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76/1995

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WIFO Working Papers No. 76
May 1995

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ABSTRACT

In this paper we apply a structural VAR model to a sample of 18 European countries. The models provide estimates for permanent and transitory shocks. The degree of integration as expressed by common fluctuations of European economies is taken as a measure for the expected long-run stability of a prospective currency union. Applying an iterative principal-axis factoring model, we identify several groups of countries, which are primarily exposed to common shocks while some countries are predominantly driven by idiosyncratic shocks. Our findings suggest that a multi-speed European Monetary Union is preferable to a single-speed union.

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JEL CLASSIFICATION: F15, E30, C30

KEYWORDS: Monetary union, asymmetric shocks, common factors, European integration, output decomposition.

The authors gratefully acknowledge valuable suggestions provided by Fritz Breuss, Gabriel S. Lee, Kevin D. Salyer, and Andreas Wörgötter.

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1. Introduction

The political endeavors to advance the introduction of a European Monetary Union (EMU) stimulated research on adjustment processes to asymmetric shocks hitting European economies. Since joining a monetary union terminates a central bank's autonomy and limits the ability to counteract such disturbances, deviations from potential output may be of a larger magnitude than without participation in it. Homogeneity with respect to asymmetric shocks therefore plays a crucial role in the stability of a prospective monetary union if prices and wages exhibit a slow adjustment dynamics. Due to the comparatively large extent of price and wage rigidities across Europe, however, the optimality of a currency area is questionable.[1] In this paper we undertake a search for regional centers within Europe which may constitute a currency area other than the Deutsche Mark zone or the area envisaged by the Maastricht Treaty.

The paper builds on the BLANCHARD and QUAH (1989) decomposition of output into permanent and transitory components. We calculate shocks to each of these components for all member countries of the European Union (EU) and the European Free Trade Area (EFTA) and use them as an input for a multivariate factor analysis. Since different data generating processes imply country-specific transmission mechanisms, we choose individual specifications of the econometric model. The interpretation of shocks with short-run effects on output and employment as demand disturbances and those with long-run effects as supply disturbances allows an inquiry into the nature of asymmetric shocks across European economies. In particular, to what extent do permanent and transitory disturbances depend on common factors compared to the importance of idiosyncratic shocks? To what extent is the degree of openness, the integration into the EU or the EFTA, and the participation in the European Monetary System (EMS) associated with the asymmetries? Furthermore we discuss how our empirical evidence relates to the two competing concepts of a single-speed EMU according to the Maastricht Treaty versus a

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1 For a review of the theory of optimum currency areas see DE GRAUWE (1992) or MASSON and TAYLOR (1993).

multi-speed EMU. As far as asymmetries are pertaining to fiscal and monetary policies, convergence programs may contribute to the stability of a European Monetary Union. If idiosyncratic shocks and shocks beyond governmental control are prevailing, however, we expect that participation in a single-speed EMU will repeatedly entail considerable adjustment costs in terms of unemployment or inflationary pressure.

Recently, several contributions have approached the issue of forming an EMU empirically. Many of them examine the role of the Deutsche Mark (DM) in the context of the European Monetary System. The majority of the empirical work suggests that the monetary policy adopted by the Deutsche Bundesbank plays a dominant role in the EMS [for example DE GRAUWE (1988); GIAVAZZI and GIOVANNINI (1989); VON HAGEN and FRATIANNI (1990); KIRCHGÄSSNER and WOLTERS (1991)]. The application of causality tests is crucial to the results of these studies. Approaches of this kind cannot explicitly link the country-specific macroeconomic structures to their analytical framework. To overcome this deficiency, HERZ and RÖGER (1992) adopt a structural approach in order to identify the determinants of inflation under different central bank intervention rules. BAYOUMI (1992) studies the bivariate correlation of supply and demand shocks of a sample of European countries with Germany. His results suggest that due to a high degree of asymmetry a monetary union among European countries is not advisable.

By construction, a bivariate approach does not account for the multi-dimensional interaction of economic activity across countries. Our paper develops a multivariate measure of similarity across European countries in terms of unexpected fluctuations of output. The joint estimation of common factors and country-specific fluctuations permits us to identify more than one area with a high degree of similarity.

The paper is organized as follows. The next section gives a brief overview of the applied methodology. Section three provides the empirical results, and section four presents some policy implications concerning the design of an optimal EMU.

2. Methodology

While the distinction of the trend and the cycle component of output depends, inter alia, on assumptions about the information set and the degree of price flexibility in an economy, the BLANCHARD and QUAH decomposition allows a unanimous assignment of disturbances to permanent and transitory factors dependent on the time-horizon of their effectiveness. The transitory component of output fluctuations is due to shocks which have only temporary effects on the level of output. The permanent component, by contrast, determines the long run behavior of output and is affected by shocks imposing permanent effects on the level of output. The goods and labor markets are represented by a structural model which is driven by permanent and transitory shocks. The supply side is characterized by output supply and labor demand functions which depend on real wages and permanent shocks. A positive permanent shock causes an increase in long run output associated with a temporary fall in the unemployment rate. Examples of shocks of this kind are changes in productivity like the oil shocks of the seventies which devaluated energy intensive machinery. As described in BLANCHARD and FISCHER (1989, p. 518), the supply side can be derived from profit maximization under perfect competition or, equivalently, as an implicit supply and demand system under imperfect competition. This flexibility is especially advantageous for an analysis of European countries since the degree of regulation and competition varies across Europe.

The short run dynamics of the model rests on the assumed wage setting behavior, where nominal wages are negotiated under uncertainty for one period in advance. The wage rate is negotiated such that expected labor demand equals expected labor supply. Realizations of permanent and transitory shocks will then cause a deviation of actual employment from the equilibrium level through changes in real wages. A transitory shock, for example, results in a shift of output demand along the short run supply curve to the right. This will result in temporarily rising output and employment levels.

The reduced form of the model includes output and unemployment as endogenous variables depending on both shocks. The short run response of the model does not differ with regard to the type of the shock. Positive permanent and transitory shocks decrease unemployment and increase output in the short term. It is the long term effect which helps to disentangle both shocks for every EU and EFTA member country by estimating a structural Vector Autoregression (VAR). The reduced form of the aggregate supply and demand model can be approximated by a bivariate Vector Autoregression,

$$x_t = \Theta(L)\, x_{t-i} + e_t,$$

where the vector x_t includes the growth rates of output and the unemployment rate, that is $x_t = (\Delta y_t, u_t)'$ and $\Theta(L)$ is a (4x4) matrix of lag polynomials composed of the coefficients on lagged values of x_t. The regression errors of both equations form e_t. This system uses only lagged information in output and unemployment and can be estimated by OLS if both equations include the same regressors. The identification problem for both shocks is solved by imposing a structural relationship between endogenous variables

$$A\, x_t = A\, \Theta(L)\, x_{t-i} + \varepsilon_t$$

where A denotes the structural relationship between unemployment and output and $\varepsilon_t = Ae_t = (\varepsilon^t, \varepsilon^p)'$ is a vector of transitory ε^t and permanent ε^p shocks to output. Structural shocks are orthogonal by definition with diagonal covariance matrix Σ_ε. The structural matrix A can be calculated starting with the original covariance matrix of residuals from the VAR Σ_e. Usually this is done by a decomposition of the covariance matrix. Given that m represents the number of elements in x_t, the covariance matrix contains m(m+1)/2 distinct elements. In our case this allows inference of three elements of A from the data, which is one less than needed. Here the assumption of permanent and transitory shocks helps calculate the fourth element. To illustrate this restriction, it is best to start with the Moving Average representation of the VAR

$$x_t = \Psi(L)\, \varepsilon_t$$

where $\Psi(L)$ is the infinite structural Moving Average matrix polynomial in the lagged shocks or, equivalently, the matrix of dynamic structural multipliers of the system. The actual value of x_t is therefore modeled as an infinitely distributed lag of orthogonalized shocks. Imposing the assumption of a transitory impact of the first element in ε_t gives a zero restriction to the sum of the upper left hand elements of all Ψ_i matrices or

$$\sum_{i=0}^{\infty} \Psi_i^{11} = 0$$

and allows for a unique calculation of the fourth element in A.[1]

3. Estimation

Annual data for the period 1960-1993 for the real output of all members of the EU and the EFTA are drawn from the International Financial Statistics of the International Monetary Fund. Unemployment rates are taken from the OECD Economic Outlook. The estimation period comprises several regime shifts, viz. three different exchange rate regimes, the productivity slow down in the mid-seventies, and several changes in the social security environment. This suggests a preceding analysis of the data for general structural breaks. The exact date of a structural break in output has been searched for by likelihood ratio tests for OECD and EU aggregate output. For both aggregates the results indicate a break in 1974 when the first oil price shock has been perceived to be permanent. This break is removed from output data by subtracting means for the pre- and post-break period from first differences of logarithms.

Analyses done by BLANCHARD and SUMMERS (1986) and others suggest even more severe estimation problems due to changes in European unemployment rates. Since the mid 1970s

1 Since the solution to $A^{-1}A^{-1\prime} = \Sigma_e$ is an orthonormal transformation of the Cholesky decomposition of Σ_e, a nonlinear system of equations has to be solved which gives rise to two solutions differing by sign.

Europe experiences the hysteresis phenomenon, that is large and non-mean-reverting changes in unemployment rates. Explanations for the high persistency in this variable combine structural shifts in the economy such as the expansion of the social security system with real wage rigidity sustained by efficiency wages or insider-outsider considerations. Figure 1 gives an example for one of the small countries in the sample. The Danish unemployment rate started to rise in 1974 and is still on an upward path.

The underlying structural model, however, requires the second variable in $\boldsymbol{x}_t$, i.e. the unemployment rates, to be a stationary indicator for cyclical swings in economic activity. In addition, stationarity is a prerequisite for the decomposition procedure [see QUAH (1992)]. A solution to this problem is the use of a proper detrending method which renders the series stationary but leaves the cyclical component unchanged. This requires an assumption about the long run behavior of the natural unemployment rate. For example, a data generating process containing a unit root might be assumed. Such a process, however, violates data admissability requirements [e.g. HENDRY and RICHARDS (1982)] because unemployment rates would be unbounded in this case. Moreover the long run implication of such a data generating process lacks economic sense.

A linear trend on the other hand does not conform with the statistical chacteristics of unemployment rates. Segmented trends might be a solution but any implementation would have to pay some attention to endogenously determined breaks. To cope with the slow adjustment of unemployment rates to higher levels, autoregressive (AR) processes with a near unit root offer a good approximation. Assuming an AR process of order 2 additionally allows for cyclical variations in the output series. The solid line in Figure 2 represents the analytical spectrum of an AR(2)-process evaluated at estimates for the Danish unemployment rate.[2] As can be seen from the spectrum, considerable mass is concentrated around frequency zero. This causes a bias in the estimated parameters of the VAR system due to structural breaks.

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2 The estimated coefficients are θ_1=1.2406, θ_2=-.2510, and σ_e=0.8989. These are substituted into $g_y(\omega) = \sigma_e^2 / [1 + \theta_1^2 + \theta_2^2 - 2\,\theta_1\,(1 - \theta_2)\cos(\omega) - 2\,\theta_2 \cos(2\omega)]$.

Applying a Hodrick-Prescott (HP) filter on such a series will erase the low frequency component with little impact on the cyclical behavior of unemployment rates. Several authors [for example HARVEY and JAEGER (1993), COGLEY and NASON (1995)] emphasize that mechanical application of the HP-filter magnifies business cycle frequencies in spectra of difference stationary quarterly time series by a factor of around 12. Hence the transfer function of the HP-filter for stationary processes,

$$\tau(\omega) = \frac{4\,(1 - \cos(\omega))^2}{\mu^{-1} + 4\,(1 - \cos(\omega))^2}$$

should be analized prior to any application, where μ is the smoothing parameter of the HP-filter, usually set equal to 1600 for quarterly series. As can be seen from $\tau(\omega)$ the effects of the HP-filter depend on μ. For annual European unemployment rates the HP-filter is applied with varying smoothing parameters across countries to cope with heteroscedasticity in the series. We apply a simple diagnostic test for heteroscedasticity based on the squared cyclical component of the unemployment rate [HARVEY (1989) pp. 259)]. If the test does not reject heteroscedasticity, the smoothing parameter is adjusted to allow for a more flexible trend. The values chosen for μ are given in table 1.

Figure 3 shows the resulting transfer function of the HP-filter evaluated at different values for $\mu = 2, 10, 50, 1600$. The filter completely erases zero and very long run frequencies. A comparison shows that lowering the smoothing parameter results in a dampening of more and more higher frequencies. No part of the spectrum will be magnified such that spurious cycles may be created. Because annual data are filtered, usual business cycle frequencies remain almost unchanged even if $\mu = 2$. The effect of the HP-filter on the spectrum of the Danish unemployment rate is exposed as the dotted line in figure 2. The zero frequency is completely erased and the maximum occurs at a cycle with period of 12.95 years.

The next step is to use output growth rates with the deterministic break removed and HP-filtered unemployment rates for the estimation of bivariate VAR's for each country. Resulting regression residuals are then transformed into orthogonal shocks by using the

BLANCHARD and QUAH decomposition of the covariance matrix. The lag length of the models varies across countries and has been determined by applying information criteria. The last columns of table 1 give the lag length and the significance level of a test for Granger causality of cyclical unemployment rates. The test rejects the null of no Granger-causality at the 10% level for all series. Besides Austria, Belgium, Greece, and Norway rejections occur at the 5% level. As QUAH (1992) proved, this is a prerequisite for a proper decomposition of output into permanent and transitory components.

A first impression of the dispersion of shocks across Europe can be achieved by running a principal component analysis. Table 2 presents the percentage of variance explained by the first principal component for several sub-samples. The first principal component is a linear combination of shocks from all countries that explains the maximum of the sample variance. It is orthogonal to all remaining components. As can be seen from table 2, the first principal component explains only a small fraction of the sample variance. Hence, there is no single common factor explaining most of the permanent or transitory fluctuations. Surprisingly, the results do not substantially improve by analysing different sub-samples. Within a core of EU members (Belgium, Denmark, France, Germany, Italy, Luxembourg, the Netherlands) the first component contains the highest information with 34.8% for permanent and 42.3% for transitory shocks. For other subgroups like EFTA-members or the EU-periphery (Spain, Greece, Ireland, Portugal, United Kingdom) this ratio is below one third.

These findings indicate that either more than a single common factor underlies permanent and transitory shocks in Europe, or that shocks are mainly country specific. Thus, in a second step we estimate factor models for permanent and transitory shocks, respectively. These will allow us to aggregate shocks into one or more general factors and, additionally, to separate common factors from idiosyncratic movements.

In a first step the number of common factors in permanent and transitory shocks has to be determined. This is done by a Scree test [CATTELL (1966)] according to which the number of common factors is chosen at the kink in the plot of eigenvalues λ of the correlation matrices of permanent and transitory shocks. Figure 3 exhibits a kink at three for permanent shocks and at two for transitory shocks. The flat descent of the subsequent eigenvalues indicates that there is some additional information in further factors ($\lambda>1$) but this information is scattered and not interpretable.

For the estimation of the factor model an iterative principal-axis factoring method is used. Comparisons with Maximum Likelihood estimates of communalities show only small differences. Results will be dropped from the presentation henceforth because two of the ML-estimates for the communalities exceed one (cf. table 3). The estimated values for communalities correspond to the percentage of variance in permanent and transitory shocks of the country which is explained by common factors. On average, common factors to permanent shocks in Europe explain 37.6% of the overall variance, while common factors to transitory shocks explain about 29.2%. This implies that common factors are slightly more dominant in permanent rather than transitory shocks. Countries with an estimated communality below the average tend to be affected more strongly by idiosyncratic shocks, whereas countries with a communality above it tend to move in line with common factors. Permanent shocks in Austria, Belgium, France, Greece, Ireland, Luxembourg, the Netherlands, and the United Kingdom depend to a larger extent on changes in common factors. The rest of the sample is more strongly affected by idiosyncratic permanent shocks. With respect to transitory shocks, common factors dominate in Austria, Belgium, Denmark, the Netherlands, Norway, and Sweden. Only Austria, Belgium, and the Netherlands appear as members in both groups, that is only these countries are integrated with respect to both permanent and transitory shocks.

A detailed analysis of factor loadings reveals another interesting aspect. Common factors are a linear combination of country specific shocks, and factor loadings represent the weights by which shocks of a particular country aggregate into the common factor. Thus an economic interpretation of a factor can be undertaken by looking for particularly large loading coefficients. Since countries differ in their economic and social structure this helps achieve an appropriate interpretation of factors. To facilitate this exercise, factor loadings are rotated by the Varimax-method.[3] The rotation emphasizes strong relationships between a country's shocks and a common factor while dampening loose connections with the consequence that structural relationships become more visible.

Varimax rotated loadings for both kinds of shocks are presented in table 3 and plots of factors against each other are given in figures 5-8. We start with the analysis of permanent shocks. The first factor has an influence on a set of seemingly unrelated countries. These are Belgium, Finland, Italy, Luxembourg, Portugal, and Spain. This combination makes it difficult to provide an economic interpretation of the most important factor. An inspection of permanent shocks shows a strong comovement between 1970-77 and 1986-93. Both episodes coincide with periods before and after the abandonment of a hitherto credible exchange rate system, viz. the Bretton Woods system and the heydays of the EMS or successful ECU-pegging. Also note that countries like Denmark and Norway have almost zero loadings for the first factor. This gives rise to the interpretation of the first factor as a misalignment factor. Fixed exchange rates are not compatible with a divergent price dynamics and will thus impair the competitiveness of a country. The distinctive common feature of the selected group is that credible exchange rate regimes were built up while price developments diverged from the anchor country which caused difficulties especially for financing operations. Maybe this is the reason why Luxembourg is most affected by the misalignment factor.

The second factor is dominated by Belgium and Germany, and less intensively, by Austria and the Netherlands. This group comprises similar countries in central Europe. The main link can be easily identified by a look at the contents and the directions of foreign trade. For the small countries Germany plays the role as the main trading partner with 20-40% export share. Trade flows are largely consisting of automobiles, steel, iron, and machinery. A deviation from this rule is formed by the Netherlands where Northsea gas pools cause

3 Varimax is chosen because common factors are not correlated with each other, see for example KAISER (1958). Alternative methods of rotation generate similar results.

exports of petrol products to be of major importance. This result conforms with the smallest loading in the group and corroborates the interpretation of the second factor as a central European industrial factor.

Permanent shocks from Denmark, Finland, Sweden, and the United Kingdom dominate the third factor. Again the directions of foreign trade provide some insights. Although Germany is among the main trading partners of those countries, the Nordic countries and the United Kingdom tend to be more distinctly oriented towards each other and the United States. Another common feature of this group is a large fraction of raw materials in exports such that the third factor can be viewed as a Nordic-British raw material factor.

Turning to transitory shocks in Europe two common factors are detected by the scree test. The first factor is dominated by Austria, Belgium, Germany, Luxembourg, and the Netherlands. The common monetary policy shared with the German Bundesbank during most of the estimation period is a reasonable and obvious link within this group. The loading coefficient for Belgium and Luxembourg almost coincides which is due to the currency union formed by these two countries. As a consequence the first transitory factor might be regarded as a Bundesbank factor. The second factor is mainly formed by Spain and Switzerland, two countries which have almost zero communalities for transitory shocks. In combination with the sharp drop from the first to the second eigenvalue in the scree plot we are inclined to regard the second factor as a statistical artefact with no meaningful economic interpretation.

4. Policy implications

The results of the foregoing empirical analysis do not uniformly suggest a single block of countries for a European Monetary Union. Therefore policy conclusions have to be drawn cautiously. ALESINA and GRILLI (1993) address the issue whether a one-speed or a multi-speed EMU is feasible from a politico-economic perspective. According to their definition, a monetary union is feasible if all participating countries are at least as well off with the union as without it. The occurrence of shocks causes welfare losses through deviations of actual output from potential output. Within a monetary union asymmetries resulting from transitory shocks can be cushioned by fiscal policies. Asymmetric permanent shocks, by contrast, require an adjustment of relative prices between countries. If the adjustment costs under a regime of fixed exchange rates exceed those under a regime of flexible exchange rates, a monetary union is not sustainable. Scepticism about the sustainability of a large EMU is supported by the break-up of the pre-1992 central parities during the EMS turmoils. Furthermore the relatively low degree of public consent to participate in a EMU as defined in the Maastricht Treaty in countries such as Denmark or Norway is in line with the only fragmentary integration of these countries.

Our study reveals that some European countries are predominantly affected by idiosyncratic permanent shocks. Additionally, we identify three subgroups of countries which are driven by common permanent shocks. Among the EU member countries Belgium, France, Greece, Ireland, Luxembourg, the Netherlands, and the United Kingdom are especially affected by common permanent shocks. This is surprising because we would expect small countries to be more strongly influenced by common shocks than large countries due to their comparatively high degree of openness. With respect to common transitory shocks none of the large EU members is hit above the average. Despite the fact that France did not withdraw from the EMS during the 1992 crisis, it does not appear in any of these subgroups. This outcome may be attributed to the small number of observations which prevents a break-up into a pre- and post-convergence period that might have revealed a different grouping.

As concerns the EFTA countries, Austria and Sweden on the one hand are influenced by common transitory shocks. In the case of Austria common permanent shocks play an important role as well. These findings demonstrate that the membership in the EFTA did not generally prevent these countries from reaching a high degree of integration with EU member countries. On the other hand, Iceland and Norway are driven by idiosyncratic shocks. Portugal is the only member country of the EU which exhibits a similar share of idiosyncratic shocks as Iceland.

While efficiency gains due to the reduction of transaction costs and a better allocation of capital can be expected to accrue to all EMU member countries - though to a different extent -, welfare gains in terms of minimized output and employment fluctuations depend on the size as well as the frequency of idiosyncratic shocks. The findings of our study, allowing the separate identification of transitory and permanent shocks, may serve as a basis for a more comprehensive cost-benefit analysis intended to design optimal monetary unions in Europe.

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Tables

Table 1: Smoothing parameters of the HP-filter, number of lags in bivariate VAR models and significance levels of Granger causality tests

Country	Smoothing parameter μ	Number of lags in VAR	Granger Causality test
Austria	10	1	0.06
Belgium	5	3	0.098
Denmark	50	2	0.00
Finland	1	1	0.00
Greece	25	3	0.07
France	1	2	0.00
Germany	10	1	0.00
Iceland	50	1	0.01
Ireland	3	1	0.01
Italy	50	1	0.00
Luxembourg	0.6	1	0.02
Netherlands	0.5	2	0.00
Norway	0.3	2	0.09
Portugal	7	3	0.00
Spain	0.2	2	0.00
Sweden	2	2	0.00
Switzerland	0.5	2	0.00
United Kingdom	0.3	2	0.00

Table 2: Principal components analysis: percentage of variance explained by first component 1963-1992

Disturbance	Europe	EU	EU-core	EU-periphery	EFTA
Supply shocks	20.4	26.0	34.8	31.8	32.1
Demand shocks	24.2	28.8	42.3	30.7	28.8

Table 3: Percent of variance of permanent and transitory shocks due to variations in common factors (communality)

Country	Supply Innovations Princpial axis factoring	Supply Innovations Maximum Likelihood	Demand Innovations Princpial axis factoring	Demand Innovations Maximum Likelihood
Austria	.61031	.41565	.66693	.62805
Belgium	.63458	.65419	.60845	.56164
Denmark	.21546	.24421	.41318	.99844
Finland	.26626	.16010	.20558	.41723
France	.69011	.99859	.09768	.10654
Germany	.27329	.24648	.22032	.18972
Greece	.71783	.64728	.37887	.37688
Iceland	.06974	.04876	.24432	.05732
Ireland	.79218	.99999	.09956	.10555
Italy	.08587	.07985	.18055	.14730
Luxembourg	.32996	.35299	.23769	.24158
Netherlands	.54611	.59095	.43227	.48347
Norway	.29234	.40495	.49447	.47622
Portugal	.07149	.03958	.20654	.02534
Spain	.24821	.12430	.07957	.07705
Sweden	.24836	.28233	.50627	.26685
Switzerland	.22496	.24354	.04901	.03668
United Kingdom	.44579	.23969	.12598	.08375

Table 4: VARIMAX rotated Factor Loadings for permanent and transitory innovations

country	permanent innovations factor 1	permanent innovations factor 2	permanent innovations factor 3	transitory innovations factor 1	transitory innovations factor 2
AUT	.27026	.40634	-.61005	.79899	.16897
BEL	.49728	.59958	-.16671	.55338	.54975
CHE	.44721	.05340	-.11230	.06281	.63971
DEN	-.08844	.10365	.49769	.44800	.06985
FIN	.58132	-.12806	.57947	.30680	.05965
FRA	.45788	-.08945	.23588	.31479	.34818
GER	.14652	.83218	-.06199	.61414	-.04114
GRE	.23582	.02001	.11716	.40625	-.28156
ICE	.38509	-.78220	-.17904	.31550	-.00411
IRE	.25745	.13924	.01411	.42485	.00699
ITA	.56860	-.02923	-.07615	.35605	.33304
LUX	.69366	.17384	-.18635	.56646	.33374
NLD	.37209	.36572	-.14190	.54616	.44292
NOR	-.05250	-.02395	.26107	-.19247	.41170
POR	.48858	-.02985	.09278	.23047	.16264
SPA	.48699	.10014	.03423	.00023	.71152
SWE	.16442	-.17526	.40891	.19818	.09867
UK	.29485	.15860	.57766	.34809	-.06940

Figure 1 - Unemployment Rate Denmark 1960-1993

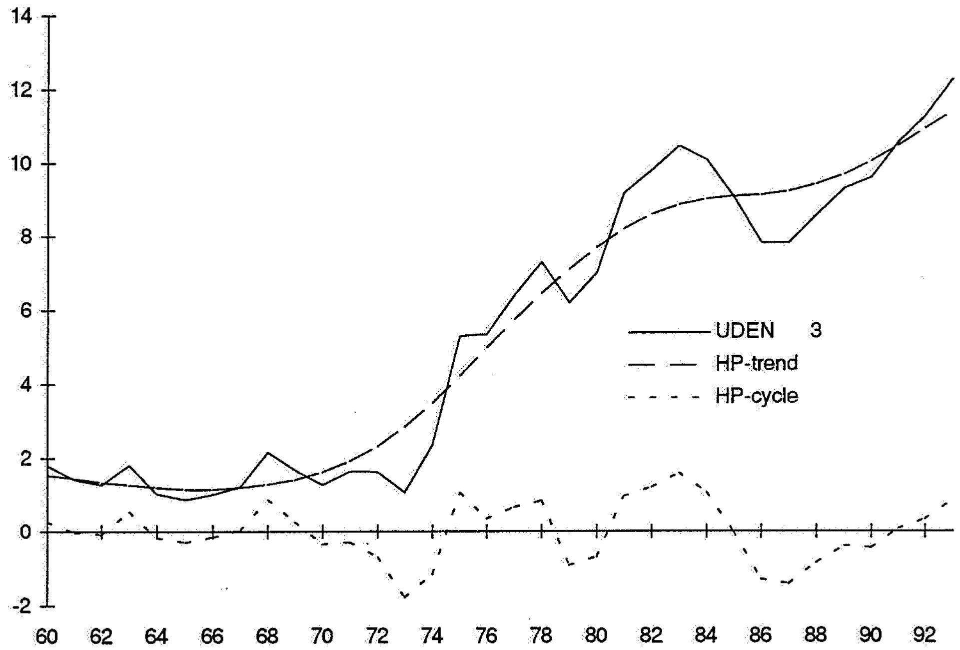


Figure 2 - Spectrum for an AR(2)-process evaluated for Danish Unemployment before and after HP-filtering

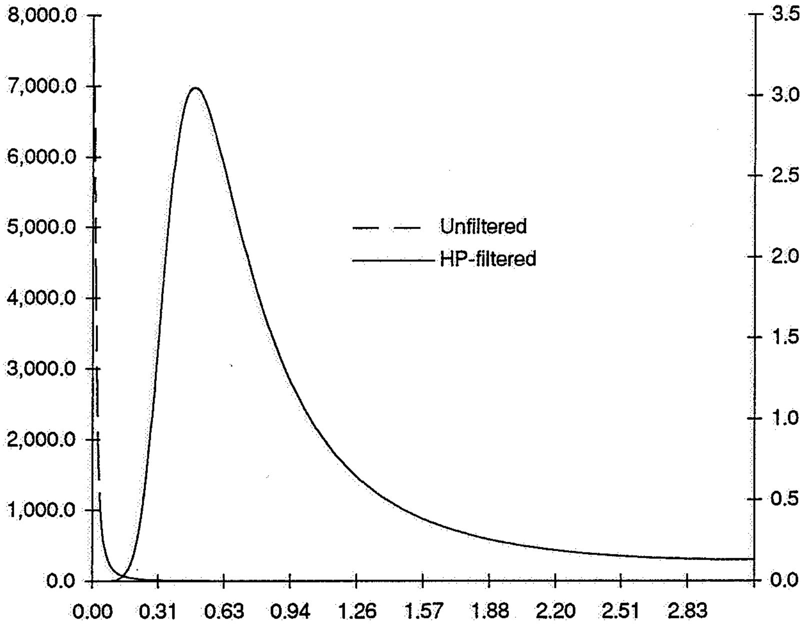


Figure 3 - Transferfunctions of the HP-filter for various smoothing parameters μ

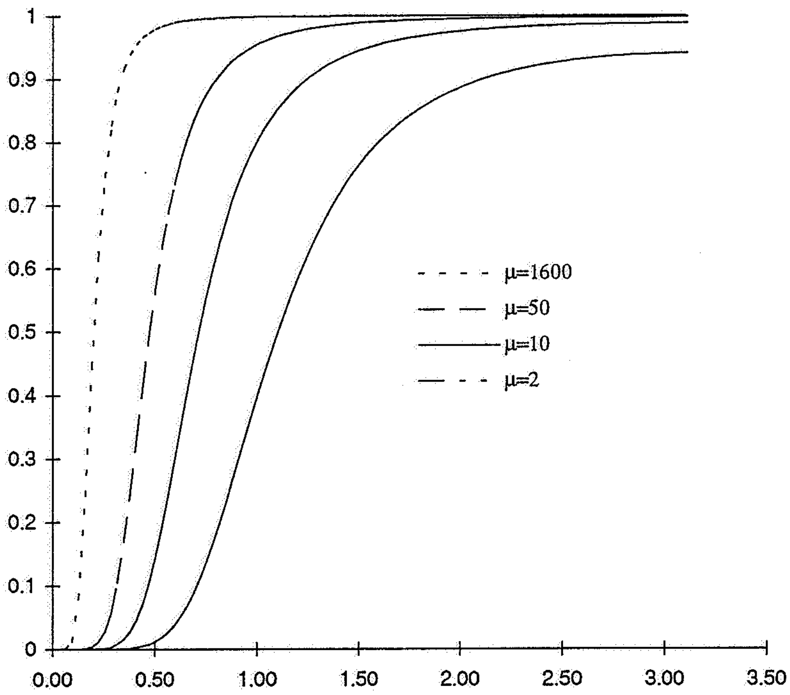


Figure 4 - Plot of Eigenvalues of correlation matrices for permanent and transitory innovations

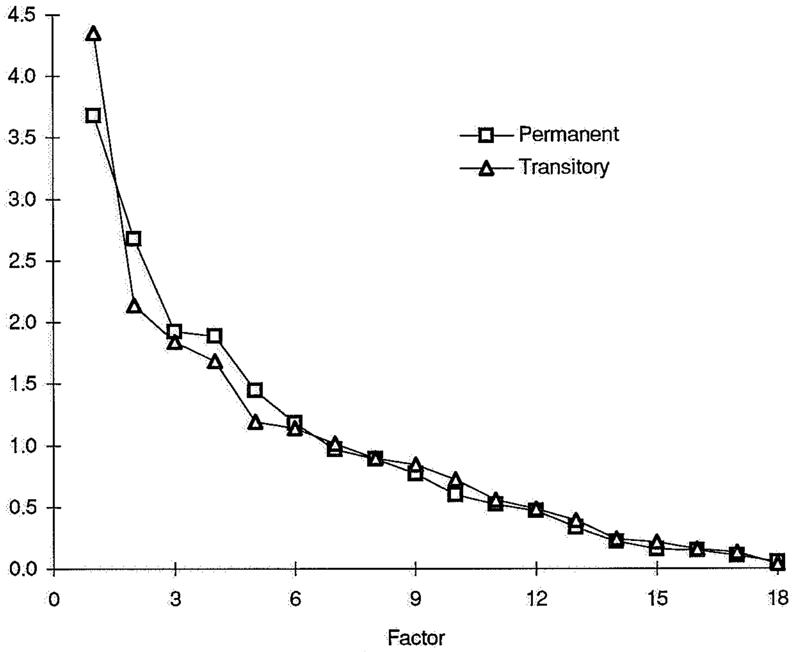


Figure 5 - Plot of Varimax rotated misalignment factor (1) against central European industrial factor (2)

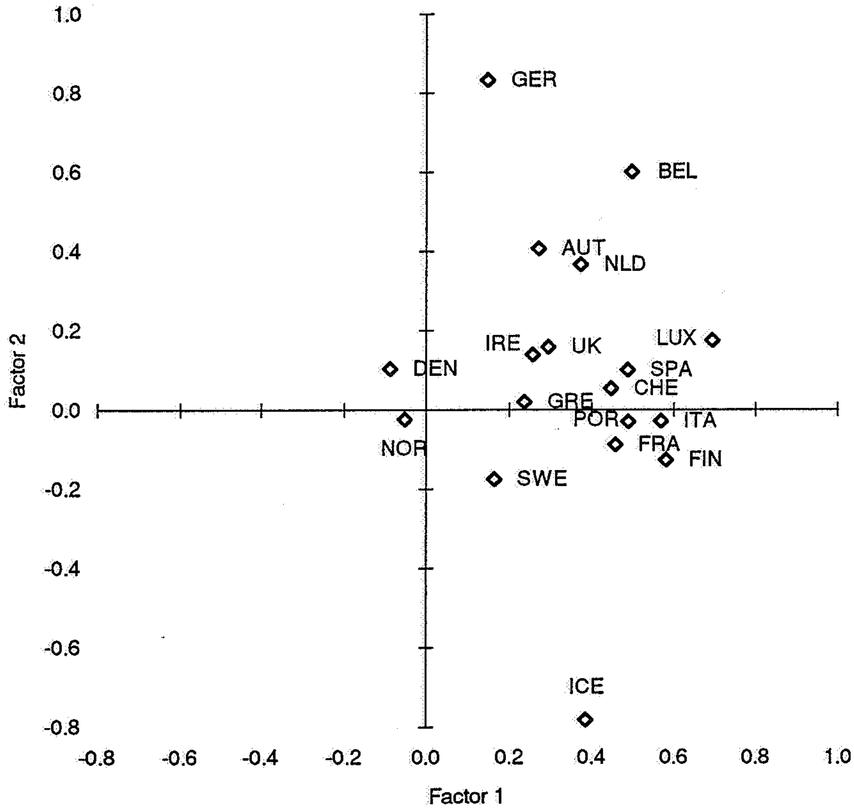


Figure 6 - Plot of Varimax rotated misalignment factor (1) against Nordic raw materials factor (3)

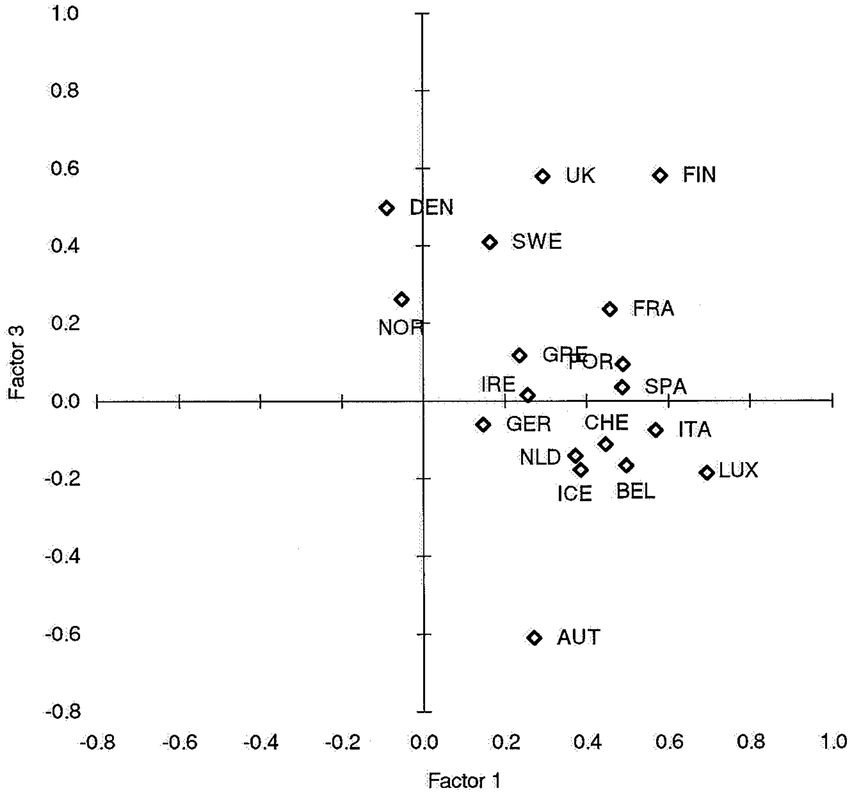


Figure 7 - Plot of Varimax rotated European industrial factor (2) against Nordic raw materials factor (3)

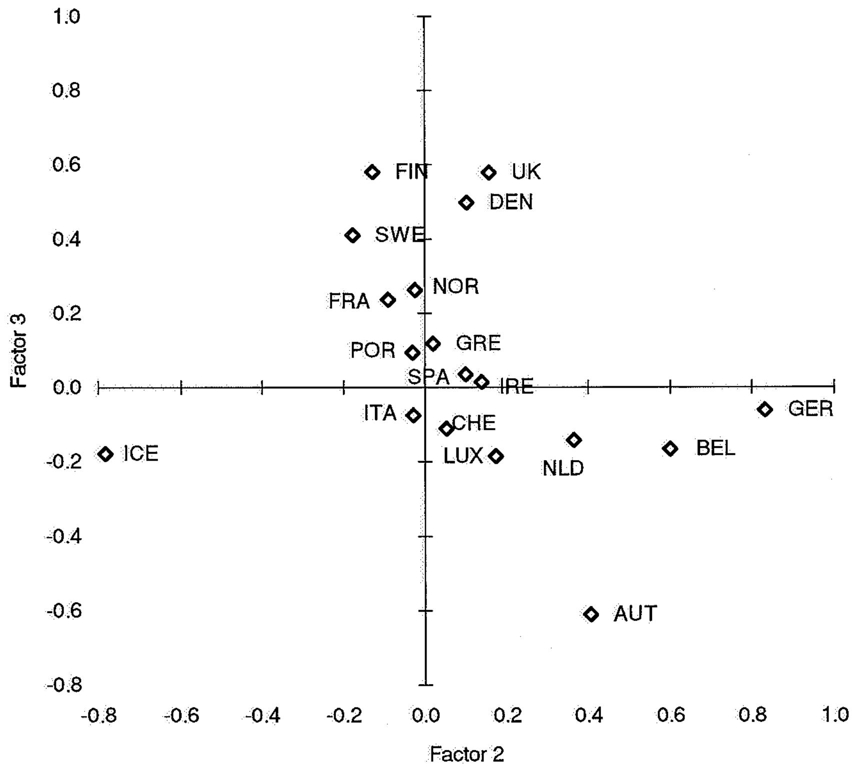
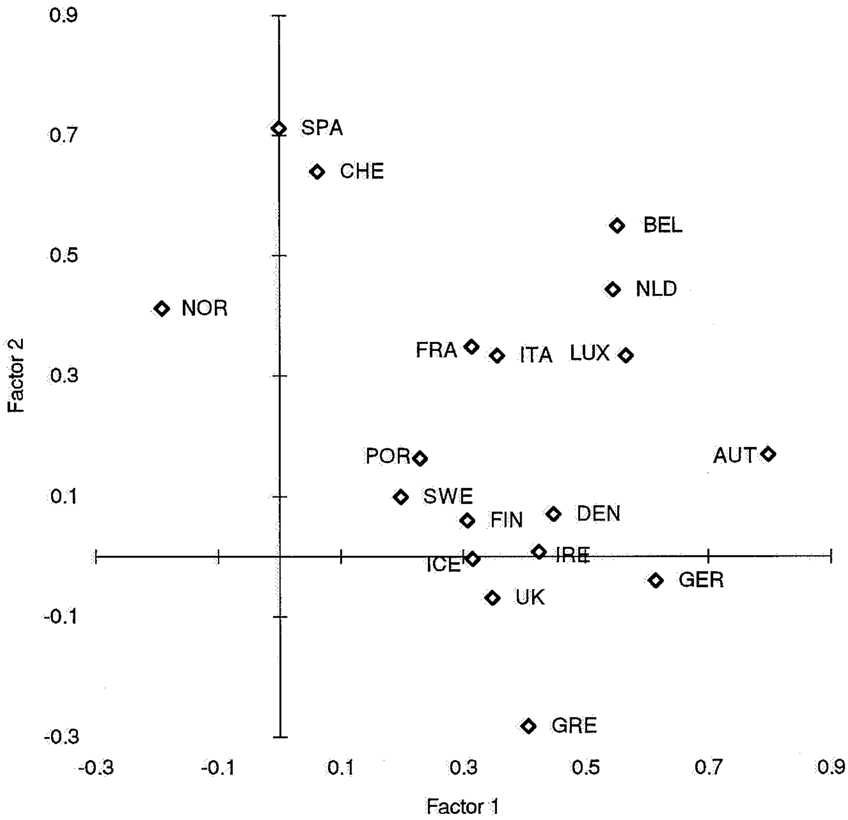


Figure 8 - Plot of varimax rotated German Bundesbank factor (1) against factor (2)



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Verkaufspreis: S 100,–.