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Common and Idiosyncratic Components in Real Output: Further International Evidence

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Common and Idiosyncratic Components in Real Output: Further International Evidence

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Abstract

This paper uses the classical *(level)* definition of business cycles to analyze the characteristics—duration, amplitude, steepness, and cumulative output movements—of the real GDP series of France, Germany, Italy, the rest of the euro area, and the United States. An index of concordance and its test statistic suggest a great deal of comovement/synchronization between output cycles. Following that result, a dynamic factor model is estimated. Output fluctuations are mostly explained by a global common component and an euro area common component. However, idiosyncratic components also matter, especially for France, the rest of the euro area, and the United States.

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Contents

Page

I. Introduction

Most macroeconomic aggregates seem to move together, and in certain cases even seem to be synchronized in that turning points occur at roughly the same point in time or differ by roughly constant intervals (e.g., Stockman, 1990). This was the original observation that led Burns and Mitchell (1946) to develop the idea of a reference cycle. Since then, as national accounts were developed, understanding comovements and synchronization of macroeconomic aggregates within a country as well as across countries in, especially, output, consumption, and productivity has become a major theme in theory, practice, and policy discussions.

A vast literature has developed models to match the statistical properties of national business cycles of industrial countries as well as the comovements of macroeconomic aggregates across countries, the most significant of which is the high correlation of output fluctuations (see the survey in Backus et al., 1995).

Undoubtedly, the extent to which output fluctuations (expansions and contractions) are global or idiosyncratic phenomena matters for policymakers. The idea of the U. S. economy as a locomotive of the world is based on the perception that the role of national policies in smoothing output fluctuations in an integrated world is somewhat limited. At a European level, the arrival of full monetary union, the different pace of fiscal consolidation under the Stability and Growth Pact, and divergences in the areas chosen for reform by several European countries, have introduced an additional sense of importance into trying to understand output comovement as well as the impact of institutional changes on output behavior. For instance, at a country level, the issue of French output comovement with the rest of the euro area, or the rest of world output, has drawn additional attention in light of the somewhat better record of France relative to other major European economies during the last cycle. Some observers have considered it to be a one-time effect of reforms, while others have suggested a more durable change in output behavior. Discriminating between the common and the idiosyncratic components of output is an important ingredient of policymaking.

The objective of this paper is to dissect major euro area and U.S. economic cycles into their common and idiosyncratic components.[2] The main finding is that there is an important global common factor in real GDP fluctuations of major industrial countries as well as an euro area common factor in the region. However, idiosyncratic components matter, especially for France, the euro area (excluding France, Germany, and Italy), and the United States. This is consistent with the findings of Canova and Marrimon (1998), Kwark (1999), and Lumsdaine and Prasad (1999).[3]

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[2] Henceforth, the words component and factor are used as synonymous.

[3] Canova and Marrimon (1998) find that the common component of shocks is most important in quantitatively reproducing actual data; Kwark (1999) concludes that while worldwide shocks and U.S. idiosyncratic shocks explain other countries' output fluctuations, U.S. idiosyncratic shocks are the most important for explaining U.S. output fluctuations; and Lumsdaine and Prasad (1999) find evidence of a world business cycle and a distinct European component.

The next section defines what is meant by a cycle in real GDP. This leads to a discussion of what is meant by comovements between economic time series. Section III calculates the index of concordance with the concordance test statistic developed by Harding and Pagan (2001a, 2001b, and 2002). Section IV develops an approach to determine whether there is a common component among the same set of series found to be synchronized. The approach is inspired by the work of Stock and Watson (1991) on coincident indicators. It is applied to estimate a "world" or global common factor, and a European or regional common factor. It also estimates the idiosyncratic factors of real GDP. The last section concludes and discusses policy implications.

II. Measuring The Cycle

A. Definition of Cycle

This study will be mostly concerned with the *level* of real GDP, the time series that represents the best available measure of aggregate economic activity. A pattern of recurrent fluctuations between phases—contractions and expansions—in the level of activity is what is normally referred to as the *classical cycle*. The analysis here will not involve detrending, as done, for instance, in the work of Cooley and Prescott (1995). The main reason for this strategy is to avoid the well-known problem that detrending itself alters the properties of the cycle (King and Rebelo, 1993).[4] This study thus stays close to Burns and Mitchell's (1946) idea of cycles in the level of GDP.

The Burns and Mitchell procedure for locating turning points and defining cycles is made operational by using an algorithm originally developed by Bry and Boschan (1971) and adapted by Harding and Pagan (2002). The algorithm defines a peak (trough) at time t as occurring when the series $y_t > (<) y_{t+2}$.[5] It also ensures that peaks and troughs alternate. Finally, it imposes the restrictions that a cycle phase must last at least two quarters and a complete cycle should have a minimum duration of five quarters.[6]

Empirical analysis will concentrate on France (FR), Germany (DE), Italy (IT), the euro area excluding Germany, France, and Italy (henceforth, the rest of the euro area, or REA), and the United States (US). The seasonally adjusted real GDP data are from the Organization for Economic Cooperation and Development (OECD) database except for French GDP which is from INSEE, the French statistical office. The sample period comprises 1975:1-2001:4.

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[4] Filters such as Hodrick-Prescott or Baxter and King's band-pass remove the permanent component of a series that is nonstationary (e.g., a unit root process I(1)). The major difficulty is that the resulting stationary series (i.e., I(0) series) is not unique because any stationary series could be added to the I(1) series and it would still be I(1).

[5] Alternatively, a local peak requires $y_t - y_{t-2} > 0$, $y_t - y_{t-1} > 0$, $y_{t+1} - y_t < 0$, and $y_{t+2} - y_t < 0$.

[6] See a technical discussion in Harding and Pagan (2001b).

The turning points in the real GDP series of the countries in the sample are shown in Figure 1.[7] Peaks are shown as taking a value of 1 and troughs as taking a value of -1. For the US, the algorithm returns the same dates of peaks and troughs as the National Bureau of Economic Research (NBER) dating. The dates for the other countries are very similar to the ones obtained by Harding and Pagan (2001b) and those reported in IMF (2002). Although the dating of the classical cycle for G-7 and euro area countries by Artis et al. (1997) used industrial production, the dates in Figure 1 are not too different from them.[8]

As in Artis et al., it is remarkable how few cases of recessions are confined to one country: IT had a recession at the beginning of 1977, and DE at the beginning of 1996. There were three clear periods of recession: the first one was the recession of 1980 which affected all countries but IT; the second one was in 1982, which affected all countries but FR and; the last one was in 1993, which had a clear European nature. Similarly, it could be speculated that the 1991 US recession was offset in major euro area economies by the positive impact of German unification. As shown below, DE real output displays a strong positive idiosyncratic component in 1991-92.

B. Cycle Characteristics

This section presents statistics on duration, amplitude (or deepness), steepness, and cumulative movements of cycles.[9] The duration of a cycle is the number of periods between two consecutive peaks (or troughs). The amplitude or deepness of a recession is the output contraction from peak to trough in percent of GDP, and mutatis mutandi, for the amplitude of an expansion. Steepness is the rate of change of output from peak to trough, or vice versa, in a given period of time. Cumulative movements of output are the output losses from peak to trough relative to the previous period. As cumulative movements of output are approximated using a linear procedure, a measure of the excess in cumulated movements is also necessary.

Statistics of the classical cycle for FR, DE, IT, REA, and the US are presented in Table 1. Output contractions are defined as PT (peak-to-trough) and expansions are defined as TP (trough-to-peak). The similarity of the duration and amplitude of contractions across countries contrasts with their divergence in terms of expansions. This seems to be quite a general phenomenon (e.g., IMF, 2002). Note, however, the similar duration of expansions for DE and the US. Overall, FR and IT have much longer cycles (expansions) than DE and the US. Recessions are longer for DE and shorter for FR and IT. Cycles are asymmetric. The asymmetry of cycles is also manifested in the differences in cumulation of output in PT and TP across countries.

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[7] Paul Cashin's assistance in running the code is greatly appreciated. The code was used in Cashin and McDermott (2002), and is based on Watson's modified Bry-Boschan algorithm.

[8] Artis et al.'s sample ends in 1993.

[9] See Harding and Pagan (2001a, 2001b, and 2002) for a technical discussion of the statistics. Importantly, the statistics do not depend on the order of integration of the series.

Figure 1. Turning Points of Real GDP
(Peaks=1, Troughs=-1)

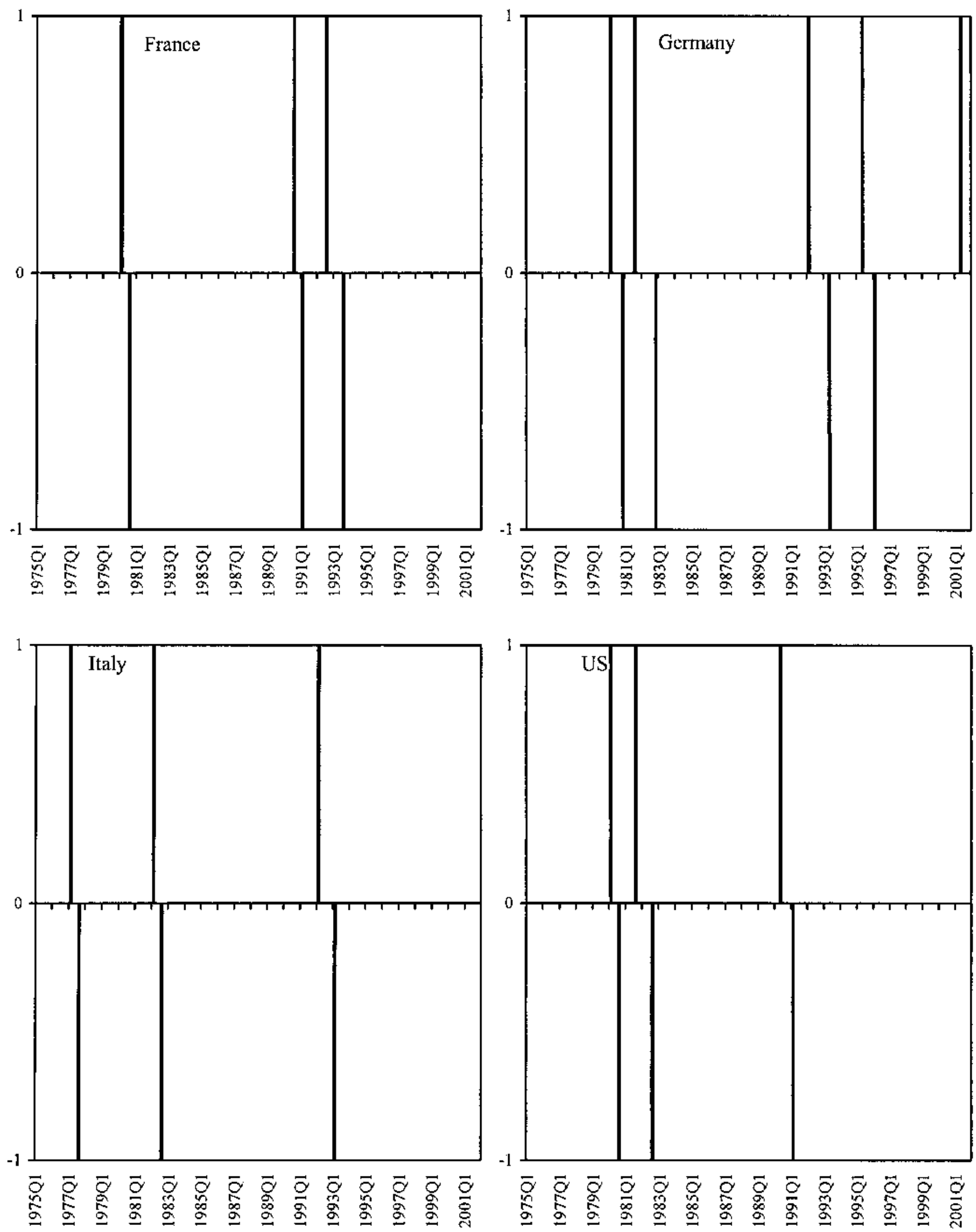

Table 1. Business Cycle Characteristics
(In percent, unless otherwise indicated)

	DE	FR	IT	REA	US
Mean duration (quarters)					
PT	4.0	2.7	2.7	3.0	3.0
TP	17.3	23.0	28.0	46.0	17.5
Mean amplitude					
PT	-1.6	-0.7	-1.2	-1.1	-2.2
TP	11.6	13.1	19.2	30.3	21.0
Steepness					
PT	-0.4	-0.3	-0.4	-0.4	-0.7
TP	0.7	0.6	0.7	0.7	1.2
Cumulation[1]					
PT	-3.9	-1.5	-1.4	-2.1	-4.4
TP	154.0	203.5	319.2	563.1	375.6
Excess					
PT	-0.1	-0.1	0.1	-0.1	-0.3
TP	-0.5	-0.8	1.3	-2.9	2.8

[1]Percent of GDP in first quarter of phase.

The steepness statistics display great similarity across European countries in both phases of the cycle. This result is possible despite the significant differences in duration (at least during expansions) because durations are positively correlated with amplitudes.

Another interesting feature of the data is the well-known rapid recovery during early expansions in the US, which is shown by the excess statistic (TP). This sort of asymmetry in business cycles has been documented in the literature.[10] In Europe, IT stands out as the only European country in the sample that also displays strong early output expansions.

The divergent cyclical characteristics of cycles among European countries raise theoretical and policy questions. To the extent that the contractionary phases of cycles tend to be more similar across euro area countries than the expansionary phases, a certain asymmetry in setting the monetary policy stance will be induced. That is, the European Central Bank will encounter less conflicting signals when the policy stance has to be eased than it will encounter when the policy stance has to be made more restrictive. Ceteris paribus, it is likely that the monetary authority will be more frequently above the target measure of price stability than below it. Also, unless monetary union and reforms to increase labor and product markets flexibility in the euro area smooth divergences in cycle characteristics, inflation and output volatility might be unnecessarily high. Finally, the results also suggest the desirability of coordinating fiscal policies to contribute to the smoothing of remaining disparities in cycles, even more so if disparities across European countries in terms of the more or less free operation of fiscal automatic stabilizers were to explain divergences in their cycles.

[10] See Nadal-De Simone (2001), and references therein.

The remainder of the paper addresses two further questions in detail: How much comovement of the output series is there? What are the relative contributions to output behavior of global, regional, and idiosyncratic shocks?

III. Concordance and Synchronization

Understanding why there is comovement between macroeconomic aggregates and across countries has been at the heart of the business cycle literature. Comovement has been associated most of the time with the covariation of time series once their permanent components have been removed. It thus seems logical to define what is meant by synchronized movements in the classical business cycle, and measure them in some way.

Because turning points signal phases of contractions and expansions, any two real GDP series would be perfectly synchronized if they were in the same phase of the cycle at all points in time. Harding and Pagan (2001a) developed a bivariate index of synchronization based on the fraction of time that the two series spend in the same phase, called the concordance index I_j (a version of Pearson's contingent coefficient). The index can be written as:

$$I_j = \frac{1}{T}\sum_{t=1}^{T}\left\{S_{it}S_{jt} + \left(1-S_{it}\right)\left(1-S_{jt}\right)\right\}, \qquad (1)$$

where i and j are any two time series, T is the number of observations, and S_t is a state variable that takes the value 1 during expansions and 0 during contractions. The index of concordance is well defined even in the case of nonstationary series, such as the level of real GDP. However, to be a useful measure of synchronization, the index has to be modified to eliminate the possibility of obtaining high values of the index simply because one of the series spends a large fraction of the time in expansions.[11] Thus, a mean correction of the index is necessary in order to obtain a concordance test statistic.[12]

The concordance index, without mean correction, among real GDP series as well as the correlation coefficients with their t-statistics (between parentheses) are shown in Table 2.[13] The relevance of mean-correcting the concordance index evinces clearly from the table: the index without mean correction displays values that are much higher than those of the correlation coefficients. There is a significant degree of synchronization between the pairs DE-FR, DE-IT,

[11] This is one difficulty with the statistics on cross-country industrial production comovements in Artis et al. (1997), as this measure does not allow a test of no synchronization between two cycles.

[12] After mean-correcting, Harding and Pagan (2001a) show that the index is proportional to the regression coefficient estimate of a linear regression of S_{jt} against a constant and S_{it}. This estimate is in turn proportional to the correlation coefficient between S_{jt} and S_{it}. This is so because the demeaned index has an expectation of zero under the null hypothesis of no synchronization.

[13] The null hypothesis is no association. The t-ratios are robust to the heteroskedasticity and serial correlation present in the state variable S_t.

DE-US, FR-US. In contrast, the degree of synchronization between the pairs FR-IT or IT-US is insignificant. Therefore, there is evidence that some European economies are well synchronized between themselves and with the US.[14]

Table 2. Concordance, Correlation and t-Statistics				
	Concordance			
	DE	FR	IT	US
DE	1	0.85	0.87	0.86
FR		1	0.89	0.92
IT			1	0.88
US				1
	Correlation and t-Statistics			
	DE	FR	IT	US
DE	1	0.35*	0.44*	0.40*
		(2.28)	(2.77)	(3.40)
FR		1	0.19	0.43*
			(1.23)	(2.42)
IT			1	0.17
				(1.15)
US				1

The concordance results are sufficient evidence to try to determine the common component of output levels across countries in a multivariate framework. The next section explores the question of the presence of a possible underlying common component or factor in a multivariate framework.

IV. A Common Component Model

A. The Model

One possible explanation for the international synchronization of business cycles is that they are driven by a common factor, although with different weights depending on the country.[15] Therefore, it seems intuitive to construct the common factor by weighting the time series in some way, very much as the NBER does with its "coincident indicator index." The model that will be used for extracting the common component of a set of real GDP time series in this section is inspired by Stock and Watson's (1991) dynamic factor model of coincident economic indicators. Stock and Watson showed that their model replicated fairly well the NBER coincident index. The objective of this section is thus formally similar to the original idea of Stock and Watson, in that a set of economic variables is assumed to move contemporaneously with overall economic conditions, and that that comovement can be traced by an index. The model of this section, however, will allow for lags in the time series to capture the possibility of phase shifts in the series comovement.

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[14] Artis et al.'s (1997) relatively higher correlation results may be due to their use of a non-demeaned index.

[15] However, the presence of a common factor does not require synchronization of the specific cycles (Harding and Pagan, 2001a and 2001b).

The dynamic factor model can be written in levels of the time series if the series are nonstationary and cointegrated. Alternatively, the model can be written in first differences if the series are not cointegrated. As it will be discussed below, the real GDP series investigated are clearly nonstationary, and are not cointegrated. Therefore, the dynamic factor model is written in first differences as follows:

$$\Delta y_{it} = I_{it} + \gamma_i \Delta c_t + e_{it}, \tag{2}$$

where Δy_{it} represents changes in the set of real GDP time series. Δc_{it} is the change in the common component, defined as:

$$\phi(L)\Delta c = \delta + \eta_t, \tag{3}$$

where ϕ (L) is a lag polynomial of order p, δ is mean growth rate of the common component $c_{t|t}$, and η_t is assumed to be normally distributed with a zero mean and a variance σ_η^2. The common component is thus a random walk with a drift. The error terms e_{it} are assumed to be independent, and to follow a process defined by the lag polynomial of order k, ψ (L):

$$\psi_i(L)e_{it} = \varepsilon_{it}, \tag{4}$$

where ε_{it} is normally distributed with mean zero and variance σ_ε^2. The independence assumption of e_{it} means that the comovements of the real GDP series in the sample have a single source c_t, although the common component is allowed to enter each real GDP series with a different weight γ_i. For each real GDP series, $I_{it} + e_{it}$ represents the idiosyncratic component.

The identification issues of a coincident economic indicator model were discussed by Stock and Watson (1991), and therefore are just briefly mentioned here. First, the scale of Δc_t is identified by setting $\sigma_\eta^2 = 1$. Second, given the mean of Δy_t, I_{it} and δ are not separately identified because it is not possible to identify the factor loadings and the variance. Thus, Stock and Watson suggested writing the model in terms of deviations from sample means, an approach followed here. With these restrictions, the model can be put in state-space form and its parameters can be estimated using full information maximum likelihood. Once the parameters are estimated, the Kalman filter is applied to obtain $\Delta c_{t|t}$.[16]

The common component of DE, FR, IT, REA, and the US proxies a "world" or global common factor in output. To identify idiosyncratic components of real GDP, the model is used to extract a euro area or regional common component that might be left in output once the global common component has been removed.[17] For this purpose, a two-step strategy is followed. First, the global

[16] A technical discussion of the modeling and estimation issues is in Kim and Nelson (1999).

[17] The European common component identified by Lumsdaine and Prasad (1999) may be biased upward due to the exclusion of Canada, Japan, and the United States from the estimation. Therefore, there is no guaranteed orthogonality between the global and the European estimated common components.

common component among the DE, FR, IT, REA, and US output is extracted. This produces the first "idiosyncratic" component of real GDP, i.e., $I_{it} + e_{it}$. Second, using those "idiosyncratic" component series, the model is run again to extract the euro area common component among DE, FR, IT, and REA output, i.e., excluding US output. After this second step, the original real GDP series contains only the "true" idiosyncratic component.

B. Empirical Results

The single-index model is estimated using seasonally adjusted quarterly real GDP series. The levels of all real GDP series are nonstationary when a constant and a time trend are included in the alternative hypothesis (Table 3). However, the rates of change in GDP are all stationary. The cointegration tests show that the series are not cointegrated.[18] Therefore, the model is estimated in the first difference of the logarithm of the series, standardized to have zero mean.[19] Note that the absence of a common trend among the real GDP series (the absence of cointegration) implies that innovations to the common component c_t are transitory.

Table 3. Elliot, Rothenberg, and Stock Test for Unit Roots
Statistics for ρ= 0
1975Q1 -2001Q4

	Lags	ΔFGLS$^{\tau}$		Lags	ΔFGLS$^{\tau}$
DE	1	-1.42	ΔDE	1	-5.94*
FR	3	-2.41	ΔFR	1	-4.20*
IT	1	-1.18	ΔIT	1	-4.81*
REA	3	-2.24	ΔREA	1	-3.36*
US	1	-2.13	ΔUS	1	-6.08*

*All variables are measured in natural logarithms. Lags are determined according to Schwarz information criterion and checking that the residuals are white noise. The ΔDFGLS$^{\tau}$ has a null of unit root with a constant and a linear trend. The 5 percent critical value is -2.89.

The global common component

Table 4 reports the maximum likelihood estimates of the model where the common component is of order two, i.e., p=2 in ϕ (L), and in which the lag polynomial ψ_i has k=1.[20]

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[18] Results of the Johansen-Juselius test for no cointegration are available upon request.

[19] Stock and Watson also imposed a unit variance on the series. This restriction is not necessary if there is good convergence of the estimation.

[20] Two versions of the model are estimated, one with one lag in the error terms e_{it} (i.e., k=1), and another one with two lags (i.e., k=2). Because the likelihood ratio test could not reject the hypothesis that the additional four lags for e_{it} were zero, Table 5 shows the results when k=1.

Table 4. Estimated Single-Index Model of Common Global Component in Real GDP

Parameters	ΔDE	ΔFR	Variable (i) ΔIT	ΔREA	ΔUS
γ_i	0.31*	0.26*	0.28*	0.26*	0.15
	(0.08)	(0.08)	(0.06)	(0.06)	(0.10)
		0.02			
		(0.06)			
ψ_i	-0.02	-0.14	0.05	0.01	0.23*
	(0.11)	(0.17)	(0.11)	(0.14)	(0.09)
σ_i	0.38*	0.10*	0.33*	0.13*	0.96*
	(0.06)	(0.03)	(0.05)	(0.03)	(0.13)

$$\underset{}{\Delta C^g_t = \underset{(0.30)}{0.66^*}\, \Delta C^g_{t-1} + \underset{(0.27)}{0.03}\, \Delta C^g_{t-2} + w_t}$$

L = 15.48

The estimates of the unobserved common global component show significant first order serial correlation and limited second order dependence. The weights of the global common component are strongly significant, and quite similar across euro area countries' output. The weight of the global component on the US GDP is, instead, only marginally significant. This is consistent with Kwark (1999), Gregory et al. (1997), and Norrbin and Schlagenhauf (1996). The (first-step) idiosyncratic components of the series contrast with the global common component results. Only the (first-step) idiosyncratic component of the United States shows significant positive serial correlation, while the European ones do not. The variances of all the (first-step) idiosyncratic components are, however, strongly significant.

While US real GDP is less affected by a global common factor, it is likely that the significant idiosyncratic shocks to US output will themselves be a source of disturbance to the rest of the world. The opposite is less likely.[21] This is result is important for understanding the international transmission of disturbances: what often is referred to as a global disturbance because it affects the US and the euro area might very well be a US idiosyncratic shock transmitted to the rest of the world via trade and asset markets linkages.[22]

The estimated model seems to be well specified. With very few exceptions, the disturbances in the observed variables are not predictable (Table 5).[23] An obvious next step, which is beyond the scope of this research, would be to identify the global common component of output.

[21] Within the framework of this paper, however, there is no formal testing of this hypothesis. Kwark (1999) finds that the transmission of US shocks to foreign countries is strong but the reverse is not true.

[22] See World Economic Outlook (2001) for a recent description of international linkages.

[23] This test regresses each of the forecast error terms of the model against a constant, 4 lags of the errors, and the changes in all real GDP series. The test was used to choose the 0-lag specification for all GDP series except the French one, where one lag was preferred. The index is thus not a purely coincident index but a mixed coincident/lagging index.

Table 5. Marginal Significance Levels of Diagnostic Test for Single-Index Model of Global Common Component

	Forecast errors				
Regressors	e_{DE}	e_{FR}	e_{IT}	e_{REA}	e_{US}
e_{DE}	0.48	0.57	0.75	0.49	0.72
e_{FR}	0.63	0.85	0.26	0.88	0.02
e_{IT}	0.87	0.04	0.25	0.35	0.17
e_{REA}	0.75	0.32	0.31	0.79	0.55
e_{US}	0.12	0.32	0.28	0.86	0.73
ΔlnDE	0.49	0.56	0.73	0.46	0.74
ΔlnFR	0.77	0.70	0.27	0.62	0.04
ΔlnIT	0.81	0.03	0.28	0.33	0.18
ΔlnREA	0.72	0.39	0.24	0.86	0.56
ΔlnUS	0.08	0.32	0.18	0.85	0.70

The series e_i are the one-step ahead forecast errors from the single-index model. The table reports the p-values from the regression of e_i against a constant and four lags of the regressors. The p-values correspond to the F-test of the hypothesis that the coefficients on those four lags are zero. The test statistics are corrected only for the number of regressors.

The regional common component

The (first step) "idiosyncratic" components of DE, FR, IT, and REA (i.e., excluding US) are used to extract a euro area common component.[24] As with the global common component, the unobserved regional common component shows significant first order serial correlation, and limited second order serial correlation (Table 6).[25] However, the regional common component is less persistent than the global common component because the duration of shocks is 2 quarters against 3. The weights of the euro area common component are relatively more significant for IT and REA output than for FR output. DE real GDP, in contrast, does not seem to be affected by the Euro area common component during the sample period. This is consistent with the previous results, i.e., the DE cycle is very similar to the US cycle and DE and US output are highly correlated.

[24] The two-step procedure is expected to guarantee that whatever common element is left in the first-step idiosyncratic component is orthogonal to the global common component.

[25] As in the first step of the estimation process, the common component is of order two, i.e., p=2 in ϕ (L), and the lag polynomial ψ_i has k=1.

Table 6. Estimated Single-Index Model of Regional Common Component in Real GDP

	Variables			
Parameters	ΔDE	ΔFR	ΔREA	ΔIT
γ_i	0.02	-0.05	0.22*	-0.14*
	(0.06)	(0.04)	(0.06)	(0.08)
	-0.07	0.12*	-0.27*	0.21*
	(0.07)	(0.03)	(0.03)	(0.06)
ψ_i	-0.05	-0.30*	0.88*	0.13
	(0.10)	(0.13)	(0.08)	(0.10)
σ_i	0.32*	0.06*	0.01	0.27*
	(0.05)	(0.01)	(0.00)	(0.04)

$$\Delta C^r_t = \underset{(0.23)}{0.51^*}\,\Delta C^r_{t-1} + \underset{(0.13)}{0.06}\,\Delta C^r_{t-2} + w_t$$

L = 182.42

The idiosyncratic factors of real GDP from the two steps, i.e., including and excluding the regional common component, are displayed in Figure 2. The euro area common factor is less significant for DE (especially before unification) and FR. In contrast, the euro area common component is very important for REA output and for IT output. Moreover, it is important to stress that the REA and French idiosyncratic components have made positive contributions to growth in the recent cycle. This contrasts with both DE and IT output, where idiosyncratic components have been larger but have dragged growth down. Therefore, the idiosyncratic component of output of European countries needs to be part and parcel of modeling and forecasting output behavior.

The fit of the single-index model of the regional common factor is satisfactory (Table 7). The disturbances in the observed variables are mostly unpredictable.[26]

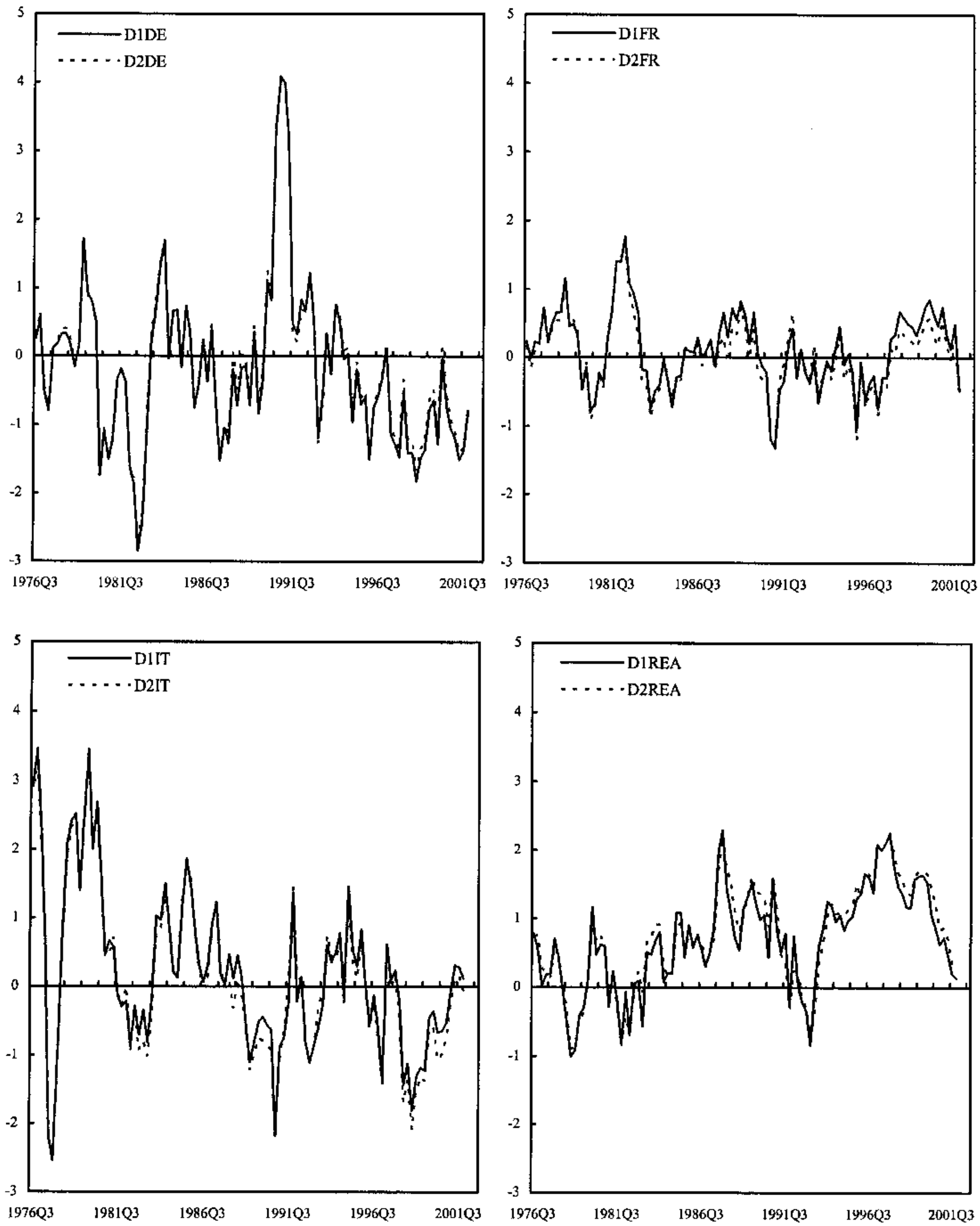
Table 7. Marginal Significance Levels of Diagnostic Test for Single-Index Model of Regional Common Component

	Forecast errors			
Regressors	e_{DE}	e_{FR}	e_{IT}	e_{REA}
e_{DE}	0.42	0.45	0.88	0.14
e_{FR}	0.73	0.36	0.52	0.13
e_{IT}	0.02	0.84	0.21	0.11
e_{REA}	0.17	0.29	0.82	0.09
ΔlnDE	0.42	0.43	0.87	0.14
ΔlnFR	0.90	0.39	0.88	0.13
ΔlnIT	0.02	0.86	0.22	0.11
ΔlnREA	0.16	0.25	0.06	0.48

The series e_i are the one-step ahead forecast errors from the single-index model. The table reports the p-values from the regression of e_i against a constant and four lags of the regressors. The p-values correspond to the F-test of the hypothesis that the coefficients on those four lags are zero. The test statistics are corrected only for the number of regressors.

[26] This test was used to choose the 1-lag specification for all GDP series.

Figure 2. Idiosyncratic Factors of Real GDP:
Including (1) and Excluding (2) the Regional Common Component
(Annual Percentage Change)



V. Summary and Policy Implications

This study uses the classical *(level)* definition of cycles to analyze the characteristics of the real GDP time series of France, Germany, Italy, the rest of the euro area, and the United States. Some insights into the links between level of output and the main features of cycles are discussed as well. The analysis follows by calculating an index of concordance and the concordance test statistic in order to assess the degree of synchronization between pairs of the real GDP series. Once the primary evidence of comovement or synchronization between series is established, the idiosyncratic components of real GDP are estimated with a dynamic factor model which extracts a global common component and an euro area common component from the series. The main results follow.

The main general finding is that there is a great deal of comovement/synchronization between the cycles of France, Germany, Italy, the rest of the euro area, and the United States. The classical cycle is very similar across countries in terms of the duration and amplitude of contractions, but diverges in terms of expansions. The expansions of European countries, excluding DE, tend to last longer than US expansions. The duration and amplitude of DE cycles is remarkably similar to the ones of US cycles. IT and FR expansions are particularly long. European countries experience similar steepness; the steepness of their cycles is lower than that of US cycles. Finally, only Italian recoveries display strong early output expansions, an asymmetry that has been well documented for US cycles.

Asymmetries in real GDP behavior are further illustrated by divergent results in terms of comovement/synchronization across pairs of countries. According to the concordance index, only some European economies are well synchronized between themselves and with the US.

The similarity of contraction phases indicates a certain commonality of negative shocks to output and/or a similarity of responses to negative shocks.[27] In contrast, divergences of expansions point to cycles that tend to be supported by relatively more idiosyncratic forces.

These results are consistent with those of the multivariate model: 1) there is an unobserved common global component of output which matters relatively less for the US than for euro area output; 2) there is also a euro area common component which has a strong influence on IT and REA output, relatively less influence on FR output, and no influence on DE output and; 3) the idiosyncratic component of output is statistically significant for all countries although it matters relatively more for the US, REA, and FR real GDP series.

These results suggest a number of policy implications. Policymaking should take into account that while cycles across euro area countries share broadly similar characteristics, disparities remain.

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[27] IMF (2002) suggests that monetary policy could be such a common shock, at least in the case of synchronized recessions: peaks in interest rates usually just preceded or just followed peaks in output. Also, interest rate increases prior to the peaks are positively correlated with the depth of the subsequent recessions.

For example, the results suggest the desirability of coordinating fiscal policies to contribute to the smoothing of remaining disparities in cycles, and to let automatic stabilizers operate symmetrically over the cycle.[28] If, for instance, expansions tend to be relatively longer in Italy, given a certain euro area monetary policy stance, it will be desirable that Italian fiscal policy contribute to achieving the appropriate overall policy mix for the country. Looking forward, however, it could be argued that attainment of the Stability and Growth Pact requirements will be sufficient to induce the required discipline. In that case, once Italy has attained a sustainable structural fiscal position determined also by the impact of aging and reforms undertaken to deal with it, the unfettered play of automatic stabilizers operating symmetrically over the cycle should be enough to bring the country close to a combination of price stability and relatively low output variance.

To the extent that the contractionary phase of cycles tend to be more similar across European countries than the expansionary phase, there may be a certain asymmetry in the stance of European monetary policy. The European Central Bank will probably encounter less contradictory signals when it comes to move to an expansionary policy stance than when it comes to shift to a contractionary policy stance. This might result in a higher likelihood of having an average inflation above the objective than having an average inflation below the objective. At a country level, inflation forces will tend to be more persistent in IT than in DE.

Similarly, the importance of idiosyncratic components in output behavior indicates the need for flexibility in labor and product markets to respond to the transmission of output disturbances across countries. Unless the reforms geared to increasing labor and product market flexibility help to smooth divergences in cycle characteristics, output and inflation volatility may be unnecessarily high in some countries.

In order to shed further light on the idiosyncratic components it would be necessary to understand their determinants. In the case of France, for example, if the component were the result of the labor market reforms enacted in the 1990s (including the significant cuts on social security contributions), the beneficial effects of at least some of those measures are likely to continue to affect output growth positively for some time. The idiosyncratic component could also be the result of more transient factors, however. For instance, reductions in social security contributions that did not increase labor force participation would not have a lasting effect on growth. Implications for policy will be, therefore, contingent on the nature of the idiosyncratic component. Although a full analysis of the issue goes beyond the scope of this research, it could be inferred that wage moderation and cuts in social security contributions (and other taxes) during the 1990s initiated a phase of labor deepening that pushed French growth up. They helped keep inflation low and increased real disposable income.[29] As a result, consumption was buoyant, which in turn had a positive impact on growth.

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[28] The functioning of automatic stabilizers in the euro area is discussed in Decressin et al. (2001).

[29] Real disposable income has a positive effect on the short-run dynamics of consumption as well as in the long run, INSEE (2001).

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