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Working Paper

The Belgian industrial confidence indicator: leading indicator of economic activity in the euro area?

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THE BELGIAN INDUSTRIAL CONFIDENCE INDICATOR: LEADING INDICATOR OF ECONOMIC ACTIVITY IN THE EURO AREA?

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of the National Bank of Belgium.

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Editorial Director

Jan Smets, Member of the Board of Directors of the National Bank of Belgium

Abstract

The international press has recently reported on the widely-held view in the financial markets that the movement of the Belgian industrial confidence indicator might precede the euro area business cycles. The initial purpose of this paper is to assess whether this market perception is more than a simple optical illusion, resulting from the inspection of graphical representations of the data. For that, explicitly formalised methods are used to identify the timing of turning points in the industrial confidence indicators for Belgium and for the euro area, and the statistical significance of the differences in timing has been assessed using the Randomization Test proposed by Banerji. We conclude that the turning points in Belgium do in fact significantly lead turning points in the euro area from 1993 onwards.

The leading nature of the Belgian industrial confidence indicator is not really surprising, as changes in the business cycle stages in Belgium seem to have been ahead of changes in the euro area during the period from 1985 to the first quarter of 2000. Among the three different reference series used to compare the business cycle movements in Belgium and in the euro area, the null hypothesis that turning points in Belgium do not lead those in the euro area is rejected at a confidence level above 90 p.c. in the case of GDP and of the degree of utilisation of production capacity in manufacturing industry. The leading nature is more pronounced for the sub-period beginning with the first quarter of 1993, especially in the case of GDP. However, the comparison of the movements of the industrial production indices does not confirm these conclusions.

Due to the lack of sufficiently long time series for the euro area it was not possible to check whether differences in the economic structure could explain the leading nature of the activity in Belgium. However, using partial industrial confidence indicators, three factors (specialisation in intermediate goods, openness and high representation of small and medium-sized enterprises) that might explain why the Belgian business indicator and Belgian activity seem to lead their euro area counterparts were investigated, but could not be validated by the data.

As it seems to be impossible to identify one or more sectors or groups of enterprises accounting for the leading nature of Belgian economic activity when looking at turning points, at least when using the business survey data, it looks as if this leading nature is a kind of general feature of the Belgian economy.

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INTRODUCTION

In order to conduct its monetary policy, the Eurosystem (composed of the ECB and the eleven members of the euro area) needs reliable and up-to-date information on the business climate in the euro area. The outcomes of the monthly business surveys are drawn upon heavily by the ECB as a leading indicator of economic activity that is readily available.

In an attempt to anticipate monetary policy decisions, players in the international financial markets are paying more and more attention to the business indicators for the euro area. Recently, some of them have discovered that the Belgian business indicator gives a good approximate idea of the business climate in the euro area and, more importantly, that it is a few months ahead of the euro area indicator[1].

Chart 1 - Industrial confidence indicator
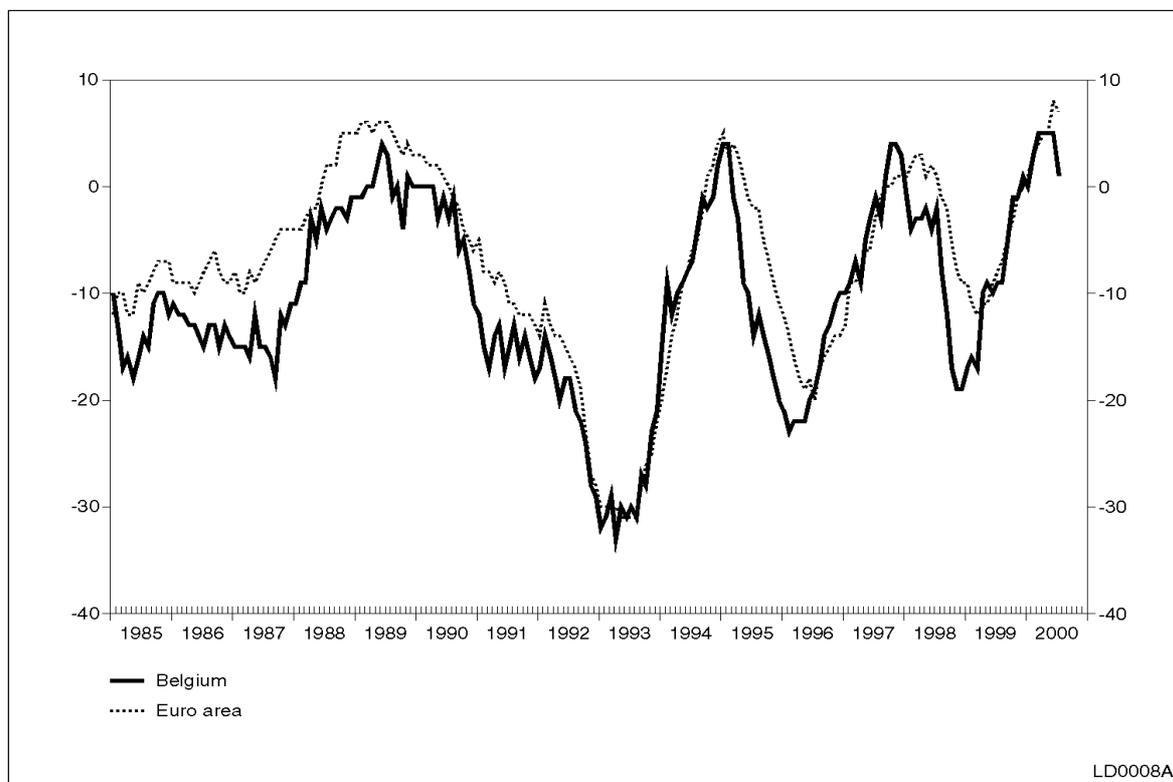
Source: EC.

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[1] See for example articles in the Wall Street Journal (14 July 1999), Le Monde (13 July 1999) or the Handelsblatt (24/25 September 1999).

In the first part of the paper, we shall assess the robustness of the relationship between the industrial confidence indicators for Belgium and for the euro area. The analysis will focus on turning points. These are identified by using two procedures: the Bry and Boschan procedure and a procedure based on a moving median transformation of the series. A simple non-parametric test, presented by Banerji at the 1999 Ciret Conference[2], is used to calculate the confidence level of the difference in timing of the turning points in the series for Belgium and for the euro area.

The most obvious reason which might explain the leading nature of the Belgian indicator lies in a leading nature of the movements in economic activity itself, compared to the rest of the euro area. In the absence of an official, widely agreed dating of the business cycles for Belgium and for the euro area, the second part looks for systematic timing differences in the cyclical movements of three reference variables: GDP, industrial production indices and the degree of utilisation of production capacity.

In the third part, some breakdowns of the global industrial confidence indicators are investigated, in order to validate or reject the explanations often put forward for the leading nature of the Belgian industrial confidence indicator and of Belgian economic activity in relation to the euro area. These explanations are related to the structure of the economy, in terms of sectors, of openness to foreign markets and of size of enterprises.

Finally, some conclusions are drawn. They are to be interpreted bearing in mind the limitations of the study. Some approaches for future work are also presented.

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[2]   Banerji (2000).

1. <u>TURNING POINTS IN THE BELGIAN AND THE EUR 11 INDUSTRIAL CONFIDENCE INDICATORS</u>

Turning points are of particular importance in macroeconomic analyses, since it is quite obvious that rapid detection of changes in the direction of the movements of an economic variable can increase the effectiveness of economic policy decisions. As far as economic activity is concerned, the turning points are referred to by the so-called "peaks" (when the acceleration in the growth rate of economic activity comes to an end) and "troughs" (when the growth rate of economic activity stops decreasing). These points are of specific interest, because they delimit the stages (expansion, slowdown) in the business cycle .

In this paper we focus on the turning points in order to determine whether or not the industrial confidence indicator for Belgium leads the indicator for the euro area. Over the period from 1985 to mid-2000[3], only a few points in the time series can be regarded as turning points and consequently taken into account for the analysis.

Typically, two kinds of problems arise when a comparison of the timing of turning points between two series is attempted. First, the turning points in the business cycle component of the series have to be identified. Second, the robustness of the differences in timing has to be assessed. The following two sections present the methods used in this paper to address these issues. There are two different industrial confidence indicators for Belgium: the NBB synthetic curve and the EC confidence indicator. We briefly present these in section 3, before comparing the timing of the turning points of the EC industrial indicator for Belgium and for the euro area.

1.1. Identification of the turning points

The dynamic of most of the variables measuring economic activity, such as production or value added, sales or expenditures, includes a trend component which needs to be excluded in order to extract the business cycle. This should not be the case with confidence indicators, since the questionnaire is designed to elicit answers expressed as a deviation from the normal evolution. Nonetheless, seasonal factors and irregular

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[3]   The cut-off date for the data was July 2000.

variability also affect responses. Some signal-extracting methods have to be used to identify the turning points in the business cycle component of the series.

In this paper, two methods were applied to detect turning points. They both try to adhere to the following general principles:

- the choice of turning points should not be affected by aberrant observations or outliers;
- irregular movements in the series should be excluded;
- the identification method should minimise the risk of false signals or missing turning points in the business cycle;
- the application of the method should not delay the identification of the turning points for too long;
- some additional requirements may be imposed in accordance with stylised facts characterising business cycle movements, such as a succession of peaks and troughs, a minimum length for the phases and for the cycles, and possibly a minimum amplitude for the movements.

The first method we use is the well-known Bry-Boschan algorithm that has been extensively applied in the analysis of turning points for much of the last three decades[4]. It involves, first of all, the detection of extreme values and their replacement by a moving average. Second, an initial set of turning points is identified in a smoothed series, by applying a moving average filter. Using gradually shorter moving averages, the analysis shifts back to the original data in the immediate vicinity of the potential turning points. The turning points detected at the different stages are checked for the alternation of peaks and troughs, for a minimum span of 15 months between two successive peaks or two successive troughs, and of 5 months between two successive turning points. Finally, turning points in the first or the last 6 months of the series are rejected.

The originality of the second method, the NBB method, lies mainly in the smoothing method used. First, a centred moving median over five months is used to exclude outliers. Second, the resulting series is smoothed by a centred 5-month moving average with weights of 1/8, 1/4, 1/4, 1/4, 1/8. In addition, three restrictions are imposed on the local extremes of the smoothed series in order to identify the turning points:

1° alternation of peaks and troughs;

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[4] Bry and Boschan (1971).

2° minimum of 5 months between two successive turning points;

3° minimum of 15 months between two successive peaks or two successive troughs.

Applied for ten years in the field of business survey indicators in Belgium, the NBB smoothing procedure has proved its value in providing a useful representation of the cyclical movements, even for series where there are considerable irregularities in the short run[5]. Unlike the Bry-Boschan method, the NBB method does not shift back to the original series in order finally to identify the turning points.

Chart 2 - NBB smoothing method - Industrial confidence indicator for Belgium
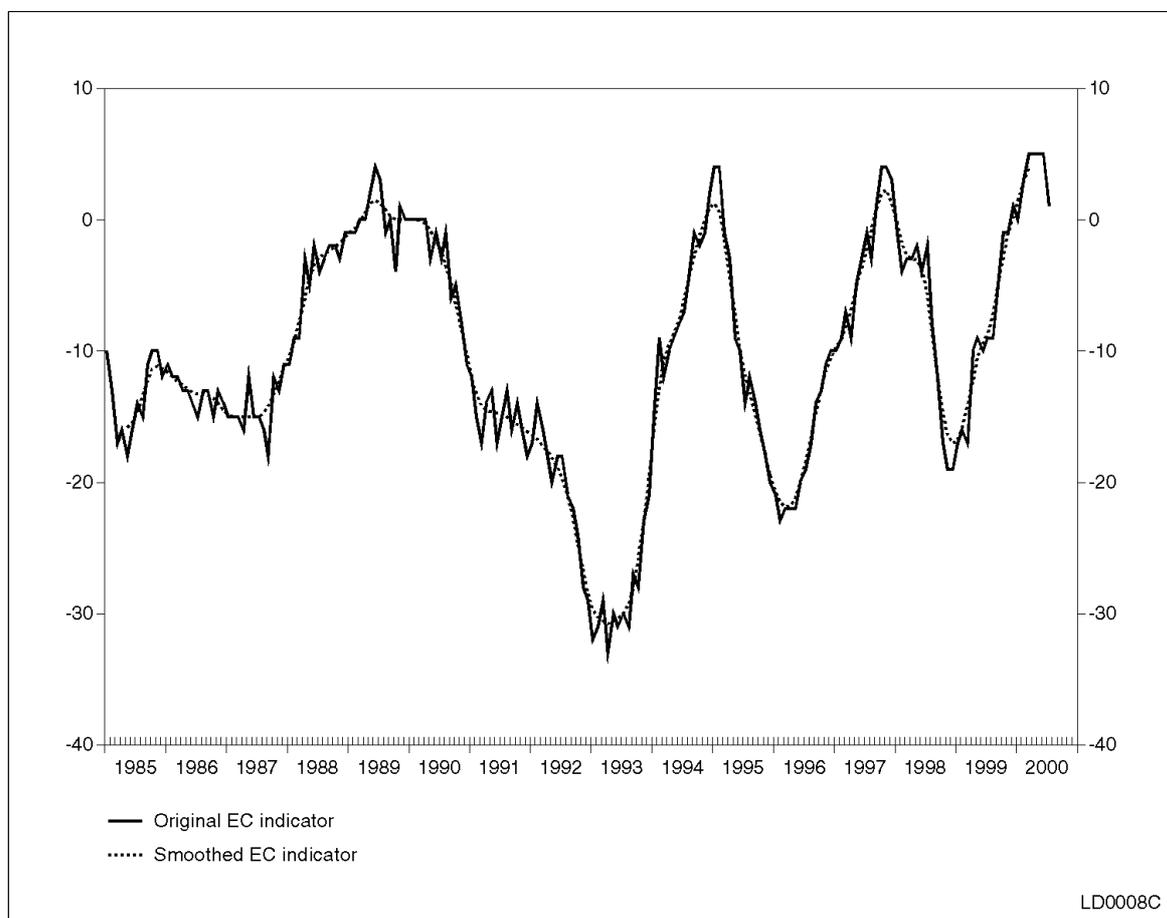
Source: EC; own calculations.

1.2. Testing for leads in the turning points

Comparing the turning points identified in two series is not sufficient for properly assessing the leading nature of one of these series. As the direction or the length of the

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[5]   NBB (1990).

lead may vary from one turning point to the next, we need some method for measuring the statistical significance of leads. However, standard statistical techniques do not apply to this problem, because of the small number of cycles (and thus of turning points) usually covered by the series.

In a paper for the 1999 CIRET Conference, Banerji (2000) presented a non-parametric test for the differences in timing at cyclical turns, applicable to matched pairs of samples. In the so-called Randomization Test, the null hypothesis that the differences are not statistically significant is to be tested against the alternative hypothesis that the leads are significant. The test can be conducted for increasing lead span, giving the confidence level at which the null hypothesis is rejected in favour of the alternative hypothesis that the difference in timing at turns significantly exceeds one, two, ... months, the full set of confidence levels thus resulting in a "lead profile chart", to use Banerji's terminology.

1.3. NBB definition versus EC definition of the Belgian industrial confidence indicator

There are two industrial confidence indicators for Belgium. In addition to the confidence indicator calculated by the EC according to the specification of the joint harmonised EU programme of business and consumer surveys[6] and published in the European Economy Supplement B, the National Bank of Belgium calculates and publishes its own synthetic indicator of confidence in manufacturing industry every month. Actually, both the EC industrial confidence indicator for Belgium and the NBB synthetic indicator are derived from the same business survey, conducted monthly by the Bank with a panel of some 1800 enterprises. The sources of differences between the two series are threefold[7]:

1° the choice of partial indicators (questions) taken into account for calculating the aggregate confidence indicator: the NBB includes eight questions in its synthetic confidence indicator, whereas the EC considers only three questions, namely on production expectations, assessment of order books and assessment of stocks of finished products (with inverted sign);

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[6] European Commission (1997).
[7] The convention for date labelling of the results is another source of difference. The National Bank of Belgium labels as results for the month t-1 the outcomes of the survey concerning the situation in month t-1. This survey is held in the first days of the month t, and published at the end of month t. The European commission labels the same outcomes as results for the month t, with publication at the beginning of t+1. In this paper, the EC's dating method has been applied to the NBB indicator.

2° the methods used for seasonal adjustment;

3° the published series: in addition to the gross synthetic curve, the NBB publishes a series smoothed by the method described in section 1.1.

Chart 3 - Comparison of the NBB and the EC industrial confidence indicators for Belgium
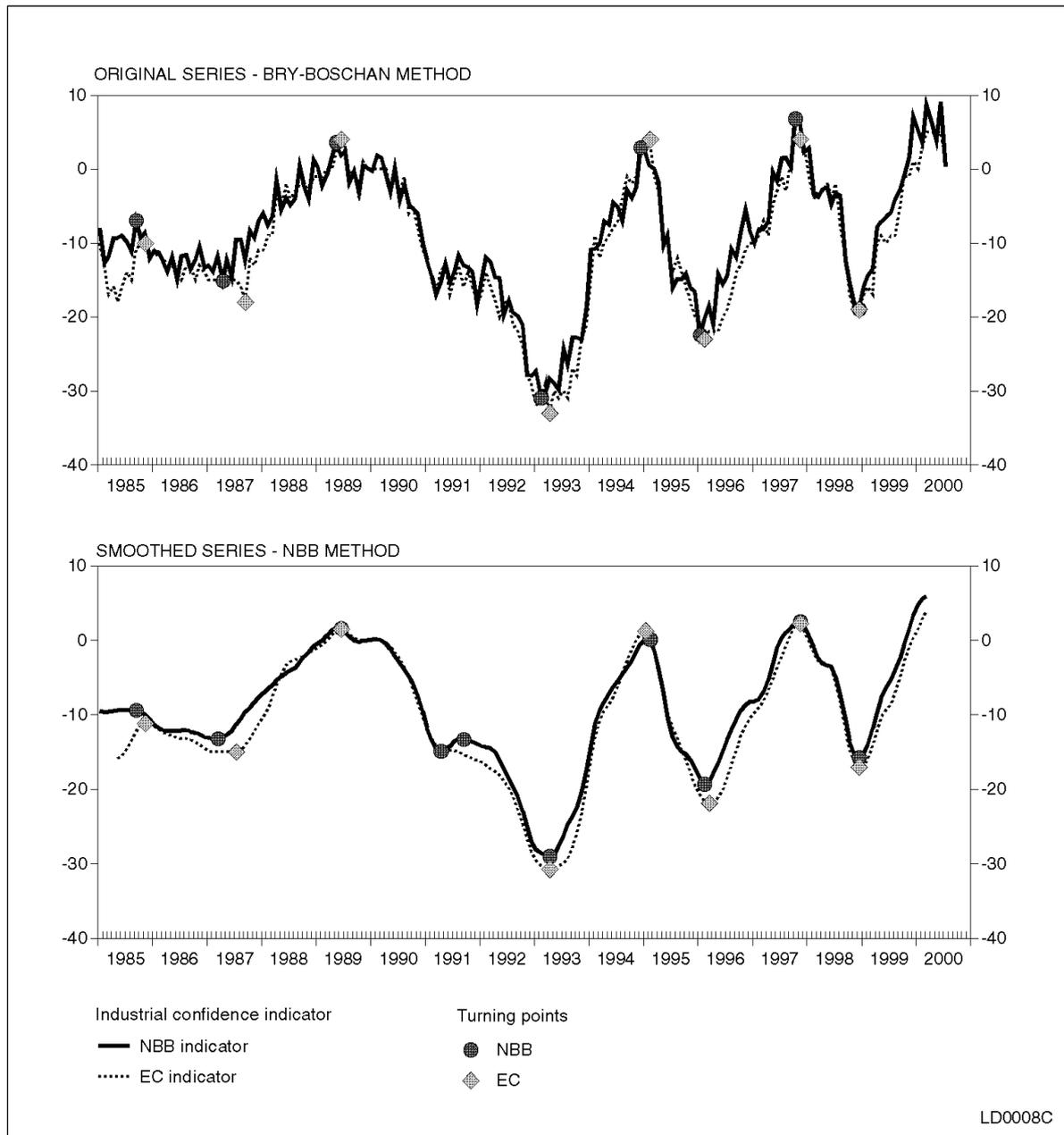
Sources: EC, NBB; own calculations.

Overall, the movements in the NBB synthetic curve and in the EC confidence indicator are very close to each other. The NBB curve seems to reach turning points a little

in advance in the case of the original gross series, but the advance is less than one month in the case of the smoothed series[8].

Among the five different partial indicators included in the NBB's synthetic indicator but not in the EC confidence indicator, it seems that the question concerning the movement of export orders systematically leads[9]. Conversely, the questions concerning the assessment of the export order book and concerning employment expectations lag, while the question about the movement of production and of domestic orders coincides with the global synthetic indicator.

For the sake of comparability with the euro area series, this study focuses on the industrial confidence indicator data for Belgium published by the European Commission. This is probably the series used by the financial markets, too. In any case, if the examination of the timing of turning points in the EC indicator shows a leading nature for Belgium, this conclusion certainly applies for the NBB synthetic curve as well.

1.4. EC industrial confidence indicators for Belgium and the euro area

The timing of the turning points in the EC industrial confidence indicators for Belgium and for the euro area is compared using both the Bry-Boschan and the NBB methods of turning-points identification and applying the Banerji test for timing differences. Chart 4 shows that the cyclical movements of the industrial confidence indicators are very similar in Belgium and in the euro area. In both cases a distinction can be made between two sub-periods: since the beginning of 1993 the business cycles have been pronounced, with a rapid succession of upward and downward phases of large amplitude, while between 1985 and 1992 the cyclical movements were less sharp. In particular, in that period the irregular movements are substantial in the original series for Belgium; they are filtered by the NBB smoothing method.

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[8]   The confidence level for the rejection of the null hypothesis of no leading nature for the NBB indicator is 99% for the original series, but 81% for the smoothed series. The respective confidence levels are 84% and 26% for the null hypothesis of no more than one month lead.

[9]   It would be worthwhile investigating whether the introduction of a question concerning the movement of export orders in the European Commission's harmonised survey, and hence in the calculation of the industrial confidence indicator, would not result in a quicker identification of turning points.

Chart 4 - Industrial confidence indicators in Belgium and in the euro area

BRY-BOSCHAN METHOD

NBB METHOD

Industrial confidence indicator
— Belgium
······ Euro area

Turning points
⬤ Belgium
◆ Euro area

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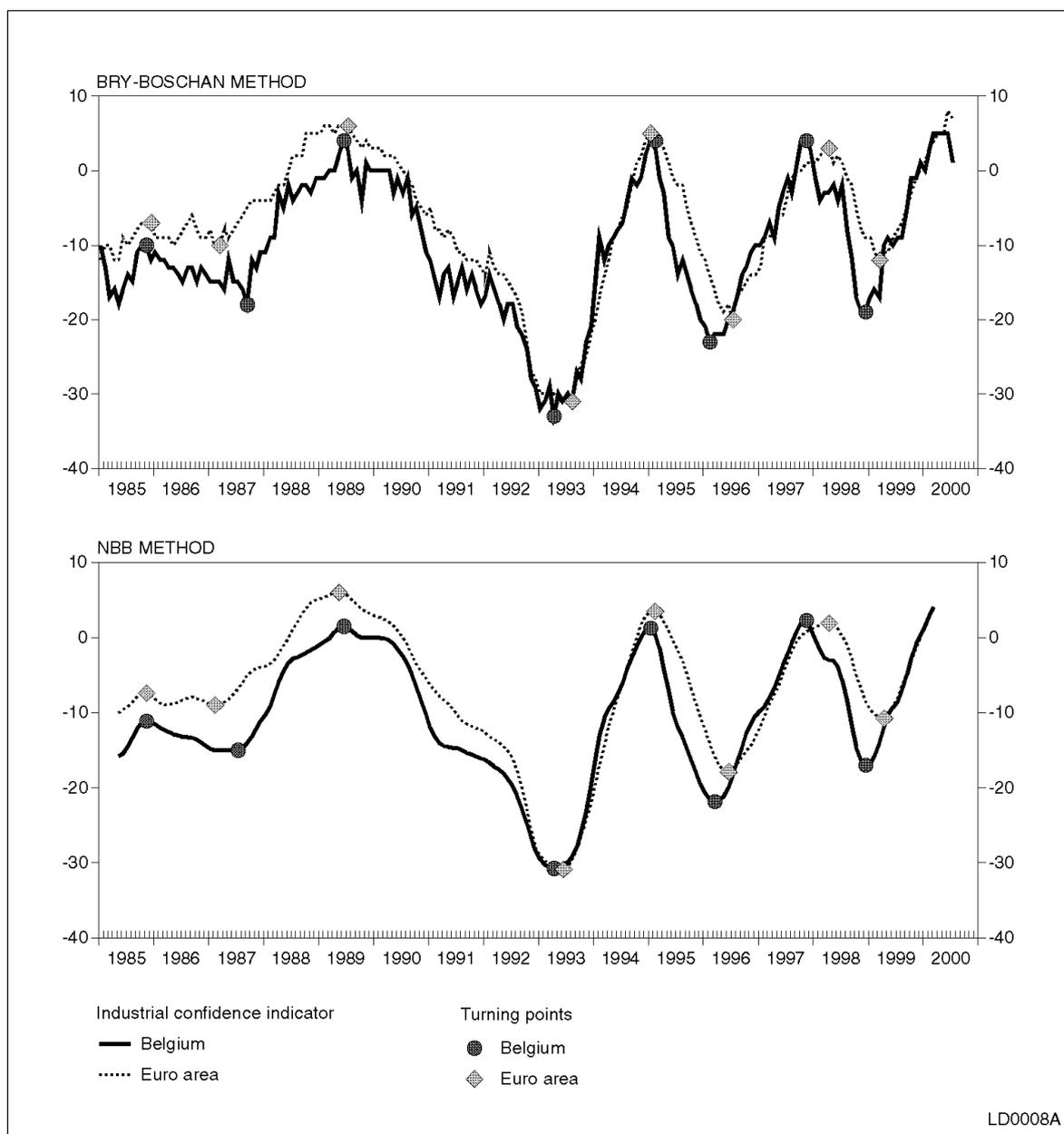
Source: EC; own calculations.

Over the period as a whole both the Bry-Boschan and the NBB procedures identify eight turning points, delimiting four cycles for Belgium and also for the euro area. For each of the economies, the results of both identification methods are quite similar. Comparing the timing of the turning points between Belgium and the euro area, and considering the results of the two methods together, Belgium leads in 11 cases out of 16 and lags in 4. The differences range from -6 to +5 months. Since the beginning of 1993 turning points in Belgium have preceded those in the euro area 9 times out of 10.

**Table 1 - Industrial confidence indicators for Belgium
and the euro area: Turning points**

	Bry-Boschan method			NBB method		
	Belgium	Euro area	Lead (+) / Lag (-)[1]	Belgium	Euro area	Lead (+) / Lag (-)[1]
Peak 1	Nov. 1985	Dec. 1985	1	Nov. 1985	Nov. 1985	0
Trough 1	Sept. 1987	Mar. 1987	-6	July 1987	Feb. 1987	-5
Peak 2	June 1989	July 1989	1	June 1989	May 1989	-1
Trough 2	Apr. 1993	Aug. 1993	4	Apr. 1993	June 1993	2
Peak 3	Feb. 1995	Jan. 1995	-1	Jan. 1995	Feb. 1995	1
Trough 3	Feb. 1996	July 1996	5	Mar. 1996	June 1996	3
Peak 4	Nov. 1997	Apr. 1998	5	Nov. 1997	Apr. 1998	5
Trough 4	Dec. 1998	Mar. 1999	3	Dec. 1998	Apr. 1999	4

Source: EC; own calculations.
1.   Lead (+) or lag (-) of the Belgian turning points, in months.

According to the Randomization Test, the confidence level for the rejection of the null hypothesis of no leading nature for the industrial confidence indicator for Belgium is around 80% for the whole period 1985-2000[10], but above 90% for the period 1993-2000.

**Table 2 - Test for the leading nature of the Belgian industrial
confidence indicator**

	Period 1985-2000	Period 1993-2000
Bry-Boschan method	83.2%	93.8%
NBB method	79.7%	96.9%

Source: EC; own calculations.

From the lead profile chart giving the respective confidence levels for the rejection of the null hypothesis of no leading nature for increasing timing differences, it appears that the confidence level decreases rapidly in the case of the period 1985-2000. For the period from 1993 to 2000 it remains above 90% for a difference of one month and close to 80% for a difference of two months. Lead profile charts show the confidence level in terms of different durations of lead. In Chart 5 this implies, for instance, that for the period 1993-2000, using the Bry-Boschan method, the null hypothesis of no leading nature can be rejected at a confidence level of 93.8%, the null hypothesis of a lead of at most 1 month can be rejected at a confidence level of 90.6%, the null hypothesis of a lead of at most 2 months can be rejected at a confidence level of 78.1%, etc.

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[10]   For the period 1985-2000, the hypothesis of a lag of at least one month is rejected with a confidence level above 90%.

**Chart 5 - Industrial confidence indicator: Lead profile of Belgium
in relation to the euro area[1]**

PERIOD 1985 - 2000 — Bry-Boschan method, NBB method

PERIOD 1993 - 2000 — Bry-Boschan method, NBB method

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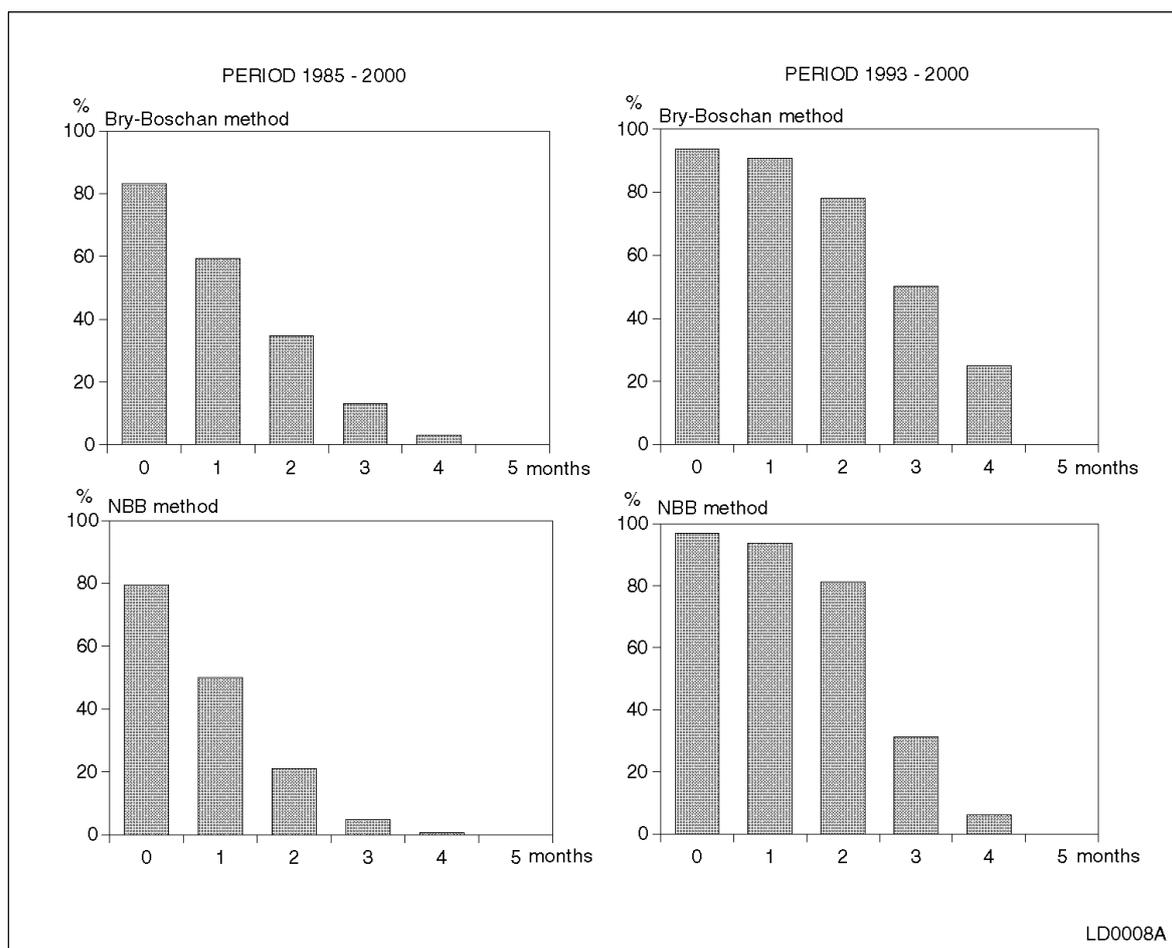
Source: EC; own calculations.
1. The chart shows the confidence level for different durations of lead, i.e. the probability that the null hypothesis of no lead can be rejected for the indicated number of months.

Confirming financial market sentiment, this first part has shown that since 1993 the turning points in the industrial confidence indicator for Belgium have significantly preceded those for the euro area with a difference usually larger than one month. The leading nature of the indicator for Belgium was far less pronounced, or even absent, before 1993. The reasons why the leading nature of the Belgian indicator was less pronounced before 1993 have not been investigated so far. Some structural changes may have occurred within the Belgian economy - for example in enterprises' stocking behaviour or in labour market flexibility, after the severe economic downturn of 1993 - or at euro area level, for instance the reunification of Germany.

As the industrial confidence indicator is composed of three questions, i.e. the assessment of order books, the assessment of stocks of finished products and

expectations concerning production, the leading nature of the Belgian business indicator might actually be attributable to a sharply leading nature in one or two of the three questions considered, while the other question(s) have (has) no leading properties.

According to the data, however, and especially during the most recent period, Belgium seems, for all of the three questions, to lead in relation to the corresponding questions for the euro area as a whole, although the rejection of the null hypothesis of no leading nature is somewhat less pronounced for the question on production expectations.

Chart 6 - Industrial confidence indicators in Belgium and in the

euro area: Breakdown by question

(Period 1993-2000)
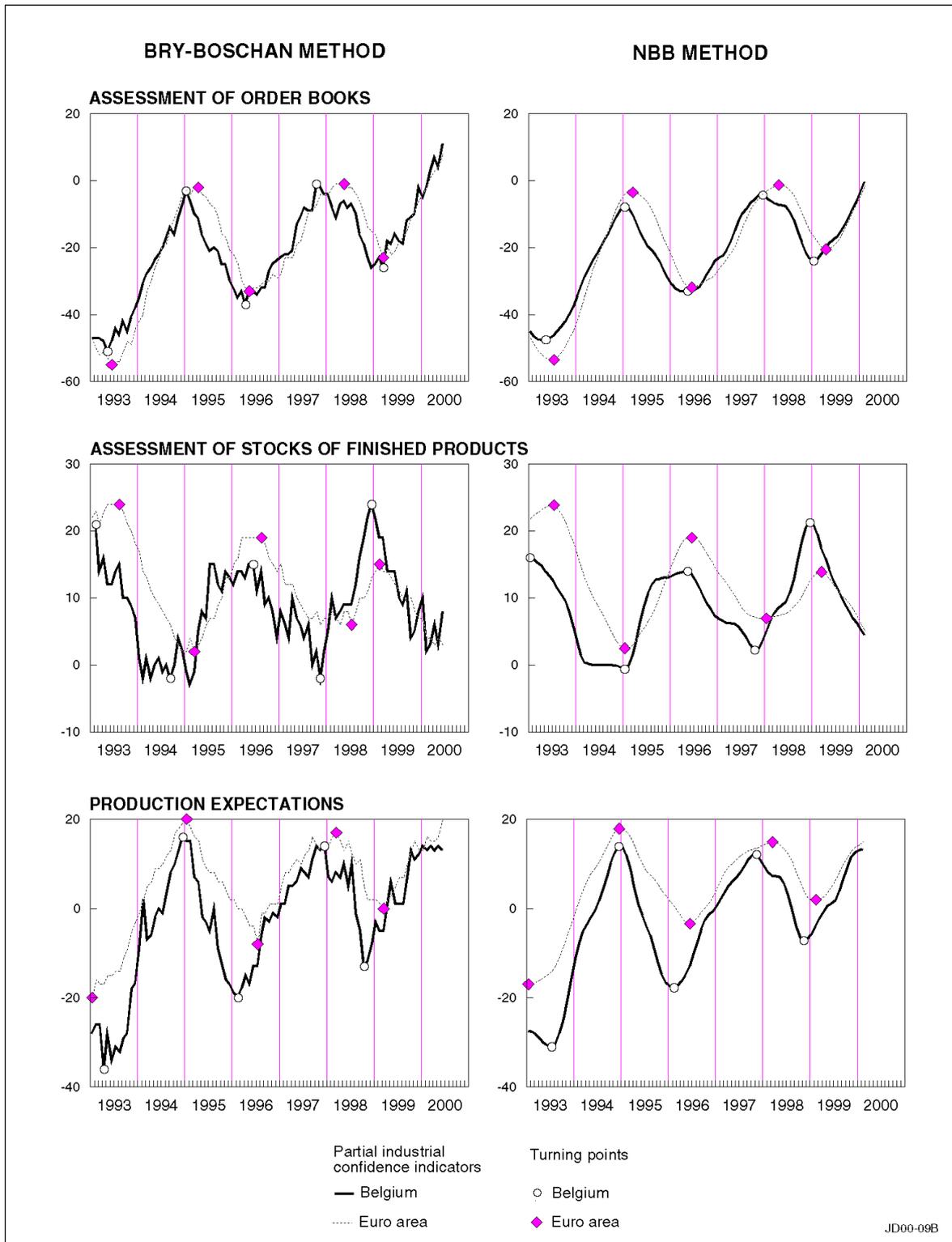
Source: EC; own calculations.

Chart 7 - Industrial confidence indicators - Breakdown by question:
Lead profile of Belgium in relation to the euro area
(Period 1993-2000)
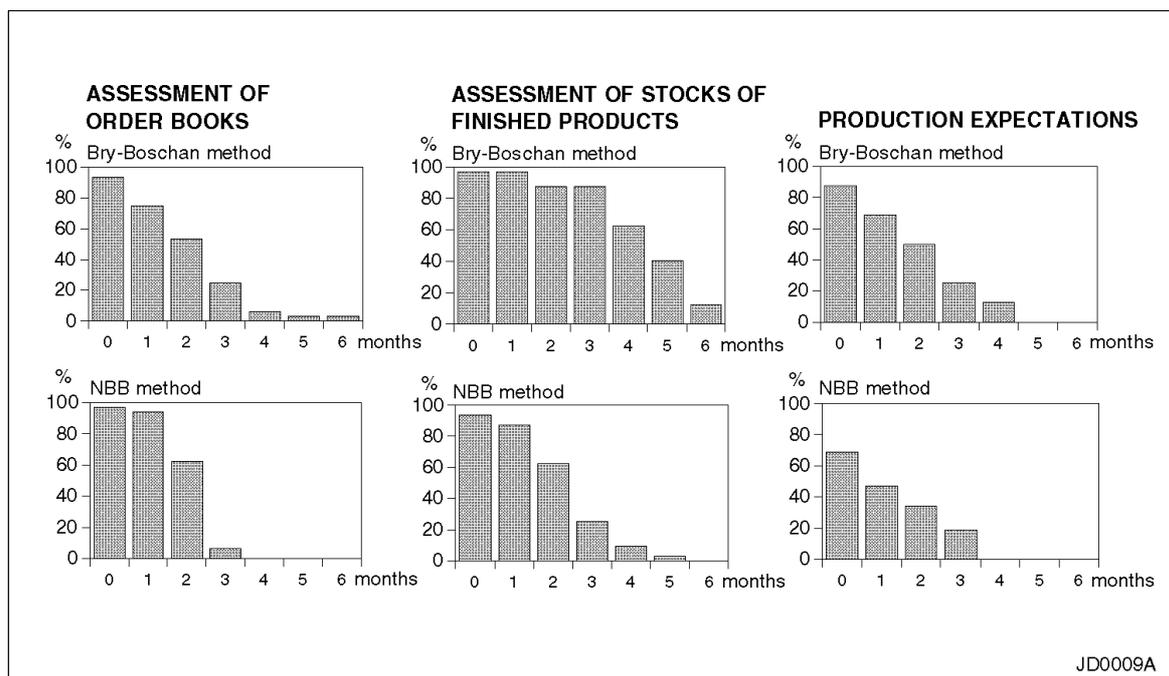
Source: EC, own calculations.

It should be stressed that the leading nature of the Belgian indicators in relation to the euro area holds good only for timing differences in the turning points. Other methods employed in business cycle research, such as correlation analysis, structural VAR, causality tests or unobserved component methods consider the entire time series. It is important to bear in mind the difference in starting point when comparing the results obtained by one method or another. Preliminary research conducted at the NBB, using the Granger causality test and the SVAR approach, does not find any evidence that the Belgian industrial confidence indicator helps to explain the euro area indicator. However, these findings are not necessarily incompatible. Even if the Belgian indicator does not help to explain the euro area indicator, it is still interesting to know that turning points in Belgium usually precede turning points at euro area level.

2. <u>COMPARISON OF THE BUSINESS CYCLES</u>

The leading nature of the industrial confidence indicator for Belgium in relation to the same indicator for the euro area might simply be due to the fact that the turning points in the business cycle movements of activity in Belgium are also ahead of those in the euro area.

In the absence of an official, widely agreed dating of the business cycles for Belgium[11] and for the euro area, three variables have been used as reference for the business cycle, namely real GDP, the index of industrial production and the degree of utilisation of production capacity in the manufacturing industry. The choice of the reference variables was restricted by the limited availability of sufficiently long detailed statistics for the euro area. In particular, the value added of manufacturing industry would have been a candidate if it had been available.

Applying the growth cycle definition[12], the turning points have been identified in the deviations from the trend for the different reference series. The trends have been calculated using the Hodrick-Prescott filter, with standard value for λ.

The whole period 1985-2000 has been considered, as well as the sub-period 1993-2000.

2.1. Turning points in the deviation from the GDP trend

The movements of the deviation from GDP trend are quite similar in Belgium and in the euro area. In both cases, nine turning points are identified by the Bry-Boschan procedure[13] over the period from 1985 to the first quarter of 2000, delimiting four complete cycles. However, both in Belgium and in the euro area, the cycle with a peak in the first quarter of 1990 and a trough in the first quarter of 1991 should be regarded as minor: the amplitude of the movement during this cycle is far smaller than during the other cycles,

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[11] For alternative dating of the business cycle in Belgium, see Lebrun (1999), OECD (1998) or Bodart and Candelon (1999).
[12] Niemira and Klein (1995), p.6.
[13] The NBB procedure is not suitable for quarterly data.

and the actual value of GDP remained above the trend value throughout the cycle, even in the trough.

Chart 8 - GDP deviation from trend and turning points in Belgium and in the euro area
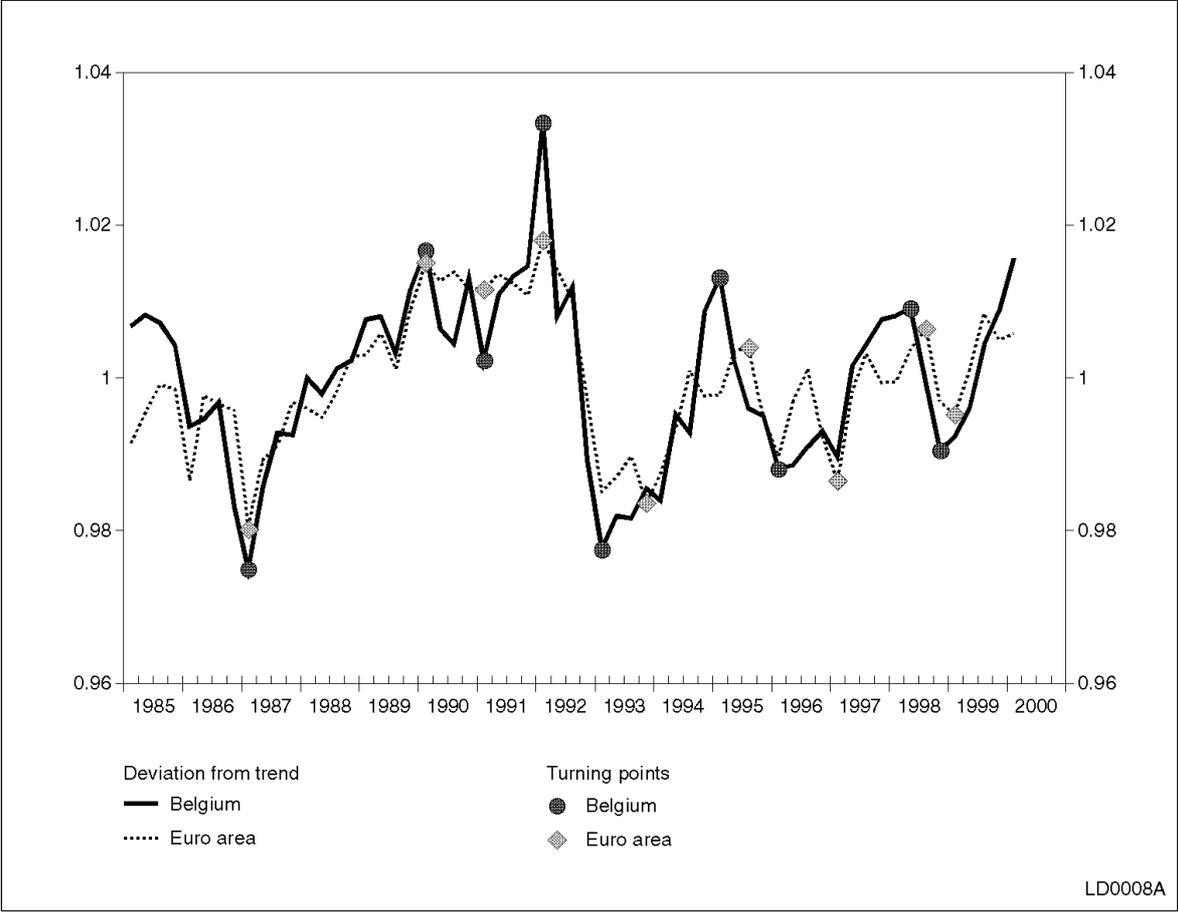
Sources: ECB, Eurostat; own calculations.

Looking at the difference between Belgium and the euro area in the timing of the turning points, the same sub-periods as before can be distinguished: during the period from the first quarter of 1985 to the fourth quarter of 1992, the turning points coincided exactly in both series, but since the first quarter of 1993, the turning points in the Belgian series of deviation from trend GDP systematically lead those in the euro area series.

**Table 3 - GDP deviation from trend in Belgium and in the
euro area: Turning points**

Turning points	Belgium	Euro area	Lead (+) / Lag (-)[1]
Peak 1			
Trough 1	1987 Q1	1987 Q1	0
Peak 2	*1990 Q1*	*1990 Q1*	*0*
Trough 2	*1991 Q1*	*1991 Q1*	*0*
Peak 3	1992 Q1	1992 Q1	0
Trough 3	1993 Q1	1993 Q4	3
Peak 4	1995 Q1	1995 Q3	2
Trough 4	1996 Q1	1997 Q1	4
Peak 5	1998 Q2	1998 Q3	1
Trough 5	1998 Q4	1999 Q1	1

Sources: ECB, Eurostat; own calculations.
1. Lead (+) or lag (-) of the Belgian turning points, in quarters.

As a matter of fact, the period of lead between Belgium and the euro area is longer for the deviation from trend GDP than for the industrial confidence indicator. From 1993 onwards Belgium's lead ranges from 1 quarter to 4 quarters for GDP, against a lead of -1 to 5 months for the confidence indicator.

The null hypothesis of no timing difference can be rejected at a confidence level of 97% both for the period 1985-2000 and for the period 1993-2000.

**Chart 9 - GDP deviation from trend: Lead profile of Belgium
in relation to the euro area**
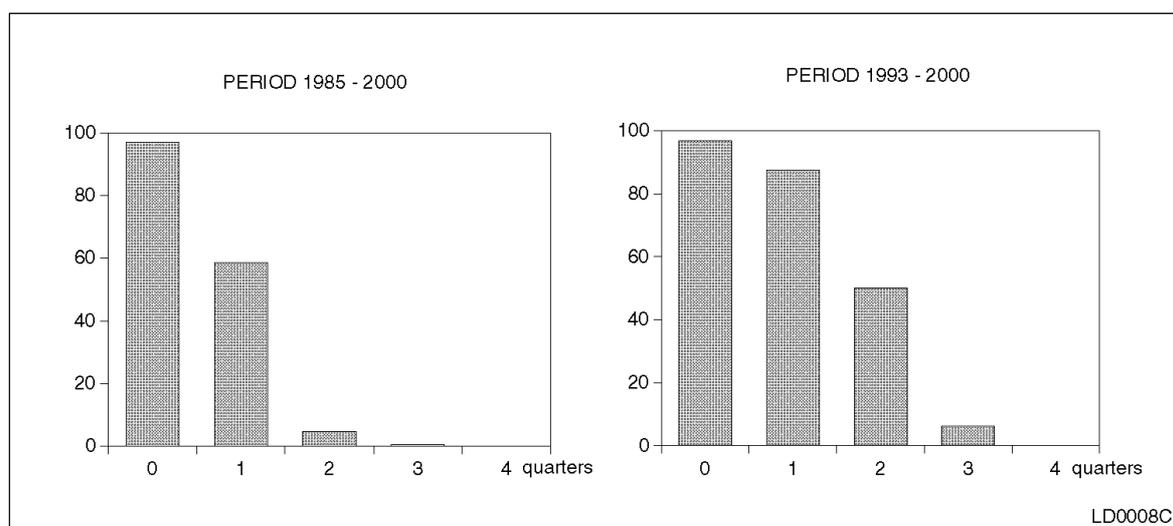
Sources: ECB, Eurostat; own calculations.

2.2. Industrial production

For different reasons, the industrial production index can be helpful for assessing the business cycle situation of Belgium and the euro area. First, its coverage of branches corresponds to the coverage of the industrial confidence indicator. Second, it is a monthly measure of the volume of activity. Moreover, indices of this kind are used for reference by the OECD.

Unfortunately, the deviation from trend of the industrial production indices exhibits a high degree of volatility, at least in the case of Belgium. Even after application of the NBB smoothing technique, the movements of the series and the dating of the turning points differ appreciably between Belgium and the euro area during the period 1985 to 1992. Since 1993 the business cycles have been more similar, but without any systematic leading nature for either of the series in terms of the timing of the turning points.

**Chart 10 - Industrial production: Deviation from trend and
turning points in Belgium and in the euro area**

BRY-BOSCHAN METHOD

NBB METHOD

Deviation from trend

— Belgium

······ Euro area

Turning points

● Belgium

◆ Euro area

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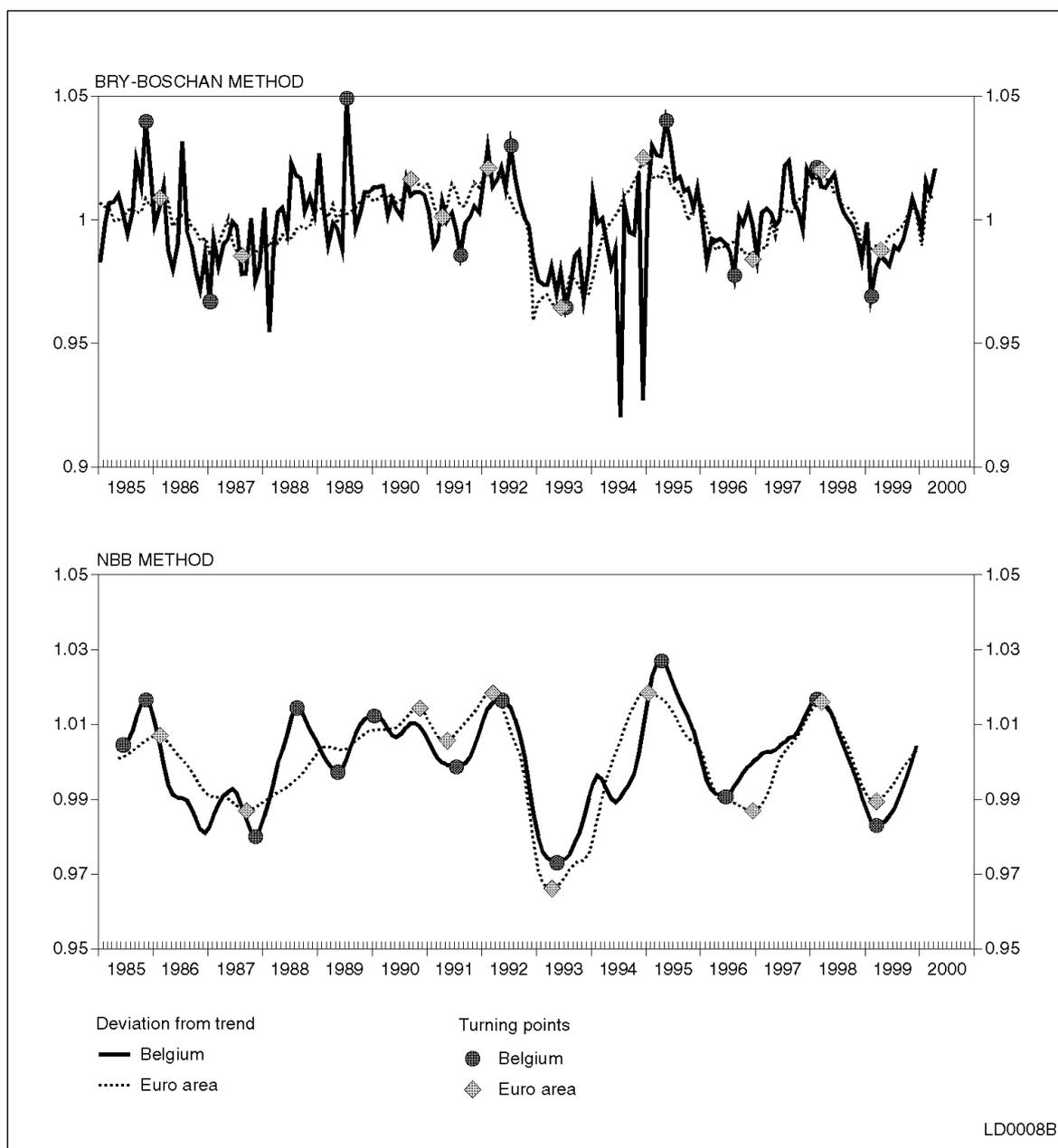
Source: OECD; own calculations.

**Table 4 - Industrial production: Deviation from trend in Belgium
and in the euro area: Turning points**

Turning points	Bry-Boschan method			NBB method		
	Belgium	Euro area	Lead (+) / Lag (-)[1]	Belgium	Euro area	Lead (+) / Lag (-)[1]
Peak 1	Nov. 1985	Feb. 1986	3	Nov. 1985	Feb. 1986	3
Trough 1	Jan. 1987	Aug. 1987	7	Nov. 1987	Sept. 1987	-2
				Aug. 1988[2]		
				May 1989[2]		
Peak 2	July 1989	Sept. 1990	14	Jan. 1990	Nov. 1990	10
Trough 2	Aug. 1991	Apr. 1991	-4	July 1991	May 1991	-2
Peak 3	July 1992	Feb. 1992	-5	May 1992	Mar. 1992	-2
Trough 3	July 1993	June 1993	-1	May 1993	Apr. 1993	-1
Peak 4	May 1995	Dec. 1994	-5	Apr. 1995	Jan. 1995	-3
Trough 4	Aug. 1996	Dec. 1996	4	June 1996	Dec. 1996	6
Peak 5	Feb. 1998	Mar. 1998	1	Feb. 1998	Mar. 1998	1
Trough 5	Feb. 1999	Apr. 1999	1	Mar. 1999	Mar. 1999	0

Source: OECD; own calculations.
1. Lead (+) or lag (-) of the Belgian turning points, in months.
2. Turning points not included in the comparison.

**Table 5: Test for the leading nature of the deviation from
trend of Belgian industrial production**

	Period 1985-2000	Period 1993-2000
Bry-Boschan method	76.2%	50.0%
NBB method	72.9%	56.3%

Source: OECD; own calculations.

Chart 11 - Industrial production: Deviation from trend:
Lead profile of Belgium in relation to the euro area

PERIOD 1985 - 2000   PERIOD 1993 - 2000

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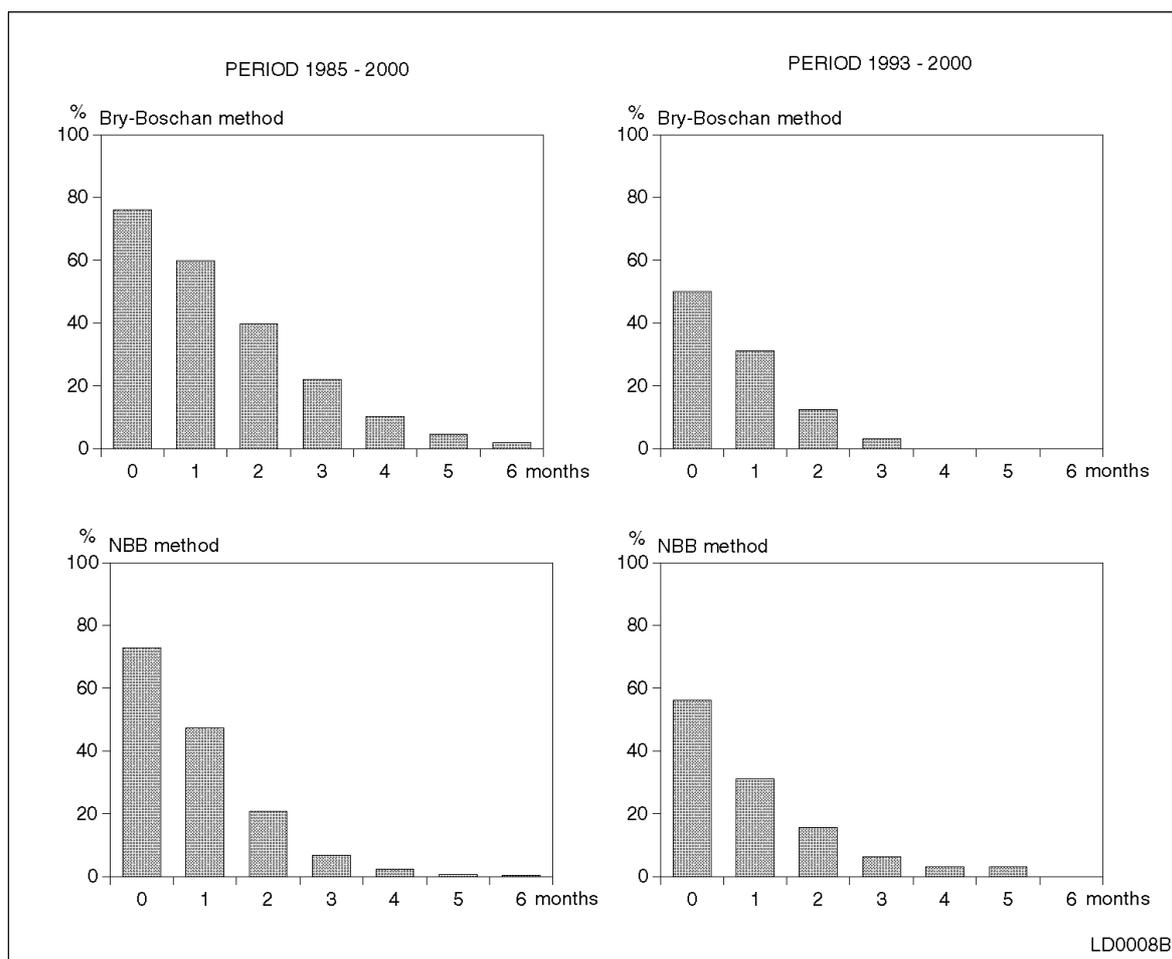
Source: OECD; own calculations.

2.3. Degree of utilisation of production capacity in manufacturing industry

Within the framework of the harmonised EU programme of business surveys, heads of enterprises in manufacturing industry are asked to report every three months the level of their capacity utilisation, expressed as a percentage of total capacity. Even if it is usually agreed that the movements in the degree of utilisation mainly reflect short-term demand fluctuations and that the level should be stable across the business cycle, it seems that some structural factors tend to raise it in Belgium[14]. Therefore, the degree of utilisation of production capacity series has been detrended.

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[14] See Vanhaelen and Dresse (2000).

Chart 12 - Deviation from trend in degree of utilisation of production capacity and turning points in Belgium and in the euro area

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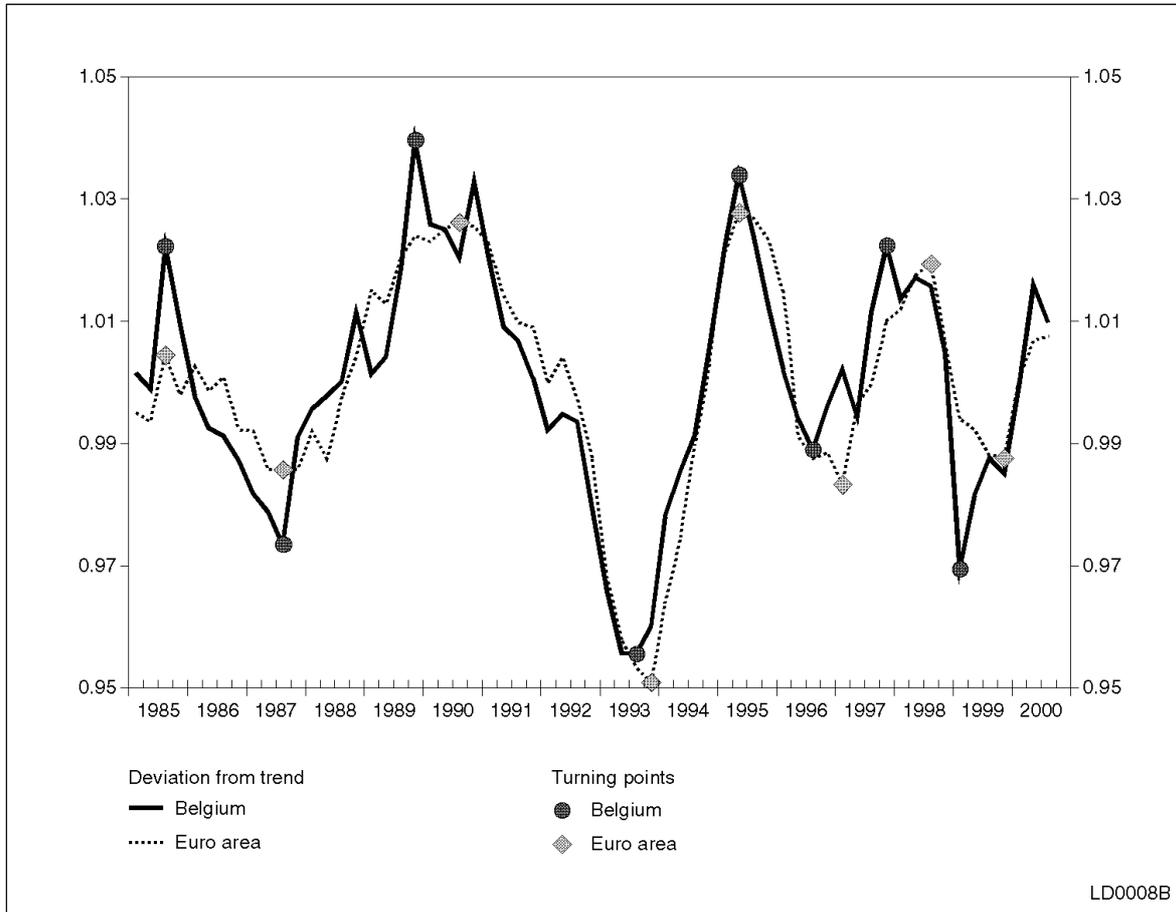
Source: EC; own calculations.

Over the period 1985 to mid-2000, turning points in the degree of utilisation of production capacity in Belgium coincided with those of the euro area on three occasions and were leading in five cases, the maximum difference being three quarters.

**Table 6 - Deviation from trend in degree of utilisation
of production capacity: Turning points**

Turning points	Belgium	Euro area	Lead (+) / Lag (-)[1]
Peak 1	1985 Q3	1985 Q3	0
Trough 1	1987 Q3	1987 Q3	0
Peak 2	1989 Q4	1990 Q3	3
Trough 2	1993 Q3	1993 Q4	1
Peak 3	1995 Q2	1995 Q2	0
Trough 3	1996 Q3	1997 Q1	2
Peak 4	1997 Q4	1998 Q3	3
Trough 4	1999 Q1	1999 Q4	3

Source: EC; own calculations.
1. Lead (+) or lag (-) of the Belgian turning points, in quarters.

Unlike in the case of the industrial confidence indicators or the deviation from GDP trend, the lead profile for the degree of utilisation is comparable for the period 1985 to 2000 and for the period since 1993. In both cases the confidence level for rejection of the hypothesis of no lead is above 90%, and around 80% for a difference of one quarter.

**Chart 13 - Deviation from trend in degree of utilisation
of production capacity: Lead profile of Belgium
in relation to the euro area**
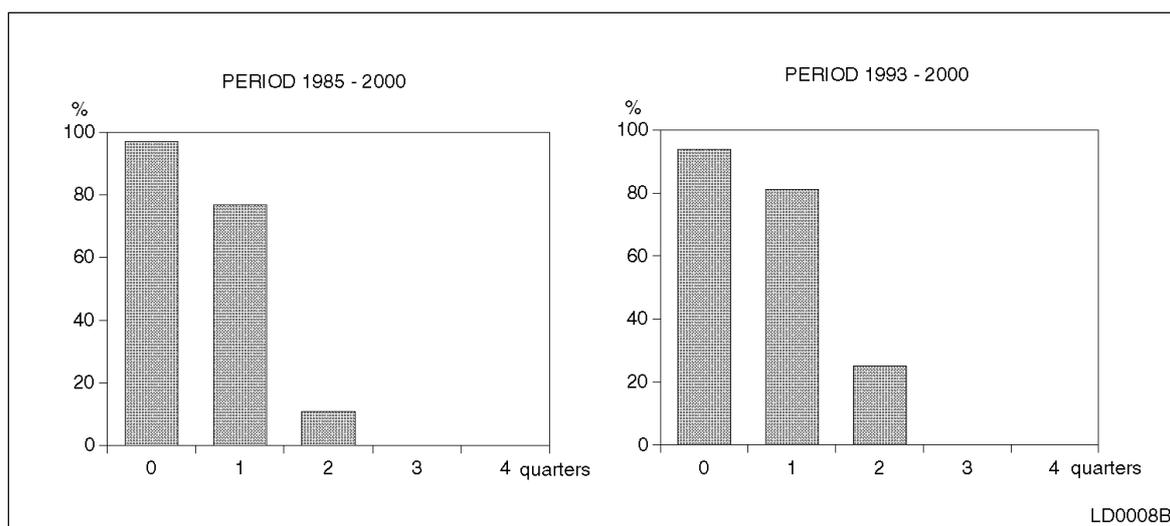
Source: EC; own calculations.

3. A MORE DETAILED ANALYSIS

Structural features might explain the leading nature of the Belgian economy in relation to the euro area. In this connection we have tried to investigate some possible explanations. The Belgian economy is characterised by a relative specialisation in intermediate goods, by its openness and by the importance of small and medium-sized enterprises.

In the absence of harmonised and internationally comparable statistics providing reliable information and data on structural features of the economies, an alternative way of looking for an explanation of the leading nature of the Belgian business cycle is to investigate the business survey data in greater detail.

In this section we concentrate on the period 1993-2000, as this is the period during which the Belgian industrial confidence indicator led that of the euro area.
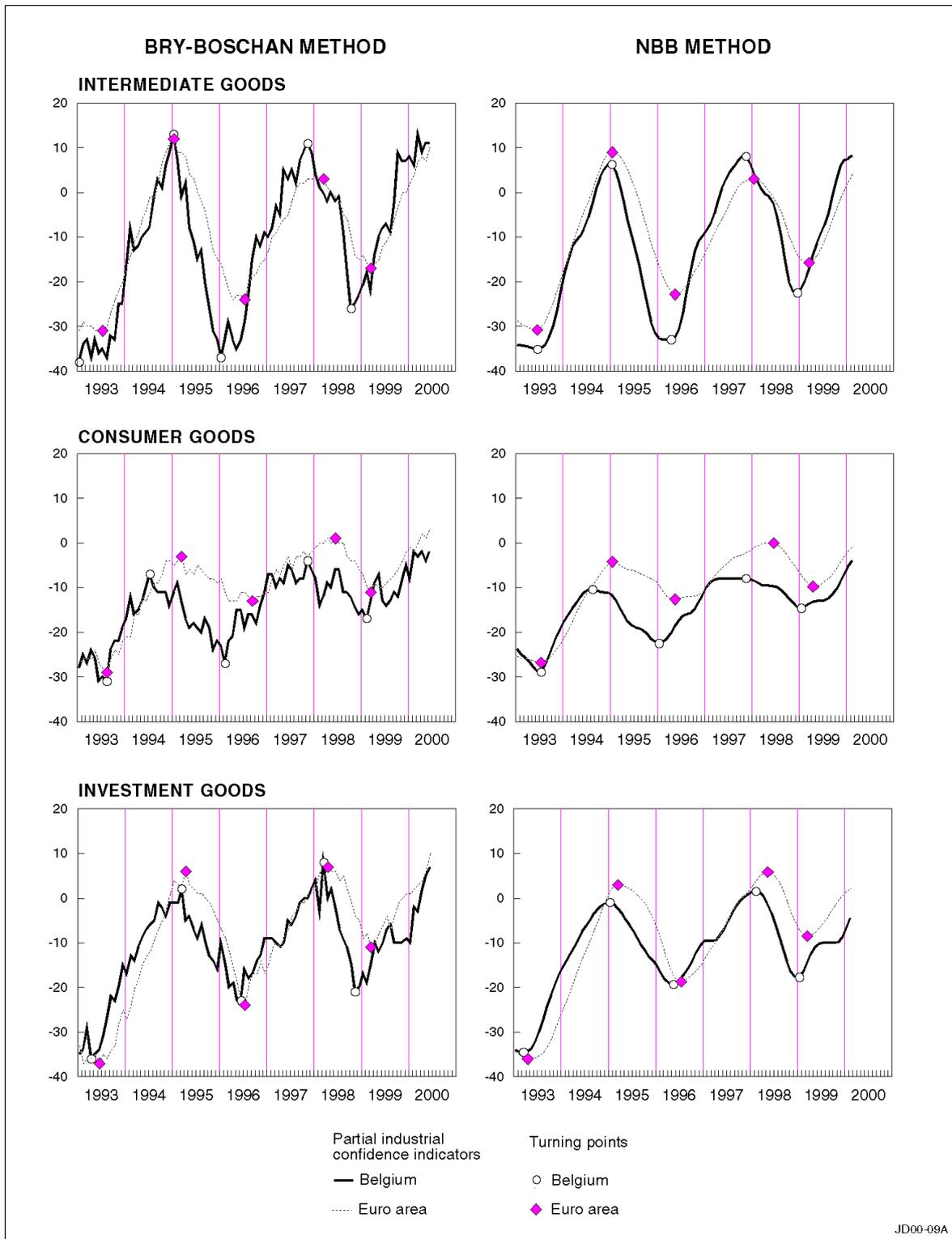
3.1. Breakdown by sector

An explanation often put forward is that the product structure of the Belgian economy, i.e. a presumed relative specialisation in intermediate goods, explains at least part of its leading nature. As intermediate goods, being an input for other production activities, constitute the goods category which is affected first by impending upswings or downturns, a relative specialisation in this kind of product could possibly explain a tendency to lead. For this assumption to be the main explaining factor, it would be necessary for the turning points of the Belgian business indicators at more detailed levels not to be significantly ahead of the turning points of the corresponding indicators for the euro area as a whole, which would mean that the leading nature at the aggregated level would be due to different weights of the different sectors in Belgium and in the euro area.

The investigation to determine whether Belgium is also in the lead at more detailed levels of production was carried out for intermediate, consumer and investment goods[15].

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[15]   Data are available to enable the same to be done at more detailed levels, but the different curves become much more volatile, and the risk of arriving at the wrong conclusions becomes very great.

# Chart 14 - Industrial confidence indicators in Belgium
and in the euro area: Breakdown by sectors
(Period 1993-2000)

BRY-BOSCHAN METHOD

NBB METHOD

INTERMEDIATE GOODS

CONSUMER GOODS

INVESTMENT GOODS

Partial industrial
confidence indicators

— Belgium

----- Euro area

Turning points

○ Belgium

◆ Euro area

JD00-09A

Source: EC; own calculations.

It appears from the lead profile chart that in most cases the null hypothesis of no leading nature of the turning points in Belgium can be rejected at a confidence level above 90%. Only in the case of the turning points for the intermediate goods, identified by using the NBB method, the confidence level for rejection of the no lead hypothesis is below 90%, and is around 50% for a lead by one month. All in all, this suggests that the Belgian product structure is not sufficient to explain the leading nature of Belgian economic activity.

Chart 15 - Industrial confidence indicators - Breakdown by sectors:
Lead profile of Belgium in relation to the euro area
(Period 1993-2000)
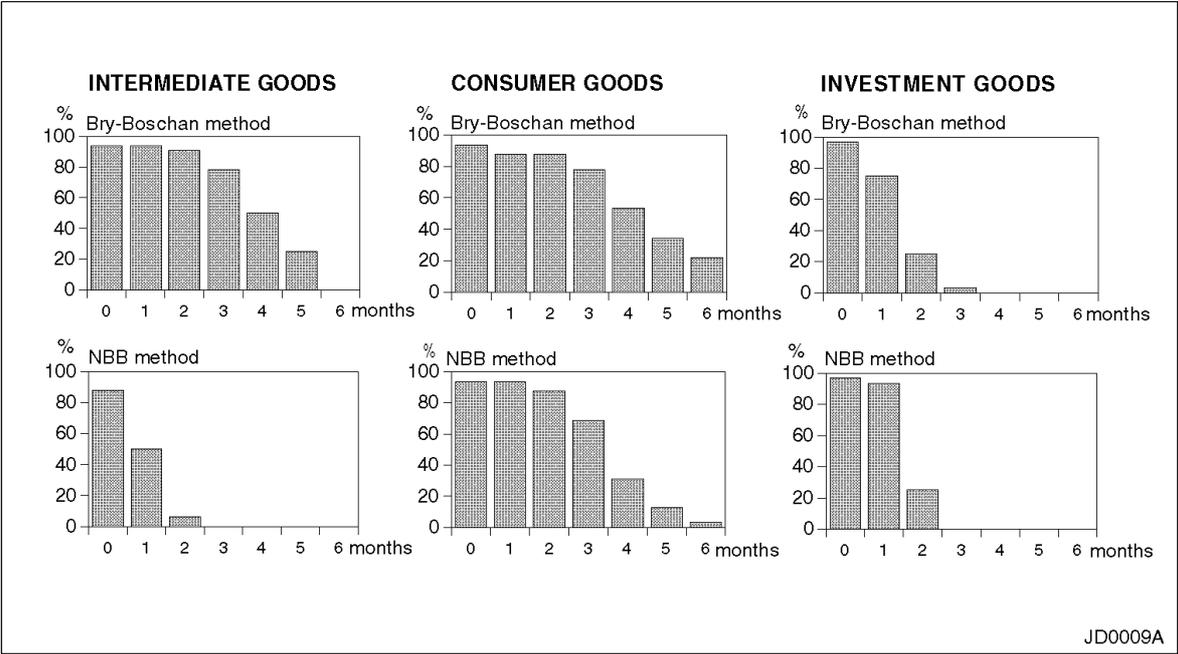
Source: EC; own calculations.

3.2. Breakdown into export-oriented and other companies

As Belgium's economy is characterised by a high degree of openness, the leading nature of Belgian activity could be due to its being more sensitive to economic developments abroad. In order to test this hypothesis, in the absence of euro area data, the Belgian manufacturing sector was broken down into two sub-sectors: export-oriented companies, defined as companies which achieve at least 50% of their turnover abroad, and other companies. If this hypothesis were correct, one could expect that the turning points of the business indicator for the former group of companies would significantly lead those of the indicator for other companies.

Chart 16 - Industrial confidence indicators in Belgium:
Breakdown into export-oriented and other companies
(Period 1993-2000)
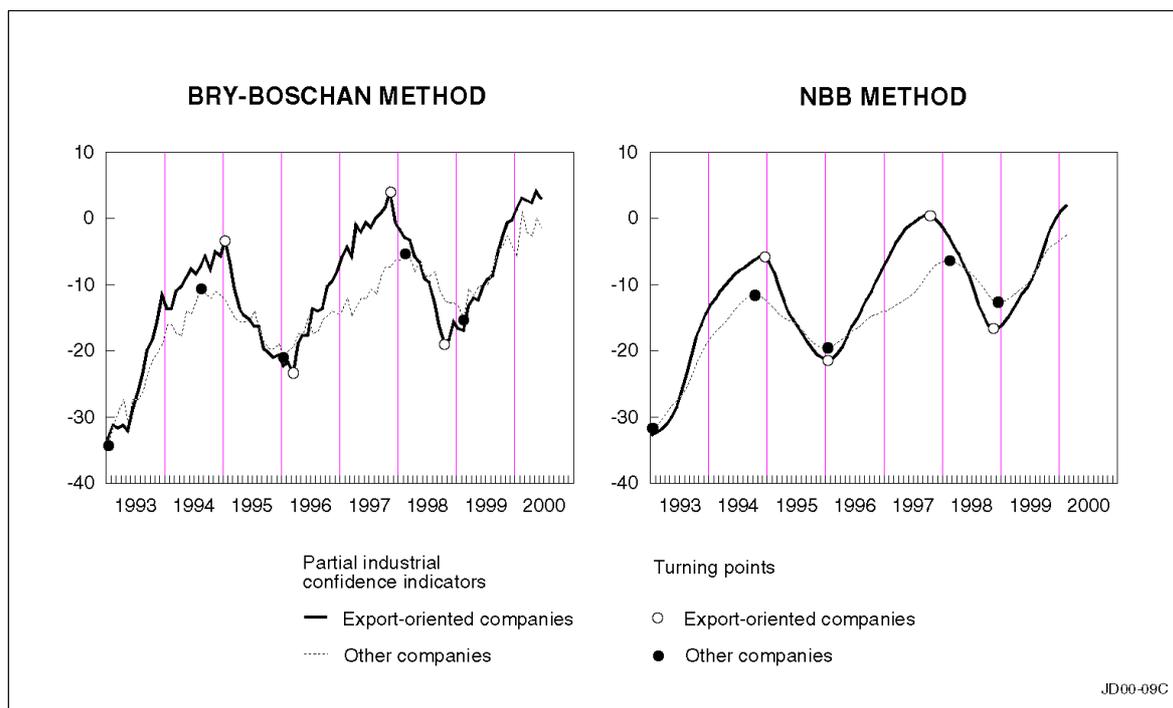
Source: NBB.

It is apparent from the charts that this was not the case. The assumption that the leading nature of Belgian activity is attributable to the economy's relative degree of openness is not supported by the data available in Belgium. However, it could be that the respective behaviour of export oriented companies and other companies exhibits more differences in the euro area than in Belgium.

**Chart 17 - Industrial confidence indicators - Breakdown into export-oriented
and other companies: Lead profile of export oriented companies
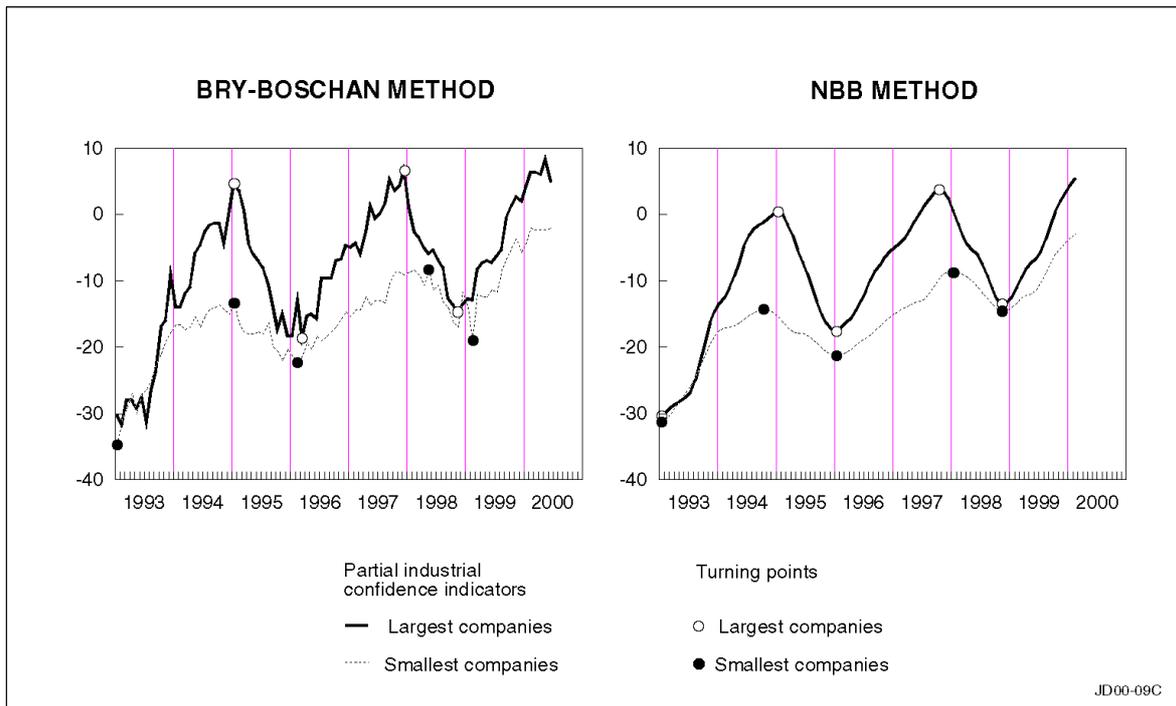in relation to other companies**
(Period 1993-2000)
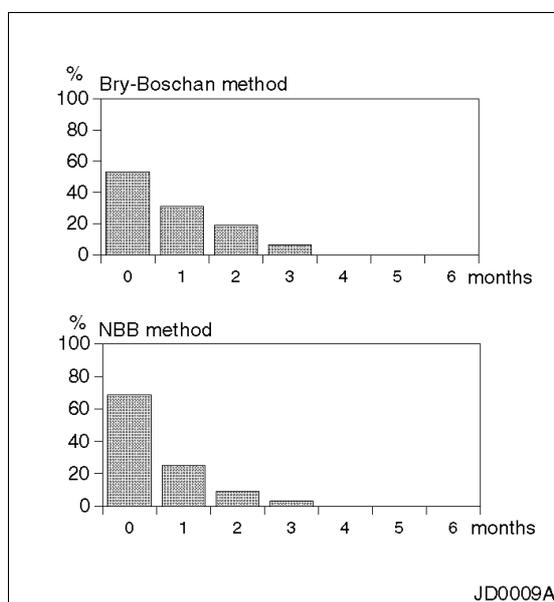
Source: NBB.

3.3. Breakdown into large and small companies

A third possible explanation is based on the fact that production in Belgium takes place to a large extent in small and medium-sized enterprises. Although no figures are available concerning the importance of this sector in other countries, a different composition as regards the size of companies could explain a leading position occupied by Belgium. The reasoning is that the managers of smaller companies are more closely involved with real production activities in the enterprise, and that they therefore indicate changes in activity earlier in their replies to the questions of the business surveys. If this is so, the turning points of the business indicator for small companies should lead those of the large companies. For this reason, all companies participating in the Belgian business surveys in the manufacturing sector were subdivided into four size groups, based on turnover. In order to test the hypothesis, the largest and smallest groups were compared.

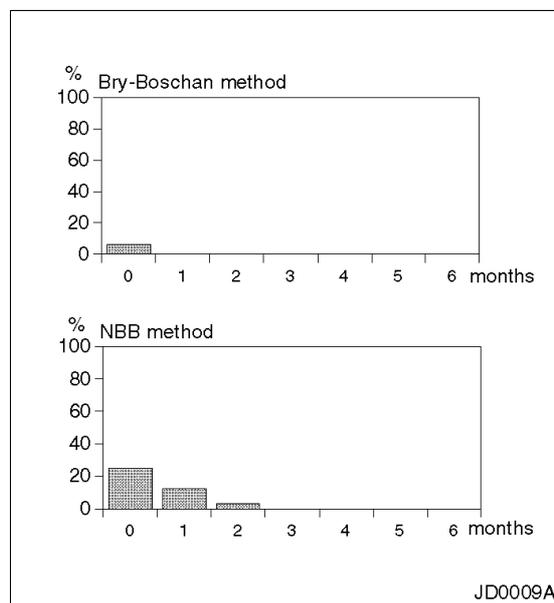**Chart 18 - Industrial confidence indicators in Belgium: Breakdown into large
and small companies**
(Period 1993-2000)

Source: NBB.

According to the data, there is no evidence of a significant lead in the timing of the turning points of small companies in relation to large ones. Thus, possible explanations referring to the relative importance of small and medium-sized enterprises are not confirmed by the data.

**Chart 19 - Industrial confidence indicators - Breakdown into large
and small companies: Lead profile of the smallest companies
in relation to the largest companies**
(Period 1993-2000)

Source: NBB.

4. <u>CONCLUSIONS</u>

The international press has recently reported on the widely-held view in the financial markets that the movement of the Belgian industrial confidence indicator might precede the euro area business cycles. The initial purpose of this paper was to assess whether this market perception is more than a simple optical illusion, resulting from the inspection of graphical representations of the data. In the first part, the timing of turning points in the industrial confidence indicators for Belgium and for the euro area has been identified using two alternative methods: the Bry-Boschan method and the NBB method, which is based on a combined median moving average smoothing of the series. Applying the Randomization Test and the lead profile of the significance of the differences in timing, proposed by Banerji, we conclude that the turning points in Belgium do in fact significantly lead turning points in the euro area from 1993 onwards.

The leading nature of the Belgian industrial confidence indicator is not really surprising, as changes in the business cycle stages in Belgium seem to have been ahead of changes in the euro area during the period from 1985 to the first quarter of 2000. Among the three different reference series used to compare the business cycle movements in Belgium and in the euro area, the null hypothesis that turning points in Belgium do not lead those in the euro area is rejected at a confidence level above 90 p.c. in the case of GDP and of the degree of utilisation of production capacity in manufacturing industry. The leading nature is more pronounced for the sub-period beginning with the first quarter of 1993, especially in the case of GDP. However, the comparison of the movements of the industrial production indices does not confirm these conclusions.

At this point it would have been interesting to look for the causes of this leading nature for Belgium using value added statistics by sectors or comparing the components of the expenditure account in Belgium and the euro area. The degree of availability of sufficiently long time series for the euro area has hampered this work. However, using partial industrial confidence indicators, three factors (specialisation in intermediate goods, openness and high representation of small and medium-sized enterprises) that might explain why the Belgian business indicator and Belgian activity seem to lead their euro area counterparts were investigated, but could not be validated by the data.

As it seems to be impossible to identify one or more sectors or groups of enterprises accounting for the leading nature of Belgian economic activity when looking at turning points, at least when using the business survey data, it looks as if this leading nature is a kind of general feature of the Belgian economy.

However, further research could be carried out along different lines. Other methods for identifying turning points could be applied to the data in order to reject or validate the results obtained so far. To overcome the lack of historical data for the euro area, Belgium could be compared to the larger euro area countries. This might contribute to finding the cause of the leading nature of the Belgian economy within the components of the expenditure account (do changes in inventories or investments by enterprises or exports play a specific role in the Belgian business cycle?). The fact that the leading nature of the Belgian indicator and of the Belgian business cycle was weak or non-existent before 1993 also needs to be explained.

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