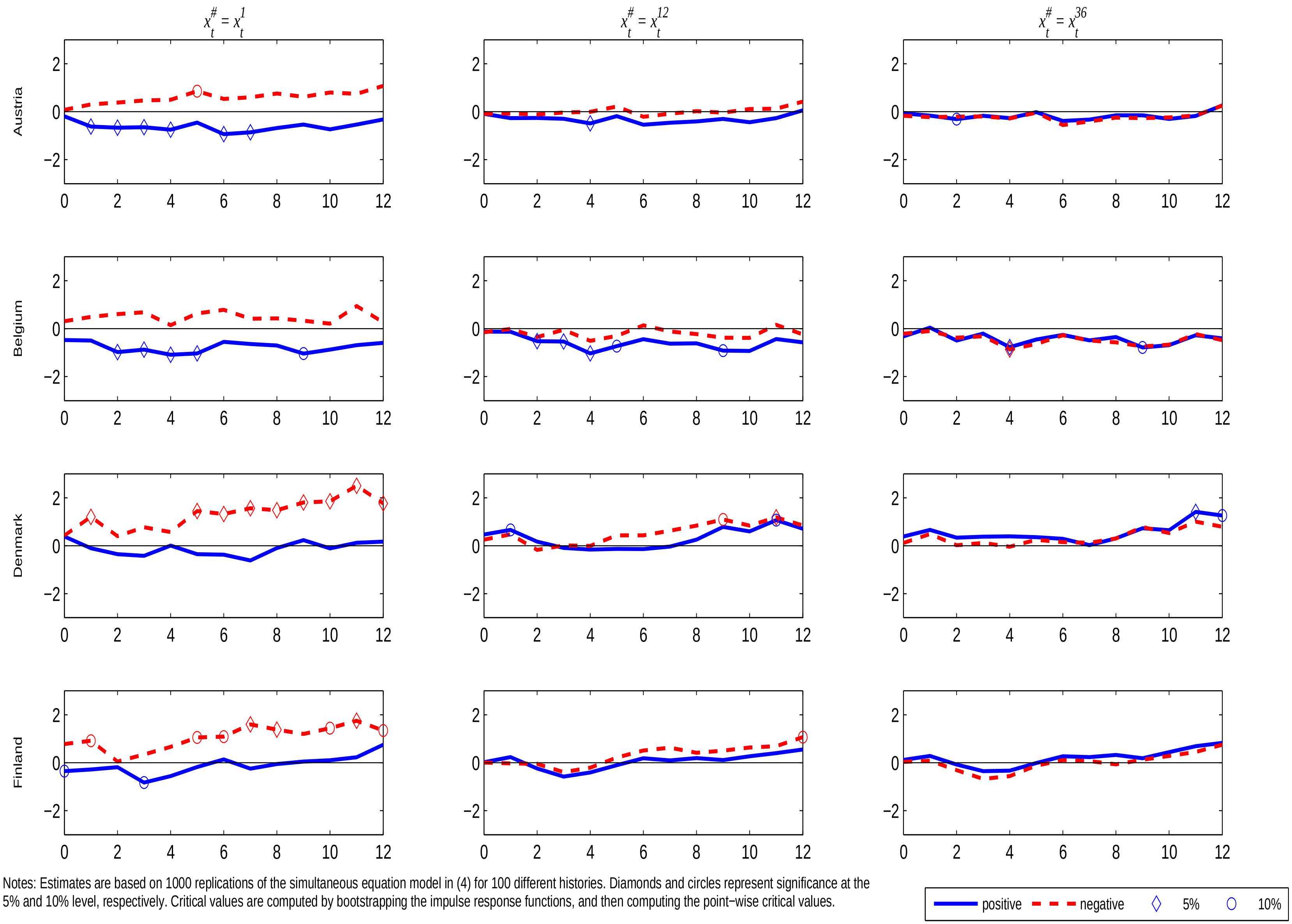
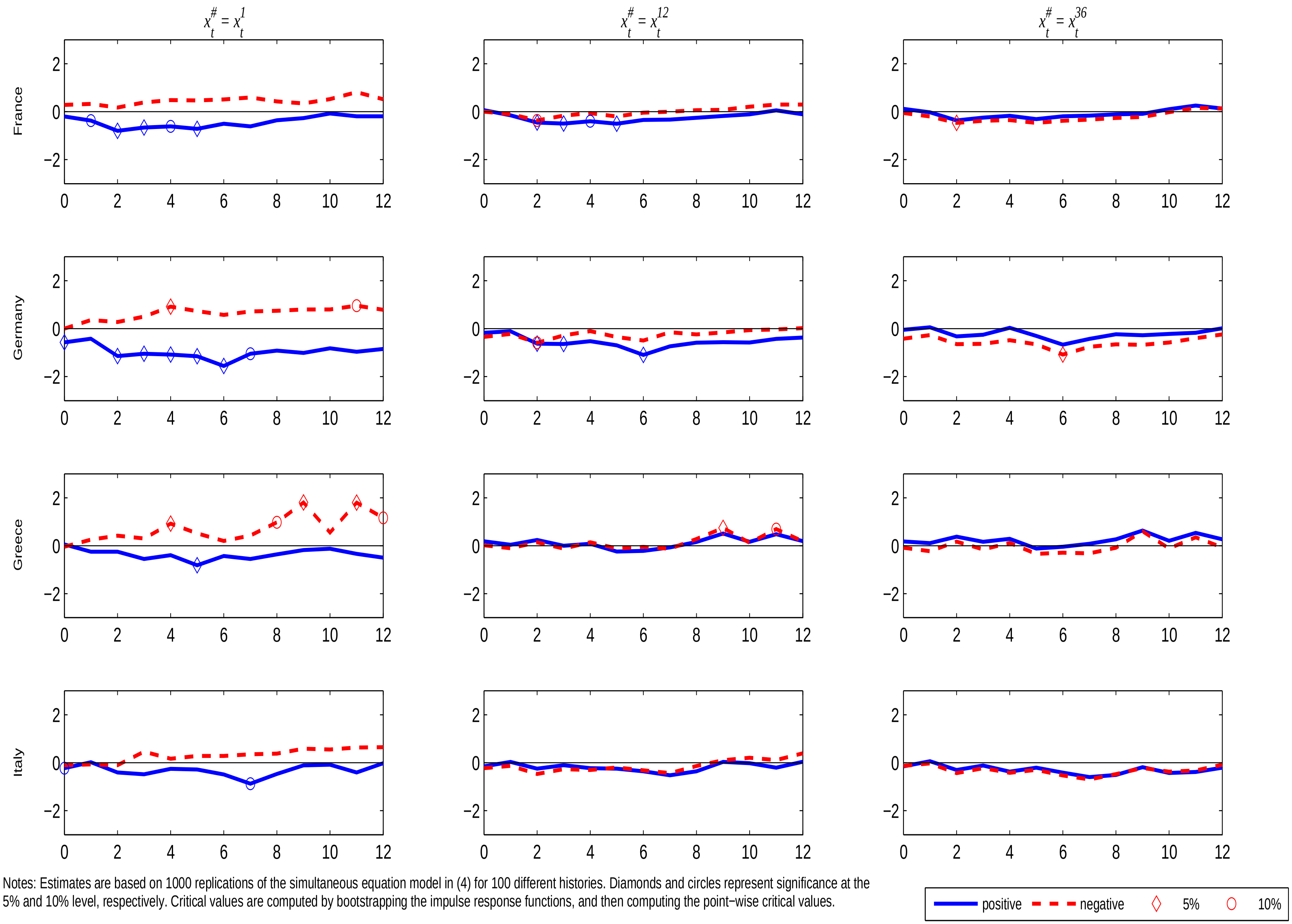


Figure A−8c: Cumulative response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



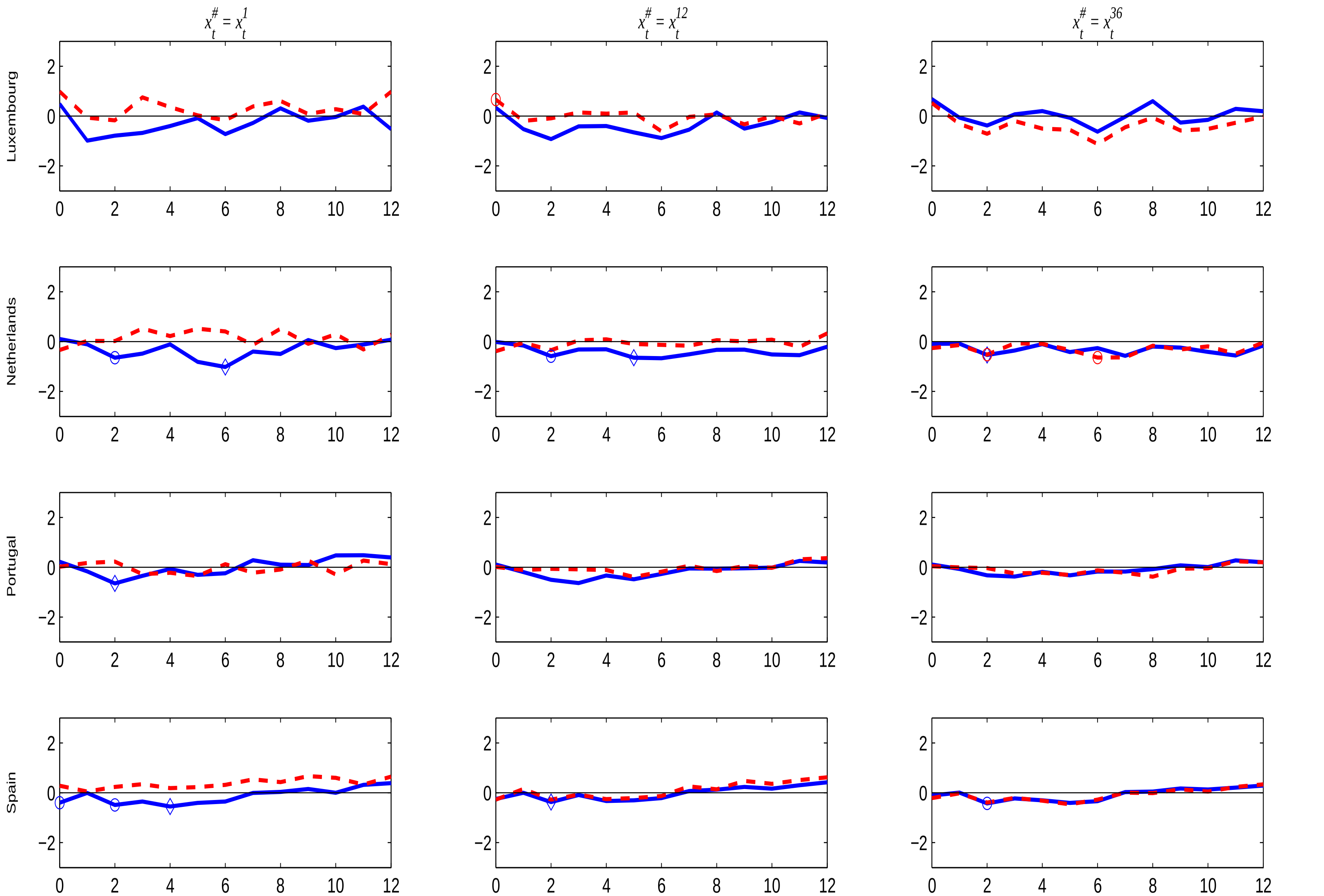
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−8d: Cumulative response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



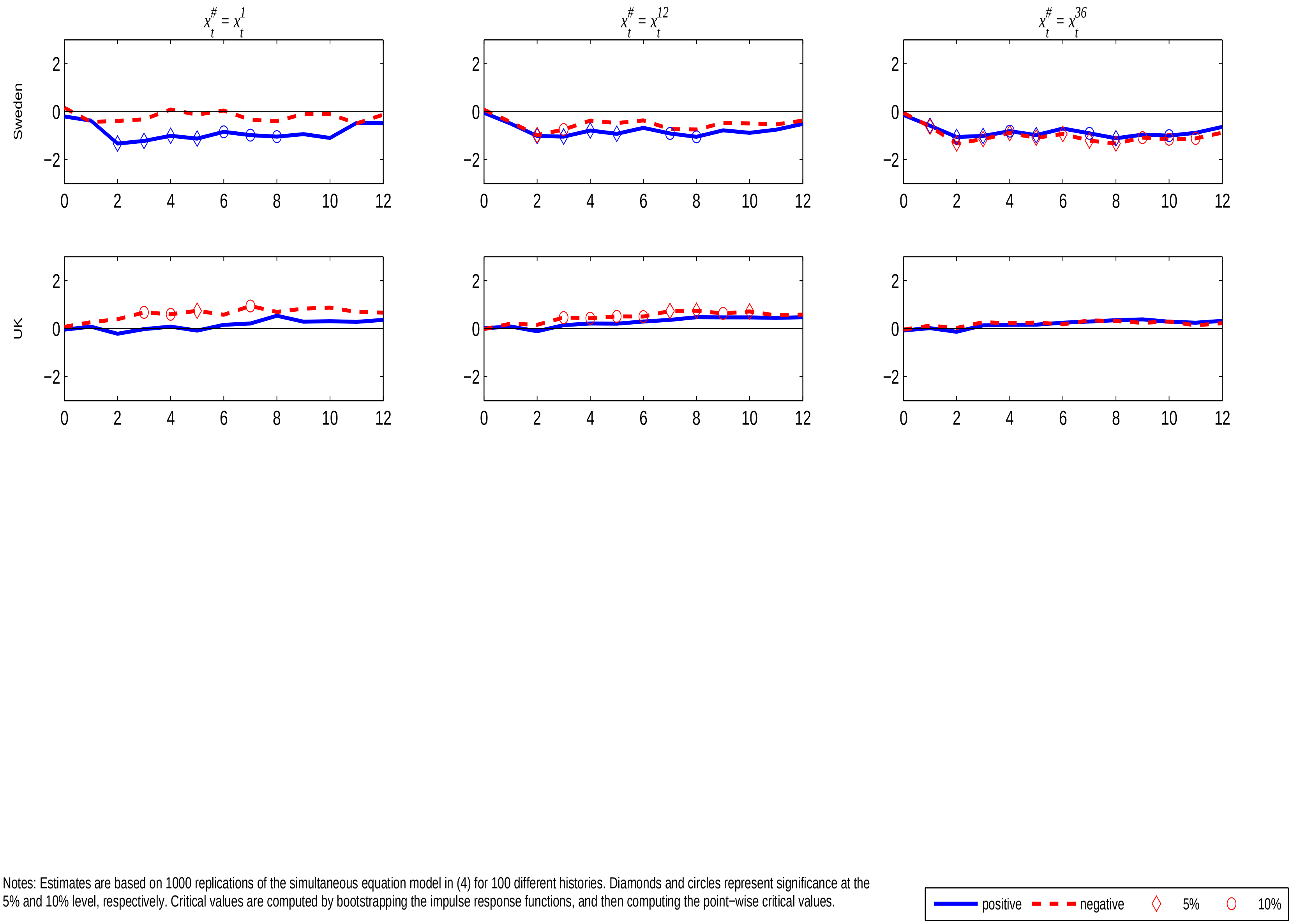
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−8e: Cumulative response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



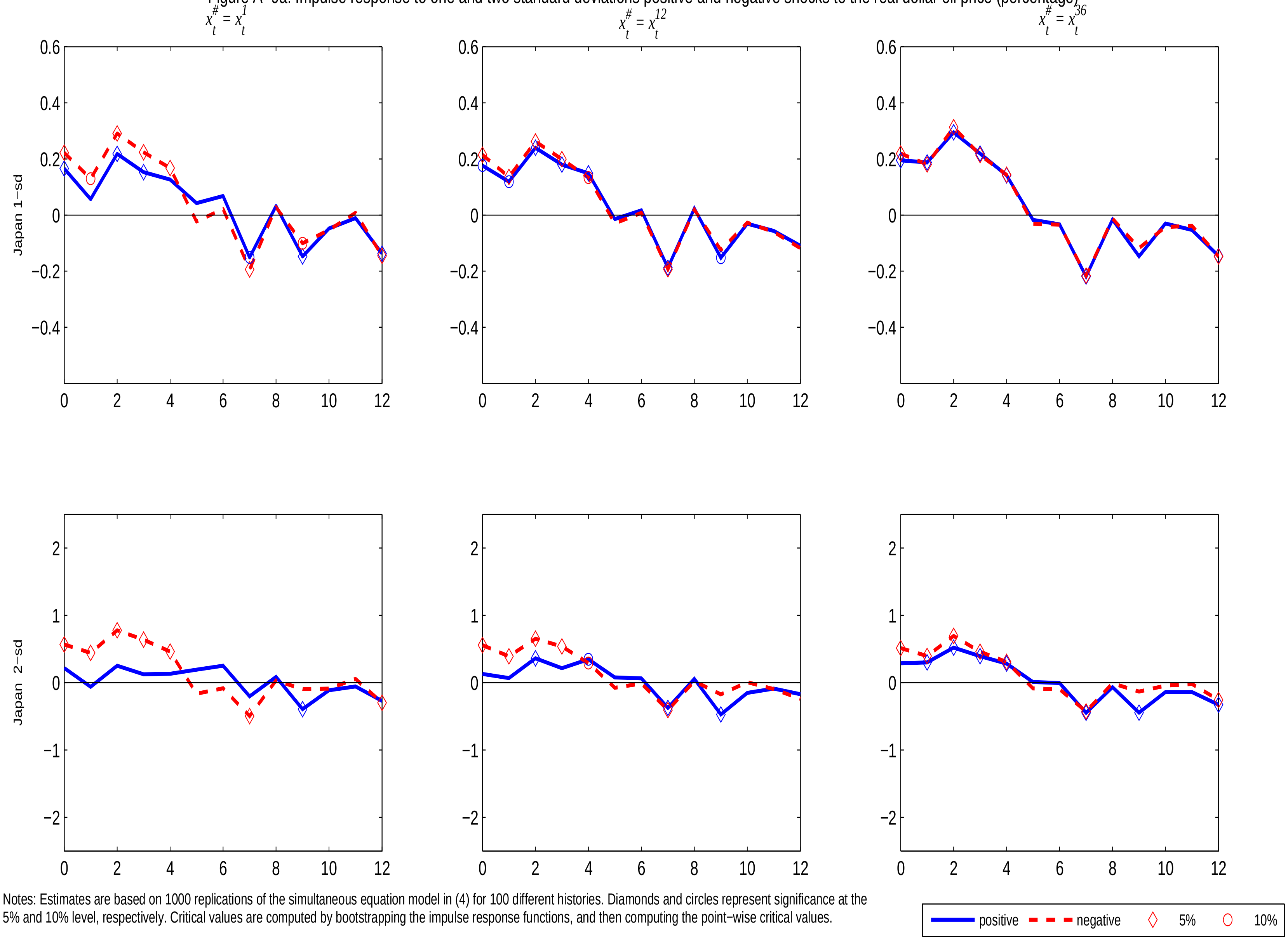
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−8f: Cumulative response to two standard deviation positive and negative shocks to the real exchange rate (percentage)



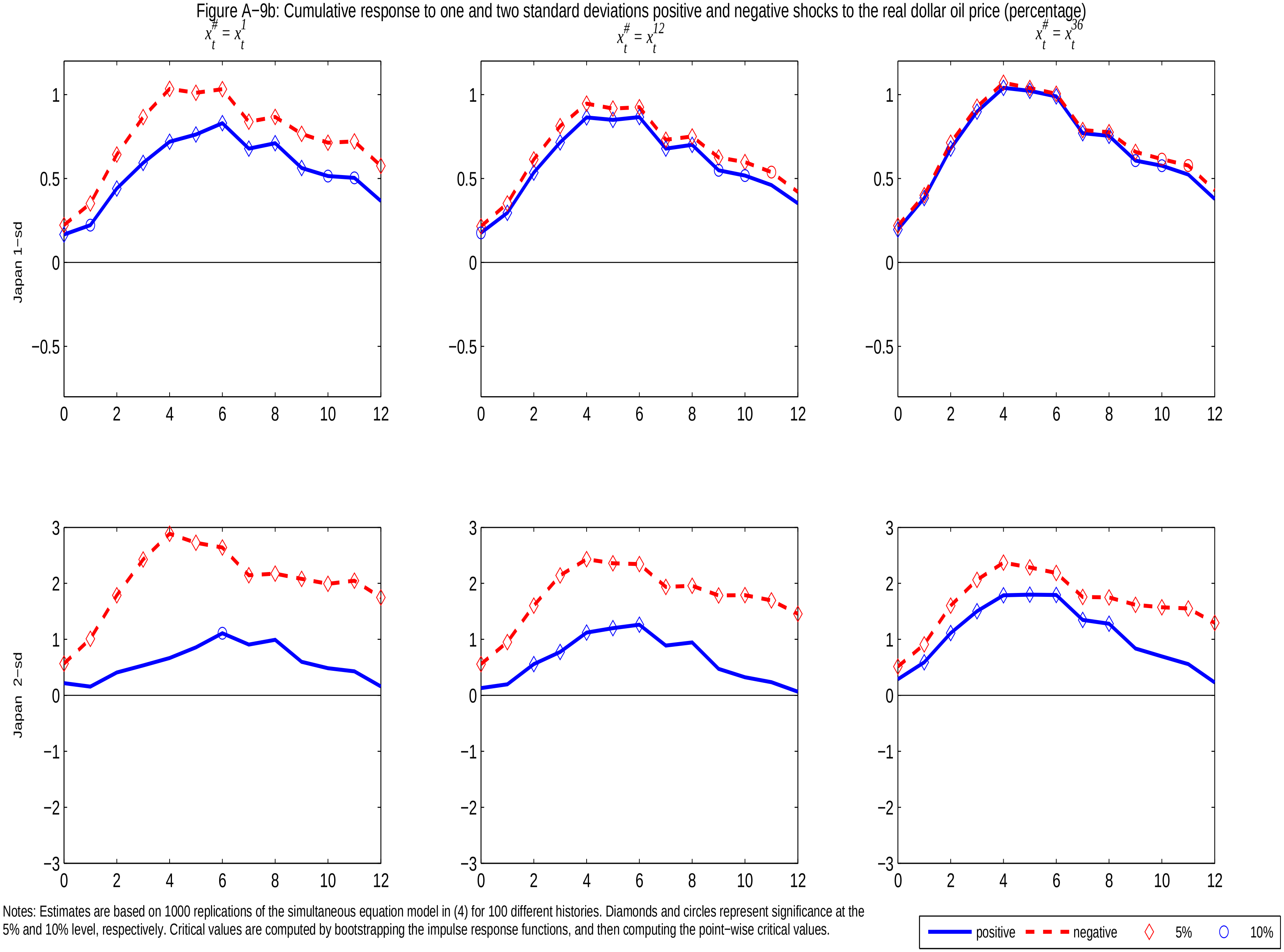
Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−9a: Impulse response to one and two standard deviations positive and negative shocks to the real dollar oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.

Figure A−9b: Cumulative response to one and two standard deviations positive and negative shocks to the real dollar oil price (percentage)



Notes: Estimates are based on 1000 replications of the simultaneous equation model in (4) for 100 different histories. Diamonds and circles represent significance at the 5% and 10% level, respectively. Critical values are computed by bootstrapping the impulse response functions, and then computing the point−wise critical values.