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Abstract

Analysis of the degree of divergence among the countries forming part of the euro area is fundamental for assessing the risks implicit in the process of economic integration, and the monetary policy measures most pressingly needed in each country. Through the use of relatively simple analytical tools, this paper seeks to identify and assess those aspects liable to be a source of disparity within the euro area, seen both through the prism of the factors that affect growth and those of a more strictly structural and cyclical nature. Some of the main conclusions presented in the paper point to the persistence of significant disparities between the euro area countries, these being related to long-term growth fundamentals such as research and development, the composition of human capital and the labour market. Conversely, from the standpoint of supply and demand factors, the degree of exposure to asymmetrical shocks is more limited, insofar as there are no substantial cross-country differences, on either the supply or the demand side. Rather, there is a tendency towards a growing degree of homogenisation which, however, appears to have been checked in recent years. The greatest disparities are observed when analysing certain aspects of the structure of trade among the Member States. Finally, with regard to cyclical considerations, a high degree of synchrony can be seen which, in any event, would have come about in the process prior to the euro area being established, rather than in the initial years of the single currency. Foreseeably, however, as greater levels of liberalisation and flexibility are attained, the ability to absorb potential shocks will increase and national cyclical patterns will move more closely in step.

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Introduction and general conclusions

Analysis of the degree of divergence among the countries forming part of the euro area is fundamental for assessing the risks implicit in the process of economic integration, and the monetary policy measures most pressingly needed in each country. Admittedly, the single currency may contribute to accelerating the process of economic integration in Europe and to making the business cycle of the euro area countries more synchronous. But it might also unleash forces conducive to a greater territorial specialisation of output and trade, thereby leading to greater asynchrony. Moreover, the loss of monetary and exchange-rate policy as domestic adjustment instruments means that it is important to analyse the possibility of asymmetrical shocks occurring in the euro area, which would demand specific national economic policy responses. One of the means of analysing the likelihood of asymmetrical shocks or conflicts in the implementation of the single monetary policy is to examine the similarities and disparities between the European economies from different standpoints.

This paper seeks to make an initial identification and assessment of these divergences. The approach is an eminently descriptive one, using relatively simple analytical instruments. On many occasions the paper will, more than explaining behaviour, identify areas for discussion susceptible to a future, more detailed analysis. In any event, it should not be forgotten that the creation of the single currency has entailed a far-reaching change in structural regime, whose consequences are still difficult to assess empirically in view of the absence of a sufficiently lengthy track record. Regarding the nature of the phenomena to be analysed, the paper is divided into three sections.

The first section studies the growth fundamentals of the Member State economies, such as demographic variables, the endowment and mix of productive factors and technological development. It is the differences in these "starting conditions" that ultimately determine the more permanent disparities between countries. And changes therein allow the degree of real convergence to be assessed.

The second section analyses the composition of the Member States' economic structures, in terms of supply, demand and foreign trade, which conditions the response of their economies to shocks of a different nature and bears on the likelihood of asymmetrical shocks arising.

The third section examines divergences in the cyclical patterns of the euro area countries. This analysis aims to ascertain whether progressive economic integration in the euro area has meant greater synchronisation in cyclical fluctuations. To do this, the business cycle of the area's Member States has been characterised drawing on a set of indicators covering different areas of the economy.

Completing the paper are several annexes detailing the statistical and methodological aspects on which the analysis set out in the four sections is based. Where it has been deemed relevant and as far as possible, the annexes include data from the United States and Japan so as to provide a point of comparison with the euro area countries.

Evidently, these sections are not self-contained; rather, there are clear threads connecting the phenomena addressed in each of them. For instance, the endowment of natural, demographic and productive resources influences the productive and trade structure of the countries and their economic growth path. And this, in turn, has a bearing on the cyclical convergence of the national economies towards a common pattern.

The main conclusions that may be drawn from the three aspects analysed are as follows:

- In relation to the United States and Japan, the euro area is in a relatively unfavourable position in respect of the conditions determining long-term growth, especially those conditions most representative of technological level and labour market workings. Furthermore, cyclical developments in the euro area have tended to lag those of the United States, which has been characterised in the past as a "global locomotive". Nonetheless, as a result of globalisation, this lag has tended to diminish in the latest cycle in which greater synchrony between the three major economies is patent.

- Appreciable disparities persist in the euro area between the different Member States in respect of the structural aspects determining long-term growth. These differences are particularly striking in areas such as investment in research and development, human capital and, to a lesser extent, in the labour market.

- In the composition of supply, demand and trade, by contrast, there are no substantial systematic differences across countries in the major aggregates and, from a relatively broad time perspective, there is a certain tendency towards a progressive homogenisation of the Member States' economies, suggesting that the euro area has

a limited level of exposure to asymmetrical shocks. However, in the past decade convergence appears to have slowed or even reversed in certain areas, although there is no evidence of clear turnarounds.

- From the standpoint of the cyclical analysis of the euro area, a high degree of synchrony is identified among the countries making up the euro area: high correlation is observed between the indicators of activity and a coincidence or closeness in time of the turning points. Specifically, in the countries with less tradition of macroeconomic stability, such as Spain or Portugal, the effort made to attain high levels of stability so as to join the euro area has possibly been conducive in recent years to less volatility in respect of the European cyclical pattern.

- While it would be premature to draw firm conclusions about the effects of the creation of the euro area on the cyclical synchrony of its members, there would not appear to have been further progress in this field since 1999. To date, the effects of the further intensification of economic integration, entailed by the introduction of the single currency, on the homogenisation of the European countries' cycles, would not seem to have reinforced, on the whole, those effects arising through the use in the past of internal monetary and exchange rate policy tools.

- In the specific case of inflation, high differentials continue to be seen, despite intense nominal convergence by the countries currently making up the euro area and their relative cyclical synchrony. And there is also lower correlation in the growth rates of prices than in the productive activity variables. That suggests that price differences are linked to the structural divergences observed in the workings of the various countries' markets.

- Nonetheless, headway towards greater liberalisation and flexibility of factor markets should be conducive to a greater adaptability by the European economy to shocks and, therefore, to maintaining closely aligned cyclical patterns among the Member States.

Bearing in mind the foregoing, the empirical evidence appears to support the fact that, despite significant differences between the euro area countries, principally in respect of

structural aspects, the challenges facing the monetary union can be met. However, the following caveats should be noted:

- Firstly, the cyclical convergence observed in the past may be partly due to the autonomous use of monetary and exchange-rate policy prior to 1999. That is to say, the independent resort for stability purposes to these policies by the countries currently belonging to the euro area may have been one of the causes behind the fact that these countries' business cycles have been more in step over the period under analysis. In this respect, it may be recalled that the sample relates in the main to the years in the run-up to the euro area being established in 1999, when the Member States still enjoyed sovereignty in these policy areas[1] .

- Secondly, the implementation of a single monetary policy for each and every Member State may, against a background of structural divergences (even though these may not be substantial), result in different adjustment paths from country to country. For example, differences from one country to another in the monetary policy transmission mechanism may ultimately affect investment behaviour [2].

- Thirdly, though it would be reasonable to expect the introduction of the single currency and the placing in circulation of euro notes and coins to step up economic integration in the area, it cannot be ruled out that Monetary Union may prompt greater specialisation on the part of economies, among other reasons because the comparative advantages of the Union's Member States become more visible[3]

[1] Nonetheless, Canzoneri, Vallés and Viñals (1996) find empirical evidence that forgoing the exchange rate and monetary policy independence does not represent a serious problem for the viability of the Monetary Union in that it does not entail a significant cost for the European economies when it comes to absorbing the effects of asymmetrical shocks. This would be due to the fact that, in terms of output variability, shocks in the foreign exchange and financial markets have a limited effect.

[2] See the papers by Chatelain et al (2001) and Ehrmann et al (2001), in the context of the ESCB Monetary Transmission Network.

[3] In this respect, there is an entire corpus of theoretical literature called "Economic Geography", which seeks to formulate models explaining the forces behind countries' productive and trade specialisation. For instance, some authors have it that only the presence of transport costs places a limit on the full productive specialisation of countries.

1 Disparities in sources of growth

This section analyses the differences in "starting conditions" that are relevant in determining the potential growth of the euro area Member States' economies. Factors are thus examined that affect the level and the growth rate of aggregate supply, paying particular heed to spatial disparities in production functions and in their fundamentals.

The set of variables used has been classified in homogenous groups, in accordance with their nature in the context of the usual growth models. Table 1.1, which summarises the latest values of the variables for the United States, the euro area and Japan, shows the classification used. The variables analysed refer mainly to the production function components and to the key characteristics of the capital stock and of the workings of the labour market. So as to use uniform units of measure allowing horizontal comparisons in levels to be made, the monetary variables are measured in euro PPPs (base year 1995). As a measure of dispersion the Pearson coefficient is used, calculated as the ratio of the weighted standard deviation to the weighted average (see Table 1.2)[4]. The period analysed has been divided into three sub-periods, enabling the current situation to be analysed with a degree of perspective (see Table 1.3).

The characterisation of disparity has been rounded off with an exercise that identifies those cases in which the values of the related variables are outside the band of one standard deviation around the euro area average. If the value of a variable in a country is above the upper limit of this band, a score of "1" is given to it; if it is below the lower limit, the score

[4] In this paper, divergences have been evaluated on the basis of the deviations by country of each variable from the European average. This average has been calculated not as an arithmetic mean of national data but as the figure observed for each variable for the euro area as a whole. This means that the weight of the biggest countries in the European aggregate is greater than that of the small countries and, therefore, that the latter are more likely to show significant differences in relation to the aggregates for the whole of the area. The drawback with this approach is thus that the larger countries exert a greater influence in the behaviour of the euro area. But it has two decisive advantages. First, it reduces the distortions that might have been introduced by the smallest countries (Luxembourg, Ireland) into a variable obtained as the arithmetic mean of the countries of the area. And second, by taking the magnitude of the variables in the euro area as a whole as a reference, the situation in each country is being related to a variable with greater representativeness and full economic meaningfulness, and one that is used in habitual analyses (the euro area unemployment rate, the euro area price index, etc.). These variables are constructed weighting national data by the relative significance of each country. For a more rigorous treatment of this matter, see Annex 2: methodological considerations.

is "-1" and, finally, a score of "0" is assigned if it falls within the band. As an exception to this rule, variables representing a cost (wages) or an under-use of resources (unemployment rate, NAIRU and the elderly[5]) are given scores with the sign reversed, allowing them to be aggregated directly to the rest and to construct a composite indicator of the relative positions of each country.

Table 1.4. reveals the presence of three major groups of countries, classified in accordance with the number of variables for which they exhibit relative positions centred on the average for the area, above the band or below it. As discussed above, the aggregation of the scores for each variable allows the countries to be put in order. Thus, those with a higher total score will, under this criterion, be those that are in the most favourable position from the standpoint of long-term growth determinants. Although this criterion is, to some extent, arbitrary, it provides an orderly summary of the diversity of European economies' fundamentals, relating this to their contribution to growth.

1.1 Per capita GDP

In recent years the trend growth rate of the euro area economy has eased off somewhat. This rate would have stood at about 2.2% in the second half of the 1990s, against 2.4% in the same five-year period a decade earlier (see Table 1.1). In the United States, by contrast, the long-term growth rate of the economy has held at over 3% for fifteen years. Consequently, the average annual increase in per capita GDP in the euro area has grown at a substantially lower rate than in the United States and, as a result of different demographic dynamics, than in the case of Japan. Bearing in mind that the relative level of per capita GDP in the United States and in Japan is higher than in the euro area, the continuation of these trends would move the euro area further off real convergence with these regions.

Moreover, the data available suggest that this development differential is fairly common to all the euro area countries except Luxembourg. If, in addition, regard is had to the moderate dispersion around the mean exhibited by the Member States' levels of per capita GDP (see Table 1.2), it may be inferred that the extra growth effort required for headway in real convergence towards the main non-Community economic points of reference is common

[5] In contrast to this group, the younger segment of the population, though it is also inactive, is an "embryonic" productive factor that will be added to the supply of labour over the course of the coming years.

to all members, though to a greater extent for the "cohesion countries", except Ireland.

Observing the usual decomposition of per capita GDP into "average productivity" and "percentage of population employed", the unfavourable position of the euro area in relation to the other two regions can be seen to be fairly generalised across the set of variables that are pivotal to long-term growth. The poorer labour productivity data are due to the fact that both capital endowment per employee and TFP are growing at lower rates in the euro area. Notwithstanding, the capital share remains above that of the United States.[6] In any event, this block of variables shows one of the lowest levels of dispersion of all those analysed, and recent changes therein have been characterised by the convergence[7] recorded over the past fifteen years (see Table 1.3).

Predominant in all the variables analysed are the countries situated within the band. Germany, France and Finland do not show an extreme deviation for any variable. Among the other Member States, positions below the band are predominant in Greece, Spain and Portugal, while in Ireland and Luxembourg positions above the band are in the majority.

Although interpreting these data proves rather complex, it is highly likely that the moderate spatial dispersion reflects the relative homogeneity of the euro area economies' fundamentals, this being in turn the result of similar levels of development and, to a lesser extent, of the progressive integration of their economies.

1.2 The capital factor

In this paper the analysis of capital is conducted taking a broad-based concept encompassing not only the stock of installed physical capital but also other variables reflecting the effort expended in refining the attendant technology . Table 1.2. notes some duality in the average level of dispersion of the variables analysed in this group. Relatively low dispersion is seen for the variables associated with the stock of physical capital compared with a most notable dispersion for the variables linked to technical progress[8]. Moreover,

[6] Some measures of the capital share adjusted for an estimation of the wage income of sole proprietors place the euro area share below that of the United States.

[7] This is the so-called σ-convergence, i.e. that which takes into account the reduction of the dispersion of the analysed variable's distribution over time.

[8] Ascribing "state of technology" to the capital factor is somewhat arbitrary since technological development is partly built into capital equipment but also overlaps into the economy as a whole, increasing the efficiency and productivity of the overall productive factors, not just of capital.

the latter dispersion proves very persistent. This highlights the fact that, in contrast to the relative homogeneity of the euro area countries in terms of levels of development and capitalisation, there is marked diversity for those variables approximating the "technological content" of their stock of capital and which are determining factors of the economy's sustainable long-term rate of advance. Although the retaining of disparate technological and innovative structures may be offset by the existence of learning and of technological diffusion and adoption processes, the fact that some countries or industries take a leading role in the process while others just follow their lead may ultimately open up a long-term productivity gap between them[9] . Note, in this connection, the difference with the United States (Table 1.1). Indeed, while the level of capitalisation of the US economy is below Europe's, the former's levels of technological and innovative effort are far higher, a fact directly related to the existence of a positive productivity and growth differential favourable to the United States.

The countries worst positioned in the sub-group of technological variables are Greece, Spain and Portugal, which are not above the band in any of the variables selected (see Table 1.4). Finland is the country with the highest technological level, one comparable to that of the United States, while the remaining countries are positioned around the mean.

1.3 Population and labour factor

The labour force and aspects relating to training and skills play a very significant role in growth models. Labour supply depends at root on demographic variables that ultimately determine potential job supply and the non-participation rate. Under these considerations, this section analyses a broad set of indicators relating to population structure, job supply and demand, and the training of the labour force.

The demographic characteristics of the euro area are more similar to those in Japan than those in the United States. Table 1.1 shows that the euro area has a low fertility rate; a low percentage of the population in the 0-14 year-old bracket, i.e. that portion of the population being educated and which, immigration aside, provides the basis of the future supply of labour; and high percentages of people aged over 65 and of population of working age. However, Europe's low participation and employment rates counter the potential

[9] Scarpetta and Tressel (2002) provide evidence of a direct relationship between innovative activity and productivity for technological leaders in the high-technology industries.

advantages of having a higher potential labour force than that of the United States. In addition, the unemployment figures, where the euro area compares most unfavourably with the United States, coupled with the fact that real US wages are outgrowing European wages, suggest lower degrees of flexibility in the workings of labour markets in Europe.

Table 1.2 reveals how the euro area population age structure has one of the lowest degrees of spatial dispersion of all the variables analysed, especially in the case of the population of working age. Consequently, the demographic characteristics of the euro area countries are relatively homogenous, as befits countries with mature economies that have attained a similar level of development. The biggest disparity is in the two groups of inactive population, the youth cohort being that which shows most dispersion. That is due to the different incidence of migratory flows in recent years (normally, the immigrant population's fertility rates are higher than those of nationals) and, possibly, to the effect of the various policies adopted by the euro area countries in recent years to encourage women to have more children. Specifically, a gradual though moderate increase has been seen since the early 1990s in the geographical dispersion of the euro area countries' fertility rates (see Table 1.3.), against the background of a reduction in the average fertility rate for the area as a whole.

In the population group up to the age of 14, five countries stand above the band of one standard deviation around the mean and only Italy lies below. As regards the population aged over 65, the spatial dispersion can be seen to have increased over the past decade. Four countries have a proportion of their population in this bracket above the band of one standard deviation around the mean, and only in Italy is the proportion of over-65's clearly below that of the European average. Potential job supply, in proportion to the total population, is very similar for all the member countries, although the dispersion of actual labour supply is greater [10].

The scale of the disparities between the institutional characteristics of the euro area countries' labour markets[11] , influencing as they do cost- and price-setting and adjustments between labour supply and demand, has a bearing on the workings of the area's labour

[10] Genre and Salvador (2002) and Jimeno and Rodríguez Palenzuela (2002) offer analyses of the relationships between demographics and the labour market.

[11] ECB (March 2002), Morgan and Mourougane (2001) and OECD (2001) refer to the disparity of the institutional frameworks of relevance for the euro area labour market and to the distortions they cause in the workings thereof.

market, its economic growth potential and the flexibility of the response by its economy to adverse shocks, should they arise.

In this respect, the information available shows the existence of notable disparity in certain variables relevant to the workings of the labour-market, such as unemployment, the NAIRU and the institutional framework. Table 1.2 shows the existence of low diversity in the most representative variables of employment supply and demand and in the length of the working day. The differences in terms of unemployment rates, though these have diminished quite considerably in the recent period, are still significant. Situated at a higher level is the dispersion of real wages, which reflects, among other factors, the diversity of national wage-setting institutions. Contractual arrangements, for their part, exhibit most substantial disparities. In this connection, it should be stressed that Spain is the only country with a number of temporary contracts above the band, this also being the case of the Netherlands with regard to part-time contracts.

In sum, despite the fact that the demographic dimension of total job supply is similar in the euro area countries, the labour force shows significant disparity, reflecting differences in work/leisure preferences, in the population age structure and in institutional frameworks. Of note in the foregoing data are the substantial divergences in unemployment rates, an imbalance which is also the result of an uneven functioning of national labour markets and which appears to have been partly corrected in the 1990s.

As regards investment in human capital, factors such as experience and training, both initial and ongoing, are qualities that heighten the productive potential of labour and synergies, if any, with technological advances. In this area, the spatial disparity seen in the euro area is fairly high (see Table 1.2), especially as far as the drive to educate and train the adult population is concerned, despite the greater homogeneity of public spending on education.

1.4 Conclusions

The main conclusions that may be drawn from this section are as follows:

- The economies of the countries making up the euro area show appreciable disparities in their structural fundaments. These disparities reach high levels for certain variables of relevance in determining potential output, per capita income and competitiveness. Specifically, the differences are substantial in innovation and technology

and in human capital, a factor of importance for productivity and sustainable growth. Thus, were this gap in technological effort to be maintained in the long run, there would be a risk of slippage in the real convergence process. The groups of variables with the lowest level of dispersion are those relating to population structure and, secondly, to per capita GDP and to the stock of capital, followed by that relating to average labour productivity. Standing at an intermediate level of diversity is the labour market area.

- Along with Germany and France , several smaller countries show starting conditions close to the euro area average[12]. Some of these, such as Austria and Belgium, show in fact most substantial similarities with the area's two biggest countries. Finland, the Netherlands and Ireland are cases in point among the small countries as they are a very dynamic group of economies with the best relative positions of all the euro area countries for the set of variables analysed, in particular for the sub-group of technological variables. The Netherlands, moreover, displays the best score in the labour area. At the other extreme, Portugal Spain and Greece are the countries with the largest number of variables with values below the euro area average.

2 Divergences in the composition of economic activity

This section analyses the composition of supply, demand and trade with the aim of identifying whether it may lead to different behaviour by the economies making up the area in the face of different types of economic shocks[13] .

2.1 Composition of supply

Much has been written on the desirable characteristics or properties that countries seeking to see through monetary integration must display if this is to be successful. Among

[12] Although these starting conditions should, in principle, change only over the long term, significant changes can be seen in the short and medium term deriving from their cyclical dependence, in certain cases, and from the setting in place of growth strategies in some countries (especially if they are small) that may give rise to significant progress over relatively short periods.

[13] In selecting the variables resort has been had to the theoretical literature and to empirical studies on economic integration and Optimum Currency Areas. See Masson and Taylor (1993), which offers an interesting overview of the literature and attendant subjects.

these, the composition of supply is pivotal for assessing the exposure of a monetary union to different shocks and their possible asymmetrical impact. The more homogeneous the productive structure of the countries making up the economic area, the lower the risk of a shock disrupting different countries in different ways. In other words, the more similar the productive structures of the euro area Member States, the lesser the differences between the responses each country makes to a given shock[14] .

In order to assess the homogeneity and diversification of the euro area's productive structure, the composition of the Member States' gross value added has been compared with that of the euro area. Firstly, the degree of dispersion of the weight of each of the major aggregates (agriculture, industry, construction and services) across the various countries is moderate (see Charts 2.1 and A3.1 in Annex 3). Taking all the due precaution as a result, among other factors, of the high level of aggregation of the information being handled, the relative homogeneity between countries and the reasonable diversification of their productive structures would, in principle, reduce the risk of asymmetrical shocks[15] .

Secondly, taking a time perspective, there are signs in the euro area of a gradual convergence of Member States' productive structures, manifest in a reduction in the standard deviations of the weights of the gross value added of virtually all branches of activity (with the notable exception of construction) over the past two decades. However, this process appears to have slowed, halted or even reversed (albeit very marginally) in the second half of the 1990s (see Chart 2.1).

Thirdly, it is worth analysing the divergences in each of these major groups of branches or industries in terms of coefficients of variation. Thus, the dispersion of the weight of agriculture among the euro area Member States is, relative to the mean, greater than in other branches, although this is due to the scant weight of this sector in the economy's gross value added (see Chart 2.1). The dispersion of the weight of industry is, by contrast, much lower than in the case of agriculture (about one-quarter). In services, dispersion is, by far,

[14] The more diversified the output of a country, the easier it will be to absorb the effects of a supply or demand shock (whether involving technology, a change of preferences, etc.). In other words, for a country to be less sensitive to the impact of a shock to a particular sector, it is better for it to produce a greater variety of goods and services.

[15] This paper does not analyse the divergences from a more disaggregated sectoral perspective. Gordo, Gil and Pérez (2003) analyse indirectly the disparities present in the productive structure of the area, with a sample of limited length using more detailed information on manufacturing. The results obtained do not contradict the conclusions of this paper.

the lowest of all the sectors. Evidently, moving to a more detailed level of disaggregation, there are more differences between countries in the respective weights[16] . Finally, unlike the other aggregates, the dispersion of the weight of construction increases (albeit moderately and gradually). In terms of the coefficient of variation, dispersion is relatively high, doubling that of industry at the end of the sample. This is partly due, as in the case of agriculture, to the relatively low weight of construction in the economy.

It is interesting to note, in each of these major aggregates, what the changes in the scale of dispersion are due to, and the singular positions of some of them (see Chart A3.1 in Annex 3).

Thus, between 1980 and 2000, although both the weight of the primary sector in the economy as a whole and its dispersion fell significantly in the euro area, this was due to its diminished significance in Portugal and Finland, as well as in Spain and Italy. The Netherlands was the only country in which the weight of the primary sector increased over the period under study. In the remaining countries (Germany, France, Belgium and Austria), the share of this sector in the total economy has scarcely altered.

In the same period, while most of the countries saw a reduction in the weight of industry, the process was particularly prominent in Germany. From a peak, among euro area Member States, of over 35% in 1980, the weight of industry in Germany fell to 24% in 2000, a somewhat higher value than the average but similar to that of Belgium or Italy. Although reunification accounted for a sudden drop of almost four points in 1991, the overall trend was, in any event, on a notably declining course. Consequently, a most sizable portion of the reduction in the weight of industry and of its dispersion in the euro area was attributable to the behaviour of Germany, which moved from being the clearest outlier to close-to-average values. Few countries evidenced different trends: in Austria, the weight of industry was unchanged, in Belgium it increased slightly and, finally, Finland stood out in that it was the only country in which the sector gained notably in significance, rising from less than 25% in 1980 to over 31% in 2000. This figure, by far the highest for the countries of the area, was due largely to the development of its electronics, IT and telecommunications industries.

In the construction industry, the increase in dispersion largely came about as a result

[16] Breaking down the services sector into Distributive Trade, Financial Intermediation and Public Services (groupings of branches with a weight in total GVA more comparable to that of industry) reveals that the dispersion of the first two groupings is greater, and on a growing trend in the second half of the 1990s, even exceeding the dispersion of the weight of industry.

of the fact that the weight of the sector in the economy as a whole diminished in most countries, while in Spain and Portugal it retained its significance for the economy.

Finally, the services sector has on average seen an increase in importance and, in parallel, a reduction in dispersion. As in industry, it is the behaviour of Germany which has been most influential here, not only because of its weight in the area total, but because of the sizable increase in the sector's weight in the economy as a whole (from 55%, the lowest figure among all the euro area countries in 1980, to 69% in 2000, very close to the average). Only in Finland has the weight of services diminished somewhat (from 62% to 60%, the lowest value in the euro area).

Lastly, the United States and Japan have, along with Europe, also shown a tendency for the weight of services to increase while that of manufacturing industry diminishes. That said, the share of the US services sector is notably far greater than that of any euro area country, while in Japan, manufacturing industry and construction are the activities that lie in the upper band of the sectoral breakdown of supply in the euro area.

2.2 The composition of output from the domestic demand side

To assess the composition of output by demand aggregate in the euro area member countries, the weights of the main domestic aggregates (private consumption, government consumption and investment) have been constructed in terms of percentages of GDP in each country and in the euro area. The weights of exports and imports of goods and services as per the National Accounts in terms of GDP are addressed in the following section, which focuses on the structure of foreign trade. Examination of the demand aggregate ratios in terms of GDP and their situation relative to that of the euro area shows that the cross-country dispersion of the composition of demand in the area is relatively small, exceptions (usually in the odd small country) aside. That is indicative of a relative homogeneity in demand patterns in the economies making up the area (see Charts 2.1 and A3.2 of Annex 3).

As in the case of the structure of supply, analysis of the weights of the aggregates of the member countries and the associated changes over time offer an insight into whether the particular trend in one country has been a determining factor of the trends observed in the average and dispersion values of the area as a whole (see Chart A3.2 of Annex 3).

The dispersion of the weights of the major domestic demand aggregates shows a clearly

declining trend between 1960 and 1990 (see Chart 2.1). In the 1990s, this trend appears to slow, but dispersion remains stable and relatively low. Country by country, the deviations of the weights of the aggregates from the average weights for the euro area tend to be persistent.

Private consumption has held at a fairly stable level since 1960, slightly below 60%. The reduction in the weights of private consumption between 1960 and 2001 is due to a substantial extent to convergence by France and Germany towards values closer to the average, but also to the sizable reduction in the weight of consumption in Ireland and Portugal (outliers which in 1960 exceeded the average by about twenty to twenty-five percentage points) and, to a lesser extent, in Spain. In these two cases, the weight of consumption appears to be inversely related to the attendant per capita income.

The share of government consumption in GDP has also been fairly stable. This is quite striking in the light of the significant changes in the role played by general government in economic activity. The moderate reduction in divergences in the significance of government consumption as a proportion of GDP over the same period is due partly to convergence by Germany towards the area average, and partly to the reduction in the disparities shown by the Netherlands (almost 9 pp above the average in 1960) and Portugal (around 13 pp below the average that year). Of note was Ireland's change in position between 1980 and 2001, from the highest weight to the lowest, the result of its sharp output growth.

There was notable convergence by the weights of gross fixed capital formation, which signified a substantial reduction in average dispersion. Behind this decline was the reduction in the weight of this aggregate in Germany and Italy from values somewhat higher than the average to figures close to it, and the reduction in deviations by the countries lying furthest out. Despite the significant convergence by countries in respect of the average for the area, the behaviour of the outliers has been somewhat erratic. Certain changes in the ranking of countries are interesting. Finland, for example, has moved from being the country with the highest weight for investment as a proportion of GDP to that with the lowest value in this respect. Spain has moved from penultimate position in terms of its investment/output relationship to second position. The case of Ireland is the most irregular one, in that it moved from last position in 1960 to first in 1980 and then back to penultimate position in 2001. It should be clarified that this great variability is due, at least in part, to the fact that investment is significantly more volatile than other domestic demand components, such as

private consumption.

Lastly, both in the United States and Japan, government consumption accounts for a lower proportion of GDP than in the euro area, offset in the case of the United States by the greater weight of private consumption and in Japan by the greater relative significance of investment.

2.3 Weight and composition of foreign trade

Along with the composition of supply, foreign trade comprises another set of variables that is essential for analysing the responsiveness of the euro area economy to potential shocks arising from different sources and their possible asymmetrical shock on the economies making up the area. The overall sensitivity of the area and its members to a trade shock depends on how proportionate trade is to the size or economic weight of the area or country (degree of openness). It is thus worth analysing the significance the area's foreign trade has in the different countries, in terms of a scale variable representing the economy, such as GDP. One very particular instance of this is energy dependence. Moreover, the more the trade structures of the euro area countries resemble one another, the fewer differentials there will be between countries in their response to a specific shock. That is to say, the more uniform the composition of trade is in the countries making up the euro area, the less risk there will be of a differentiated response in the various countries in the face of the same shock. This is why it is worth analysing the composition of foreign trade by product and by geographical area.

As regards assessment of the data on the degree of openness, the weights of trade in the economies making up the euro area show sizable disparities. In terms of National Accounts trade in goods and services, the degree of openness of the euro area economies and the weights accounted for by exports and imports in terms of GDP show considerable dispersion and high levels (see Charts 2.2 and A3.2 in Annex 3). As was to be expected, it is the small countries that tend to trade most abroad, meaning that the four countries with the biggest weight in the area's output are below the average, and the rest, except Greece, above it. Concerning the historical perspective, dispersion in relative terms in respect of the weight of trade in GDP has tended to diminish. However, from 1960 to 2001, the increase in the significance of trade in the economy meant that, in general, economies were more exposed than in the past to trade shocks, the degree of exposure continuing to vary in each

case, although the differences lessened.

To assess how the inception of the Monetary Union has affected the degree of openness and the composition of trade of its component Member States, it is worth drawing a distinction between trade with third countries and trade between the members of the area. The advantage of the National Accounts data on exports and imports is, first, that they are available in real terms, which eliminates unwanted valuation effects, and further, that they cover both trade in goods and in services. Nonetheless, their main disadvantage is that they do not yet offer an intra-area/extra-area breakdown. For this, resort must be had to foreign trade figures drawn from the trade balance statistics, although they are only available for trade in goods in nominal terms. With this information, an evaluation can be made as to whether intra-euro area trade as opposed to trade with third countries is tending to intensify.

In the light of these data, trade in goods with third countries has grown significantly over the past twenty years in terms of its weight in GDP, whereby the area's exposure to external shocks has increased. The dispersion of these weights has also increased, as a result of which the differences in the degree of exposure of the different countries have been accentuated, irrespective of whether the weight of intra-area trade in GDP has done likewise (see Charts 2.2, 2.3.1, 2.3.2 and A3.3).

As with National Accounts data, the data on trade in goods drawn from the trade balance show that the small countries are usually more open. Thus, the four weightiest countries are below or around the average for the area, although it is worth noting that Germany exports more goods in terms of GDP to destinations outside the area than the other major countries, and is in fact above the average for the euro area. Conversely, Spain is comparatively the most closed of these four Member States, being the smallest member of this group. There are medium-sized countries such as the Netherlands and Belgium that are very open, although it should be noted that this is due in a far from negligible proportion to the significance in these countries of import re-exporting processes. Although the weight in GDP of its trade with third countries is among the highest of the euro area countries, Belgium stands out especially for the even higher weight, in terms of output, of the intra-area component. Finally, as regards the small countries, Ireland is notable for its high degree of openness and for the preponderance of its extra-area trade over its trade with euro-area partners, which is undoubtedly due to its relations with the United States and

the United Kingdom. By contrast, Austria is very close to the average and, obviously, the weight of its intra-area trade in GDP is higher than that of its trade with third countries.

During the 1990s, energy dependence and, in particular, oil dependence (its largest component), as measured in terms of net imports, diminished appreciably. As a result, the hypothetical magnitude of the effect of a shock of similar intensity has probably fallen significantly. Moreover, the dispersion by country in dependence also been declining, so that the risk of the impact varying across the euro area countries has also diminished. In short, the area seems to be in a better position than it was ten years ago to absorb an energy shock (see Chart 2.4).

Specifically as regards oil dependence (approximated by the net imports of this commodity by the member countries of the euro area), the high level in the Netherlands, in terms of GDP, is striking (close to 2.8% in 1991, which is well above the area average of 1%). However, this figure needs to be clarified. First, it declined over the 1990s, to close to 1.9%, which is still far, but less so, from the euro area average of 0.8%. Second, the Netherlands is a markedly negative outlier with respect to the average for the area in its net imports of energy in general, reflecting the fact that this country exports oil products refined within its borders. By contrast, Belgium-Luxembourg and Portugal are positive outliers as regards the net oil imports of the area (although their energy dependence has also declined), and yet they have higher net energy imports than net oil imports, which shows that they are also net importers of other sources of energy[17] . Finally, Greece is an interesting case. Although its net oil imports are currently very close to the euro area average, its net imports of energy as a whole are lower than those of oil and much lower than the area average, illustrating the relative importance of oil refining in this country, which is an exporter of oil products.

As for the information on the degree of diversification of the trade of the euro area Member States, they have a notable variety of trade structures, in geographical terms (see Charts A3.4 to A3.7 of Annex 3). The divergence from the average pattern in the area is greatest in the case of the smaller economies.

The product composition of a country's trade is related to its endowment of resources and the relative specialisation of its production. Naturally, the exports of smaller economies

[17] The net imports of oil and energy of Belgium and Luxembourg are affected by the fact that, as the latter country has no refining industry, it does not import crude oil, but only oil products.

are usually more specialised than those of large ones. For example, Greece, Ireland and Portugal display significant deviations from the average, with the exports of Greece and Ireland showing a relative specialisation in food, drink and tobacco. The importance of Greece's energy imports and exports indicates the importance of oil refining in that country. Ireland is notable for its increasing specialisation in the export of chemical products, linked to the presence of foreign capital in this sector. Finally, the large weight of machinery and transport equipment exports in Germany and France is a notable exception to this rule that size and export specialisation are inversely related (see Charts A3.8 to A3.11 of Annex 3).

The geographical composition of trade is, at least in part, determined by geographical, linguistic and cultural proximity and by the importance of direct investment links with trade partners. As an example of the importance of geographical proximity in trade with other countries, a larger proportion of the exports of Austria, Greece and, to a lesser extent, of Germany, Italy and Finland, goes to Central and Eastern Europe than in the case of the other countries, and Ireland and Portugal are the very countries that export least to these countries. As examples of cultural proximity, a factor that also influences the importance of direct investment links, a higher proportion of Ireland's exports go to the United States than in the case of the other countries, and the same is true of Spain's exports to Latin America. These patterns are also apparent, albeit with slight differences, in the structure of imports.

The proportion of goods trade that takes place with partner countries and with third countries, as well as its trend over the last twenty years, varies markedly across the euro area member countries, and their trade structures remain significantly dispersed. Ireland and Finland trade mostly with third countries, although in the latter case there has been a trend decline in the weight of extra-area trade in the total. At the other extreme, the intra-area trade of Austria and Belgium-Luxembourg is larger than their extra-area trade, although in the former, the proportion of trade with third countries has been growing for about a decade at the expense of the share of euro-area partners. As special cases, it is worth highlighting the trends in the shares of intra- and extra-area trade in Spain and Portugal. At the beginning of the 1980s, these countries had a much higher share of trade with third countries than with their current euro area partners, but since joining the EU, the dynamics of trade creation with partner countries have led to a reversal in the relative weights of their intra- and extra-area trade.

Finally, during the last five years, irrespective of the different starting levels in each case (more or less than 50% of the total), a certain trend seems discernible whereby the proportion of trade with third countries is growing at the expense of intra-area trade. This recent development seems to indicate a change in the secular trend for the weight of intra-Community trade to increase, which stemmed from economic integration, the removal of tariffs and monetary and exchange rate stability[18] . Although the depreciation of the euro in the period 1999-2001 was probably conducive to the increase in exports outside the euro area, this trend may have a more structural element, arising from the strong growth of world trade in recent years, which has outstripped the expansion of output and trade within the euro area. However, it is obviously still early to assess the effects on intra-area trade of the creation of the euro area.

Thus, in the light of all the information on the degree of openness, on intra- and extra-euro-area trade and on the geographical structure and product composition of trade, it is not possible to argue that there has been a reduction in the probability of trade-related shocks with asymmetrical effects across the various economies making up the euro area. On the contrary, the member countries have been subject to the general trend for the weight of trade at a world level to increase, and their economies show varying degrees of openness. At the same time, their trade structures remain very different, but it is also true, at least in aggregate terms, that there has been no increase in the disparity between countries. The consequences of these phenomena are a greater sensitivity to trade-related shocks, faster transmission of such shocks and asymmetry in the reactions of the various countries to the same shock.

2.4 Conclusions

The following conclusions can be drawn from the trends described in this section:

- Divergences in both supply and demand are now smaller within the euro area.
- Over the last two decades, the productive structure of the euro area Member States has witnessed a narrowing of the divergences in the weights of the value added of the main branches of activity (with the notable exception of construction). In the

[18] See Masson and Taylor (1993).

second half of the 1990s, this convergence seems to have slowed or even moved into reverse, albeit very moderately.

- The structure of demand is also tending to become more homogeneous. As in the case of supply, this trend is slowing, but the dispersion is holding steady and is relatively small. Despite the growing weight of exports and imports in GDP, the dispersion of GDP is also decreasing.

- Against this background, the weight in GDP of intra-area goods trade has also increased. This might be thought to result from a productive specialisation that exploits comparative advantages, but the homogenisation of the productive structures indicates that it is probably intra-industrial trade that has increased most, as a result of the decentralisation of production and the increased trade in intermediate goods, or of product differentiation.

- At the same time, in more recent years, the weight of extra-area trade in total trade has tended to increase in most of the Member States. There has also been a significant increase in the dispersion of the weight in GDP of trade with third countries. This reflects, overall, a greater and more differentiated degree of exposure of countries to external trade shocks.

- There is great variety in the structure of external trade with third countries, both in terms of its geographical distribution and its product composition. In the first case, there seems to be a positive correlation between the relative importance of trade flows and geographical, linguistic or cultural proximity, which may affect variables that play a significant role in the determination of trade flows such as direct investment.

- In contrast, the product composition of trade is related to the countries' resource and factor endowment and their productive specialisation. The larger the country, the more diversified its productive and trade structure tends to be, which entails a greater capacity to absorb shocks. On the other hand, smaller countries tend to display a higher degree of productive and trade specialisation.

- The United States and Japan also show a tendency for the weight of the services sector to increase and for the weight of industry to fall. However, the services sector

is much more important in the United States than in the euro area countries, the same being true of industry and construction in the case of Japan.

- In the United States and Japan, government consumption has a much lower weight in output than in the euro area. In the United States, private consumption has a higher weight, while in Japan it is investment that is of relatively greater importance.

3 Analysis of cyclical divergences in the euro area

Another important aspect in assessing the degree of homogeneity among Member State economies is the comparative analysis of the business cycle. This concept refers to the regular, sequential pattern of broad movements of a stationary nature in economic variables around their long-term trend. In principle, synchronism in the cycles of the euro area countries can be considered a positive factor in monetary union because it facilitates the co-ordination of economic policies and, in particular, the conduct of a common monetary policy.

Therefore this section examines whether the cyclical behaviour of the Member States is homogeneous and synchronous with the euro area's aggregate cycle (as characterised) and, if so, whether this behaviour has become clearer in recent years. To do this, an estimate of the relevant cyclical deviations was used to analyse the relative variability, correlation and turning points of the economic variables customarily used to characterise the business cycle: GDP, its main components in real terms, and the industrial production index excluding construction.

3.1 Identification of the euro area's business cycle and comparison with that of the Member States[19]

Chart 3.1 shows the estimated output gap of the euro area, the Member States, the United States and Japan on the same methodological basis[20][21]. A cursory glance reveals relatively different behaviour, especially in the past, among the various economic areas. However, as the chart shows, in the second half of the 1990s the cycles of the euro area and the United States were fairly similar. In fact, the highest correlation between the cyclical behaviour of these two areas was 90% during the period 1995-2002, with the US cycle leading the euro area cycle by two quarters. This co-efficient is much higher than that for the whole period, as shown in Table 3. The Japanese cycle is reasonably synchronised with the European cycle, although its variability is appreciably greater than that of the business cycle of the United States or of the euro area economies. Comparison of the European and US cycles shows that the higher cyclical synchronisation of these economies in recent years is largely related to the influence of global shocks, such as the technology crisis, the oil price rise and, more recently, the geopolitical tension following the 11 September terrorist attacks. The effect of these shocks was magnified by the international propagation channels through which economic fluctuations spread. Thus the greater geographical diversification of business interests and of the portfolios held by households and financial intermediaries has meant that the spending decisions of economic agents are more highly correlated. Moreover, the progressive trade, financial and business integration of the US and the euro area in the world market over the last few decades has made it more likely that shocks will impact the two areas symmetrically.

[19] No information is available on Luxembourg. The data on Ireland are insufficient and excluded in this exercise. The sample period for analysis of the quarterly items in the National Accounts extends from 1988 Q1 to 2002 Q4. In the case of the monthly series, it runs from January 1985 to December 2002.

[20] In this section all references to ouput gap are in a strictly statistical sense and refer to the cyclical deviation from real GDP.

[21] The definition of cycle used in this paper is that of cyclical deviations. In this connection, expansion phases are those in which economic activity is above its long-term trend, while contraction phases are defined as below trend. To estimate the cyclical component, a band pass filter was used, as against the more conventional Hodrick-Prescott filter. Specifically, the trend-cycle component is estimated using TRAMO-SEATS applications. Subsequently, the cycle is extracted using the TRACE application. The main references followed are: Maravall and Gómez (1996), Kaiser and Maravall (1999) and Gómez (1999 and 2001). Annex 2 describes in detail the methodology used in this section.

As regards cyclical synchrony in the euro area economies, simple inspection of Table 3.1 and Chart 3.1 reveals a high degree of homogeneity in their business cycles throughout the sample period. Analysis of the correlations for the sample as a whole confirms this first impression. The contemporaneous correlations between the output gap of the euro area and that of each member country are mostly around 90%. Moreover, when allowance is made for leads and lags in the series, the contemporaneous correlation is the highest found, so the hypothesis that the cycles are coincident cannot be rejected. The chart also shows that Finland is a special case which has a low correlation with the euro area and lags the other euro area countries. This may be because in the past it had strong trade ties with the USSR and was affected by the Soviet economic collapse at the end of the 1980s. Additionally and more recently, Finland's industrial structure is singular in that it is very much specialised in the high technology sector. Germany's output gap is also somewhat asynchronous in the period 1991-1992, which has to do with reunification. Spain shows very high synchronism throughout the whole period, the contemporaneous correlation of its output gap with that of the euro area being 0.9[22].

Another way of looking at the degree of divergence is that which is depicted in the top panel of Chart 3.2, which summarises the movements in the dispersion of the various countries' output gaps, weighted by their weight in the euro area. The greatest progress in reducing divergence was made before the process of setting up the euro area began; it took place from 1993, after the impact of Germany's reunification had been absorbed and the euro area crisis in late 1992 and the first few months of 1993 had been resolved. However, since 1999 divergences have not decreased significantly. Indeed, there is notable stability around the levels reached in the immediately preceding period, although this is the outcome of uneven behaviour across countries.

Another feature of interest is the variability of the countries' output gap in relation to that of the euro area. This measure gives an idea of the relative amplitude of each country's cycle with respect to that of the euro area. In this connection, Table 3.1 also shows that the countries generally have ratios around unity, except Finland which has a

[22] These results are in line with studies conducted by the European Commission which analyse the correlation between the output gap of various Member States and that of the euro area. They show a progressive increase in the degree of synchronism between the various economies during the 1990s. In any event, idiosyncratic factors persist to a certain extent not only in the main euro area countries, but also in the other smaller economies. See European Commission (2002).

clearly higher variability for the reasons mentioned above. Notwithstanding this similarity, the bottom panel of Chart 3.2, which compares the relative variability in the pre-euro area period (1988-1997) with that in the period 1998-2002, shows that the countries furthest away from the core are the ones that have most reduced their relative variability in the period analysed. Thus countries such as Portugal, Greece, Spain and, to a lesser extent, Italy, have seen greater convergence in terms of reduction of cyclical amplitude. This may be related to the significant progress of these economies since the mid-1990s in macroeconomic stabilisation and structural reforms, which has improved their ability to deal with external shocks. However, the countries that already belonged to the euro area core, like France, Belgium, the Netherlands and Austria, and that started from much more highly integrated trade and financial relationships, do not seem to have increased their cyclical synchrony as a result of Monetary Union. In the particular case of Germany, although the amplitude of its cycle does show a clear decrease in relative variability in this latest stage, that reduction is very much tied up with the effect of reunification, which generated greater asynchronism in the period 1991-1992.

The purpose of identifying turning points is to characterise the transition between the expansion and deceleration phases. A monthly frequency is most appropriate for this type of analysis because it better captures phase changes in economic phenomena. To analyse economic activity in monthly terms, we used as a proxy variable the industrial production index excluding construction (IPI), which is a monthly activity indicator that behaves similarly to GDP, which it is coincident with or leads slightly (by less than a quarter) in all countries[23][24]. Indeed, Table 3.2 reveals a high correlation (0.7 to 0.9) between the IPI cycle and the GDP cycle. This means that, for the sample period analysed, the cyclical variability of the IPI explains a large part of that seen in the GDP. The table also shows that the IPI acts as a coincident indicator in the euro area as a whole and in most of the euro area countries, although in Germany, Spain, Italy and Finland this indicator tends to

[23] In fact, the NBER (National Bureau of Economic Research), which officially dates the changes in phase of business cycles in the United States, uses the Industrial Production Index (IPI) as one of its four reference indicators. See also Stock and Watson (1991), for the United States, and the INE (1994). Their international comparison shows that the IPI is a coincident indicator biased such that it leads the real GDP turning point by about a quarter.

[24] The procedure followed is based on Abad and Quilis (1996 and 1997). Annex 2 contains the main methodology .

lead GDP by a quarter.

Specific analysis of the turning points in the period 1985-2002 identifies nine dates (four maxima and five minima) in the euro area IPI (which is taken as the reference cycle) that approximate the phase changes in the series (see Table 3.2). Four cycles, from maximum to maximum, can thus be defined in this period which broadly coincide with the cycles identified for GDP[25]. The cycles extracted from the IPIs of all the countries can be characterised as coincident with that corresponding to the euro area as a whole, with an average lag of around two months, except for Portugal, the IPI cycle of which lags by nearly five months. Also, the lags between the turning points have decreased over time, particularly since 1998. Notably Finland, unlike what might be expected from the correlation analysis, did not differ greatly from the euro area as a whole in the turning points identified. Portugal has the most significant lag with respect to the euro area, particularly in the turning points at the start of the period.

Based on the analysis made, the amplitude and duration of each country's cycle can be characterised using the average lag as the statistical measure. Chart 3.3 shows that the average cycle in the euro area lasts 38 months and that the expansion and contraction phases are highly symmetrical (as regards amplitude and duration). A feature common to the various countries is that decelerations last somewhat more than expansions. Although the profiles of the two phases are relatively similar, there are some cases in which they do differ. Greece, which is the country whose IPI least tracks its GDP, exhibits a particularly different cyclical characterisation in terms of amplitude and duration. The case of Finland is again noteworthy because the amplitude and duration of its average cycle exceed those of the euro area as a whole. Spain's cyclical pattern is similar to that of the area as a whole, both in duration and in amplitude, with considerable symmetry between the expansionary and contractionary phases. A general observation that can be made from Chart 3.3 is that the cyclical characteristics (cycle amplitude and duration) of the larger economies of the area tend to bear a greater resemblance amongst themselves and to contrast with the average pattern identified in the smaller countries. This is evidence of certain differences in the growth patterns analysed above.

[25] See ECB (2002b).

3.2 Composition of the business cycle

In characterising the business cycle, another factor that should be considered is how the various aggregates influence it and contribute to it. In this connection, the composition of the business cycle in each country can be analysed, in the first instance, by calculating the correlations between the cyclical components of National Accounts items and of real GDP. Chart 3.4 is an inter-country comparison of the lag associated with the highest correlation, in absolute terms, between the cyclical deviation of GDP and that of each of its main components.

The cyclical characterisation of the domestic demand components in relation to GDP is fairly similar across countries and the euro area as a whole. Thus private consumption shows a high positive correlation that is practically contemporaneous or slightly lagged with respect to GDP. Gross fixed capital formation is also strongly procyclical in all countries, with a correlation coefficient near unity, and is in phase with the business cycle in the case of the euro area. In addition, the pattern of changes in inventories differs depending on how inventory adjustment bears on GDP composition and on lags. In any event the behaviour of this component is procyclical and leads in nearly all countries, indicating that stockbuilding tends to precede changes in the output gap. In the case of the euro area, the lead is reckoned at around two quarters. This lag is larger in Germany, Italy and Spain, where it is as much as five quarters. By contrast, in France, for example, inventory adjustment leads by less than a quarter[26].

The domestic demand component in which most differences are observed is government consumption. These differences may reflect, for example, divergent political cycles or differences in the application of fiscal policies in the member countries. The only country in which a marked counter-cyclical, albeit practically coincident, relationship has been recorded is France, where this component leads by around one quarter. In the other countries, government consumption exhibits a positive, lagged correlation within broad limits. Thus in the euro area as a whole this lag is four quarters. In other countries, such as Italy, Belgium, the Netherlands and Austria, these lags are longer. However, in Germany, Spain and France this component can be regarded as coincident, with lags of around a quarter.

As regards the external sector components, goods and services imports are coincident

[26] Belgium is the only country in which there is considered to be a contemporaneous counter-cyclical relationship, for which it is difficult to find an economic justification.

with the business cycle and their pattern is similar in all countries. However, exports, although they tend to coincide in being procyclical and in leading GDP, differ in their degree of correlation and in the lags with which they act. In any case, what seems to be common to all countries is that exports have a stimulatory effect on GDP, particularly in recovery phases.

To complete this study of cyclical composition, we analyse the cyclical correlation and identify and classify the turning points in a series of monthly indicators considered to be representative of activity, demand, prices, external sector, labour market and the financial part of the economy. The monthly reference cycle has been extracted from the respective industrial production indices. A detailed analysis of these indicators is included in Annex 4.

The results of this exercise point to the conclusion that, at a more disaggregated level, there is strong cyclical synchrony as regards demand and activity, with a certain difference between the behaviour of large and small countries. The behaviour of the latter is more strongly determined by idiosyncratic factors, and this is even more evident in certain demand and opinion indicators. The aggregate external sector for goods and services is also highly synchronised across countries and with respect to the euro area as a whole. In addition, the financial sector shows a relatively high degree of cyclical convergence, although credit is characterised by notable differences across countries and with respect to the euro area as a whole.

By contrast, two key indicators in the analysis of real convergence, namely the unemployment rate and the consumer price index, exhibit cyclical behaviour which differs from that of each country's respective business cycle and from that of the cycle of these indicators for the euro area as a whole. This was particularly so prior to commencement of the third stage of European Monetary Union.

As regards inflation, since the mid-1980s there has been a significant process of disinflation, accompanied by a significant reduction in its dispersion. Generally, except for certain exceptions, the countries with greater cyclical expansion of their economies tend to have higher levels of inflation as well. However, the significant level of asymmetry at the inception of the euro area still persists, since, in addition to strictly cyclical factors, there are other factors—associated with spatial disparities of a structural and sectoral nature analysed above—which play a not insignificant role in the uneven behaviour of inflation

rates. Taking into account the framework of the single monetary policy, these disparities, should they persist, may give rise to divergent behaviour of real interest rates with asymmetric effects in member countries which in turn may be self-fuelling, thereby aggravating the spatial disparities in the area.

3.3 Conclusions

The main conclusions that can be drawn from this analysis of cyclical divergences are as follows:

- Following various decades of progress in European integration, a high degree of cyclical synchrony has been achieved in member countries. This process, in addition to tightening the trade and financial linkages of European countries, has allowed them to move purposefully towards the macroeconomic stability that is so essential if the Monetary Union established in 1999 is to function properly. Against this background, the efforts made by the so-called peripheral countries have been particularly significant and underpinned by autonomous use of their economic policy instruments, which has enabled them to achieve high levels of nominal convergence.

- Although it is premature to draw definitive conclusions about the effects that the euro area will have on the cyclical synchrony of its members, it seems that no additional progress has been made in this connection. So far, the effects on cycle homogeneity in European countries arising from the closer economic integration due to the single currency do not seem to have produced any noticeable improvement upon the advances achieved in the past through the use of domestic monetary and exchange rate policy tools. However, any progress towards greater liberalisation and flexibility of factor markets should improve the European economy's ability to deal with shocks and therefore help the member countries to maintain similar cyclical patterns.

- The composition of the business cycle differs somewhat from one euro area country to another. Government consumption is the domestic demand component that is least synchronised with the general business cycle of the member countries and in which these countries differ most notably; this may be related to its instrumental nature and to its linkage to the political cycle. The other domestic demand components exhibit very similar cyclical behaviour and low variability with respect to the euro

area cycle. The behaviour of investment is coincident with that of GDP, whereas private consumption moves with a slight lag. The external sector shows a high degree of cyclical synchronism in nearly all countries.

- As regards the behaviour of inflation, the last fifteen years have seen notable disinflation, accompanied by growing convergence. In the most recent period, a larger number of countries have consumer inflation rates concentrated around the euro area average, although there is still some disparate behaviour. In this connection, viewed through the cyclical prism, the high degree of synchronism in the euro area countries does not seem to assure homogeneous behaviour of inflation. In fact, despite the fact that inflation has recently become more tightly coupled to the business cycle, the persistence of other structural disparities plays a major role in maintaining the inflation differentials. The continued existence of these inflation rate disparities hinders the action of monetary policy. That said, it seems clear that cyclical synchronism alone does not assure homogeneous unemployment levels.

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Table 1.1

SOURCES OF GROWTH IN THE EURO AREA, THE U.S. AND JAPAN (1996-2001)

	Euro area	U.S.	Japan
Trend GDP	**2.2**	**3.3**	**1.2**
Per capita GDP	**2.1**	**3.4**	**3.2**
Productivity per person employed	0.9	2.7	3.6
Capital/employment	0.8	1.9	3.1
Capital share (a)	43.5	38.5	41.0
Implied TFP (residual)	0.7	0.9	1.5
Employment/population (a)	42.1	53.4	52.9
Capital factor			
Capital/GDP	-0.3	-0.1	2.4
Gross investment rate (a)	21.2	20.5	27.5
Gross saving rate (a)	21.4	17.1	29.3
Innovation and technology (*)			
Private sector R&D (b)	1.2	2.0	2.1
Total R&D (b)	1.9	2.7	3.0
Patents (per million inhabitants)	233.6	471.2	398.6
Venture capital investment (b)	0.1	0.4	n.a.
ICT expenditure (b)	6.3	8.2	9.0
High-technology exports (c)	15.2	28.6	24.7
Households equipped with Internet (c)	35.4	46.7	34.0
Firms equipped with Internet (over 9 employees) (c)	88.6	n.a.	45.0
Labour factor			
Population (a)			
Fertility rate	1.4	2.1	1.4
0 to 14 years	16.6	21.5	15.1
15 to 64 years	67.4	65.8	68.6
65 years and over	16.0	12.7	16.2
Labour market			
Employment/labour force (a)	90.5	103.7 (***)	95.9
Labour force/working-age population (a)	62.5	81.1	77.1
Unemployment rate (a)	10.2	4.6	4.2
NAIRU (a)	9.2	n.a.	n.a.
Working hours per week (a)	38.2	n.a.	n.a.
Part-time contracts (a)	15.3	n.a.	n.a.
Temporary contracts (a)	14.4	n.a.	n.a.
Real compensation per employee	0.9	2.6	1.1
Human capital (**)			
Science and technology graduates (d)	10.1	10.2	12.5
Public expenditure on education (b)	5.1	n.a.	n.a.
Adult population in education (c)	5.4	n.a.	n.a.

(*) Average annual growth unless otherwise specified.

(**) Comparison with 2001 for these variables.

(***) Value exceeds 100 because employment is a domestic concept and the labour force is national.

(a) Average for the period.

(b) Percentage of GDP.

(c) Percentage of total.

(d) Percentage of population of age 20 to 29.

Source: European Commission.

Table 1.2

SOURCES OF GROWTH IN THE EURO AREA
Spatial distribution of each variable. Average 1996-2001

	No. of countries (a)			Co-efficient
	"-1"	"0"	"1"	of variation
Trend GDP (average annual growth)	0	10	2	54.1
Per capita GDP	3	5	4	12.2
Productivity per person employed	2	7	3	10.9
Capital/employment	3	8	1	13.5
Capital share	0	8	4	13.5
Implied TFP (residual)	1	8	3	12.8
Employment/population	3	5	4	9.7
Capital factor				
Capital/GDP	3	7	2	12.0
Gross investment rate	2	7	3	8.6
Gross saving rate	1	7	4	9.4
Innovation and technology (*)				
Private sector R&D (% of GDP)	4	6	2	47.8
Total R&D (% of GDP)	4	7	1	37.7
Patents (per million inhabitants)	3	7	2	64.5
Venture capital investment (% of GDP)	1	9	2	41.6
ICT expenditure (% of GDP)	3	7	2	18.2
High-technology exports	3	6	3	50.4
Households equipped with Internet (%)	2	6	4	28.2
Firms equipped with Internet (%) (over 9 employees)	2	8	2	10.5
Labour factor				
Population (a)				
Fertility rate	1	7	4	15.9
0 to 14 years	1	6	5	10.3
15 to 64 years	2	10	0	1.7
65 years and over (**)	1	7	4	6.8
Labour market				
Employment/labour force	1	7	4	4.0
Labour force/working-age population	4	4	4	6.6
Unemployment rate (**)	1	7	4	33.9
NAIRU (**)	1	7	4	27.1
Working hours per week	1	8	3	5.3
Part-time contracts	2	9	1	50.3
Temporary contracts	2	9	1	49.3
Real compensation per employee (**)	2	9	1	48.4
Human capital				
Science and technology graduates	2	7	3	48.5
Public expenditure on education (% of GDP)	2	6	4	12.4
Adult population in education	1	9	2	56.7

Source: European Commission

(a) Number of euro area countries having values of the relevant variable that lie within a band of one standard deviation from the mean (0), above that band (1) or/and below it (-1).

(*) These variables relate to 2001.

(**) Since these variables represent a "cost" or "under-use of a resource", their sign is changed to facilitate comparison with the others.

Table 1.3

SOURCES OF GROWTH IN THE EURO AREA. SPATIAL DISPERSION

	Co-efficient of variation (%)		
	1986-1990	1991-1995	1996-2001
Trend GDP (average annual growth)	**40.7**	**52.7**	**54.1**
Per capita GDP	**14.6**	**13.7**	**12.2**
Productivity per person employed	13.2	12.2	10.9
Capital/employment	15.4	14.3	13.5
Capital share	14.4	13.4	13.5
Implied TFP (residual)	16.5	12.4	12.8
Employment/population	12.2	11.3	9.7
Capital factor			
Capital/GDP	12.3	10.6	12.0
Gross investment rate	5.9	8.5	8.6
Gross saving rate	11.4	11.3	9.4
Innovation and technology (*)			
Private sector R&D (% of GDP)	47.7	47.7	47.8
Total R&D (% of GDP)	37.8	37.6	37.7
Patents (per million inhabitants)	63.4	64.2	64.5
Venture capital investment (% of GDP)	58.3	34.9	41.6
ICT expenditure (% of GDP)	18.2	18.1	18.2
High-technology exports (% of total)	52.2	50.2	50.4
Households equipped with Internet (%)	42.6	37.4	28.2
Firms equipped with Internet (%) (over 9 employees)	13.7	13.8	10.5
Labour factor			
Population (a)			
Fertility rate	11.7	13.8	15.9
0 to 14 years	12.9	10.0	10.3
15 to 64 years	2.5	1.9	1.7
65 years and over (**)	6.2	5.3	6.8
Labour market			
Employment/labour force	3.9	4.7	4.0
Labour force/working-age population	8.3	7.6	6.6
Unemployment rate (**)	41.1	44.0	33.9
NAIRU (**)	32.5	32.4	27.1
Working hours per week	n.a.	5.3	5.3
Part-time contracts	n.a.	53.4	50.3
Temporary contracts	n.a.	62.3	49.3
Real compensation per employee (**)	49.9	49.1	48.4
Human capital			
Science and technology graduates	n.a.	53.8	48.5
Public expenditure on education (% of GDP)	n.a.	12.3	12.4
Adult population in education	n.a.	58.8	56.7

(*) For these variables the years 1999, 2000 and 2001 are compared.
Source: European Commission,

2.1.a Euro area. Composition of economic activity. Euro area averages and spatial dispersion (co-efficient of variation)

Averages			Percentage of total or scale variable							
			1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000
Supply		in % total GVA								
Agriculture							3.2%	2.9%	2.6%	2.7%
Industry							26.5%	25.8%	23.8%	23.3%
Construction							6.6%	6.1%	6.3%	5.6%
Services							63.4%	65.0%	67.3%	68.5%
Demand		in % real GDP								
Private consumption			54.6%	55.2%	56.1%	57.3%	56.8%	56.9%	57.3%	56.6%
Public consumption			20.8%	19.7%	19.3%	19.8%	20.7%	20.4%	20.7%	20.1%
Gross fixed capital formation			24.1%	24.1%	23.7%	21.3%	19.5%	20.4%	21.0%	21.1%
Trade										
Measurement of degree of openness:										
- using National Accounts variables		in % real GDP								
Goods and services exports			12.3%	15.0%	18.1%	20.3%	22.8%	24.7%	26.8%	34.0%
Goods and services imports			12.0%	14.7%	18.0%	19.4%	19.8%	22.8%	25.9%	32.0%
Degree of openness (X+M)			24.4%	29.7%	36.1%	39.8%	42.6%	47.5%	52.7%	65.9%
- using Foreign Trade variables		in % nominal GDP								
Exports	intra-euro area						11.5%	12.1%	11.8%	13.8%
	extra-euro area						12.5%	10.8%	10.3%	13.5%
Imports	intra-euro area						11.4%	12.1%	11.5%	13.1%
	extra-euro area						13.6%	10.4%	10.0%	12.5%
Trade structure										
- intra-extra breakdown		in % total trade								
Exports	intra-euro area						47.7%	52.8%	53.4%	50.6%
	extra-euro area						52.3%	47.2%	46.6%	49.4%
Imports	intra-euro area						45.6%	53.7%	53.4%	51.3%
	extra-euro area						54.4%	46.3%	46.6%	48.7%

Aggregate indicators of spatial dispersion			Co-efficient of variation (standard deviation/average)							
			1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000
Supply		in % total GVA								
Agriculture							0.687	0.545	0.463	0.437
Industry							0.202	0.194	0.100	0.067
Construction							0.074	0.093	0.122	0.181
Services							0.071	0.063	0.033	0.030
Demand		in % real GDP								
Private consumption			0.094	0.079	0.062	0.053	0.049	0.051	0.057	0.063
Public consumption			0.165	0.163	0.159	0.143	0.129	0.115	0.111	0.121
Gross fixed capital formation			0.154	0.097	0.069	0.063	0.068	0.056	0.085	0.083
Trade										
Measurement of degree of openness:										
- using National Accounts variables		in % real GDP								
Goods and services exports			0.521	0.501	0.488	0.436	0.416	0.437	0.443	0.429
Goods and services imports			0.550	0.515	0.484	0.483	0.467	0.434	0.412	0.405
Degree of openness (X+M)			0.529	0.500	0.483	0.456	0.436	0.432	0.426	0.415
- using Foreign Trade variables		in % nominal GDP								
Exports	intra-euro area						0.675	0.625	0.632	0.639
	extra-euro area						0.332	0.381	0.357	0.389
Imports	intra-euro area						0.559	0.525	0.497	0.491
	extra-euro area						0.366	0.416	0.443	0.494
Trade structure										
- intra-extra breakdown		in % total trade								
Exports	intra-euro area						0.185	0.149	0.152	0.172
	extra-euro area						0.169	0.167	0.174	0.176
Imports	intra-euro area						0.172	0.127	0.130	0.157
	extra-euro area						0.145	0.148	0.149	0.166

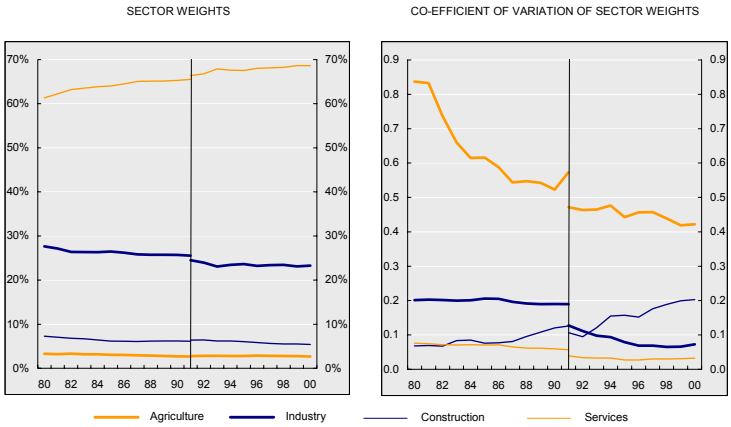
2.1.b Euro area. Composition of activity. Country-variable in equality. Average 1996-2001

	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
Composition of supply												
Agriculture	0	-1	n.a.	1	0	n.a.	0	n.a.	0	0	1	1
Industry	0	0	n.a.	0	-1	n.a.	0	n.a.	-1	0	0	1
Construction	0	0	n.a.	1	-1	n.a.	0	n.a.	0	1	1	-1
Services	0	0	n.a.	-1	1	n.a.	0	n.a.	0	-1	-1	-1
Composition of demand												
Private consumption		0	1	0	0	-1	0	-1	-1	0	1	-1
Public consumption		0	-1	-1	1	-1	-1	-1	1	0	0	0
Gross fixed capital formation		0	0	1	-1	0	0	0	0	1	1	-1
Goods and services trade (National Accounts)												
Exports	1	0	0	0	0	1	0	1	1	0	0	0
Imports	1	0	0	0	0	1	0	1	1	0	0	0
Degree of openness (X+M)	1	0	0	0	0	1	0	1	1	0	0	0
Trade in goods (Trade Balance) - Weight as % GDP												
Extra-euro area exports	1	0	n.a.	-1	0	1	0	n.a.	1	0	-1	1
Intra-euro area exports	1	0	n.a.	0	0	1	0	n.a.	1	0	0	0
Extra-euro area imports	1	0	n.a.	0	0	1	0	n.a.	1	0	0	0
Intra-euro area imports	1	0	n.a.	0	0	0	0	n.a.	1	1	1	0
Trade in goods (Trade Balance) - Composition												
Extra-euro area exports	-1	0	n.a.	0	0	1	0	n.a.	-1	0	-1	1
Intra-euro area exports	1	0	n.a.	0	0	-1	0	n.a.	1	0	1	-1
Extra-euro area imports	-1	0	n.a.	0	0	1	0	n.a.	0	-1	-1	1
Intra-euro area imports	1	0	n.a.	0	0	-1	0	n.a.	0	1	1	-1

Chart 2.1

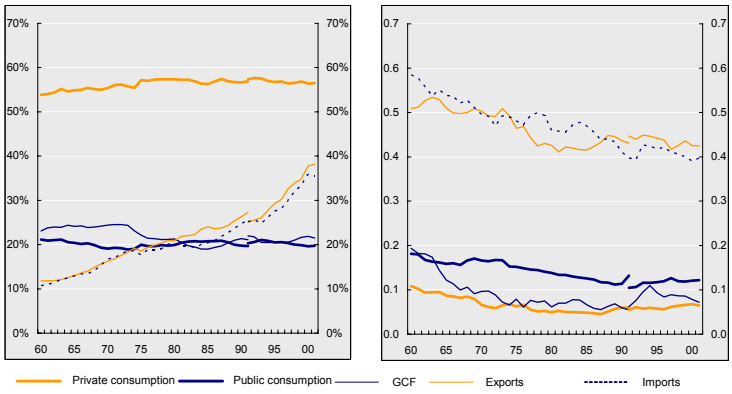
SUMMARY MEASURES: BENCHMARK AND DISPERSION

Structure of euro area gross value added



(a) There is a break in the series in 1991. East Germany, Ireland and Luxembourg not included in the period 1980-1990. Greece, Ireland and Luxembourg excluded since 1991.

Euro area demand structure

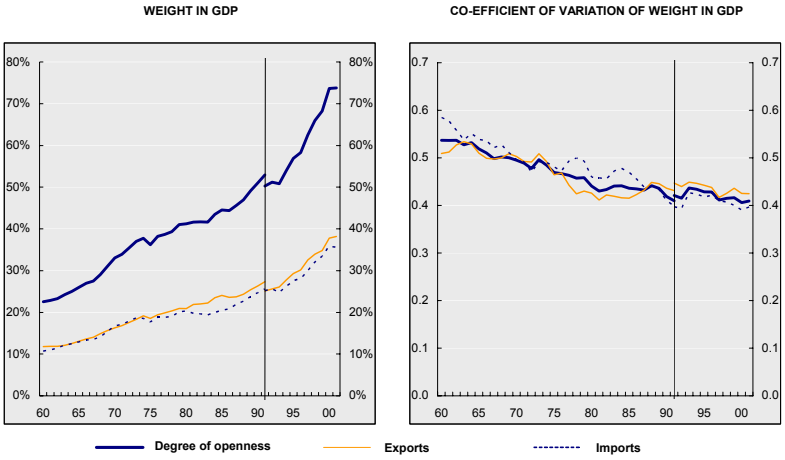


(b) There is a break in the series in 1991. East Germany not included in the period 1980-1990.

Chart 2.2

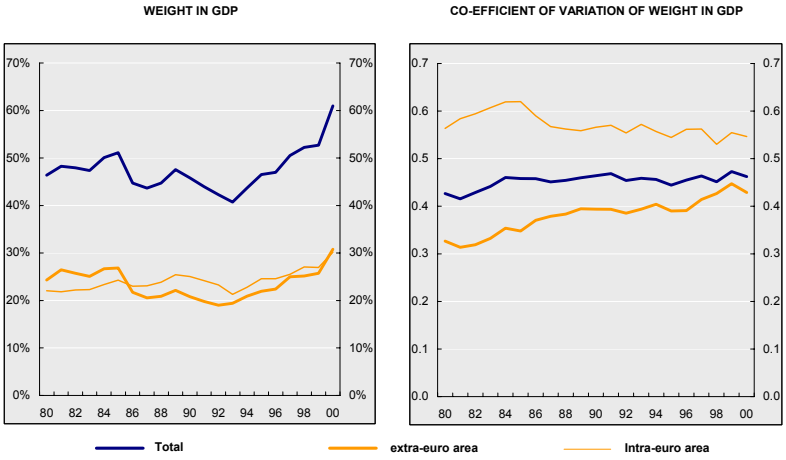
SUMMARY MEASURES: BENCHMARK AND DISPERSION

Degree of openness of the euro area



(a) There is a break in the National Accounts series in 1991. East Germany not included in the period 1980-1990.

Weight of trade in goods in euro area GDP



(b) There is an extra/intra breakdown for trade in goods (trade balance). Greece not included. The broken vertical line marks the creation of the euro area in January 1999.

Chart 2.3.1

INTRA/EXTRA-EURO AREA FOREIGN TRADE IN % GDP

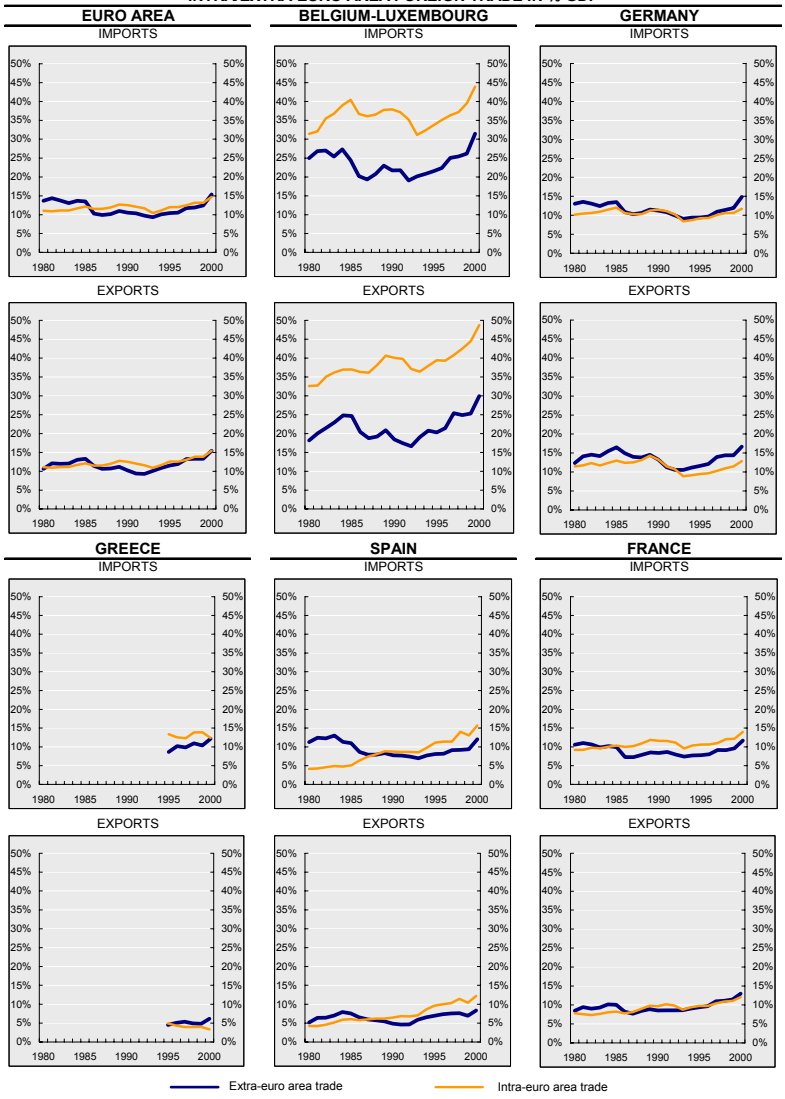


Chart 2.3.2

INTRA/EXTRA-EURO AREA FOREIGN TRADE IN % GDP

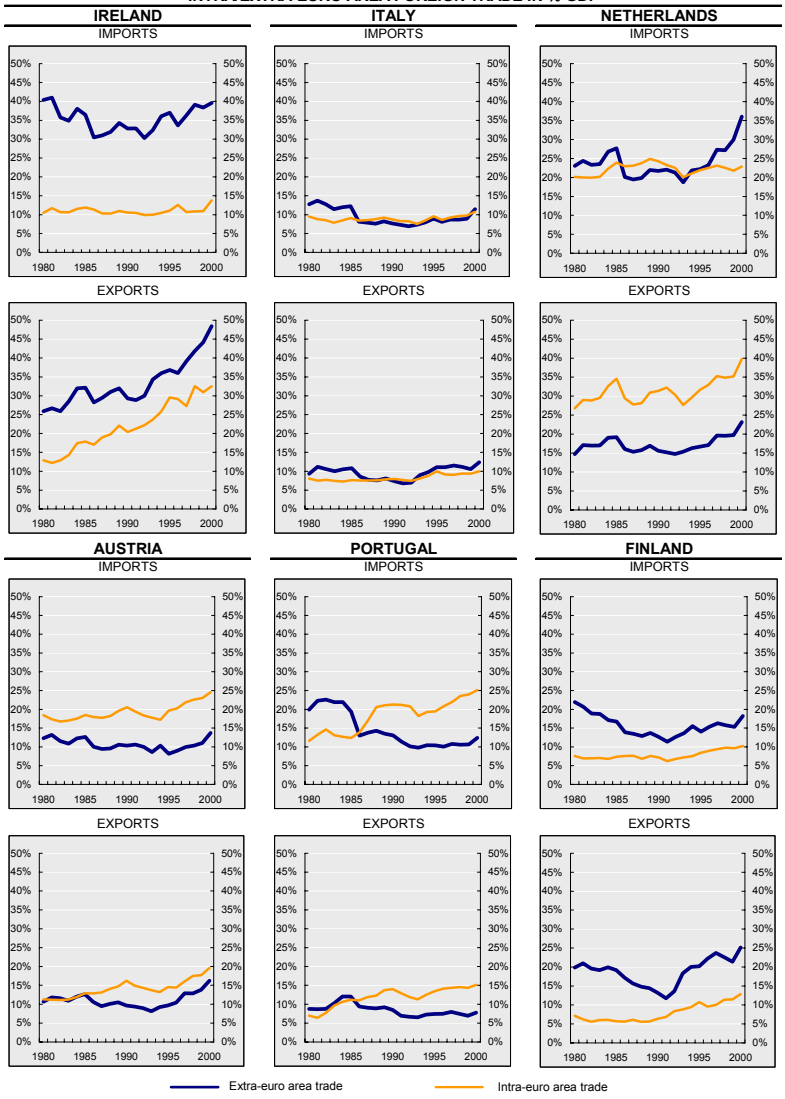
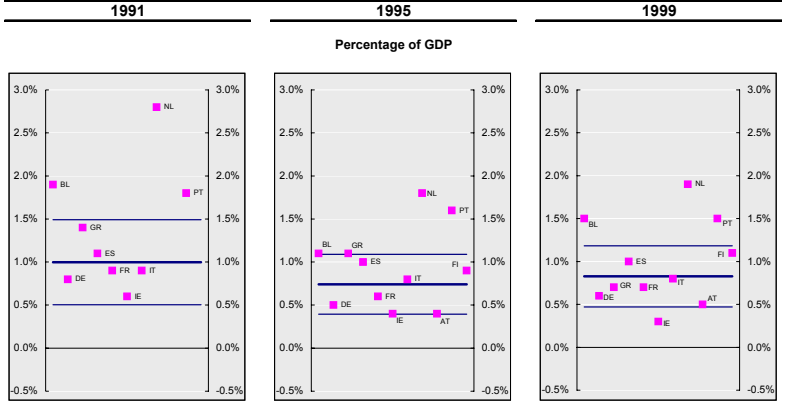
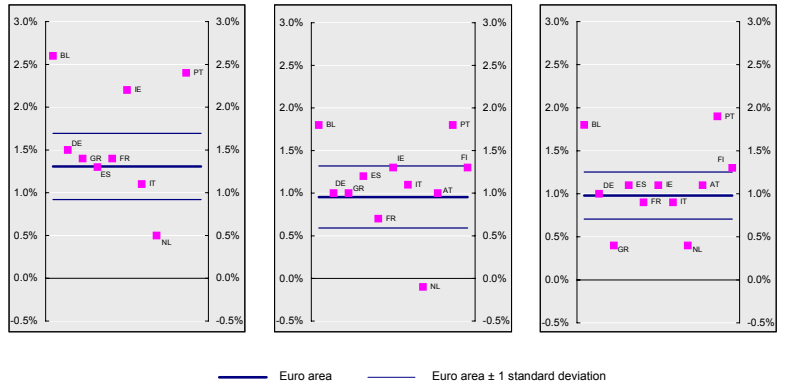


Chart 2.4

NET OIL IMPORTS OF THE EURO AREA AND OF MEMBER COUNTRIES



NET ENERGY IMPORTS OF THE EURO AREA AND OF MEMBER COUNTRIES



Euro area Euro area ± 1 standard deviation

Table 3.1

CORRELATION BETWEEN THE EURO AREA'S OUTPUT GAP AND THAT OF VARIOUS COUNTRIES

	Relative variability (1)			Lead of countries with respect to the euro area (2)				Coinci-dent	Lead of euro area with respect to the countries (2)			
	1988-1997	1998-2002	1988-2002	4	3	2	1	0	1	2	3	4
Germany	2.2	1.1	2.0	0.1	0.4	0.6	0.7	0.8	0.8	0.8	0.7	0.6
France	1.0	1.0	1.0	0.4	0.6	0.8	0.9	0.9	0.9	0.7	0.5	0.2
Italy	0.9	0.8	0.9	0.5	0.6	0.8	0.9	0.9	0.8	0.6	0.4	0.1
Spain	1.3	1.0	1.2	0.6	0.7	0.9	0.9	0.9	0.9	0.7	0.5	0.2
Netherlands	1.2	1.2	1.2	0.6	0.8	0.9	1.0	0.9	0.9	0.7	0.5	0.3
Belgium	1.1	1.3	1.1	0.5	0.7	0.9	0.9	0.9	0.8	0.6	0.3	0.0
Austria	1.1	1.1	1.1	0.5	0.7	0.8	0.9	1.0	0.9	0.8	0.6	0.4
Greece	1.0	0.5	0.9	0.6	0.7	0.7	0.8	0.7	0.6	0.4	0.2	0.0
Portugal	1.6	1.1	1.5	0.5	0.7	0.8	0.9	0.9	0.8	0.7	0.5	0.3
Finland	2.7	1.8	2.4	0.7	0.7	0.6	0.5	0.3	0.1	-0.1	-0.4	-0.6
United States (3)	0.9	0.6	1.1	0.2	0.1	0.0	-0.1	-0.2	-0.3	-0.4	-0.4	-0.4
Japan	1.4	0.6	1.4	0.3	0.4	0.4	0.4	0.4	0.3	0.2	0.1	0.0

(1) Calculated as the ratio of the standard deviation of each country's GDP to the standard deviation of the euro area's GDP.
(2) Shadowed figures indicate the highest correlation and lag.
(3) The highest correlation is in lag 6, showing a lead with respect to the euro area, with a value of 0.5.

Table 3.2

TURNING POINTS IN THE EUROPEAN CYCLE

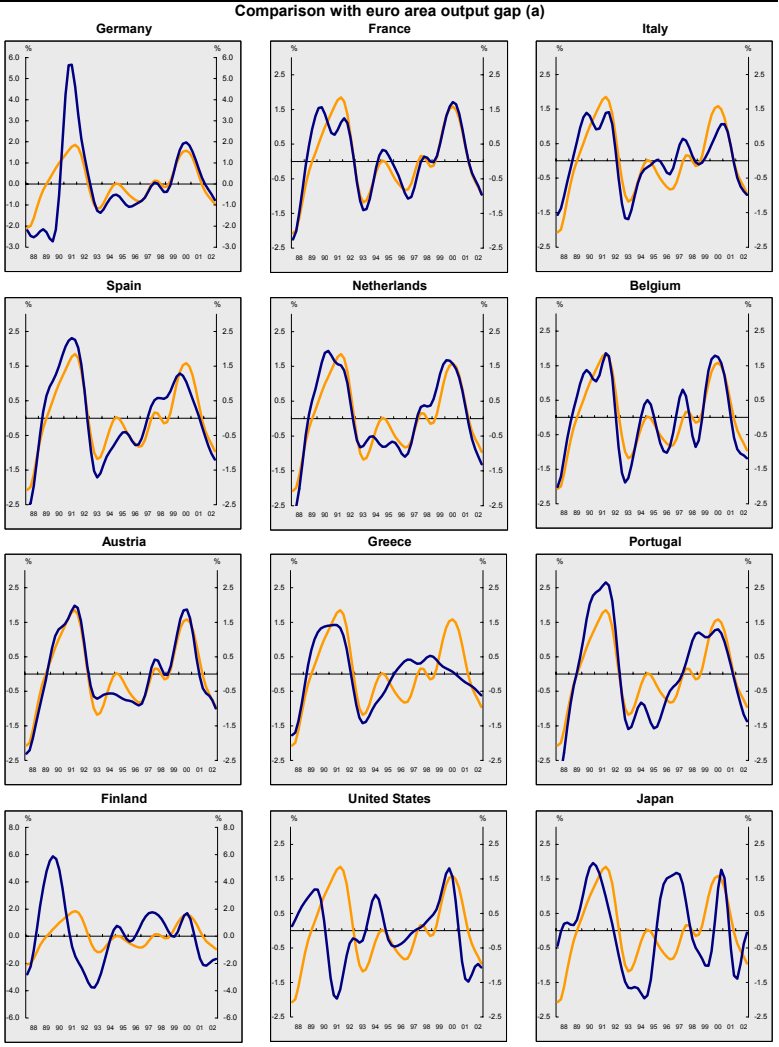
	Correlation and lags GDP - IPI		Lag with respect to the maxima of the reference series (a)				Lag with respect to the minima of the reference series (a)					Average lag	Classifi-cation (b)
	Correla-tion	Lag	Aug 90	Mar 95	Feb 98	Oct 00	Jul 87	Jul 93	Oct 96	Apr 99	Apr 00		
Germany	0.7	-1	15	-3	1	0	5	0	-7	1	1	1	C
France	0.9	0	-4	-2	2	1	-2	1	0	0	*	0	C
Italy	0.7	0	-10	3	-2	1	-4	2	1	0	*	0.5	C
Spain	0.6	-1	-10	-1	0	-5	-12	-2	-2	-1	-2	-2	C
Netherlands	0.5	0	2	11	*	2	1	-1	*	0	*	1.5	C
Belgium	0.8	0	-1	3	-2	-2	-3	1	-4	0	-5	-2	C
Austria	0.8	0	2	2	2	-1	-1	3	1	-2	*	1.5	C
Greece	0.3	0	-7	7	*	-2	-4	0	9	*	*	-1	C
Portugal	0.6	-1	1	11	3	-2	12	9	5	4	*	4.5	L
Finland	0.6	-1	-8	-3	4	-1	-22	-17	-2	1	-1	-2	C

(a) An asterisk indicates that no relationship has been found for the reference turning point. A minus sign (-) indicates a lead and a plus sign (+) indicates a lag with respect to the reference indicator.
(b) Classification with respect to the reference indicator: C=Coincident, L=Lagged.

Chart 3.1

REAL GDP. OUTPUT GAP

Comparison with euro area output gap (a)

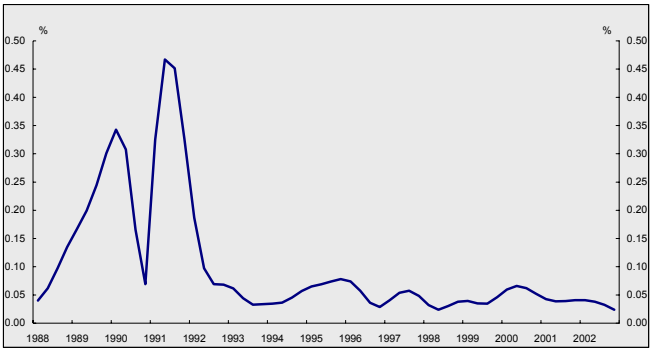


(a) Latest available informatoin Q4 2002.

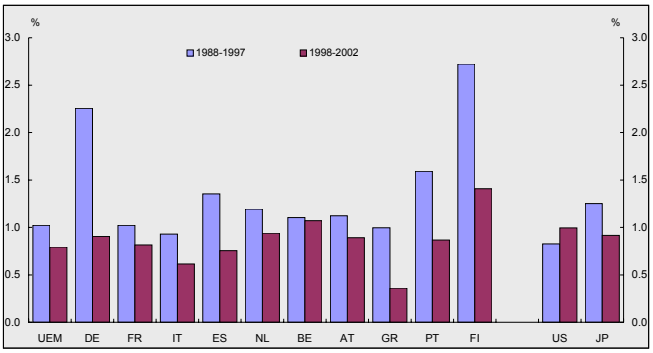
Chart 3.2

OUTPUT GAP: AMPLITUDE AND DIVERGENCES BETWEEN THE EURO AREA COUNTRIES

Output gap divergences (a)



Standard deviation of output gaps (b)



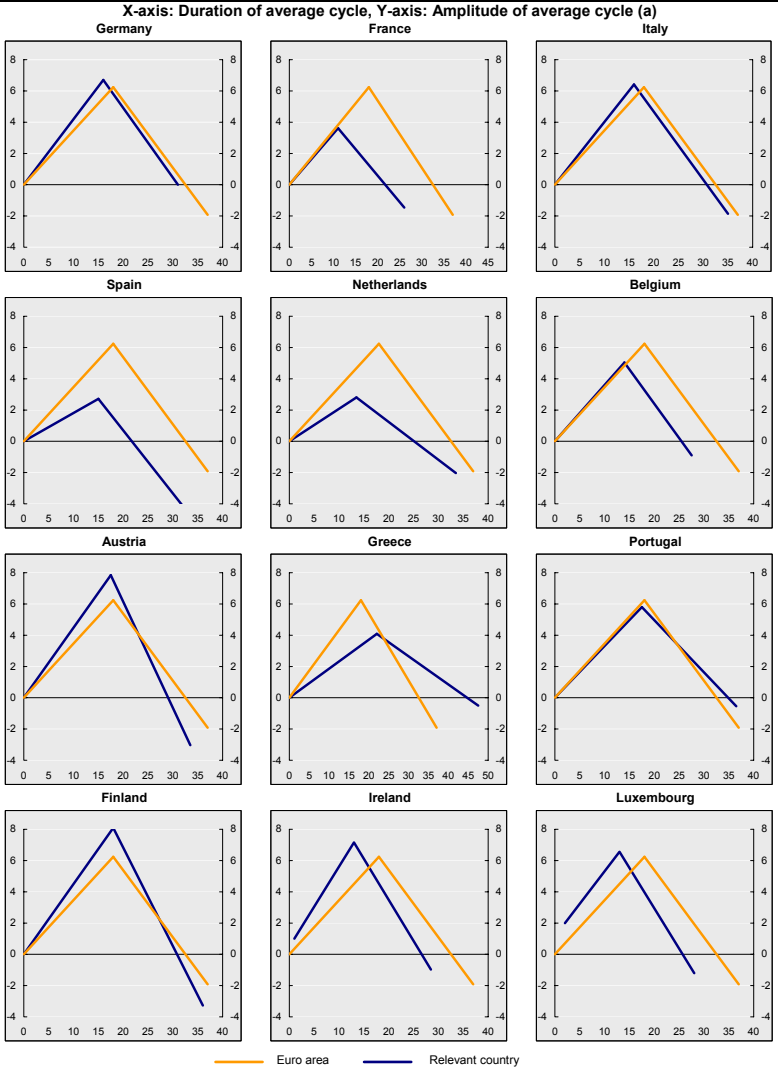
(a) Measured by the weighted standard deviation of the cyclical deviations between countries at any given time.

(b) Relative variability is calculated as the standard deiation of each country's output gap divided by that of the euro area as a whole.

Chart 3.3

IPI EXCLUDING CONSTRUCTION. AMPLITUDE AND DURATION OF AVERAGE CYCLE (months)

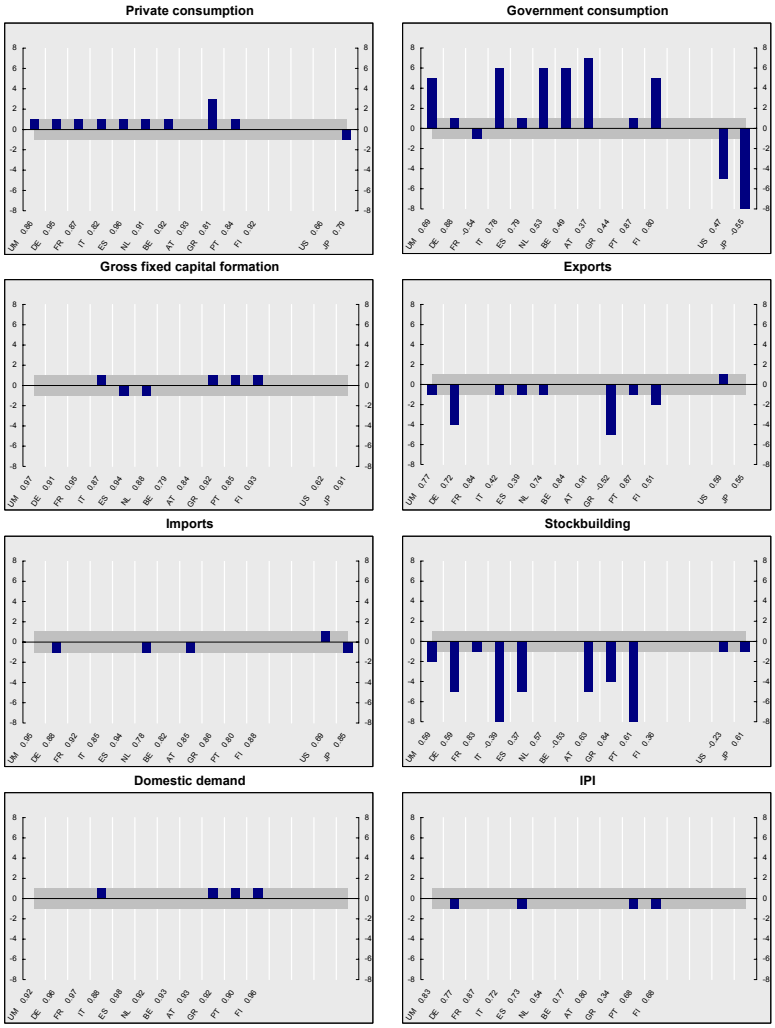
X-axis: Duration of average cycle, Y-axis: Amplitude of average cycle (a)



(1) Duration: Number of months elapsed between a turning point and the immedaitely preceding one.
Amplitude: Difference in absolute terms between the growth rate (or level) at a turning point and that at the preceding turning point.
Intensity: Calculated as the ratio of duration to amplitude and approximated by the slope of the curve.

Chart 3.4

CYCLICAL BEHAVIOUR OF GDP AND IPI COMPONENTS (a) (b)



(a) The bars represent the lag (+) or lead (-) in quarters with the highest correlation in absolute terms. The shadowed area indicates the ± month range which would be regarded as coincident.
(b) The y-axis indicates countries together with their respective correlatoins. The (-) sign indicates a countercyclical relationship between the standard deviation of real GDP and the gap of the relevant component.

ANNEX 1

LIST OF ECONOMIC INDICATORS USED FOR ANALYSIS OF TRANSVERSAL INDICATORS IN THE EURO AREA

DISPARITIES IN GROWTH SOURCES (a)

Description	Source	Frequencies available (M, Q, Y)	Period used	Remarks
Trend GDP	AMECO-CE	Y	1986-2001	
Per capita GDP	AMECO-CE	Y	1986-2001	
Productivity per person employed	AMECO-CE	Y	1986-2001	For employment the 'domestic' concept is used
Capital/employment	AMECO-CE	Y	1986-2001	
Capital share	AMECO-CE	Y	1986-2001	Gross operating surplus as a percentage of GDP at basic prices
Total factor productivity (TFP)	AMECO-CE	Y	1986-2001	Calculated residually within the growth accounting framework
Employment/population	AMECO-CE	Y	1986-2001	
Capital factor				
Capital/GDP	AMECO-CE	Y	1986-2001	
Gross investment rate	AMECO-CE	Y	1986-2001	Gross fixed capital formation/GDP
Gross saving rate	AMECO-CE	Y	1986-2001	Gross saving/GDP
Innovation and technology				
Private sector R&D	New Cronos-EUROSTAT	Y	1999-2001	As % of GDP
Total R&D	New Cronos-EUROSTAT	Y	1999-2001	As % of GDP
Patents (per million inhabitants)	New Cronos-EUROSTAT	Y	1999-2001	Number of patents registered in the USA and in Europe
Venture capital investment	New Cronos-EUROSTAT	Y	1999-2001	For initial facility, expansion and replacement (% of GDP)
ICT expenditure	New Cronos-EUROSTAT	Y	1999-2001	Information and communications technology (% of GDP)
High-tech exports	New Cronos-EUROSTAT	Y	1999-2001	As % of total exports
Households equipped with Internet	New Cronos-EUROSTAT	Y	1999-2001	Households connected to the Internet as % of total
Firms equipped with Internet	New Cronos-EUROSTAT	Y	1999-2001	Firms with over 9 employees connected to Internet as % of total
Labour factor				
Population				
Fertility rate	New Cronos-EUROSTAT	Y	1986-2001	Number of children per woman
Population from 0 to 14 years	AMECO-CE	Y	1986-2001	As % of total population
Working-age population (15 to 64 years)	AMECO-CE	Y	1986-2001	As % of total population
Population over 64 years	AMECO-CE	Y	1986-2001	As % of total population
Labour market				
Employment/Labour force	AMECO-CE	Y	1986-2001	Employment rate
Labour force/working-age population	AMECO-CE	Y	1986-2001	Participation rate
Unemployment rate	AMECO-CE	Y	1986-2001	National concept
NAIRU	CE	Y	1986-2001	Estimate by the EC's DGFIN
Working hours per week	New Cronos-EUROSTAT	Y	1993-2001	Hours worked per week in main job (total employment)
Part-time contracts	New Cronos-EUROSTAT	Y	1990-2001	Persons employed under part-time contract as % of total employment
Temporary contracts	New Cronos-EUROSTAT	Y	1990-2001	Persons employed under temporary contract as % of total employment
Real compensation per employee	AMECO-CE	Y	1986-2001	With GDP deflator
Human capital				
Science and technology graduates	New Cronos-EUROSTAT	Y	1993-2001	Per 1,000 inhabitants of age 20 to 29
Public expenditure on education	New Cronos-EUROSTAT	Y	1993-2001	As % of GDP
Adult population in education	New Cronos-EUROSTAT	Y	1994-2001	% of population of age 25 to 64 undergoing education and training

DIVERGENCES IN THE COMPOSITION OF ECONOMIC ACTIVITY

Description	Source	Frequencies available (M, Q, Y)	Period used	Remarks
Composition of production				
GVA total economy	AMECO and NC-EUROSTAT	Y	1980-2000	As % of total GVA
GVA agriculture	AMECO and NC-EUROSTAT	Y	1980-2000	As % of total GVA
GVA industry	AMECO and NC-EUROSTAT	Y	1980-2000	As % of total GVA
GVA construction	AMECO and NC-EUROSTAT	Y	1980-2000	As % of total GVA
GVA services	AMECO and NC-EUROSTAT	Y	1980-2000	As % of total GVA
Composition of demand				
Private consumption	New Cronos-EUROSTAT	Y	1960-2000	As % of GDP
Government consumption	New Cronos-EUROSTAT	Y	1960-2000	As % of GDP
Gross fixed capital formation	New Cronos-EUROSTAT	Y	1960-2000	As % of GDP
Goods and services exports	New Cronos-EUROSTAT	Y	1960-2000	As % of GDP
Goods and services imports	New Cronos-EUROSTAT	Y	1960-2000	As % of GDP
Trade structure: foreign trade by type of goods and geographical distribution				
Exports:				Yearly aggregates of monthly series
Food, drink and tobacco (sitc_0and1)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Raw materials (sitc_2and4)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Other manufactured articles (sitc_6and8)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Energy (sitc_3)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Chemicals (sitc_5)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Machinery and transport equipment (sitc_7)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
All products (Total)	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total
Exports to the euro area countries	New Cronos-EUROSTAT	M(Y)	1994-2001	As % of total, as % of GDP

Annex 1 (cont'd)

DIVERGENCES IN THE COMPOSITION OF ECONOMIC ACTIVITY				
Balance of payments				
Goods balance	EUROSTAT	Y	1991-2000	As % of GDP
Services balance	EUROSTAT	Y	1991-2000	As % of GDP
Income balance	EUROSTAT	Y	1991-2000	As % of GDP
Current and capital transfers balance	EUROSTAT	Y	1991-2000	As % of GDP
Budget situation				
Government expenditure	New Cronos-EUROSTAT	Y	1995-2000	As % of GDP
Government revenue	New Cronos-EUROSTAT	Y	1995-2000	As % of GDP
CYCLICAL DIVERGENCES				
Description	**Source**	**Frequencies available (M, Q, Y)**	**Period used**	**Remarks**
National accounts (real terms)				
GDP	Eurostat and OECD	Q	1988-2002	Series for Germany (up to 1990) and Portugal (up to 1994) linked using the rates of change obtained from the ESA79 series available. Series for the euro area from 1988 to 1990 linked using the rates of change for the total countries except Ireland. Ireland from 1988 to 1996 calculated as the difference between the linked euro area level and the level of the total countries less Ireland. Certain components for Greece from 1988 to 1990 estimated using its weight in euro area GDP. The source used for USA and Japan is OECD.
Private consumption	Eurostat and OECD	Q	1988-2002	
Government consumption	Eurostat and OECD	Q	1988-2002	
Gross fixed capital formation	Eurostat and OECD	Q	1988-2002	
Exports	Eurostat and OECD	Q	1988-2002	
Imports	Eurostat and OECD	Q	1988-2002	
Stockbuilding	Eurostat and OECD	Q	1988-2002	
Domestic demand	Eurostat and OECD	Q	1988-2002	
Final demand	Eurostat and OECD	Q	1988-2002	
Activity				
Nominal GDP	ECB	Q	1988-2002	Time series taken from AWM model database
IPI excluding construction	Eurostat and OECD	M	1985-2002	
Manufacturing IPI	Eurostat and OECD	M	1985-2002	
Orders	Eurostat and OECD	M	1985-2002	Spain and Portugal since 1987
Opinion surveys. Construction confidence indicator	EC	M	1985-2002	Spain and Portugal since 1989. Austria since 1996
Opinion surveys. Industrial confidence indicator	EC	M	1985-2002	Spain and Portugal since 1987. Finland since 1993
Consumption				
New car registrations	OECD	M	1985-2002	Portugal not available
Opinion surveys. Consumer confidence indicator	EC and OECD	M	1985-2002	Spain and Portugal since 1985. Finland since 1987. Austria since 1995. Luxembourg not available
Foreign trade				
Total imports (c.i.f.)	OECD	M	1985-2002	Luxembourg not available. Total volume
Total exports (f.o.b.)	OECD	M	1985-2002	Luxembourg not available. Total volume
Population and employment				
Total registered unemployment	OECD, IMF	M	1985-2002	Figures for the euro area up to December 1992 calculated as the weighted average of the various countries based on the proportion of the population that is of working age. Series for Austria and Greece taken from the IMF. Source for the other countries is the OECD.
Prices				
Consumer price index	OECD	M	1985-2002	Ireland. Up to 1997 interpolation of quarterly data
General PPI	OECD	M	1985-2002	Portugal, data since 1990
Monetary indicators				
M1 monetary aggregate	ECB	M	1985-2002	
M3 monetary aggregate	ECB and OECD	M	1985-2002	
Loans, oher resident sectors	ECB, IMF and OECD	M	1985-2002	Series for Italy, Holland, Belgium, Greece, Portugal, Ireland and Luxembourg linked using rates obtained from loan series taken from the IMF
Financial indicators				
General stock market indices	ECB and OECD	M	1985-2002	Series for Germany, France, Italy and Spain up to 1992 linked using series taken from the OECD. The source used since 1992 is the ECB. Figures for the euro area up to January 1994 based on the change in the stock market general index.

(a) All monetary variables have been converted into euro PPPs (base year 1995)

Annex 2. Methodological considerations

The methodological approach used in this paper is designed to appropriately identify and assess the divergences in the behaviour of the euro area countries. It takes as a reference point the euro area as a whole, considered as a geographical entity with full economic meaning and, since the introduction of the single currency, as subject to the action of economic policy managers. Therefore, in each set of variables addressed, use has been made of measures representing the euro area or, equivalently (as proven in this and the next annex), of appropriately weighted averages of national data.

Faced therefore with the problem of overall assessment of the macroeconomic divergences in the euro area, the aforementioned central (benchmark) reference measures lead to the search for measures of dispersion that sum up in a single value the disparities present in the area at each point in time. These measures have to be both representative and methodologically consistent with the values representing the euro area, and have to serve also as a yardstick for assessing whether the isolated behaviour of each euro area member is moving towards or away from that of the area as a whole.

Obviously this does not mean that the disparities are not measurable by other alternative methods, each with its strengths and weaknesses.

2.1 The euro area as reference point: aggregation, weighting and measurement of divergence. the example of demand structure

2.1.1 Aggregation and weighting

As regards the calculation of representative measures of the euro area as a whole that serve as a reference point for assessing each country's situation with respect to the area, it is shown below why summing GDP flows and demand aggregates and then calculating ratios is the same as weighting (with consistent weights) country ratios.

Let:

$$GDP_{EMU} = \sum_i GDP_i \quad \text{and} \quad PRC_{EMU} = \sum_i PRC_i$$

Where PRC stands for PRivate Consumption (as distinct from public consumption). The weight of consumption in GDP is defined as:

$$prc_i = \frac{PRC_i}{GDP_i}$$

For the euro area:

$$prc_{EMU} = \frac{PRC_{EMU}}{GDP_{EMU}}$$

But this is equal to:

$$prc_{EMU} = \frac{PRC_{EMU}}{GDP_{EMU}} = \frac{\sum_i PRC_i}{\sum_i GDP_i} = \frac{1}{GDP_{EMU}}\left(PRC_1 + ... + PRC_{12}\right)$$

Multiply and divide each consumption of each country by its GDP:

$$prc_{EMU} = \frac{1}{GDP_{EMU}}\left(\frac{GDP_1}{GDP_1}PRC_1 + ... + \frac{GDP_{12}}{GDP_{12}}PRC_{12}\right)$$

Or equivalently:

$$prc_{EMU} = \frac{GDP_1}{GDP_{EMU}}\frac{PRC_1}{GDP_1} + ... + \frac{GDP_{12}}{GDP_{EMU}}\frac{PRC_{12}}{GDP_{12}}$$

But this is:

$$prc_{EMU} = gdp_1 prc_1 + ... + gdp_{12} prc_{12} = \sum_i gdp_i prc_i$$

where the weights applied to the PRC/GDP ratios are the weights of each country in euro area GDP

$$gdp_i = \frac{GDP_i}{GDP_{EMU}}$$

Therefore, by using the euro area aggregate as the central (benchmark) reference, we are implicitly "weighting" even though we may not be aware of it. Therefore, a measure of dispersion must be sought that is representative and methodologically consistent with the central (benchmark) measure of position.

2.1.2 Variance and standard deviation as measures of dispersion consistent with the average that are obtained by weighting. Desirable properties:

To measure by how much the weights of consumption in the GDP of each country diverge from the euro area average, the most recommendable measure of dispersion is the variance or its square root (the standard deviation), defined with the same weights as those used to devise the measure.

Because of the way it is constructed, weighted variance (and standard deviation) is the measure that is methodologically most consistent with the weighted average and therefore has certain desirable properties:

1. Just as the weighted average is a representative measure of grouping, the weighted variance is a representative measure of dispersion.

2. Variance is always positive.

3. Variance, the second moment about the mean, is the second moment about the origin (weights multiplied by observations raised to the second power) minus the first moment about the origin (weighted average) raised to the second power.

4. Variance is the measure of dispersion with the minimum square deviation.

The sum of the square deviations is defined as:

Variance:

$$S^2 = \sum_i (prc_i - prc_{EMU})^2 gdp_i$$

Standard deviation:

$$S = \sqrt{\sum_i (prc_i - prc_{emu})^2 gdp_i}$$

This measure expresses the dispersion on the same scale as the mean, i.e. in the same "units of measure" (in our case, in percentage points). This enables consistent bands to be constructed around the central (benchmark) reference measure.

Co-efficient of variation or of dispersion:

$$CV = \frac{\sqrt{\sum_i (prc_i - prc_{emu})^2 gdp_i}}{\sum_i prc_i gdp_i}$$

This measure expresses, in relative terms, the standard deviation from the mean. It has no units.

The proof of properties 3 and 4 above is of interest:

Property 3: This elegant and interesting result makes it much easier to calculate the variance.

Required to prove:

$$S^2 = \sum_i (prc_i - prc_{EMU})^2 gdp_i = \sum_i gdp_i prc_i^2 - (\sum_i gdp_i prc_i)^2$$

that is to say

$$M_2 = A_2 - A_1^2$$

or, equivalently, that the second moment about the mean is equal to the second moment about the origin minus the square of the first moment about the origin.

Note: the weights of the two moments about the origin are the same

Proof

$$S^2 = \sum_i (prc_i - prc_{EMU})^2 gdp_i = \sum_i gdp_i (prc_i^2 - 2prc_i prc_{EMU} + prc_{EMU}^2) =$$

$$= \sum_i gdp_i prc_i^2 - \sum_i 2prc_{EMU} gdp_i prc_i + \sum_i gdp_i prc_{EMU}^2$$

Removing from the summations all terms independent of i:

$$= \sum_i gdp_i prc_i^2 - 2prc_{EMU} \sum_i gdp_i prc_i + prc_{EMU}^2 \sum_i gdp_i =$$

Which can be rewritten:

$$= \sum_i gdp_i prc_i^2 - 2prc_{EMU}^2 + prc_{EMU}^2 = \sum_i gdp_i prc_i^2 - \left(\sum_i gdp_i prc_i \right)^2$$

which is the same as

$$M_2 = A_2 - A_1^2$$

as had to be proved.

Property 4: This proof further highlights the consistency between weighted average and weighted variance.

Required to prove: If the square deviation is defined as the (weighted) arithmetic mean of the squares of the deviations of the variable from an arbitrary reference value, this deviation is at a minimum when that reference value is equal to the (weighted) average.

If the square deviation is

$$D^2(\omega) = \sum_i (prc_i - \omega)^2 gdp_i$$

then:

$$\min D^2(\omega) = D^2(A_1) = S^2 = M_2 \text{ when } \omega = A_1$$

but

A_1 is the weighted average.

Note: For the sake of consistency, it is recommendable to use the same weights for the weighted mean and the weighted variance

Proof:

To minimise the expression for square deviation, differentiate the above expression with respect to and equate to zero (necessary condition for a minimum):

$$\left[D^2(\omega)\right]' = 2\sum_i gdp_i (prc_i - \omega)(-1) = 0$$

from which

$$\sum_i gdp_i cpr_i - \sum_i gdp_i \omega = 0$$

or, equivalently

$$\sum_i gdp_i prc_i = \omega$$

which says that for the square deviation to be at a minimum, the arbitrary reference value has to be the weighted average. Also, the suffcient condition for a minimum:

$$\left[D^2(\omega)\right]'' = -2\sum_i gdp_i(-1) = 2 > 0$$

is met,$\varpi = A_1$ so it is true that, if

$$\min D^2(\omega) = D^2(A_1) = S^2 = M_2$$

as had to be proved.

2.2 methodological and accounting framework for analysis of sources of growth and their divergences

The relationships between the variables analysed in Section 1 of this paper are set forth below. They are also summarised in Scheme 1. The starting point is the following multiplicative decomposition of GDP per capita:

$$\frac{y}{P} = \frac{y}{L} \times \frac{L}{P}$$

The foregoing two factors can in turn be decomposed as follows[30]

$$\frac{y}{L} = TFP \times (K/L)^{(ks)}$$

$$\frac{L}{P} = \frac{L}{P_a} \times \frac{P_a}{P_e} \times \frac{P_e}{P}$$

where:

y Real GDP total

[30] Willman, A (2002) reports that a Cobb-Douglas function is a good approximation to the euro area production function

P Population (demographic variable)

L Number of persons employed (labour demand)

PTF Total factor productivity (residual variable)

K Total capital stock

K_s Share of capital income in output

P_a Labour force (effective labor supply)

P_e Working age population (demographic variable representing the potential labour supply)

In the foregoing expressions, the output per capita depends on the rate of employment and on average labour productivity. The rate of employment depends on the determinants of labor supply and demand and of the demographic age structure. Apparent productivity depends on the capital allocation per worker and on total factor productivity.

2.3. Methodology used to analyse the cycle in the euro area

In the literature on business cycle analysis there is no general agreement on the distinction between the concepts of trend and cycle, or on the best method for decomposing these components[31]. Specifically, the mechanical use of the Hodrick-Prescott filter traditionally employed for business cycle analysis tends to have serious drawbacks, as reported by Kaiser and Maravall (1999). Therefore, here we have opted for the approximation proposed by those authors, based on the estimation of models to obtain a decomposition into the non-observable trend and cycle components[32]. This paper introduces a slight variation in that use is made of a band-pass filter to estimate the non-observable cyclical component by means of a frequency band. The method used for this purpose is that proposed by Gómez (1996 and 2001). This type of frequency band filter, unlike the traditional Hodrick-Prescott filter, enables the cyclical component to be estimated more clearly, avoiding ambiguity and providing a sounder theoretical framework.

[31] See Artis et al. (1997) for a discussion of the various methodological approaches to cyclical analysis

[32] The concept of cycle used in this paper is that of cyclical deviations, generally more commonly used in recent years than the so-called classical cycle. Under this concept, expansion phases are those in which economic activity is above its long-term trend, while contraction phases have growth that is below trend.

The general cyclical analysis of the euro area was conducted through identification of the turning points that characterise the transition between expansion and deceleration phases. A monthly frequency is most appropriate for this type of analysis because it better captures changes of phase in economic phenomena. To analyse economic activity in monthly terms, the industrial production index (IPI) excluding construction was used as a proxy variable because it shows a high degree of proximity to real GDP[33]. This same methodological approach, along with the considerations described below about identifying and classifying turning points, has also been used to analyse and classify a wide variety of monthly indicators for the Member States.

The turning points are obtained as described above based on an estimate of the cyclical component of the respective IPI indicators, using the procedure developed by Abad and Quilis (1996 and 1997) to identify and classify them. Specifically, use was made of the <F> and <G> applications (Abad and Quilis, 1992 and 1996), which enable the business cycle of individual series to be characterised and to be classified with respect to a reference cycle. This procedure is as follows. Based on a signal that approximates the cyclical changes in an indicator, the turning points are identified and a detailed analysis is made of the cyclical recovery and decay processes, including calculation of the amplitude and symmetry of these processes. In the case at hand, the signal used to approximate the cyclical changes is that obtained via the band-pass filter, applying the trend cycle component of the various monthly indicators.

It should be noted that this approximation, as distinct from, for example, the use of a smoothed annual rate of the original series or of the trend cycle itself, to obtain the cyclical signal, has the advantage that it will always automatically strip out some turning points that would be spuriously identified and would have to be eliminated the second time round, following visual inspection of the series and of the tentatively identified turning points. In any event, certain results show that the application still identifies as turning points some that should be classified as "saddle points" rather than as true turning points. Given the volume of information processed, only a preliminary filtering was performed of the turning points identified automatically by the application in the cases of the reference indicator itself (IPI excluding construction) and of the series relating to loans to other

[33] In fact, the NBER (National Bureau of Economic Research), which officially dates the changes in phase of business cycles in the United States, uses the Industrial Production Index (IPI) as one of its four reference indicators.

resident sectors (ORS), which exhibited an excessive number of clearly spurious turning points in certain countries.

It should be mentioned that the use of the <F> and <G> dating and classification applications is subject to the following constrains:

- Only monthly series can be used.
- The required length of time for proper turning point identification and cycle classification is at least ten years (120 observations). This is a major limitation in our case because many series of indicators for the euro area have a very short sample period beginning in 1995. Thus in the case of short series the results may be found wanting because few turning points are identified and the rest of the exercise may be baised. Therefore, an attempt has been made to select indicators and information sources that provide sufficiently long series.
- Although the application furnishes a volume of statistical information that enables the business cycle of each indicator to be characterised and classified, the information processing is inconvenient, particularly for the type of analysis desired. Various supplementary applications had to be developed to manage and analyse all the information furnished.

Each set of indicators is used to obtain a synthetic characterisation of the "average cycle" and its relationship with the reference cycle. The average cycle is characterised on the basis of the duration and amplitude of the various cycles obtained from the turning points identified. For each indicator the application provides a complete characterisation of all the turning points, the duration of growth and decay phases, the amplitude in months, the smoothness index and the symmetry of both the duration and the amplitude. The cycle classification is performed by relating the turning points of the reference indicator to the other indicators. For each series a calculation is made of the lags with respect to the maximum and minimum turning points of the reference indicator and the related average lag, as well as a coincidence indicator, which to some extent approximates the correlation between the two indicators based on the lag between turning points.

Based on this classification, a coincident indicator is considered to be one with an average phase difference of around plus/minus three months with respect to the reference indicator.

If the absolute value of the time difference exceeds three months, the indicator is classified as lagging (+) or leading (-). If a two-way relationship cannot be established between the indicator and its reference cycle for a minimum number (60%) of turning points, the former is considered to be technically unclassifiable with respect to the latter.

The concepts and statistics used in this methodological approach are:

- **Duration associated with a turning point:** Number of months elapsed between the turning point and the immediately preceding one of opposite sign.
- **Amplitude of a turning point:** Difference in absolute terms between the rate (or level) at the turning point in question and that at the immediately preceding one of opposite sign.
- **Intensity of turning point**: Ratio of duration to amplitude. This is the slope of the cyclical characterisation graph.
- **Symmetry**: Ratio of the duration to amplitude of the respective cyclical maxima and minima. A ratio of around one indicates that the cycle of the indicator has a similar characterisation between the maximum and minimum turning points.
- **Rx and Ry**: Relationship between all the turning points of the relevant indicator (x) and of the reference indicator (y), and those between which there is a two-way relationship; from X to Y and from Y to X, respectively. A necessary condition for there to be a cyclical relationship between the variables is that the two ratios are close to unity. If this ratio is lower than 0.6, it is considered that a reliable cyclical relationship cannot be determined and this indicator is deemed to be unclassifiable with respect to the reference indicator.
- All the ratios are equal to the average ratio at the maximum and minimum turning points.

The following tables illustrate, for the case of indicators for the euro area as a whole, the type of information obtained for each indicator and used for cyclical analysis.

	EURO AREA INDICATORS											
	CYCLICAL CHARACTERISATION											
	Turning points				Duration			Amplitude			Intensity	
	Maxima	Minima	Total	Smoothness	Maximum	Minimum	CYCLE	Maximum	Minimum	Difference	Maximum	Minimum
Overall IPI	4	5	9	0.8182	19	18.5	37.5	0.05	0.04	0.01	0	0
Manufacturing IPI	5	6	11	0.8462	18	18	36	0.05	0.04	0.01	0	0
Order book	4	5	9	0.8182	18.5	19	37.5	30.91	32.35	-1.44	1.77	1.33
Industrial confidence	5	5	10	1	19	18	37	17.06	22.95	-5.89	1.04	0.95
Construction confidence	4	3	7	1	28	29	57	18.55	21.57	-3.02	0.55	0.63
Consumer confidence	5	5	10	0.7692	20	16	36	9.76	6.46	3.3	0.47	0.39
New car registrations	5	4	9	0.8182	30.5	17	47.5	0.09	0.06	0.03	0	0
Imports	6	6	12	0.8571	15	16	31	0.09	0.1	-0.01	0.01	0.01
Exports	6	6	12	0.8571	11	15.5	26.5	0.02	0.11	-0.09	0	0.01
CPI	5	4	9	1	17	26.5	43.5	0.01	0.01	0	0	0
PPI	5	4	9	0.9	20.5	19	39.5	0.04	0.03	0.01	0	0
Unemployment rate	3	3	6	0.75	32.5	33	65.5	0.1	0.1	0	0	0
M1	4	5	9	0.8182	28	22.5	50.5	0.02	0.04	-0.02	0	0
M3	6	5	11	1	15	22	37	0.01	0.02	-0.01	0	0
Loans to ORS	2	2	4	0.8	50.5	56	106.5	0.06	0.05	0.01	0	0
Stock market	6	5	11	0.8462	15	15	30	0.15	0.17	-0.02	0.01	0.01

	CLASSIFICATION WITH RESPECT TO THE IPI					
Indicator	**Classification**	**Ry**	**Rx**	**Average lag**	**Coincidence index**	**Cyclicity sign**
Manufacturing IPI	C	1	0.8182	0	0.907	+
Order book	C	1	1	-1	0.8326	+
Industrial confidence	C	1	0.9	-2	0.6372	+
Construction confidence	I	0.6667	0.8571	-2	0.4326	+
Consumer confidence	C	1	0.9	0	0.5721	+
New car registrations	R	0.8889	0.8889	14.5	-0.2186	+
Imports	C	1	0.75	3	0.3023	+
Exports	R	1	0.75	6	0.1215	+
CPI	R	0.8889	0.8889	7.5	0.1907	+
PPI	C	0.8889	0.8889	0	0.5256	+
Unemployment rate	I	0.6667	1	5	0.4791	-
M1	A	0.7778	0.7778	-4	0.2651	+
M3	R	0.8889	0.7273	8.5	-0.2	+
Loans to ORS	I	0.4444	1	9	0.1721	+
Stock market	C	0.8889	0.7273	-2.5	0.3116	+

	Lag with respecto to the maxima of the reference series				Lag with respect to the minima of the reference series				
Indicador	**1990.08**	**1995.03**	**1998.02**	**2000.1**	**1987.07**	**1993.07**	**1996.1**	**1999.04**	**2002.04**
Manufacturing IPI	-1	0	0	0	1	0	-1	0	0
Order book	-10	-1	1	-1	-4	0	-1	0	0
Industrial confidence	-13	-2	-1	-3	-4	-2	-3	0	-2
Construction confidence	-3	-3	*	-3	6	-1	7	*	*
Consumer confidence	-5	-2	8	0	4	0	2	2	-4
New car registrations	17	13	16	13	20	0	4	18	*
Imports	2	5	7	-1	-9	3	11	3	-4
Exports	1	6	6	0	24	4	12	7	-5
CPI	20	9	-1	6	13	18	0	5	*
PPI	-12	5	-4	3	-3	7	2	-2	*
Unemployment rate	1	6	*	5	5	5	13	*	*
M1	5	-11	*	-11	4	-4	-11	*	1
M3	6	16	2	11	22	-18	5	18	*
Loans to ORS	24	*	*	8	10	*	6	*	*
Stock market	-5	-12	0	-5	11	-7	1	1	*

Annex 3. Supplementary tables and charts

Chart A3.1

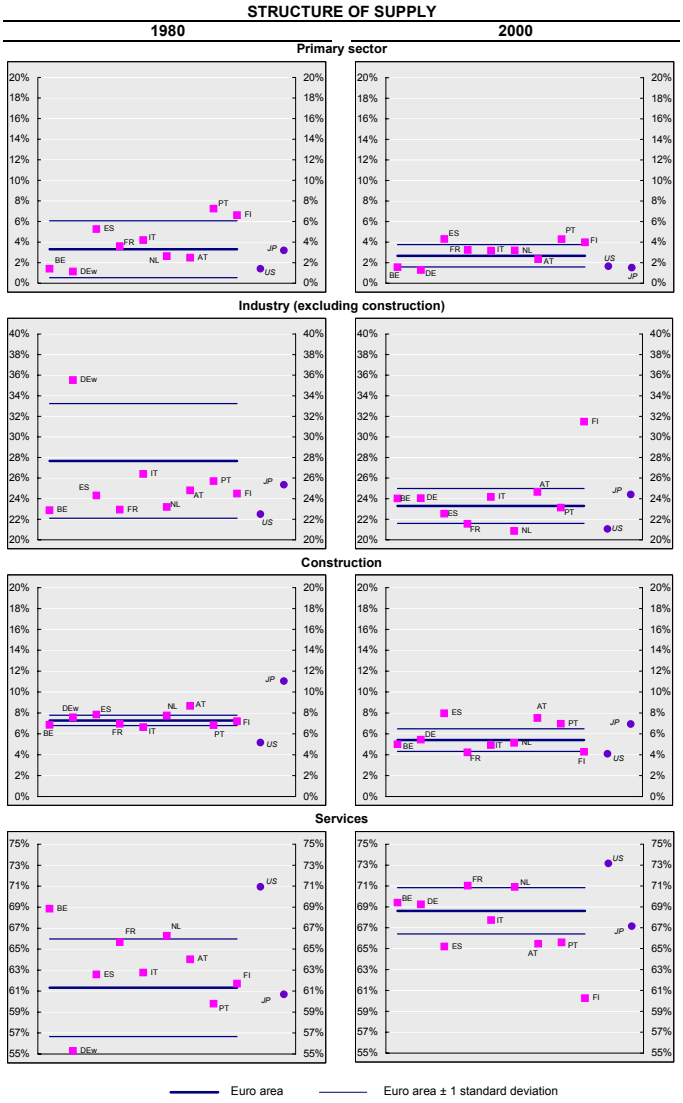


Chart A3.2

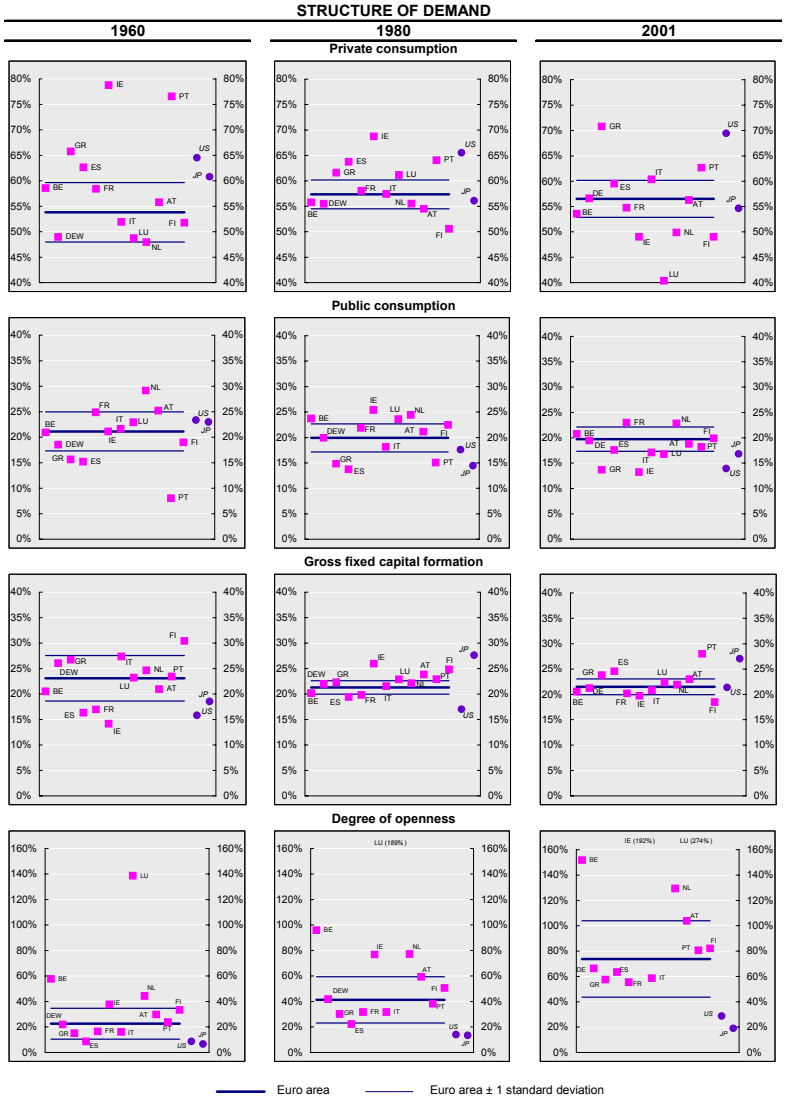

STRUCTURE OF DEMAND
1960
1980
2001
Private consumption
Public consumption
Gross fixed capital formation
Degree of openness
LU (189%)
IE (192%)
LU (274%)
Euro area
Euro area ± 1 standard deviation

Chart A3.3

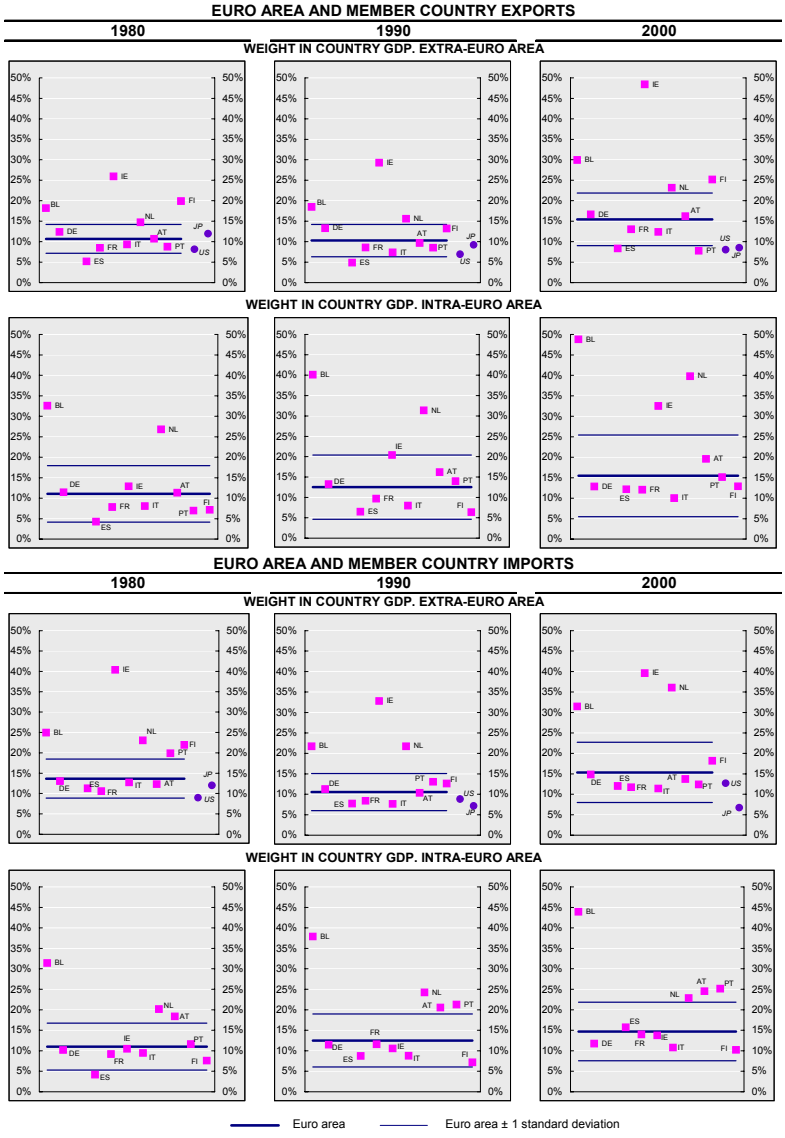

EURO AREA AND MEMBER COUNTRY EXPORTS
1980
1990
2000
WEIGHT IN COUNTRY GDP. EXTRA-EURO AREA
WEIGHT IN COUNTRY GDP. INTRA-EURO AREA
EURO AREA AND MEMBER COUNTRY IMPORTS
1980
1990
2000
WEIGHT IN COUNTRY GDP. EXTRA-EURO AREA
WEIGHT IN COUNTRY GDP. INTRA-EURO AREA
Euro area
Euro area ± 1 standard deviation

Chart A.3.4

EXPORT STRUCTURE BY DESTINATION

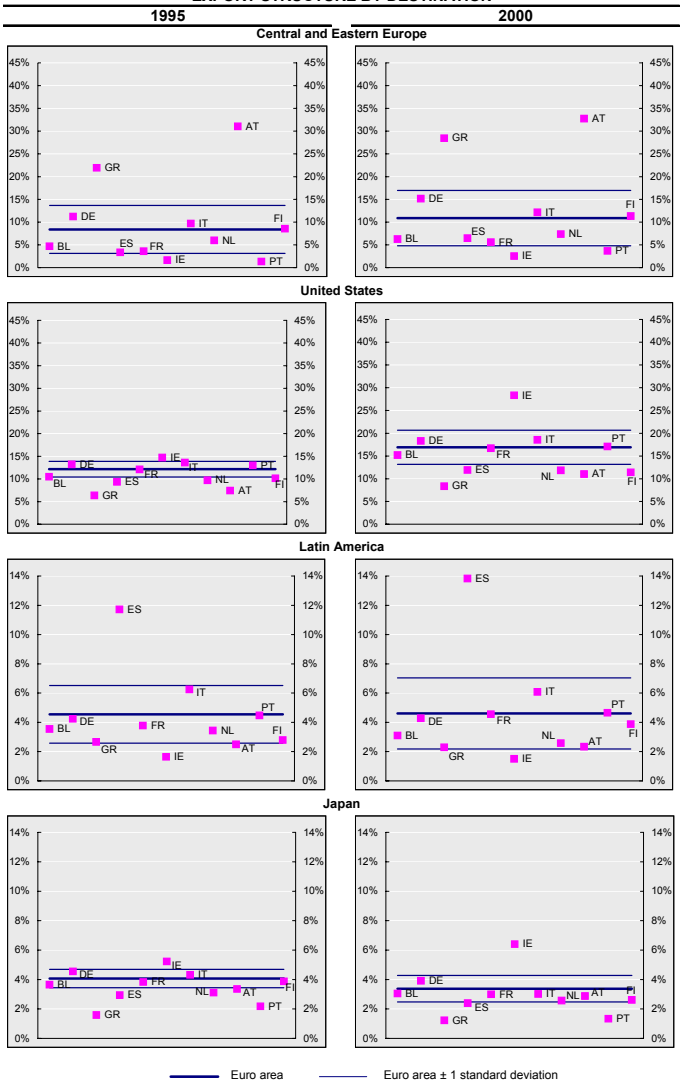


Gráfico A.3.5

EXPORT STRUCTURE BY DESTINATION

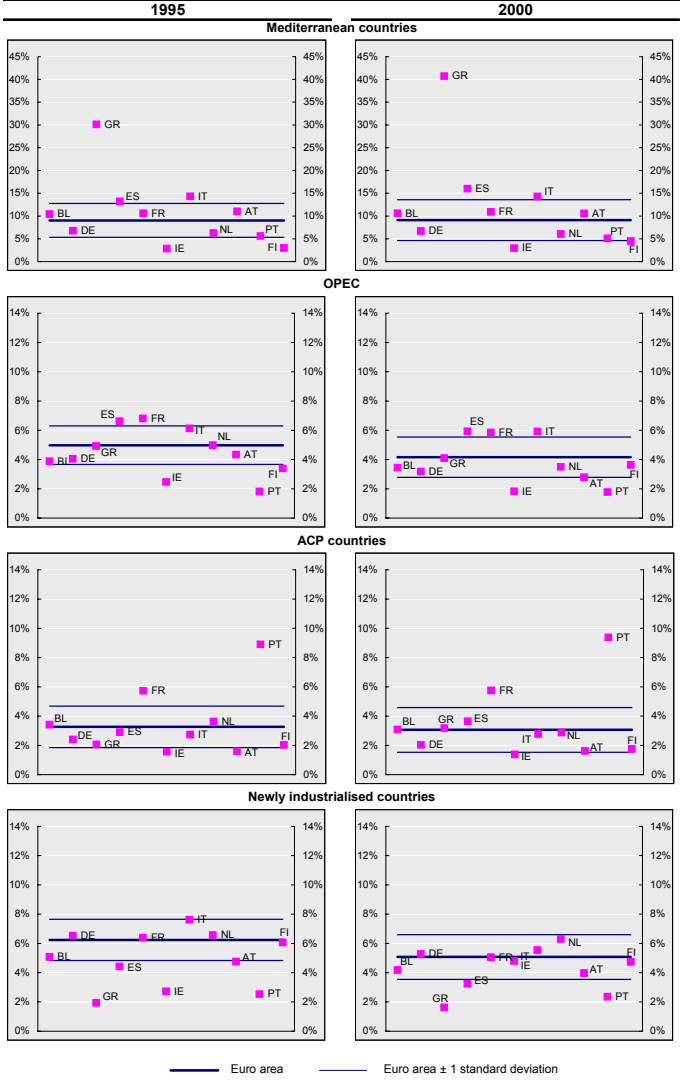


Chart A.3.6

IMPORT STRUCTURE BY ORIGIN

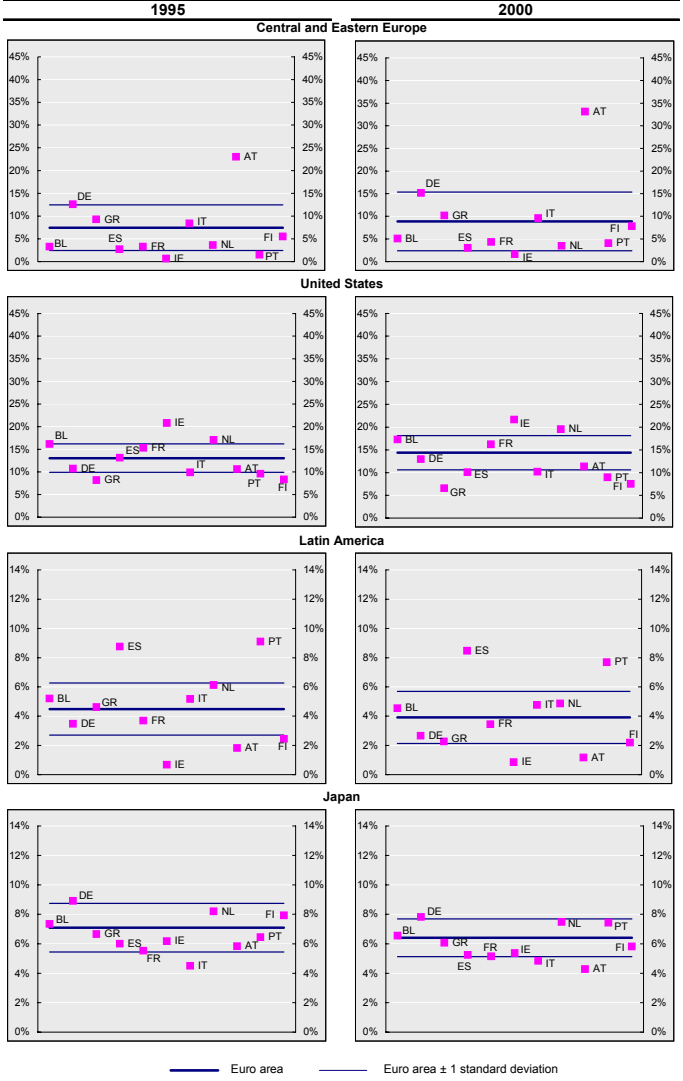


Chart A.3.7

IMPORT STRUCTURE BY ORIGIN

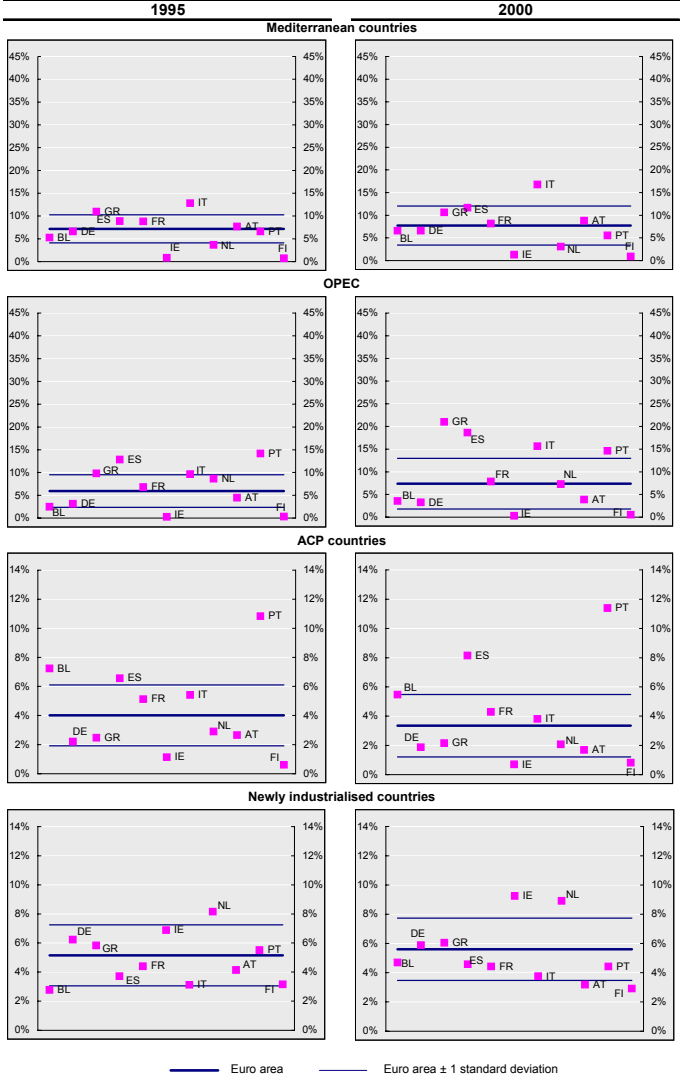
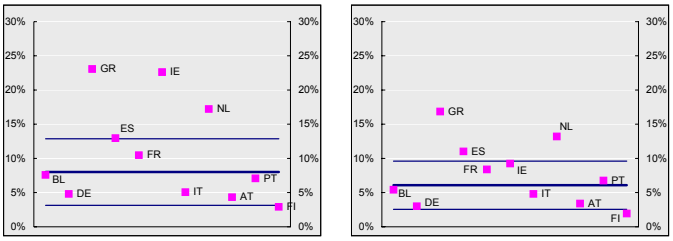


Chart A.3.8

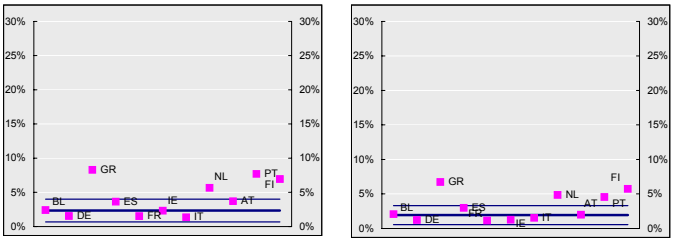
EXPORT STRUCTURE BY PRODUCT

1995	2000

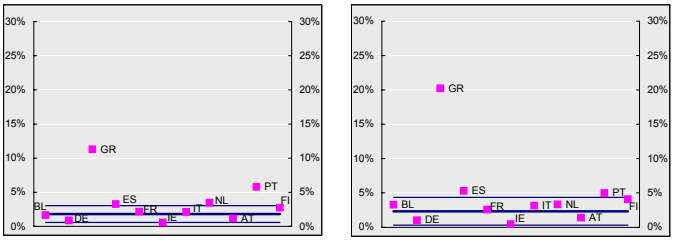
Food, drink and tobacco



Raw materials



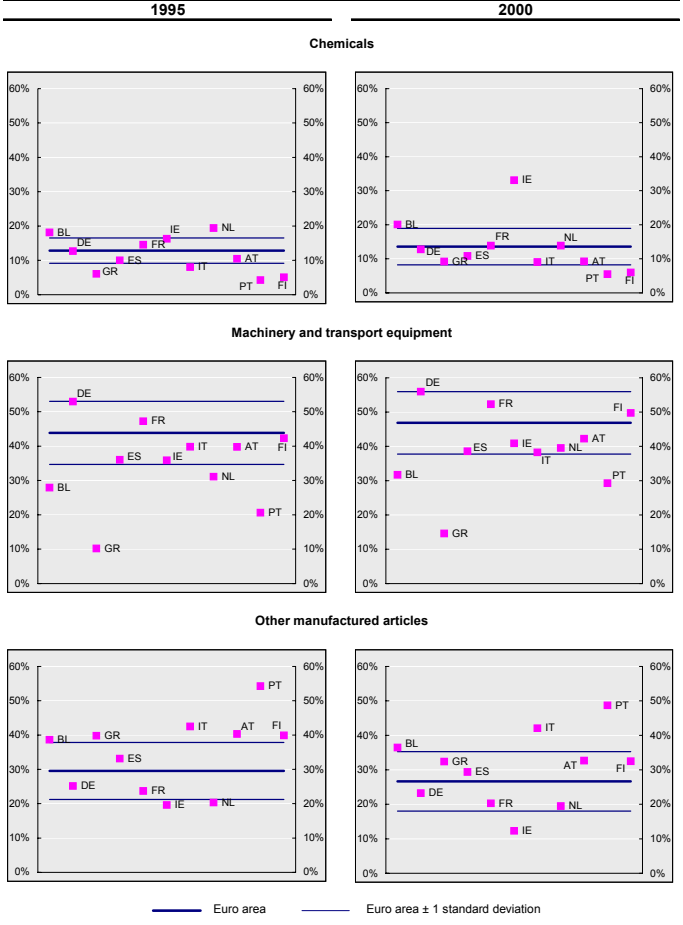
Energy



Euro area Euro area ± 1 standard deviation

Chart A.3.9

EXPORT STRUCTURE BY PRODUCT



ANNEX 4 Cyclical clasiffication of economic indicators

This annex analyses the cyclical behaviour of a number of monthly indicators representing the various economic sectors of the euro area and of each Member State, based on the methodology for identifying and classifying turning points. It supplements Section 3[34][35].

The exercise described here has two parts: the first compares the cyclical relationship of each indicator with its reference cycle, represented by the respective industrial production indices of each country, and the second compares the relative cyclical position of each indicator with the cycle approximated by the related euro area indicator. Charts A.4.1 and A.4.2 summarise the average lags obtained by identifying the turning points, in order to help reach a conclusion in the two analyses. To make this exercise easier to follow, the indicators used have been classified according to the macroeconomic sector that they represent.

A.4.1 Cyclical characterisation of activity and demand indicators

Regarding the indicators used as proxy variables for activity and demand (manufacturing IPI, orders, new car registrations and consumer, industrial and construction confidence indicators), the confidence indicators predominantly lag slightly behind the cyclical component of the IPI (see Chart A.4.1)[36]. In the smaller countries, the consumer confidence and construction confidence indicators seem to lead more, whereas in the larger countries they seem to be characterised by a lag in relative terms. Notable in this respect is the lag of more than one year in the cycle shown in Germany by, for example, the new car registrations indicator.

[34] See list of indicators in Annex 1, which describes the characteristics of each indicator used, the source and how it has been constructed whenever any compilation has been involved.

[35] Note that in many cases sufficiently long time series of homogeneous indicators are not available for the euro area. This has been a major constraint on the selection of more appropriate alternative indicators to represent the cyclical characterisation of each economic sector.

[36] This finding, at first surprising because the indicators would be expected to be coincident or lead slightly, is because qualitative variables are constructed from responses to questions that usually have a time reference value similar to a non-centred year-on-year rate of change, which gives rise to a lag. This problem can be avoided by analysing the correlation between the year-on-year rate of change of the IPI and the confidence indicators.

In comparison with the related euro area cycle, the activity variables analysed have different patterns in the large and the small countries, as is seen in certain confidence indicators, such as the industrial production and the construction indicators (see Chart A.4.2). However, the cyclical behaviour of manufacturing or orders coincides fully, except in Portugal, which has a markedly different cyclical behaviour (perhaps linked to data quality). The consumer confidence and new car registration indicators broadly coincide with the euro area average.

A.4.2 Cyclical characterisation of external sector indicators

Analysis of the turning points of the indicators used as proxies (which include both intra- and extra-euro area trade) confirms that there is considerable synchrony[37] with the respective IPIs and with the aggregate cycle representing the euro area as a whole. Indeed, goods exports and imports lag about six months behind the reference cycle in most countries, except Finland and Ireland. The size of these latter countries and the relative importance of their external sectors, particularly the high-technology sector, may mean that the external demand cycle responds with less inertia to the production cycle.

A.4.3 Cyclical characterisation of price indicators

As mentioned at the beginning of this annex, the price indicators of large countries differ a good deal from the reference cycle (see Chart A.4.1). Whereas in France the consumer price index (CPI) leads activity somewhat, in Italy and Spain it lags. Once again, in small countries the consumer price cycle tends to coincide with that of activity. By contrast, industrial prices exhibit a fairly homogeneous profile across all countries, with a certain propensity to lead in the larger countries.

Specifically, consumer prices exhibit differing volatilities across countries and more disparate trends over time. Comparison of the average cycle reveals differences in the duration of the cycle. By constrast, the amplitudes are rather more similar. In fact, national CPIs do not show a specific pattern with respect to the euro area. This may be partly because the goods baskets are defined differently in the various countries.

[37] The results obtained from analysis of the monthly indicators of imports and exports are not exactly comparable with those obtained by analysing the external sector of the national accounts. In this respect, it should be taken into account that the cyclical classification of the monthly indicators is based on the IPI. Moreover, these indicators include only goods imports and exports.

A.4.4 Cyclical characterisation of the labour market indicator

The monthly indicator used to approximate the cyclical pattern of the labour market (the cyclical component of the unemployment rate) is strongly counter-cyclical in all countries, but it is likely that the different labour market structure causes this indicator's relationship with the IPI cycle to differ across countries. Notably this indicator lags somewhat in the main countries, except Spain, where the cyclical behaviour tends to coincide with that of the reference cycle[38] . Also striking in this respect is the case of Italy, where the unemployment cycle tends to lead the activity cycle itself.

A.4.5 Cyclical characterisation of monetary and financial indicators

The study of monetary and financial indicators yields some findings of interest. First, the M1 aggregate shows fairly homogeneous behaviour in relation to the IPI reference cycle. In general, in all countries it leads the activity cycle by six to eleven months, although Greece and Portugal again behave differently from the other countries. These observations are in line with certain results reported by the ECB supporting the use of M1 as a leading indicator of activity. Such a role is not so clear for the M3 aggregate, which includes financial assets that may be demanded for reasons other than transactions.

Also worthy of note are the cyclical differences seen in an indicator of indebtedness such as bank lending to other resident sectors. Although for the euro area as a whole this indicator lags considerably, individual country analysis reveals relationships that are both coincident, as in Germany, and lagging, as in France, or slightly leading, as in Portugal and Luxembourg. These results show that caution should be exercised in interpreting the behaviour of the bank lending aggregate in the euro area as a whole, given the different cyclical patterns exhibited by the various countries. Differing cyclical patterns are also detected in the indicator of lending to other resident sectors. For example, with respect to the euro area as a whole, bank lending in Spain leads considerably whereas the lending cycle in Germany lags.

In contrast, stock market indices are rather homogenous and either coincident or lead slightly by three or four months in most countries. Indeed, the degree to which the

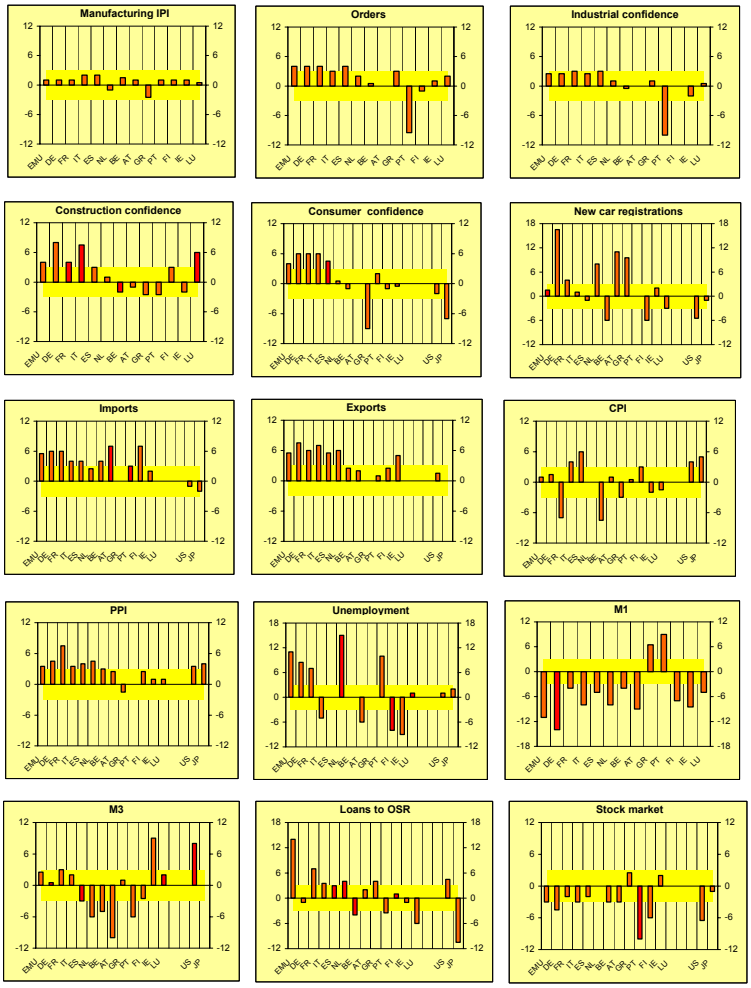
[38] This result is surprising from the standpoint of economic analysis because it could be interpreted to mean that the labour market allows more rapid adaptation to the cycle in Spain than in the other large countries, and its significance must be assessed with great caution. In any event, this rapidness in adjusting is sure to be related to the high percentage of temporary contracts in the Spanish labour market.

fluctuations of these financial variables are interconnected in the euro area as a whole is clearly seen in Chart A.4.1, which shows how the cyclical profile of the Eurostoxx 50 index coincides with those of the national stock market indices.

Chart A.4.1

CHARACTERISATION OF AVERAGE LAG OF VARIOUS INDICATORS WITH RESPECT TO THE IPI CYCLE IN EACH COUNTRY

Average lag(-)/lead(+) in months

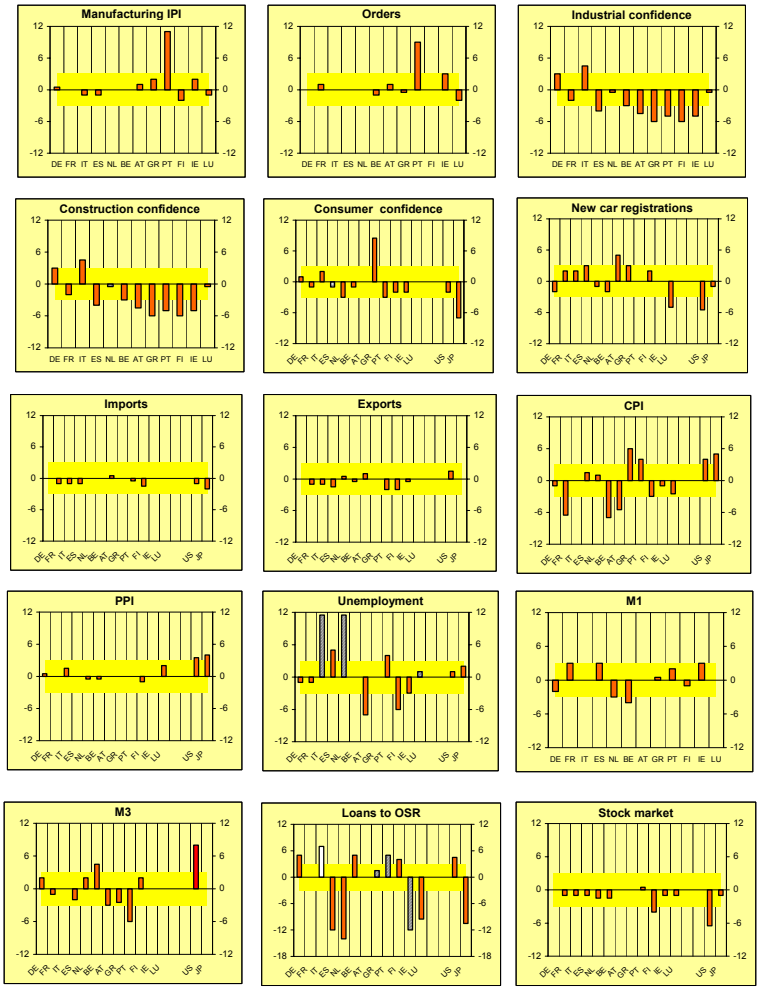


* The shadowed bands mark a range of ± three months within which the indicator would be classified as coincident.
The white bars mean that for the country concerned the indicator is technically unclassifiable.

Chart A.4.2

CHARACTERISATION OF AVERAGE LAG OF VARIOUS INDICATORS WITH RESPECT TO THE EURO AREA INDICATOR

Lag(-)/lead(+) in months



* The shadowed bands mark a range of ± three months within which the indicator would be classified as coincident.
The white bars mean that for the country concerned the indicator is technically unclassifiable.