Business cycles within the Eurozone are converging again

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Since the creation of the single currency, the countries which make up the Eurozone have adopted monetary and fiscal policies intended to bring about greater convergence between their economies. And yet, nearly twenty years later, the economic cycles of the Eurozone nations have not converged uniformly. The quantified macroeconomic data show that, on the one hand, growth rates diverged between 2009 and 2013, with the gaps closing sharply thereafter. On the other hand, France and Italy are the countries whose cycles most resemble those of their main Eurozone partners, while Germany and Spain are following their own trajectories.

The business tendency surveys conducted in a harmonised manner across different member states of the European Union serve to track divergences in the business cycles in real time. Common trends for the economic outlook across the Eurozone can then be identified. Once again, France and Italy are central to the overall economic trajectory of the Eurozone, accounting for half of the fluctuations in the joint indicators. The Belgian and Dutch economies are also closely aligned with the general European cycle. Meanwhile, the contributions made by the German and Spanish economies are less substantial.

Business tendency surveys can also provide real-time indicators of individual countries' divergence from the general trajectory. More often than not, these early indicators are closely correlated with the final growth rate differentials estimated in the national accounts. For Germany, these figures confirm the highly atypical trajectory followed by the economic climate since 2000, with conditions systematically less favourable than in neighbouring countries between 2000 and 2005, and systematically more favourable between 2010 and 2014. These indicators reveal that France has lagged behind the general trend since 2014. Nonetheless, in early 2017 the dispersion among the economic outlook indicators is practically as low as it has been since the creation of the Eurozone, indicating a new convergence between the economic cycles of the main Eurozone countries.

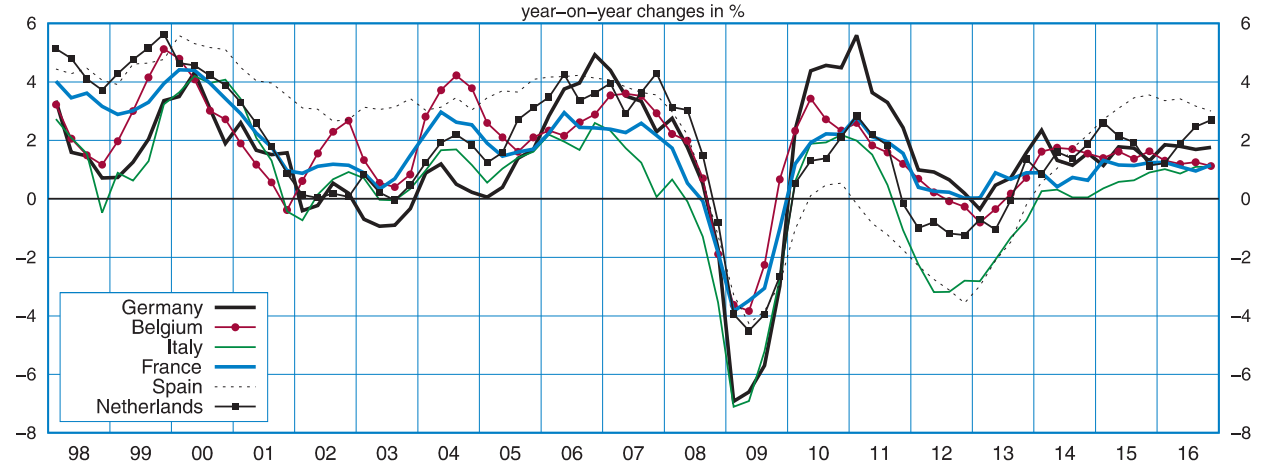
Business cycles within the Eurozone are converging again

Since 1999, the economic outlook for the Eurozone countries has followed a common cycle, albeit with occasionally substantial divergences

Within the Eurozone, growth differentials widened between 2009 and 2013, but have narrowed sharply since

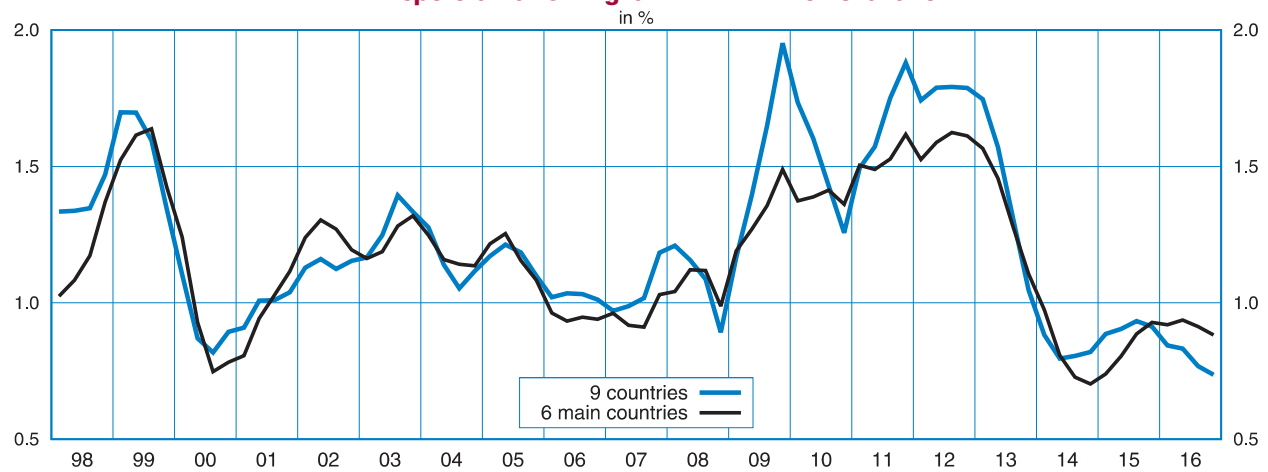
In 2000, just after the formation of the Eurozone (1999) and at a high point in the economic cycle, growth in gross domestic product (GDP) in the major European nations was relatively homogenous, standing somewhere between 3% and 5% (*Graph 1*). The dispersion of these growth rates, a measurement of the mean deviation from the trend during a given period, was relatively small at below 1% (*Graph 2*). Dispersion then increased slightly, fluctuating at just over 1% until 2007. It then rose sharply between 2009 and 2013, most notably during the sovereign debt crisis. It was in this period that the national economies which make up the monetary union diverged most significantly: Germany, hard hit by the crisis of 2008-2009 on account of the German economy's heavy reliance on exports, rapidly bounced back from mid-2009 onwards and was little affected when the second crisis hit the Eurozone; meanwhile, some countries in southern Europe, particularly Spain and Italy, barely bounced back and went through a long period of recession.

1 - GDP growth in the six largest Eurozone economies



Sources: INSEE and other national statistical institutes, quarterly national accounts

2 - Dispersion of GDP growth within the Eurozone



Notes: every quarter, the standard deviation in year-on-year GDP growth is calculated for the six (respectively nine) main economies which accounted for 86% (respectively 93%) of Eurozone GDP in 2016: Germany, Belgium, Italy, France, Spain and the Netherlands (respectively the same plus Austria, Portugal, Finland). To make them easier to read, the two curves are smoothed over four quarters. These correlation calculations do not take into account the relative weight of each country within the Eurozone.

Sources: INSEE and other national statistical institutes, quarterly national accounts

Business cycles within the Eurozone are converging again

Since 2014, dispersion among the business cycles has dropped back to below 1%, close to where it was in 2000. Put differently, the business cycles of the various Eurozone economies have converged once again and are now more "in sync".

France and Italy are the countries whose business cycles have most closely matched those of their Eurozone neighbours, while German growth is the least correlated

The correlation between the growth rates in different Eurozone members over the past twenty years demonstrates how closely the economic cycle of each Eurozone economy is intertwined with that of the other members. Italy (0.94) and France (0.92) are the countries whose economic cycles most resemble those of their respective Eurozone partners (*Table 1*). Belgium (0.87) and the Netherlands (0.90) - both highly dependent on foreign trade, particularly with other Eurozone nations - nevertheless reported economic growth which was less closely correlated with that of their neighbours, especially Germany, their main trading partner. Growth in Germany, whose GDP represents just over a quarter of total Eurozone GDP, displayed the lowest level of correlation with growth in the country's partners (0.74). The Spanish economy also developed at its own quite specific rate (0.77).

Shocks which affect the German economy seem to hit its main trading partners relatively less substantially

The economic cycle of a given country may be more or less advanced in relation to the cycles of the country's neighbours. Negative or positive domestic demand shocks may, via trade channels, have a knock-on effect on activity levels in the neighbouring economies in subsequent quarters. In theory, the bigger a country is the more influential its business cycle will be upon its neighbours; by the same token, the more reliant it is on trade with countries outside the Eurozone, the more scope there is for its economic cycle to be ahead of immediate neighbours.

The correlation between growth in the Eurozone in a given quarter and growth in a specific member economy a few quarters before or after indicates how far ahead the country's business cycle is in relation to its Eurozone neighbours (*Graph 3*). Germany therefore appears to be the economy for which lagged growth in a given quarter is least correlated with contemporaneous Eurozone growth over the same period, even though it is the largest economy in the Eurozone and remains, for its size, relatively reliant on foreign trade. The same is true of time lags lasting multiple quarters. Shocks affecting the German economy thus do not appear to have a decisive impact on the Eurozone economy. Belgium, on the other hand, which accounts for just 4% of total Eurozone GDP, is the country where quarterly growth lags are most strongly correlated with the Eurozone. The Belgian business outlook appears to be just ahead of the curve for the Eurozone, probably on account of the country's high level of exposure to fluctuations in world trade. Belgian business tendency surveys are therefore often seen as a useful advanced indicator for the general European outlook (Lenglart *et al.*, 2002).

Table 1 - Correlation between year-on-year GDP for each country and Eurozone GDP over the period 1996-2016

	Germany	Belgium	Italy	France	Spain	Netherlands
Eurozone, not included the country concerned	0.74	0.87	0.94	0.92	0.77	0.90
Eurozone	0.87	0.89	0.97	0.95	0.81	0.93
Germany	1.00	0.74	0.79	0.78	0.46	0.74
Belgium	0.74	1.00	0.86	0.86	0.68	0.81
Italy	0.79	0.86	1.00	0.90	0.81	0.84
France	0.78	0.86	0.90	1.00	0.74	0.88
Spain	0.46	0.68	0.81	0.74	1.00	0.81
Netherlands	0.74	0.81	0.84	0.88	0.81	1.00

Sources: Eurostat, INSEE and other national statistical institutes, quarterly national accounts

Business cycles within the Eurozone are converging again

Business surveys track the diverging outlooks of different countries in real time

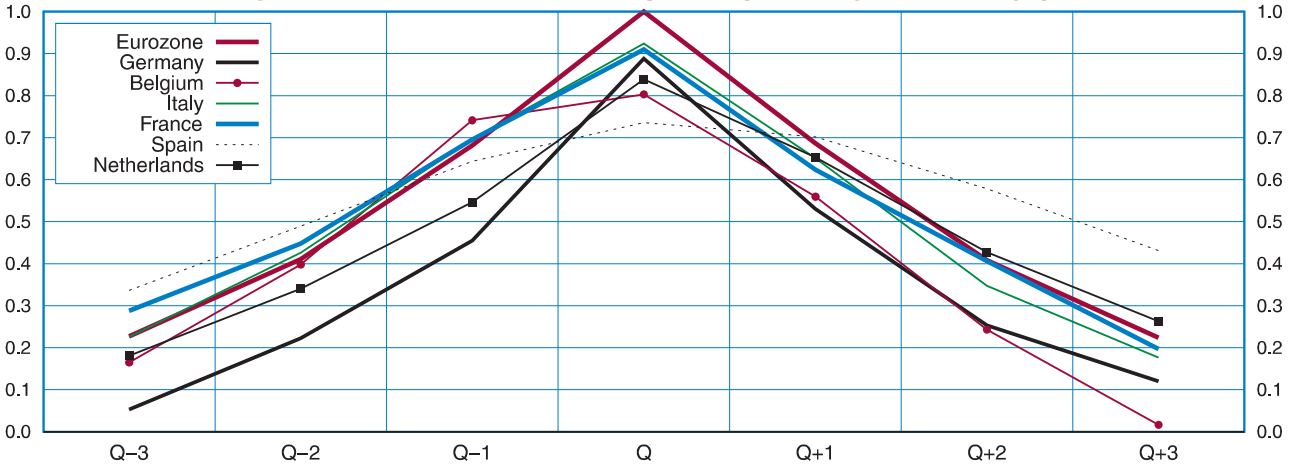
A common factor of the business climate, as well as indicators showing divergences in different countries, are constructed based on the results of the business tendency surveys

The business tendency surveys conducted on business leaders throughout the monetary union can help to identify divergences between the economic outlooks for individual Eurozone countries before quantified macroeconomic data become available. Lenglart *et al.* (2002) developed a model for analysing the European business cycle on the basis of business tendency surveys in the industrial sector, identifying and analysing divergences in advance. The aim of this model was to produce a consistent, simultaneous, composite indicator for the short-term outlook in the Eurozone, as well as a set of real-time divergence indicators covering the six largest Eurozone economies. This model has been updated and expanded here to include the services and construction sectors in these six member states (*Appendix*).

The common factor accurately reproduces variations in the Eurozone outlook

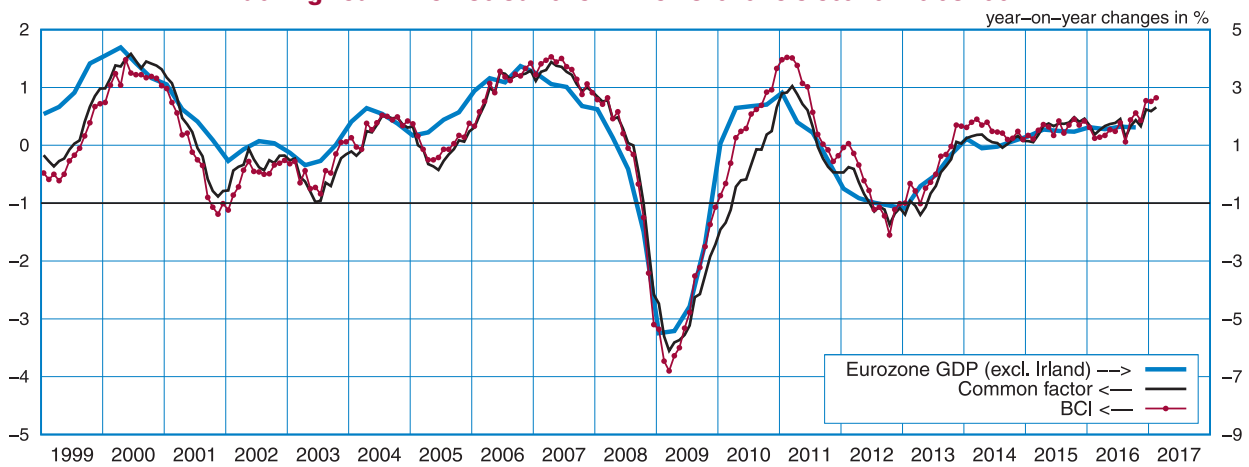
The common factor derived from these calculations accurately tracks GDP growth across the Eurozone as a whole. It proves to be tightly correlated with quarterly GDP growth calculated year-on-year (0.95; *Graph 4*). This common factor for the Eurozone economies is also very close to the "BCI" indicator (Business Climate Indicator for the Euro Area) published monthly by the European Commission. This is logical enough, as although the models are different they both aim to represent the current business outlook across the Eurozone. Both

3 - Average correlation, for the period 1996-2016, between Eurozone growth in Quarter Q and the growth of each individual country in the preceding and ensuing quarters



How to read it: the correlation coefficient between the quarterly variation in France in quarter Q-1 and Eurozone variation in Quarter Q is 0.70.
Sources: Eurostat, INSEE and other national statistical institutes, quarterly national accounts

4 - The Common Factor and the Business Climate Indicator (BCI), two composite indicators tracking real-time fluctuations in the Eurozone's economic outlook



Note: GDP of the Eurozone excluding Ireland, as this country's accounts present a break in series in Q1 2015
Sources: Eurostat, European Commission, INSEE

provide a faithful portrait of the successive phases in the economic cycle observed over the past twenty years: a peak between 1998 and 2000, a slowdown between 2001 and 2003 as a result of the bursting of the dot-com bubble and the attacks of 11th September 2001 in the United States; a rebound from 2004 onwards and a sharp acceleration in 2006-2007; then a major recession in 2008-2009 as the fall-out from the subprime mortgage crisis unfolded; a rebound in 2010, wiped out by the sovereign debt crisis between 2011 and 2013. The current outlook is characterised by a business climate which has been slightly higher than the long-term average since early 2015, consistent with annual GDP growth of around +1.5%.

For each country, twelve balances of opinion are taken from among those provided in the three principal market sectors (five from the industry surveys, four from services and three from construction). The balances from the surveys on industrialists are the most closely correlated to the common factor (*Table 2*). With the notable exception of Germany, the correlation coefficient is above 0.90 for at least one of the balances in industry in each country. In the service sector, on the other hand, with the exception of the Belgian balance for past employment, no correlation breaks the 0.90 barrier. Finally, the balances of opinion derived from the surveys in the construction sector present the weakest correlation with the common factor, this correlation being particularly low in Germany. This sector thus seems to be governed by the specific national outlook, at odds with the common outlook.

Germany contributes little to the common factor, even if analysis is restricted to industry

In the model used here, the common factor is a linear combination of the selected balances. As such, it is possible to calculate the contribution of each balance to these fluctuations (*Table 3*).

Table 2 - Correlation coefficients between the composite common outlook indicator and the balance of opinion in each country

	Germany	Belgium	Spain	France	Italy	Netherlands
Industry						
Past output trends	0.63	0.76	0.84	0.88	0.96	0.74
Variation in output expectations	0.65	0.76	0.68	0.89	0.85	0.84
Order books	0.76	0.82	0.90	0.95	0.96	0.94
Demand and export order books	0.74	0.94	0.78	0.95	0.92	0.92
Finished goods inventory level	–0.62	0.93	–0.56	–0.29	0.16	–0.57
Services						
Development expectations	0.59	0.21	0.64	0.87	0.72	0.55
Past activity	0.62	0.78	0.67	0.85	0.62	0.70
Expected activity	0.66	0.86	0.58	0.88	0.66	0.80
Past employment	0.61	0.91	0.69	0.86	0.49	0.71
Construction						
Past activity	0.05	0.80	0.46	0.78	0.57	0.66
Order books	–0.11	0.69	0.43	0.57	0.52	0.67
Expected employment	–0.07	0.61	0.47	0.62	0.39	0.75

How to read it: the correlation or "loading" coefficient between the Eurozone common factor and the balance of opinion from the Belgian industrial sector with past output trends is 0.76.
Sources: European Commission, INSEE

Table 3 - Contributions of different balances of opinion to the variance in the composite common outlook indicator, by sector and by country

	Germany	Belgium	Spain	France	Italy	Netherlands	*Sectors' contribution*
Industry	3%	12%	6%	17%	21%	12%	71%
Services	2%	6%	2%	8%	2%	3%	22%
Construction	0%	2%	1%	2%	1%	2%	7%
Countries' contribution	5%	20%	9%	27%	24%	16%	

How to read it: balances of opinion from the Belgian industrial sector contribute 12% of the variance observed in the common factor (the percentages in the table are rounded)
Sources: European Commission, INSEE

The French (27%), Italian (24%), Belgian (20%) and Dutch (16%) balances make the greatest contributions: these economies are most representative of the common outlook in the Eurozone. At the other end of the scale, as can be inferred from the correlation data, German balances have very little impact. They account for just 5% of total variance, 5 times less than the French balances, a very low figure considering Germany's economic heft. Spain's contribution is also small (9%).

The weak contribution of German business surveys to the common economic outlook confirms the observations made on the basis of the quantified macroeconomic data. The situation remains the same even if the analysis is restricted to the balances from industry. Industrial balances make the greatest contribution to total variance in the common outlook factor, accounting for 71% (*Table 3*). The strongest contribution comes from the French and Italian balances. However, and even though German industry accounts for 40% of total value added of the manufacturing industry in Europe, Germany's industrial outlook shows only a weak correlation with the common outlook factor for the Eurozone (3%).

In order to verify that this result does indeed come primarily from the industrial sector, a common outlook factor is calculated using only the industrial balances (5 from each country). The result is very close to the common factor for all sectors, which is logical considering that industry is at the heart of the business cycle. Nonetheless, even if the contribution of German balances increases slightly (6%) while the French contribution slips back (20%), the hierarchy of country-by-country contributions to variance in the common factor remains broadly unchanged (*Table 4*).

Outlook divergence indicators appear to be correlated with growth differentials between the countries

A composite outlook divergence indicator can be calculated for each country

Following the lead of Lenglart *et al.*, and in order to expand the information on the common outlook, for each country it is possible to identify the component of the individual balances of opinion which is not reflected in the common factor. This could be described as the "individuality factor" of each country, or the "outlook divergence indicator" (ODI).

ODIs for all balances mainly reflect the outlook in the construction sector

Since the industrial sector mainly structures the common component of the European economic outlook, it seems natural that the specific national components will be determined by the balances from other sectors. Fluctuations in the ODIs are primarily a reflection of the changing outlook in the construction sector (*Table 5*). The construction sector plays a much more important role in fluctuations in the ODIs than it does in the fluctuations observed in the common European outlook. In all countries except Spain, at least two of the three balances of opinion derived from surveys on the construction sector reveal correlation coefficients close to or above 0.90 with the overall ODI. Spain's specific outlook is more closely correlated with the service sector.

Table 4 - Contributions of the national balances to variance in the composite common outlook indicator, industrial sector only, by country

	Germany	Belgium	Spain	France	Italy	Netherlands
Past output trends	1%	2%	2%	3%	8%	1%
Variation in output expectations	1%	2%	1%	4%	2%	3%
Order books	2%	8%	3%	5%	11%	6%
Demand and export order books	2%	8%	2%	8%	9%	7%
Finished goods inventory level	1%	0%	1%	0%	0%	1%
Countries' contribution	6%	20%	8%	20%	29%	18%

How to read it: the balances of opinion from Italian industry contribute 29% of the variance observed in the common factor for "industry".
Sources: European Commission, INSEE

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ODIs for industry alone display a closer general correlation with the growth differentials of each country

More often than not, the ODIs are closely correlated with disparities in individual countries' GDP growth in relation to the rest of the Eurozone. With the exception of Spain and Italy, the ODIs for the industrial sector alone demonstrate a closer correlation than those calculated for the three main market sectors (*Table 6*). In both cases, these ODIs appear closely correlated with the growth differentials recorded for Germany and Spain. These are also the two countries that make the smallest contribution to the common factor. In Italy, France and the Netherlands the correlation coefficient is weaker, while in Belgium the ODI calculated for all three sectors shows no correlation with the country's growth differential with the rest of the Eurozone.

The fact that the ODIs calculated for the three main market sectors are less closely correlated would appear to suggest that expanding the scope does not enrich the analysis of divergences in economic outlook. The construction sector, predominant in the ODIs, certainly contributes to growth differentials but is not such a dominant factor.

In early 2017, the positions of the different Eurozone countries in relation to the business cycle have clearly converged

The German business outlook is becoming less of an anomaly within the Eurozone

The outlook divergence indicators reveal specificities which are consistent with the economic realities. For example, the German ODI based solely on industrial balances turns out to be consistently negative between 2000 and 2005, and consistently positive between 2010 and 2014 (*Graph 5*). The period 2001-2005 corresponds to a phase in which the Germany economy encountered greater difficulties as a result of the global slowdown and grew less rapidly than the economies of other Eurozone members. Between 2010 and 2013, however, the German economy was quicker to recover from the financial crisis and hardly suffered at all from the sovereign debt crisis. The growth differentials and the ODIs both show that this advantage over the general outlook has been reduced since 2014.

Table 5 - Correlation between balances of opinion and national ODIs

	Germany	Belgium	Spain	France	Italy	Netherlands
Industry						
Past output trends	0.51	–0.23	0.52	–0.18	0.58	–0.55
Variation in output expectations	0.48	–0.33	0.51	–0.17	0.54	–0.41
Order books	0.76	0.32	0.78	0.20	0.49	0.39
Demand and export order books	0.62	0.08	–0.15	–0.08	–0.30	–0.22
Finished goods inventory level	–0.77	0.09	0.00	0.18	0.44	0.52
Services						
Development expectations	0.19	–0.19	0.96	0.36	–0.05	0.00
Past activity	0.39	–0.35	0.98	0.55	–0.27	0.19
Expected activity	–0.05	–0.09	0.91	0.60	0.50	0.13
Past employment	0.41	–0.13	0.91	0.02	0.44	0.50
Construction						
Past activity	0.78	0.43	0.40	0.87	0.96	0.50
Order books	0.96	1.00	0.56	0.92	0.69	1.00
Expected employment	0.98	0.87	0.64	0.96	0.91	0.91

How to read it: the correlation or "loading" coefficient between the German outlook divergence indicator and the balance of opinion in German industry on predicted employment in the construction sector is 0.98.
Sources: European Commission, INSEE

Table 6 - Correlation of the ODIs with national growth differentials

	Germany	France	Italy	Spain	Belgium	Netherlands
Total ODI	0.78	0.15	0.43	0.80	–0.01	0.50
Industry ODI	0.83	0.35	0.26	0.59	0.32	0.54

How to read it: the total ODI is the outlook divergence indicator estimated for each country based on the balances of opinion from the three main market sectors. In Germany, the correlation between the ODI and the country's GDP growth differential (in relation to the Eurozone average) is 0.78.
Sources: Eurostat, European Commission, INSEE

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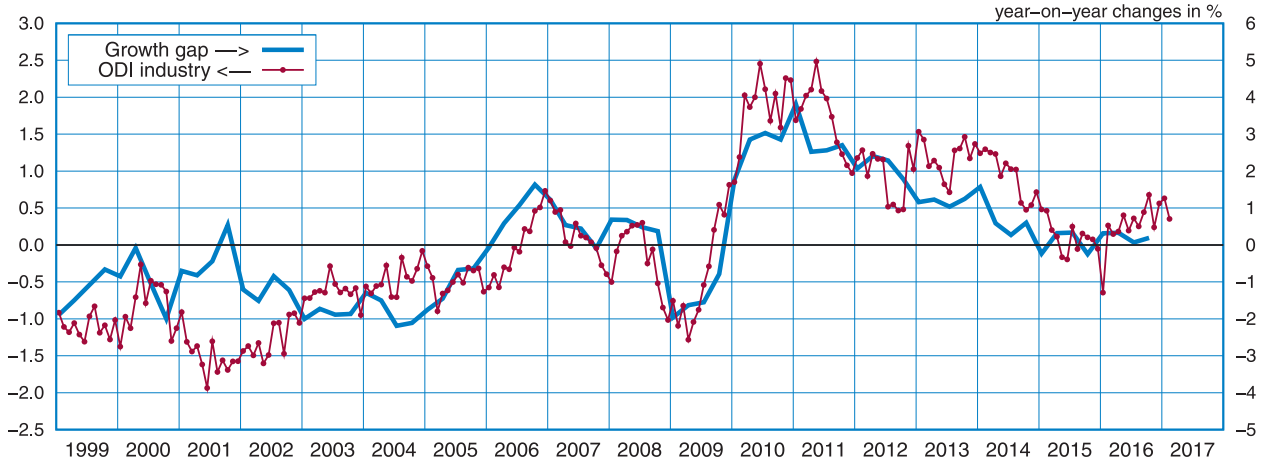
The French economy has been growing less rapidly than its Eurozone partners since 2014

The French economy has its own specificities. The outlook divergence indicator calculated solely on the basis of industrial surveys does not reveal any lasting positive or negative phases, suggesting that divergences in the outlook for the French economy are only short-lived.

The ODI does reveal that the impact of the recession of 2008-2009 was much less substantial in France than in the other countries, particularly because the social security system helped to limit the effects (however, the rebound in 2010 was far less dynamic). France also suffered much less during the sovereign debt crisis than its partners in the south of the Eurozone: from mid-2011 to the end of 2012, French GDP continued to grow while activity contracted in Italy and Spain; over the same period, the French ODI was above its average level. However, since 2014 French growth has been more sluggish than that of its partners, and the ODI has been almost constantly negative over this period.

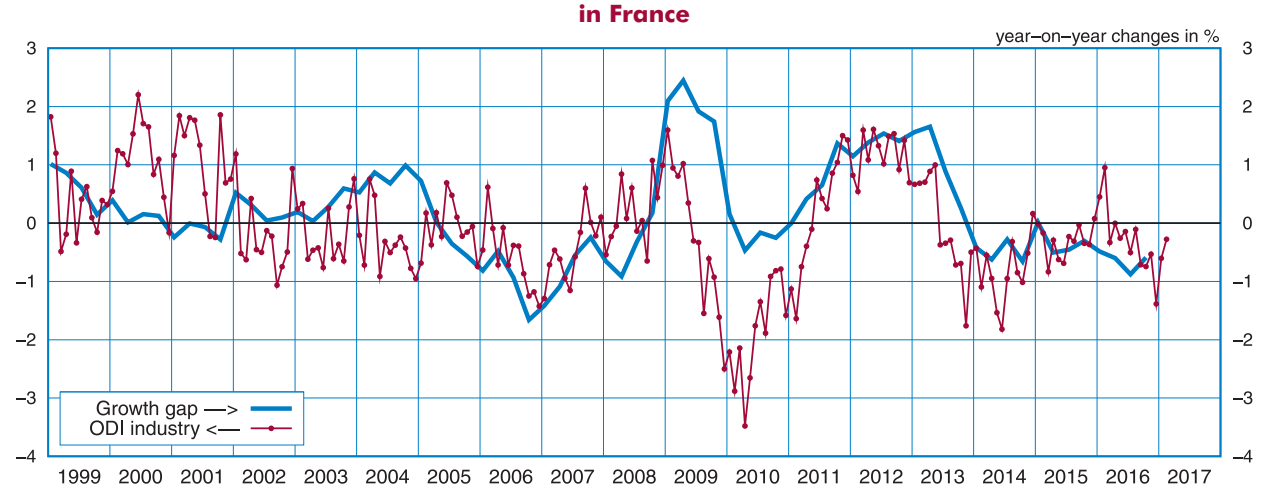
5 - Growth gaps and ODIs

in Germany



Sources: Eurostat, European Commission, Destatis, INSEE calculations

in France



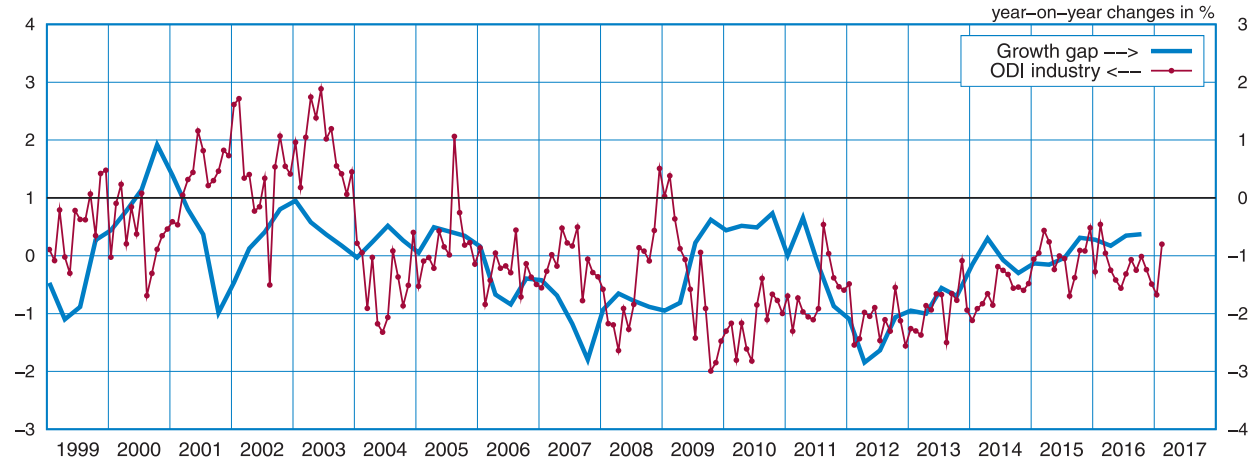
Sources: Eurostat, INSEE

In Italy, after a long period between 2010 and 2014 in which the ODI was negative, it has picked up since 2015, when Italy's economy returned to a moderate rate of growth (still below the Eurozone average).

The ODI for Spain reveals that the economic outlook was generally more favourable in the period 1998-2007 than it was elsewhere in the Eurozone. During this period, Spain's economic growth was boosted by a more favourable business outlook, driven by a growing service sector and a property bubble. When the bubble burst and the sovereign debt crisis set in, the ODI was consistently negative between 2010 and 2013, as Spanish GDP contracted. Since 2014 the ODI has returned to a more favourable level; however, it has slipped again more recently, indicating that the catch-up phase is coming to an end and that Spanish growth is converging with the Eurozone average.

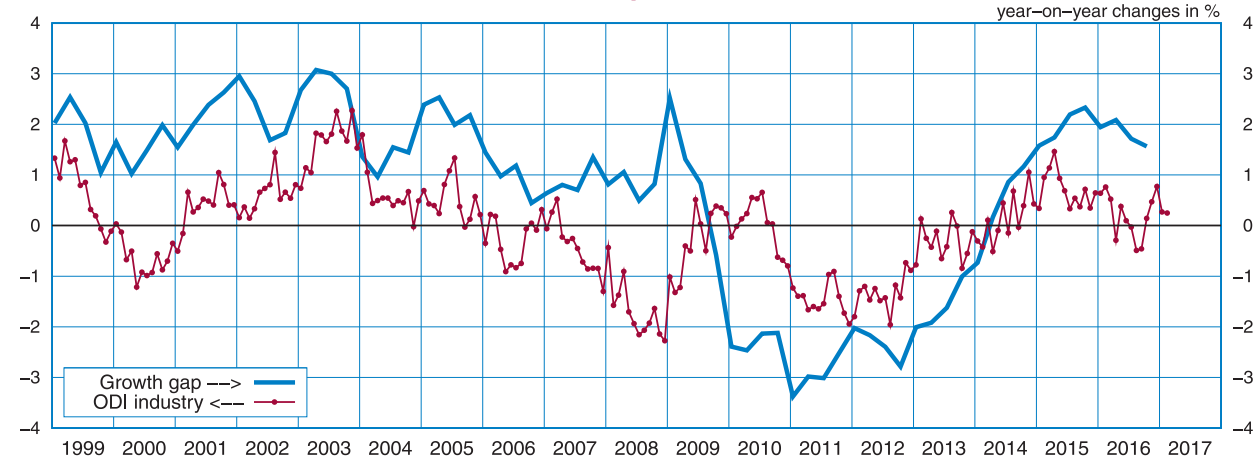
5 bis - Growth gaps and ODIs

in Italy



Sources: Eurostat, European Commission, Istat, INSEE calculations

in Spain



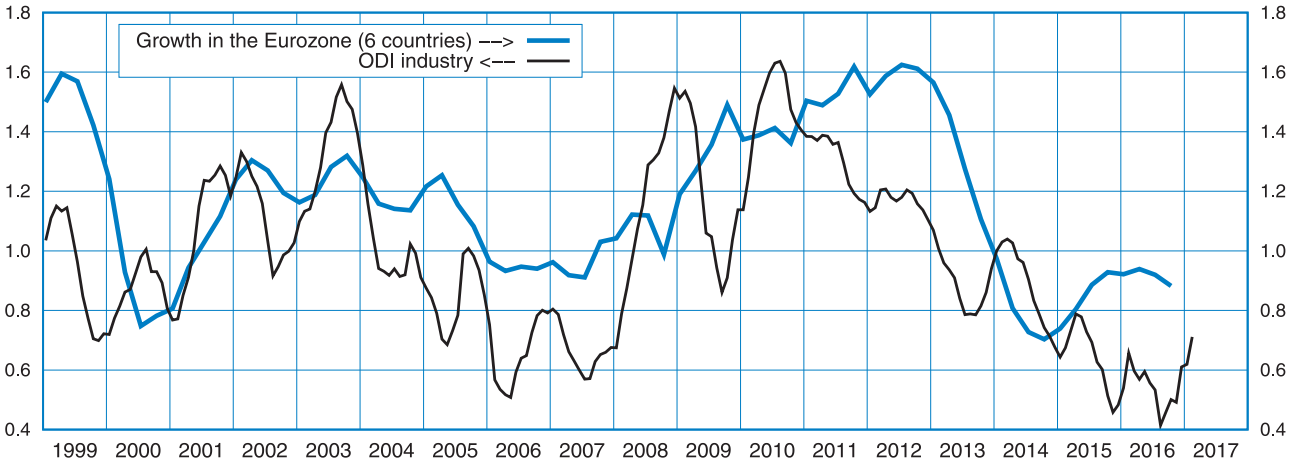
Sources: Eurostat, European Commission, INE, INSEE calculations

Business cycles within the Eurozone are converging again

In 2016, disparities in the business outlook were at their lowest level since 1999

As the outlook divergence indicators are generally closely correlated with growth differentials, the dispersion of these indicators can be interpreted as an alternative measurement of the average outlook divergences in each period, comparable to the dispersion indicator calculated based on differences in growth, but available more rapidly (*Graph 6*). In both cases, dispersion in 2016 was at practically its lowest level since 1999. This suggests that the respective positions of the different Eurozone economies within the business cycle have converged sharply in recent months. ■

6 - Dispersion of growth rates and outlook divergence indicators in industry



Sources: Eurostat, European Commission, INSEE calculations

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Methodological Appendix

The aim of this model is to analyse fluctuations in the balances of opinion derived from the business tendency surveys conducted in the Eurozone nations, in order to identify both a common trend and indicators which are specific to individual countries. This is an adapted version of the model originally developed by Lenglart *et al.* (2002). Rather than dynamic estimation, this model is based on a two-step static estimation.

Six countries were included in this model: Germany, Belgium, Spain, France, Italy and the Netherlands. Collectively, they account for 86% of Eurozone GDP.

An initial estimate for "all sectors" uses twelve balances of opinion taken from the three main market sectors (*Table*). The balances used are those available for the three sectors over the studied period and for the six countries. These balances are derived from the business tendency surveys conducted by different forecasting institutions and submitted to the European Commission. They are corrected for seasonal variations over the period 1998-2017.

A second estimate is produced based solely on the five balances of opinion from the industrial sector.

Variables used in the surveys

Industry	Services	Construction
Past output trends	Development expectations	Past activity
Variation in output expectations	Past activity	Order books
Order books	Expected activity	Expected employment
Demand and export order books	Past employment	
Finished goods inventory level		

This approach is different from that employed by the European Commission to calculate the BCI indicator. The latter is constructed by aggregating the balances of opinion at Eurozone level, weighting them by the value added of each country, then conducting a single factor analysis. Lenglart *et al.* have already demonstrated that this aggregated approach runs the risk of neglecting smaller countries whose information may nonetheless be useful when analysing the outlook; they therefore adopted a non-aggregated methodology in order to calculate a common factor which "summarises" the information contained in the 72 individual balances.

Step One: estimating the common factor of the Eurozone outlook

The first step consists of determining the common factor of the business outlook in the Eurozone based on all of the balances of opinion from all of the countries included here, by means of a single factor analysis. Each balance of opinion is broken down as follows:

$$\forall (i,p) \in \{1,\ldots,I\} \times \{1,\ldots,P\}, x_{i,p}(t) = \lambda_{i,p} F_{ZE}(t) + u_{i,p}(t)$$

Where :
- $x_{i,p}(t)$ is the standardised i^{th} balance of country p at date t;
- F_{ZE} is the standardised "Eurozone" common factor;
- $u_{i,p}$ is the specific component for question i in country p;
- P is the number of countries, I is the number of balances per country.

In matrix form: $x(t) = \Lambda F_{ZE}(t) + u(t)$

Where:

- $\Lambda = \begin{pmatrix} \Lambda_{.1} \\ \vdots \\ \Lambda_{.P} \end{pmatrix}, x(t) = \begin{pmatrix} x_{.1}(t) \\ \vdots \\ x_{.P}(t) \end{pmatrix}, u(t) = \begin{pmatrix} u_{.1}(t) \\ \vdots \\ u_{.P}(t) \end{pmatrix}$

- $x_{.p}(t) = \begin{pmatrix} x_{1,p}(t) \\ \vdots \\ x_{I,p}(t) \end{pmatrix}$ and $u_{.p}(t) = \begin{pmatrix} u_{1,p}(t) \\ \vdots \\ u_{I,p}(t) \end{pmatrix}$ are the vectors of the balances and components specific to country p;

- $\Lambda_{.p} = \begin{pmatrix} \lambda_{1,p} \\ \vdots \\ \lambda_{I,p} \end{pmatrix}$ is the "loadings" vector for country p.

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On the assumption that the error terms are orthogonal:

$\forall (i,p) \in (1,\ldots,I)\times(1,\ldots,P) \quad E\left(u_{i,p}(t)F_{ZE}(t)\right)=0$

$\forall (i,p) \in (1,\ldots,I)\times(1,\ldots P) \quad \forall (i',p') \in (1,\ldots,I)\times(1,\ldots,P), \quad E\left(u_{i,p}(t)u_{i',p'}(t)\right)=0$

the variance-covariance matrix of the specific components can be written as:

$$D=\begin{pmatrix} \text{var}(u_{1,1}(t))=d_{1,1}^{\ 2} & & \\ & \ddots & \\ & & \text{var}(u_{I,P}(t))=d_{I,P}^{\ 2} \end{pmatrix}$$

and $\text{var}\left(x_{i,p}(t)\right)=\lambda_{i,p}^{\ 2}+d_{i,p}^{\ 2}=1$, $cor\left(x_{i,p}(t),F_{ZE}(t)\right)=\lambda_{i,p}$

Estimating this model requires further hypotheses concerning the normality of the balances of opinion (i.e. formally at each date $x(t)\approx N\left(0,\Lambda\Lambda'+D\right)$) and the independence of the observations $\left(x(t)\right)_{t=1\ldots T}$ over time. Subject to this additional hypothesis, the parameters of the model $\theta=(\lambda_{i,p})_{i,p}$ are calculated by the maximum likelihood method, maximising the function of these parameters $\theta \rightarrow -tr\left(\Sigma^{-1}S_T\right)-\ln|\Sigma|$

where:

- $\Sigma=\Lambda\Lambda'+D$
- S_T is the empirical estimator of the variance-covariance matrix of the observations.

The "Eurozone" climate is then estimated using the Thompson estimator: $\hat{F}_{ZE}(t)=\Lambda'\Sigma^{-1}x(t)$

This estimator is justified with the addition of a normality hypothesis $\begin{pmatrix}F_{ZE}(t)\\x(t)\end{pmatrix}\approx N\left(\begin{pmatrix}0\\0\end{pmatrix},\begin{pmatrix}1 & \Lambda'\\ \Lambda & \Sigma\end{pmatrix}\right)$, which implies that $E\left(F_{ZE}(t)\mid x(t)\right)=\Lambda'\Sigma^{-1}x(t)$.

Lenglart *et al.* (2002) point out that the natural framework for a breakdown of this kind would be within a dynamic model. Nonetheless, we can produce an estimate in static mode as long as the series are stationary. Tests conducted on normalised balances of opinion have not convinced us of the need to reject the hypothesis that the balances are indeed stationary.

Step Two: determining the indicators of outlook divergence

For each country, the balances of opinion are corrected for their "Eurozone" common factor and a factor analysis is conducted in order to characterise the specific national outlook. For a given country, p, the model will be: $\forall i \in 1\ldots I \quad {u_{i,p}(t)}/{d_{i,p}}=\gamma_{i,p}V_p(t)+\varepsilon_{i,p}(t)$

where:

- the coefficients γ and V_p factors are estimated as above,
- V_p can be interpreted as the outlook factor specific to country p, or else as an outlook divergence indicator for p in relation to the Eurozone.

In practice, factor analysis is performed on the components specific to the country $\hat{u}_{i,p}(t)=x_{i,p}(t)-\hat{\lambda}_{i,p}\hat{F}_{ZE}(t)$, whereas in the previous step, $\hat{\lambda}_{i,p}$ was estimated by maximum likelihood and $\hat{F}_{ZE}(t)$ is the Thompson estimator, standardised in advance with $\hat{d}_{i,p}$ its estimated standard deviation.

The full model, combining steps one and two, is: $x_{i,p}(t)=\lambda_{i,p}F_{ZE}(t)+d_{i,p}\left(\gamma_{i,p}V_p(t)+\varepsilon_{i,p}(t)\right)$

However there is nothing to guarantee that the common factor and the ODI are indeed orthogonal ($E\left(F_{ZE}(t)V_p(t)\right)=0$), in contrast with the multiple factor model used by Lenglart *et al.* (2002). Nevertheless, a comparison of the results obtained using both methods reveals them to be very close, and as such any effects of this assumption would appear to be marginal. ■