Do political events affect business cycles?

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Outline

1. Motivation and issues
2. Questions
3. Methodology and related literature
4. Data and Results
5. Conclusions

Motivation

1. Cyclical features of OECD economies are changing.

2. Focus so far on changes in the transmission or magnitude, frequency and type of shocks

3. How about changes in institution/operational features of markets? Effects difficult to figure out:

    a. changes occur slowly;

    b. effects maybe on medium-term cycles;

    c. externalities and threshold effects important;

    d. changes don't come alone.

Open issues

Euro area has two major unique events: Maastricht treaty and ECB creation

1. Exogenous political events: Preceding or following business cycle changes?

2. Monetary events (comparable to establishment of the FED, the Gold Standard,etc): What's is the effect of monetary events on business cycles?

3. Separate business and other cycle: Does it make sense in this case?

4. Are changes common: National idiosyncrasies don't matter?

Questions asked in the paper

1. Any tendency for national and area-wide cycles to change after these events?

Focus on direction, magnitude and intensity by constructing indicators of national and EMU cycles

2. Does a clean structural break take place when these events occurred or do changes occur slowly?

3. Did the two events have different relative impact?

Methodology

Panel VAR approach allows us to handle multi-country set-up with unit specific and interrelated dynamics and time variation in the correlation structure of cyclical fluctuations across variables and countries

- Canova-Ciccarelli: *Estimating multi-country VAR models*, ECB WP no. 603

- Canova, Ciccarelli and Ortega: *Similarities and convergence in G7 cycles*, JME (forthcoming)

The model

$$y_{it} = D_{it}(L)Y_{t-1} + C_{it}(L)W_t + \varepsilon_{it}$$

$i = 1, ..., N$ refers to countries and y_{it} is $G \times 1$ vector, $Y_t = \left(y'_{1t}, \ldots y'_{Nt}\right)'$.

- Parameters unit specific and random

- Can't estimate with classical methods: parameters vary with i and t ($k = NGp + qM$). Even if no time variations, large dimension.

SES and Parsimonious parameter representation

$$
\begin{aligned}
Y_t &= X_t\delta_t + E_t \qquad E_t \sim N(0, \Omega) && (1)\\
\delta_t &= \Xi_1\lambda_t + \Xi_2\alpha_t + \sum_{h=1}^{f} \Xi_h\rho_{h,t} && (2)\\
&= \Xi\theta_t + u_t \qquad u_t \sim N(\Omega \otimes V) && (3)
\end{aligned}
$$

$$\theta_t = [\lambda_t', \alpha_t', \rho_{1,t}', \ldots, \rho_{f_1,t}']'$$

1) δ_t $(N \cdot G \cdot k \times 1)$; Ξ_1 and Ξ_2 are matrices of zeros and ones of dimension $N \cdot G \cdot k \times s$ and $N \cdot G \cdot k \times N$ dimensions; Ξ_h are conformable matrices

2) λ_t is the common component (dimension 1).

3) α_t is the unit specific component (dimension N)

4) $\rho_{1,t}$ is the variable specific component (dimension G). u_t captures unmodelled effects.

Observable index model

$$Y_t = X_t \delta_t + E_t$$

$$\delta_t = \Xi_1 \lambda_t + \Xi_2 \alpha_t + \sum_{h=1}^{f_1} \Xi_h \rho_{h,t} + u_t$$

imply

$$\begin{aligned} Y_t &= \mathcal{Z}_{1,t} \lambda_t + \mathcal{Z}_{2,t} \alpha_t + \sum_h \mathcal{Z}_{h,t} \rho_{h,t} + v_t \\ &= \mathcal{Z}_t \theta_t + v_t \end{aligned}$$

where

$$Z_{1,t} = X_t \Xi_1, \quad Z_{2,t} = X_t \Xi_2, \quad Z_{h,t} = X_t \Xi_h$$

$$v_t = E_t + X_t u_t$$

1. The regressors are averages of lags of the VAR variables. Dynamically span lagged interdependencies (different from factor models).

2. $\alpha_t, \lambda_t, \rho_{h,t}$ are the factor loadings. Time varying!!

3. Indicators constructed from the VAR (observable). They are correlated! Can have leading or coincident versions of them (e.g. $CLI_{t|t} = Z_{1,t}\lambda_{t|t}$ coincident indicator based on the common information; $CULI_{t|t-1} = Z_{1,t}\lambda_{t|t-1} + Z_{2,t}\alpha_{t|t-1}$ leading indicator based on the common and unit specific information) and recursively estimate them.

4. Indicators emphasize low frequency movements: MA terms of order p in the regressors, even when y_{it} are serially independent. Good for medium term forecasting!

5. Analysis feasible with small T and small N and when degrees of freedom in Panel VAR small. Estimate loadings not VAR parameters!!

Example

$G = 2$ variables, $n = 2$ countries, $p = 1$ lags, $q = 0$

Here $\delta_t = [vec(d_t)]$ is a (16×1) vector. If

$$\delta_t = \Xi_1 \lambda_t + \Xi_2 \alpha_t + \Xi_3 \rho_t + u_t \tag{4}$$

where λ_t is a scalar, α_t is a 2×1 vector, ρ_t is a 2×1 vector, Ξ_1 is a 16×1 vector of weights ,and

$$\underset{(16\times 2)}{\Xi_2} = \begin{bmatrix} \iota_1 & 0 \\ \iota_1 & 0 \\ 0 & \iota_2 \\ 0 & \iota_2 \end{bmatrix} \qquad \underset{(16\times 2)}{\Xi_3} = \begin{bmatrix} \varkappa_1 & 0 \\ 0 & \varkappa_2 \\ \varkappa_1 & 0 \\ 0 & \varkappa_2 \end{bmatrix}$$

with $\iota_1 = \begin{pmatrix} w_y^1 & w_x^1 & 0 & 0 \end{pmatrix}'$ $\iota_2 = \begin{pmatrix} 0 & 0 & w_y^2 & w_x^2 \end{pmatrix}'$

$\varkappa_1 = \begin{pmatrix} w_{y,1} & 0 & w_{y,2} & 0 \end{pmatrix}'$ and $\varkappa_2 = \begin{pmatrix} 0 & w_{x,1} & 0 & w_{x,2} \end{pmatrix}'$.

Hence, the VAR can be rewritten as

$$\begin{bmatrix} y_t^1 \\ x_t^1 \\ y_t^2 \\ x_t^2 \end{bmatrix} = \begin{bmatrix} \mathcal{Z}_{1t} \\ \mathcal{Z}_{1t} \\ \mathcal{Z}_{1t} \\ \mathcal{Z}_{1t} \end{bmatrix} \lambda_t + \begin{bmatrix} \mathcal{Z}_{2,1,t} & 0 \\ \mathcal{Z}_{2,1,t} & 0 \\ 0 & \mathcal{Z}_{2,2,t} \\ 0 & \mathcal{Z}_{2,2,t} \end{bmatrix} \alpha_t + \begin{bmatrix} \mathcal{Z}_{3,1,t} & 0 \\ 0 & \mathcal{Z}_{3,2,t} \\ \mathcal{Z}_{3,1,t} & 0 \\ 0 & \mathcal{Z}_{3,2,t} \end{bmatrix} \rho_t + v_t \tag{5}$$

We have

$$\mathcal{Z}_{1t} = w_y^{c,1} y_{t-1}^1 + w_x^{c,1} x_{t-1}^1 + w_y^{c,2} y_{t-1}^2 + w_x^{c,2} x_{t-1}^2$$

$$\mathcal{Z}_{2,1,t} = w_y^1 y_{t-1}^1 + w_x^1 x_{t-1}^1, \qquad \mathcal{Z}_{2,2,t} = w_y^2 y_{t-1}^2 + w_x^2 x_{t-1}^2$$

$$\mathcal{Z}_{3,1,t} = w_{y,1} y_{t-1}^1 + w_{y,2} y_{t-1}^2, \qquad \mathcal{Z}_{3,2,t} = w_{x,1} x_{t-1}^1 + w_{x,2} x_{t-1}^2$$

When λ_t is large relative to α_t, y_t^1 and x_t^1 comove with y_t^2 and x_t^2. On the other hand, when λ_t is zero, y_t^1 and x_t^1 may drift apart from y_t^2 and x_t^2.

Estimation

- Estimation is Bayesian, meaning that prior information on the structure must be combined with data to get posterior distribution of interest

- Need to specify the evolution over time of $\theta_t = [\lambda_t,\ \alpha_t, \rho_t]$

$$\delta_t = \Xi\theta_t + u_t \qquad\qquad u_t \sim N(0, \Omega \otimes V)$$

$$\theta_t = \theta_{t-1} + \eta_t \qquad\qquad \eta_t \sim N\left(0, B_t\right)$$

  The variance of θ_t is time-varying: it produces ARCH-M type of effects.

Assumptions:

1. $V = \sigma^2 I_k$,, σ^2 known.

2. $B_t = \nu_1 B_{t-1} + \nu_2 B_0 = \xi_t B_0$, where $\xi_t = \nu_1^t + \nu_2 \left(1 - \nu_1^t\right) / (1 - \nu_1)$, ν_1, ν_2 known.

3. $B_0 = diag\left(B_{01},\ B_{02}, ..., B_{0f1+2}\right)$

4. η_t, ϵ, v_t uncorrelated

5. Weights can in principle be estimated. Here are known.

- To summarize, the model has the hierarchical structure

$$\begin{aligned} Y_t &= \mathcal{Z}_t \theta_t + v_t \\ \theta_t &= \theta_{t-1} + \eta_t \end{aligned}$$

where $v_t \sim \left(0, \Upsilon_t = (1 + \sigma^2 \mathbf{X}_t' \mathbf{X}_t)\Omega\right)$. The likelihood is proportional to

$$\prod_t |\Upsilon_t|^{-1/2} \exp\left[-\frac{1}{2}\sum_t (Y_t - \mathcal{Z}_t\theta_t)' \Upsilon_t^{-1} (Y_t - \mathcal{Z}_t\theta_t)\right]$$

- To compute posterior distributions we need prior densities for $(\Omega,\ \sigma^2,\ B_0)$.

- Analytical posteriors are not available. Rely on MCMC methods also for model selection and IRF.

The data

Five variables (output, industrial production, employment, consumption and investment) with four lags

Seven European countries (Germany, France, Italy, Spain, Belgium, Netherlands and Finland)

Sample 1980:1 to 2004:4.

Exogenous: growth rates of oil prices, world trade, of US GDP and stock prices and the US federal funds rate (2 lags)

Demeaned and weighted by the share of GDP in the country.

Results: fit of the model

1. Specification searches: three factors, time varying with lagged interdependencies best model.

2. Time path of indicators.

a. areawide indicator captures smoother cycles. Different than areawide GDP.

b. no areawide indicator before 1990, important afterward: increased national synchronicity

c. areawide indicator has three clear expansion phases (1987-88, 1995, 1998-2000) and one strong recession (1992-93). 2001?

d. national indicators display dips in correspondence with the official recession dates and display cycles with well established features.

e. No evidence of reduced national cycles in 1990s (consistent with Canova et al. (2005)).

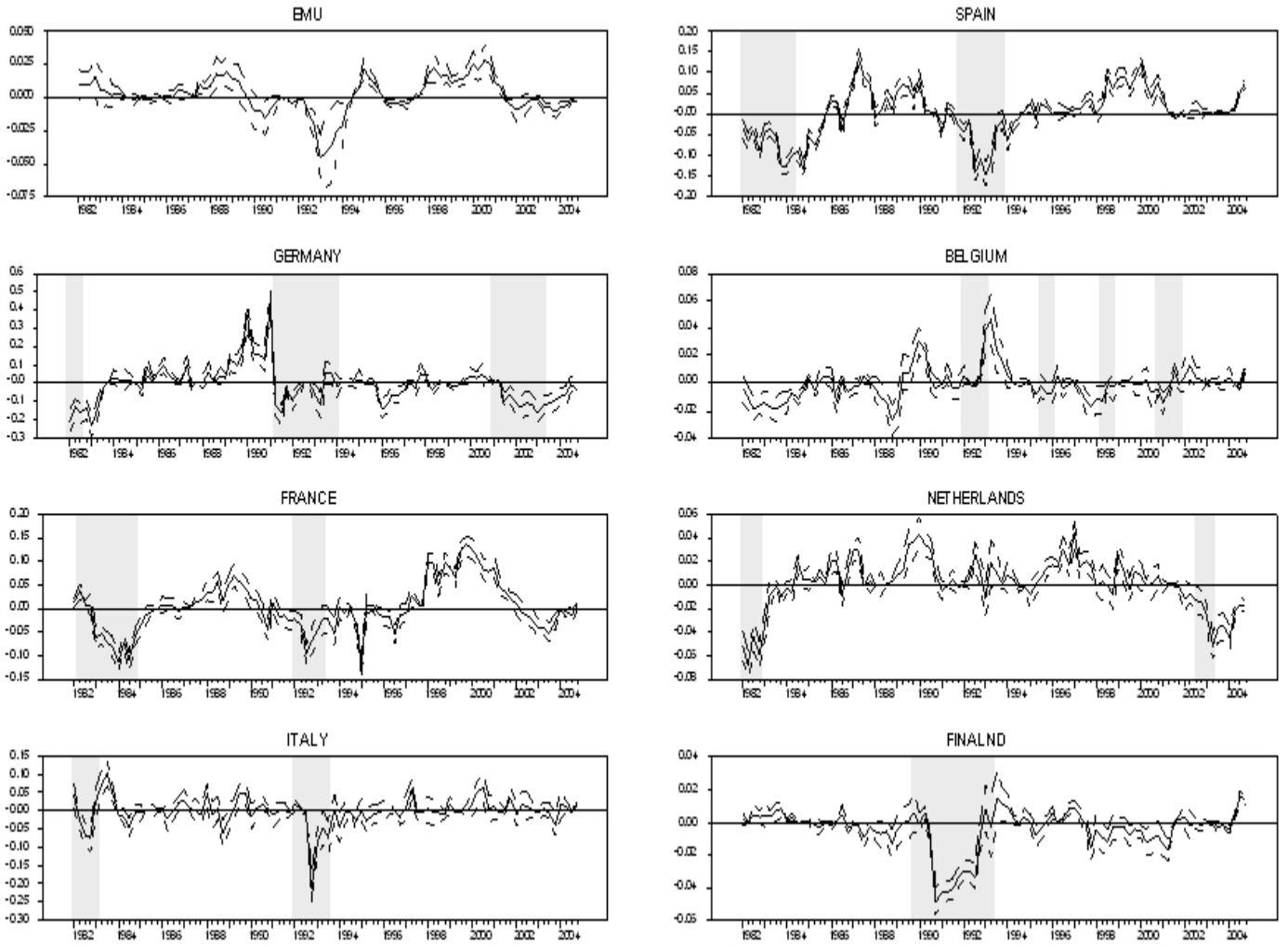

Figure 1: Cyclical Indicators, Posterior medians and 68 percent bands

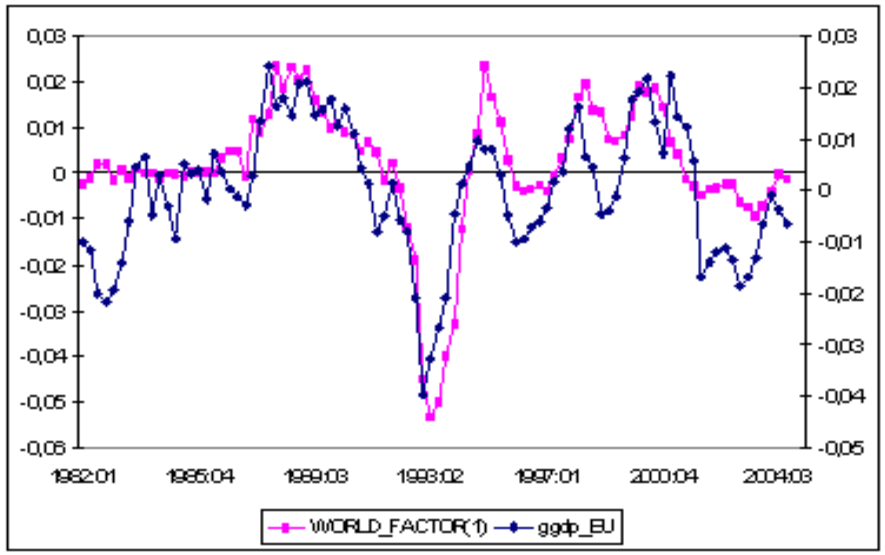

Figure 2: Areawide indicator and GDP

a. GDP growth tends to have longer peak to peak or trough to trough cycles than our EU indicator. (The same pattern clearly emerges when we compare the our national indicators with national GDP growth)

b. Amplitude of the cycles is roughly the same and the concordance in the turning point dates is high.

c. Half phases roughly symmetric, much smaller difference than in US.

Results: Reduced Form statistics

Table 1: Statistics of the median of cyclical indicators

	Euro	DE	FR	IT	ES	BE	NET	FIN	EuroGDP
	Full sample								
Var	1.42	9.31	5.32	3.83	6.06	1.24	2.06	1.14	1.30
AR(1)	0.91	0.57	0.81	0.39	0.82	0.70	0.77	0.68	0.85
Corr		0.25	0.44	0.33	0.54	-0.61	0.09	0.31	0.77
Max		0.25	0.49	0.41	0.62	-0.61	0.24	0.41	0.80
Lag		0	-2	-1	-2	0	4	-2	-1
	Pre Maastricht								
Var	1.67	11.55	4.36	4.81	6.80	1.61	2.26	1.44	1.47
AR(1)	0.94	0.51	0.82	0.42	0.80	0.73	0.76	0.67	0.88
Corr		0.19	0.46	0.32	0.52	-0.66	0.07	-0.28	0.82
Max		0.25	0.49	0.41	0.62	-0.61	0.23	0.41	0.83
Lag		-1	-2	-1	-2	0	4	-2	+1
	Inter Maastricht-ECB								
Var	1.28	4.02	5.35	2.36	3.16	0.71	1.34	0.59	0.74
AR(1)	0.79	0.51	0.50	0.07	0.50	0.54	0.65	0.62	0.75
Corr		0.45	0.19	0.03	0.67	-0.47	-0.43	-0.77	0.59
Max		0.53	0.31	0.40	0.67	0.10	0.31	0.37	0.90
Lag		1	-1	1	0	-4	4	-4	1
	Post-ECB								
Var	0.88	6.3	5.90	2.07	4.09	0.47	1.73	0.65	1.34
AR(1)	0.93	0.88	0.93	0.26	0.81	0.79	0.76	0.66	0.84
Corr		0.82	0.89	0.48	0.77	-0.33	0.72	-0.51	0.79
Max		0.82	0.93	0.48	0.85	0.04	0.72	-0.16	0.81
Lag		0	-1	0	-1	-4	0	-4	-1

Table 2: Turning point statistics

	Full sample		Pre-Maastricht		Inter		Post ECB	
	P-P	T-T	P-P	T-T	P-P	T-T	P-P	T-T
Euro	10.5	10.8	10.0	10.4	12.0	12.0	5.0	NA
Germany	10.8	10.8	11.5	12.0	11.0	12.0	8.0	8.0
France	13.6	14.4	16.6	16.6	9.0	12.0	14.0	NA
Italy	11.7	12.3	12.5	12.6	18.0	15.0	7.0	6.0
Spain	10.5	10.5	11.5	13.3	11.0	9.0	6.0	8.0
Belgium	15.5	13.5	21.0	18.0	10.0	10.0	NA	16.0
Holland	20.5	19.0	20.6	18.0	20.0	28.0	NA	12.0
Finland	12.6	12.4	12.5	12.0	16.0	20.0	11.0	6.0
EuroGDP	20.0	17.0	24.0	26.0	24	NA	8.0	8.0

Tables 1/2

a) Volatility of the median of all indicators falls, when going from the early to the later subsamples; decline in the post ECB sample is the largest of all.

b) the contemporaneous correlation of national indicators and areawide indicator also dramatically increases in the latest subsample. (cyclical co-movements across countries have increased, while those within countries have remained roughly unchanged).

c) AR(1) increases after the creation of the ECB, except for the Italian and the Finnish indicators, while no change in the persistence of the national indices is recorded after the Maastricht treaty.

d) national indicators of the four major countries leaded the areawide indicator in the first two subsamples, they became coincident with the Euro area indicator after that date.

e) The opposite appears to be true for the indicators of the smaller countries.

f) small decline in the length of both business cycle phases as we move from the first to the last subsample.

Conclusion: some changes; weak evidence that the Maastricht treaty and the creation of the ECB had anything to do with them.

Results: Unconditional forecasting

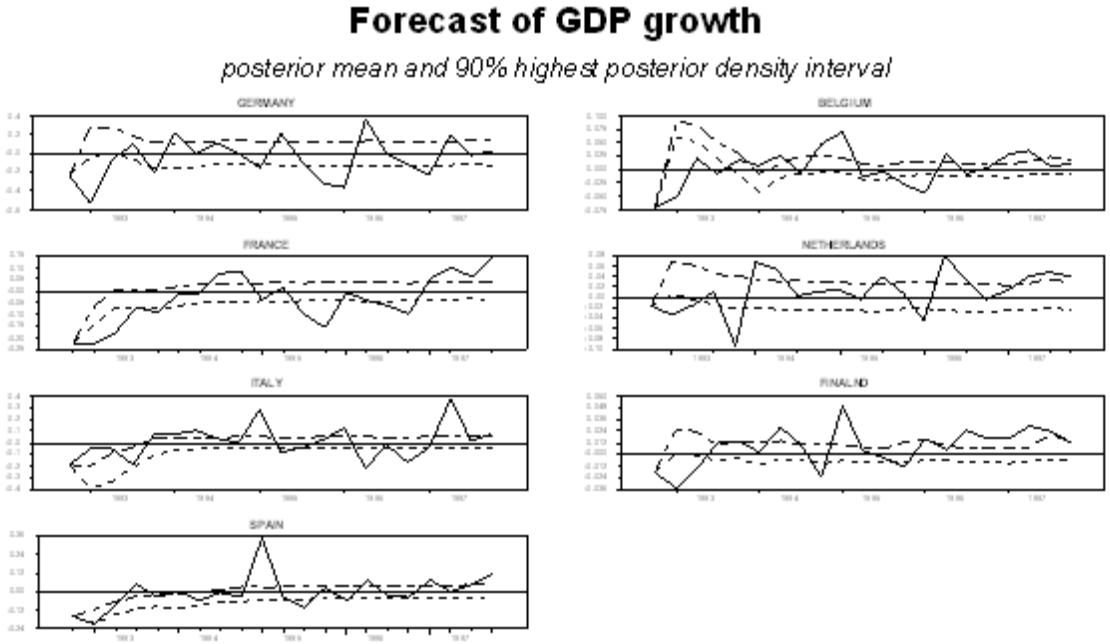

Figure 3. Pre-Maastricht

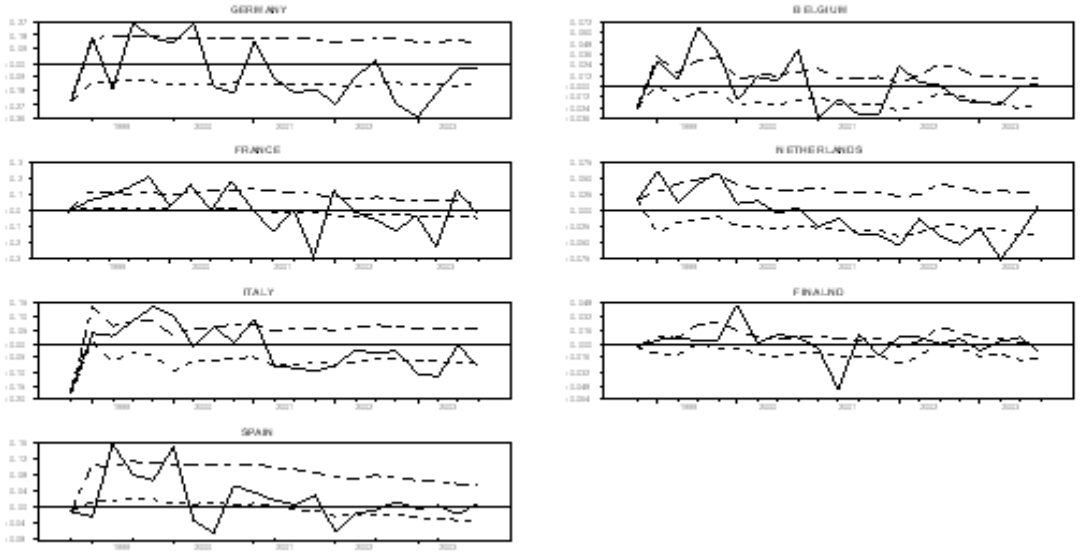

Figure 4. Pre-ECB

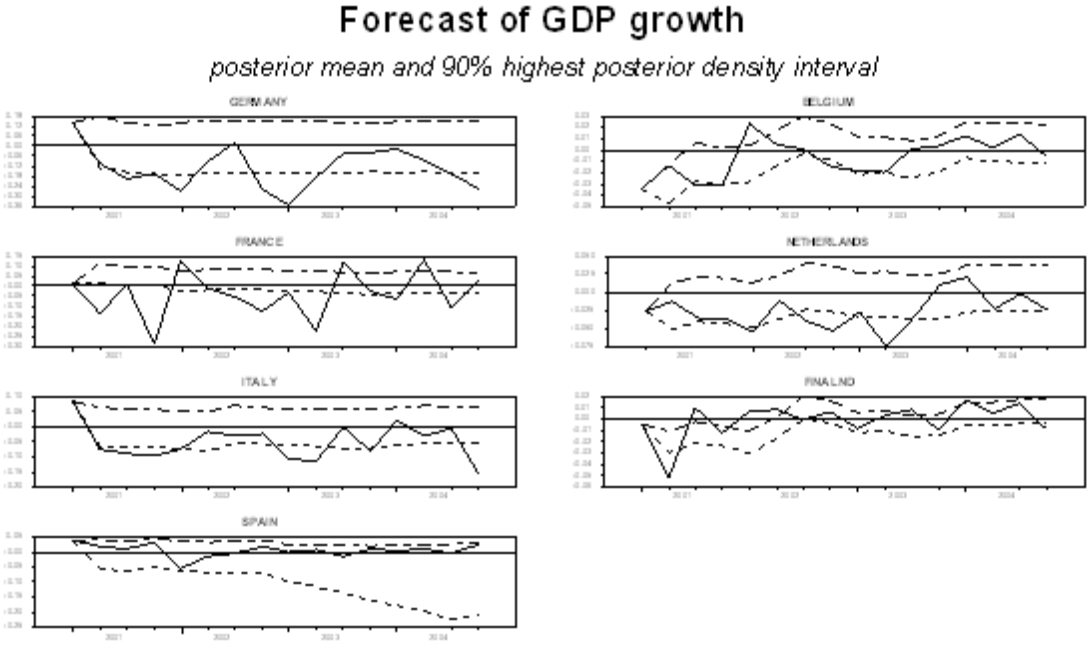

Figure 5. 2001 Information

a) no clean once-and-for-all structural break

b) performance of the model roughly unchanged across episodes

c) the right direction and approximately the right magnitude in the four major countries at all three selected dates. Before the Maastricht treaty and after the creation of the ECB, they also replicate the persistence of the actual series.

d) The difference are even less noticeable and the pattern much more similar across countries when we look at employment, consumption or investment growth.

d) Performance is less appropriate for industrial production growth

e) can predict medium run trends well

Results: conditional forecasting

- Transmission of a German real shock

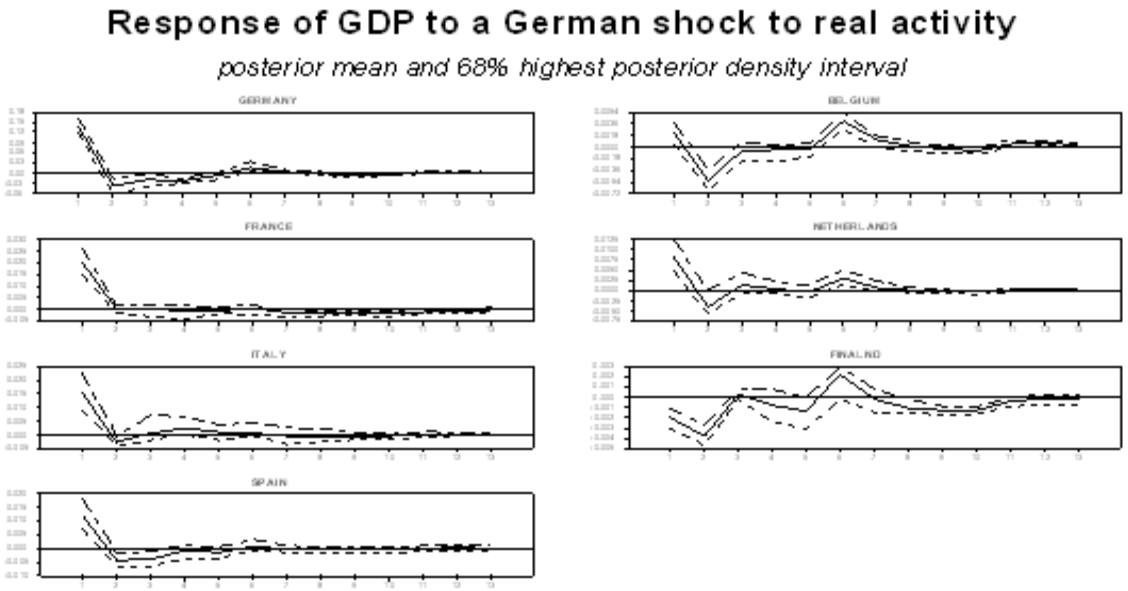

Figure 6: Pre Maastricht

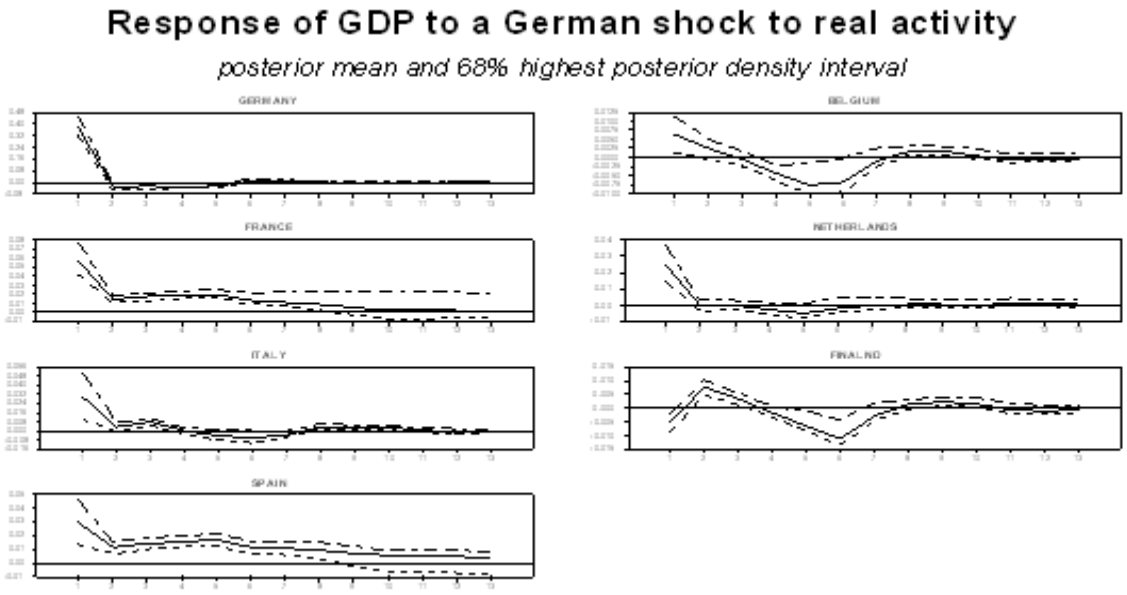

Figure 7: Pre-ECB

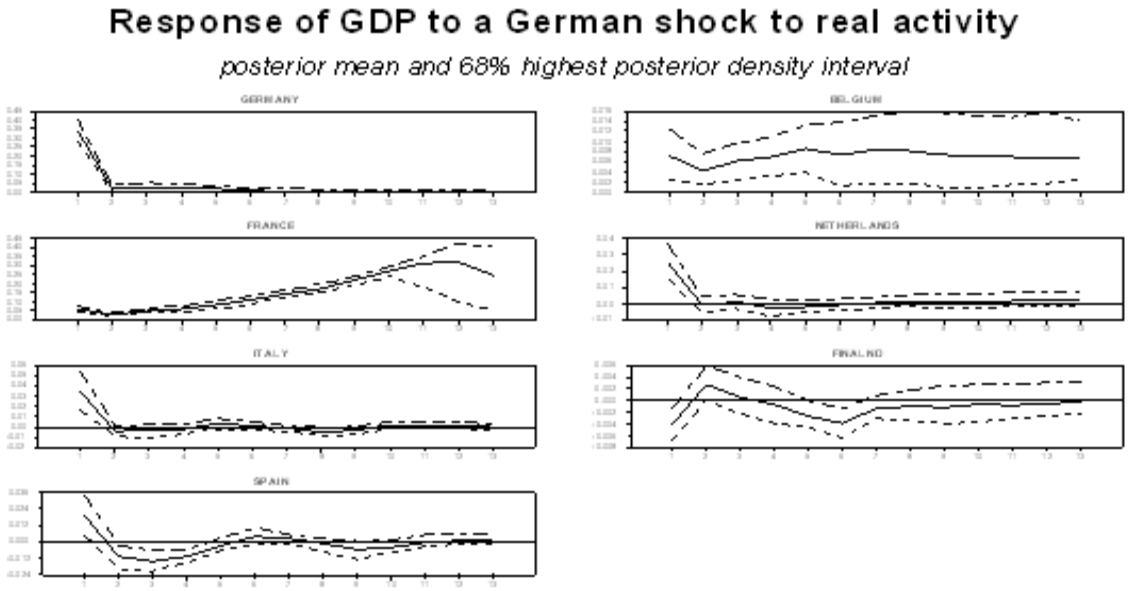

Figure 8: 2001 Information

a) lots of commonalities in the responses in the four large countries in pre-Maastricht

b) The shape of the responses are largely unchanged in 1998:4. Relatively speaking, the output growth effects in all countries is larger but the instantaneous international transmission weaker.

c) qualitative and quantitative changes in the responses after the creation of the ECB.

d) dynamics of employment more heterogeneous, but no big changes across samples.

e) other series behavior intermediate

Conclusions: changes up to 1998:4 appear to have limited. After that date noticeable changes.

To be done: responses to an US FFR shock.

Conclusions

- Same changes in reduced form statistics

- Little changes in unconditional forecasting exercises

- Some alterations of responses after the ECB was created

- No overwhelming support that these changes are related to the two polictical events