New sub-sector business climate indicators to improve economic outlook analysis

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What does the economic outlook have in store over the next few quarters? How will gross domestic product grow? Conjoncture in France provides answers to these questions every quarter. It applies econometric models mainly using information from the business tendency surveys, covering the main sectors of the economy. In particular, INSEE produces composite business climate indicators which summarise common information from the balances of opinion extracted from the surveys. The advantage of using these indicators for forecasting has long been well known.

Industry and services represent 61% of total production of goods and services and three-quarters of its quarterly fluctuations. Exploiting the variations in these sectors, by using the industry and service business climates, can improve the accuracy of gross domestic product quarterly growth forecasts, which is why they are already used regularly for analyses in Conjoncture in France.

By disaggregating the available data even further, new information which is relevant for analysing the economic outlook can be provided. New composite business climate indicators have therefore been calculated at sub-sector level, in order to exploit as fully as possible the information contained in the business tendency surveys. These business climate indicators give a better understanding of sub-sector balances of opinion and are also relevant for showing the economic outlook specific to each sub-sector. They demonstrate, for example, that the transport equipment sub-sector is a driving force in industry and that the 2009 financial crisis had little impact on production in the information-communication sector. In addition, they provide satisfactory production forecasts for the corresponding sub-branches. Lastly, aggregating these forecasts improves the quality of the short-term economic scenario in both industry and services by clarifying the contributions made by each sub-branch and producing a better-argued forecast. In the case of industry, the forecasting model for manufacturing output obtained by aggregating the sub-sector forecasts is actually significantly better than the direct models used at present. This report also provides the opportunity to propose a new business climate indicator in retail trade, which is easier to interpret and more accurate than the one published until now.

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Business tendency surveys: valuable sources of information currently used to understand short-term sectoral fluctuations

The questions put to firms in the business tendency surveys are mainly qualitative. They provide early information on firms' recent past, their present situation and short-term prospects, especially in terms of activity, employment and investment. This information is then summarised in the form of quantitative variables called balances of opinion. These are available quickly and are not revised to any great extent, and they therefore serve to track the French economy in real time, ahead of the main quantitative indicators such as the industrial production index (IPI) or the quarterly national accounts.

Due to the range and variety of the questions asked, it can be difficult to interpret the business tendency surveys for two main reasons:
- a balance of opinion may vary from month to month in a volatile fashion, which makes it difficult to interpret;
- for a given month, different balances of opinion from the same survey can give out apparently contradictory signals.

Business climates: accessible and useful indicators

To overcome these difficulties, INSEE prepares and publishes monthly composite indicators called the "business climate". These indicators reflect the views of business leaders on the economic outlook in their sector and are less volatile, and hence more accessible than balances of opinion. They are calculated for the industry, services, construction, wholesale and retail trade sectors. A business climate for "France" brings together information from all these sectors. It is very closely correlated to the quarterly gross domestic product (GDP) growth rate[1] so that French economic cycles can be analysed (Bardaji *et al.*, 2008).

Industry and services branches are determining factors for assessing the economic outlook

A separate analysis of the key economic sectors helps to understand the French economic outlook in more detail. Analysis of the short-term economic outlook is based primarily on qualitative and quantitative information on the branches[2] of manufacturing industry and market services (excluding trade). In the national accounts, these two branches represent 61% of total output of goods and services and account for 75% of its fluctuations (*Graph 1*). More precisely, even though the manufacturing industry represents only 19% of total output of goods and services (against 42% for services), since its activity fluctuates more, it accounts for 41% of overall variance (against 34% for services).

Business tendency surveys reflect the dynamics specific to each sector...

Understanding the economic cycles of each of these branches is thus essential in order to analyse overall changes in the French economy. Business tendency surveys in industry and in services[3] bring some crucial elements to this analysis, and are just as essential for an understanding of the economic climate of France as a whole.

On the one hand, they contribute to the variance in quarterly growth in the "France" business climate to the same extent as the branches of industry and services contribute to total output in the national accounts. On the other hand, business tendency surveys and the associated business climates reflect the different dynamics of these two branches (Bouton and Erkel-Rousse, 2002). Notably, as services have a much lesser degree of openness to international trade,

1. The correlation between the quarterly changes in GDP in volume at chained prices and quarterly readings for the "France" business climate, taking its value from the third month of the quarter, is 0.64.
2. Business tendency surveys are broken down by "sector" of activity whereas the national accounts are broken down into "branches". A given company may have different activities, classified under as many different branches, but its principal activity determines the one sector of activity in which it is classified. In practice, when business tendency surveys are used to analyse the economic outlook, the sector is considered equivalent to the branch of the same name.
3. In fact, the scope of these business tendency surveys focuses on manufacturing industry and market services excluding trade and excluding financial activities. In order to simplify, in what follows the term "industry" is used to refer to the manufacturing industry and the term "services" is used to refer to the market services excluding trade. Moreover, the term "capital goods" is used to refer to machinery and equipment goods.

this branch is much less sensitive than industry to external shocks. For example, the gap between the business climate in industry, which has been above its long-term average since spring 2015, especially with the effect of favourable shocks for exporters, and the climate in services, which is currently much lower, can also be seen in terms of growth in output[4].

... and using them improves the accuracy of growth forecasts

In addition, by exploiting these different sectoral dynamics improvements can be made in preparing the economic outlook analysis for France. Indeed, when forecasting quarterly GDP growth, the use of a combination of the industry and services business climates produces forecasts that are of better quality than when using only the business climate for France as a whole (*Box 1*).

Dynamics are also differentiated within branches

Industry and services include a wide variety of sub-branches...

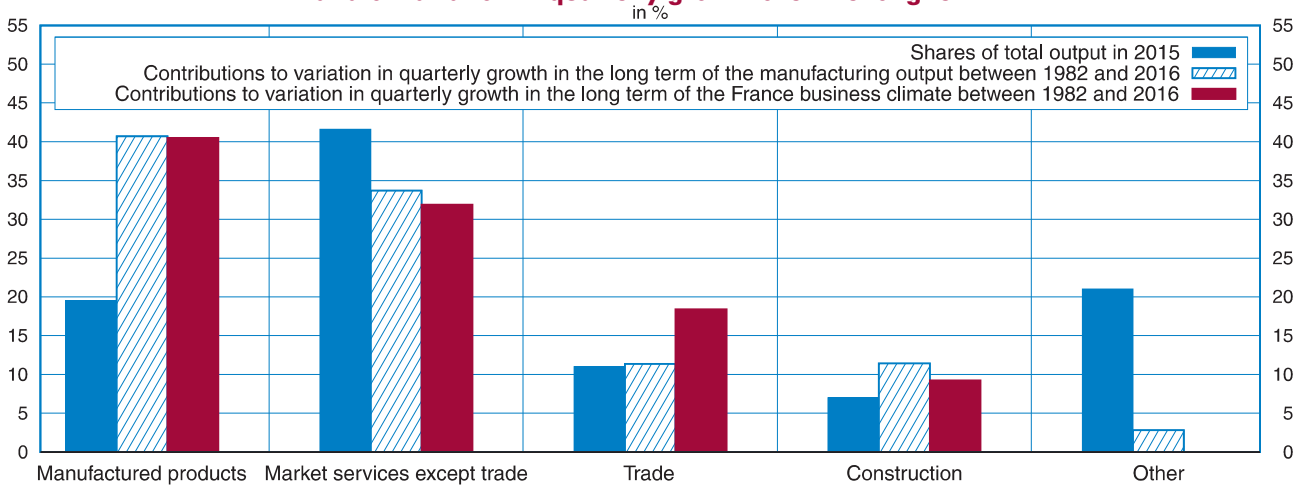
Industry and services are themselves composed of sub-branches covering a variety of activities, with characteristics that are once again different in terms of exposure to international competition, concentration, etc., and which therefore do not all follow the same economic pattern. While some sub-branches evolve in phase with the overall economic situation (e.g. basic metals, chemicals or machinery and equipment goods), others fluctuate in a more independent manner (such as real estate activities or the manufacture of coke and refined petroleum products). The scale of their cyclical divergences can vary considerably, especially with regard to their sensitivity to external shocks. Since using sectoral information provides a better analysis of the economic outlook for France, sub-sector dynamics can also be exploited to refine the economic outlook in industry and services.

... and their fluctuations can contribute very differently from what their weight would suggest

The "other manufacturing" sub-branch (item "C5" in classification "A17" which includes 17 levels of aggregation) represents almost half of industrial output in the national accounts (*Graph 2*) and represents around 40% of its volatility. It includes activities as diverse as basic metals, chemicals, plastic products and pharmaceuticals. The other sub-branches all contribute in their own way to the level and volatility of industrial output. For instance, food products and beverages represents 21% of industrial output but contributes very little to volatility (4%). In contrast, transport equipment contributes twice as much to variance in output (29%) as to level (16%). Finally, almost 70% of fluctuations in manufacturing output are due to two sub-branches, other manufacturing and transport equipment, and this feature has intensified in recent times.

4. « The gap between industry and services in the business tendency surveys is not expected to persist », *Conjoncture in France*, June 2015, p. 60-61.

1 - Distribution of total output of goods and services in 2015 and of variation in quarterly growth over the long term



Scope: the part labelled "others" includes extractive industries (DE), agriculture (AZ) and non-market services (OQ). These sectors are not used to calculate the "France" business climate.
Note: shares of total output are calculated in value and contributions to the variation in quarterly growth of output are calculated in volume at chained prices.
Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

Box 1 – Taking sectoral information into account gives a more detailed analysis of activity in France

Business tendency surveys in industry and services provide useful information for forecasting quarterly GDP growth. In 2009, Erkel-Rousse and Minodier showed that to this end, balances of opinion from business tendency surveys in services contained specific information that could be added to that provided by the balances from surveys in industry. Thus forecasting GDP is significantly improved when using indicators from these two surveys in combination rather than only one of the two.

These results are still valid today, even when considering only sectoral business climates which summarise information provided by the surveys. Indeed, using industry, services and building industry business climates in combination gives better quality quarterly GDP growth forecasts than those obtained from using only the business climate for France. According to the Diebold-Mariano test, the predictive performances of a model including the different sectoral business climates (*model 2*) are significantly better (at a 9% threshold) than those obtained when using only the business climate for France (*reference model 1*). These two approaches are currently used to produce the GDP forecast.

The same result is obtained with a forecasting model using sub-sector business climates in industry and services (*Appendix 1*) and the business climate in building industry. Performances of a model that includes sub-sector business climates (*model 3*) are also better than those of the reference model (6% threshold) but not significantly better than model 2.

Model 1: GDP forecast using business climate for France (reference model)

$$pib = \underset{(-7.85)}{-2.70} + \underset{(6.71)}{0.13}(facfr_{m2} - facfr_{m1}) + \underset{(8.96)}{0.03}\, facfr_{m1} + \varepsilon$$

(Student's t coefficients given in brackets)
Estimation period: 1992Q2-2013Q4
Adjusted R^2: 0.55
"Out-of-sample" RMSE (for the period 2000Q1-2016Q1): 0.36

Where:
- *pib* is the quarterly GDP growth rate;
- $facfr_{m1}$ and $facfr_{m2}$ are the business climate in France in the first and second months of the quarter respectively.

Model 2: GDP forecast using sectoral business climates

$$pib = \underset{(-6.45)}{-2.16} + \underset{(6.47)}{0.09}(facind_{m2} - facind_{m1}) + \underset{(9.43)}{0.05}facser_{m2} - \underset{(-4.54)}{0.02}\, facbat_{m1} + \varepsilon$$

(Student's t coefficients given in brackets)
Estimation period: 1992Q2-2013Q4
Adjusted R^2: 0.65
"Out-of-sample" RMSE (for the period 2000Q1-2016Q1): 0.32

Where:
- $facind_{m1}$ and $facind_{m2}$ are the business climate in industry in the first and second months of the quarter respectively;
- $facser_{m2}$ is the business climate in services in the second month of the quarter;
- $facbat_{m1}$ is the business climate in building industry in the first month of the quarter.

Model 3: GDP forecast using sub-sector business climates

$$\begin{aligned} pib = {} & \underset{(2.77)}{0.05}facind\_c4_{m2} - \underset{(-2.35)}{0.03}\, facind\_cl1_{m2} - \underset{(-3.06)}{0.02}\, facind\_cl2_{m2} + \underset{(4.61)}{0.06}\, facind\_c5_{m2} \\ & - \underset{(-4.15)}{0.04}\, facind\_ce_{m2} - \underset{(-3.97)}{0.03}\, facind\_cm_{m2} + \underset{(2.17)}{0.03}(facind\_cg_{m2} - facind\_cg_{m1}) + \underset{(4.37)}{0.04}\, facser\_m_{m2} \\ & + \underset{(2.81)}{0.04}(facser\_n_{m2} - facser\_n_{m1}) - \underset{(-3.40)}{0.02}\, facbat_{m1} + \underset{(3.48)}{0.11}(facbat_{m2} - facbat_{m1}) + \varepsilon \end{aligned}$$

(Student's t coefficients given in brackets)
Estimation period: 1992Q2-2013Q4
Adjusted R^2: 0.79
"Out-of-sample" RMSE (for the period 2000Q1-2016Q1): 0.31

Where:
- $facind\_subsect_{mi}$ is the business climate in the "subsect" industry sub-sector in month *i*;
- $facser\_subsect_{mi}$ is the business climate in the "*subsect*" services sub-sector in month *i*.

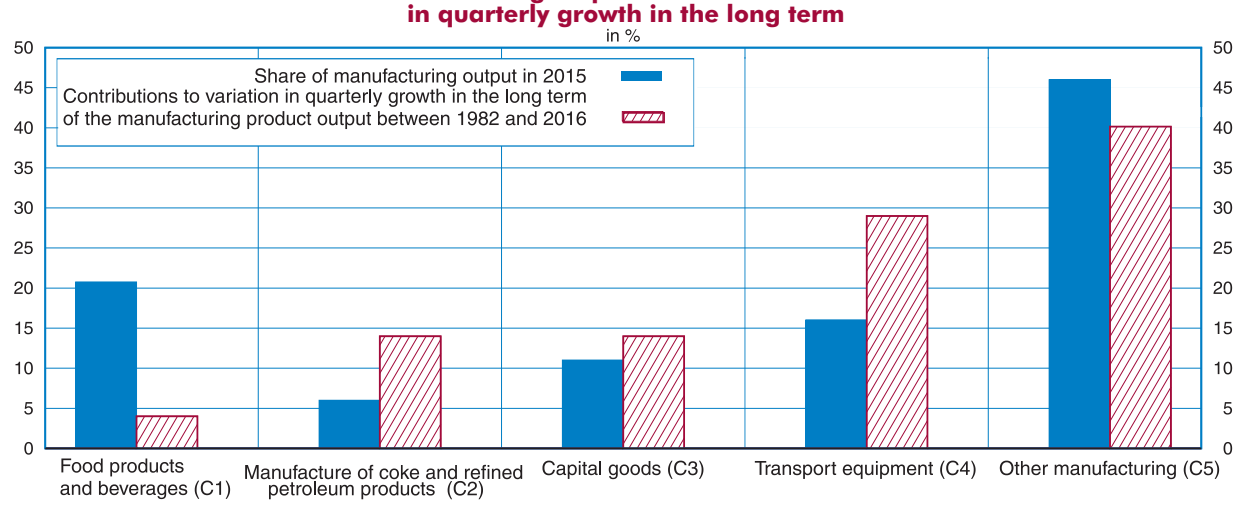
In services, almost one third of production and also of volatility in growth comes from "business services" (item "MN"; *Graph 3*). This sub-branch includes a variety of activities, mainly business oriented, and among which figure head office activities and consultancy, architectural and engineering activities, research and development, renting and leasing activities, and legal and accounting activities. The second sub-branch in services, in terms of output, is real estate activities. However, it contributes little to overall variance (7%). Business services, transportation and information-communication alone account for three quarters of the fluctuations in production by services.

Business climate indicators to track the economic outlook in sub-sectors

Building sub-sector business climates

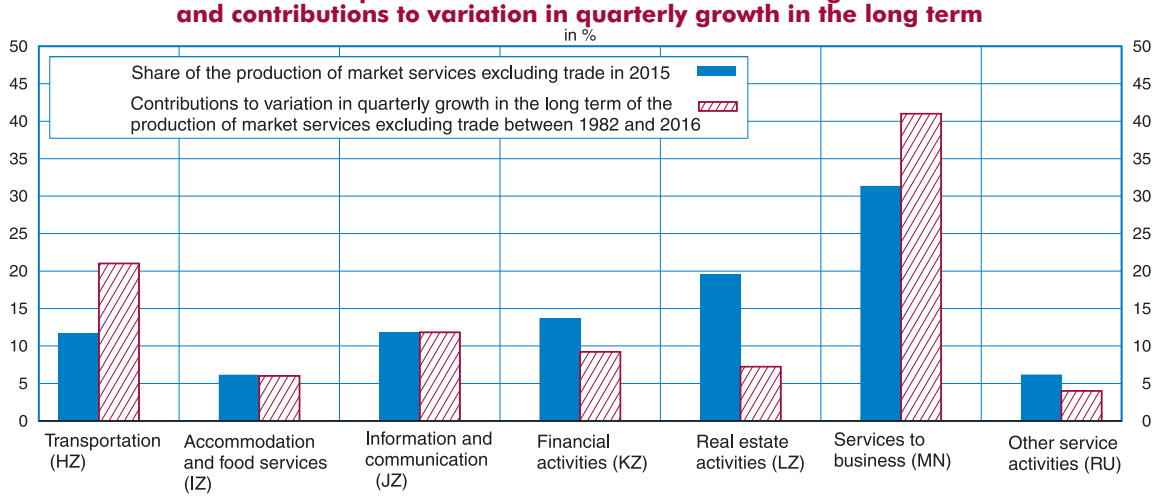
Business tendency surveys can help track the diversity of the economic situation in the industry and services sub-sectors. In fact, balances of opinion derived from business tendency surveys are calculated and disseminated at sub-sector level. To summarise the short-term economic information common to all balances in each sub-sector and to improve accessibility, composite business climate indicators can be constructed from these balances of opinion in the majority of sub-sectors, based on what is already done in the sectors (*Appendix 1*).

2 - Distribution of manufacturing output in 2015 and contributions to variation in quarterly growth in the long term



Note: shares of total output are calculated in value and contributions to the variation in quarterly growth of output are calculated in volume at chained prices.
Source: INSEE

3 - Distribution of production of market services excluding trade in 2015 and contributions to variation in quarterly growth in the long term



Note: shares of total output are calculated in value and contributions to the variation in quarterly growth of output are calculated in volume at chained prices.
Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

These sub-sector business climate indicators show the change in output in each sub-branch very satisfactorily. Correlations between business climates and changes in corresponding outputs over one year prove satisfactory, better than 60% in most cases (*Table 1*).

Sub-sectors like real estate activities have a specific short-term dynamic

By analysing the correlations between each sub-sector business climate and, depending on the case, the business climate in services or industry, two types of sub-sector can be distinguished (*Graph 4*): those where the outlook is closely linked to the overall economic outlook and those where short-term fluctuations have features specific to the whole of the period. For example, the real estate activities sub-sector, or, in industry the "other transport equipment" sub-sector (most notably aeronautics) follow short-term fluctuations that are less well correlated with those in other sectors and with fluctuations overall.

Even when a sub-sector follows the economic outlook very closely overall, its business climate may occasionally show some specific features which could be useful in a more detailed and more accurate analysis.

Table 1 - Correlations between sub-sector climate and year-on-year quarterly production in the corresponding sub-branch

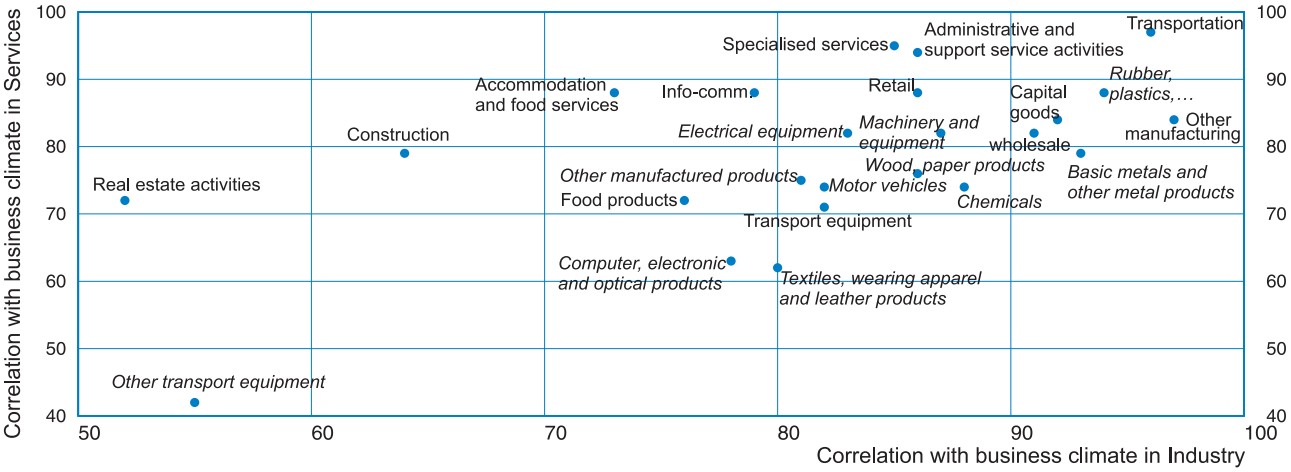
Sub-sectors/sub-branches in aggregated classification (NA 2008)	Month 2	Month 3
Total Industry	**0.78**	**0.78**
Food products and beverages (C1)	0.41	0.41
Capital goods (C3)	0.75	0.75
Transport equipments (C4)	0.60	0.60
Other manufacturing (C5)	0.85	0.85
Total Services	**0.82**	**0.82**
Transportation (HZ)	0.85	0.84
Accommodation and food services (IZ)	0.64	0.66
Information and communication (JZ)	0.75	0.76
Real estate activities (LZ)	0.46	0.44
Specialised, scientific and technical activities (M)*	0.80	0.79
Administrative and support service activities (N)*	0.76	0.72

* For the business climates of sectors "M" and "N", the correlation with production is tested with production in the aggregated branche (MN).

How to read the table : business climate for "Month 2" corresponds to the quarterly indicator of which the value in quarter T corresponds to the value of the business climate in the second month of quarter T.

Source: INSEE

4 - Correlation of sub-sector climates with overall climates for industry and services



Notes: correlations are calculated for the period 1991-2016 (except 2006-2016 for the transportation sector). Normal text denotes climates calculated at level A17 or A21 of the aggregated classification; italics denote climates calculated at level A38 of this classification in industry.

Source: INSEE

Sub-sector climates show different recovery dynamics, depending on the branch

For example, the industrial climate has been gloomy since 2012, but it has recovered at different rates, depending on the sub-sector (*Graph 5*). Whereas the climate for transport equipment had returned to its long-term average by H2 2013, the capital goods indicator remained below its long-term average for a considerable time, not returning to its average level until the very end of 2015.

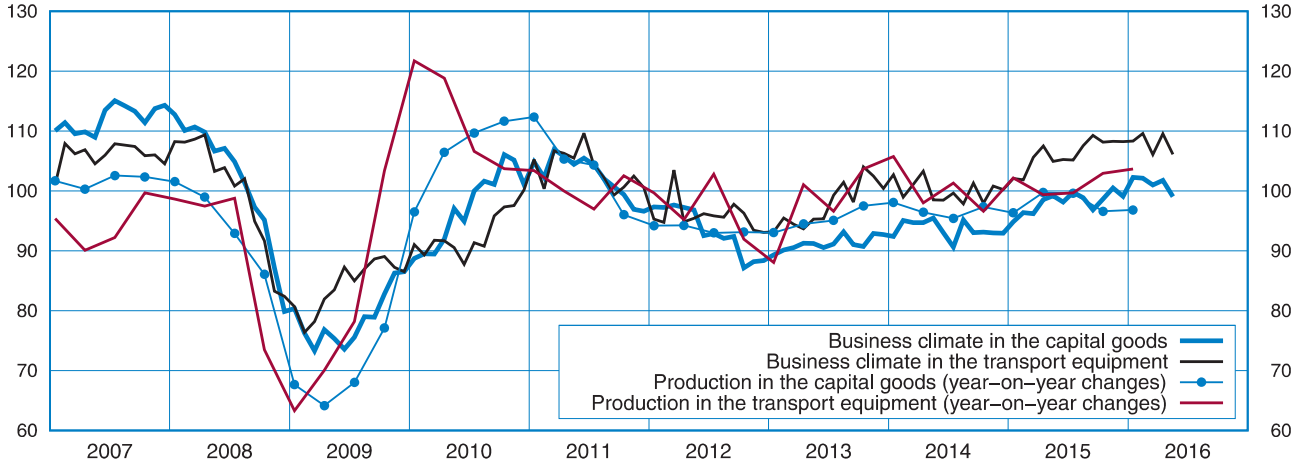
The change in composite indicators for these two sub-sectors clearly shows the change in production over this period: by mid-2013 transport equipment output had exceeded its level at the start of 2012 and was 8% higher at the beginning of 2016. Conversely, activity in capital goods was barely higher at the end of 2015 than it had been at the beginning of 2012.

In transport equipment, the 2008 crisis and the mid-2009 recovery is reflected in the sub-sector business climate

In summer 2008, the business climate of transport equipment started to deteriorate severely. It stood at 102 in August 2008, then lost 26 points in six months to reach its lowest level (76) in February 2009. It bounced back the following month. This development is coherent with that of automobile production, which was hit very hard by the 2008 crisis: exports and domestic demand dropped sharply and automobile production plummeted, affecting all transport equipment. To support the industry, the authorities took measures such as the "scrappage bonus" and introduced a plan to help manufacturers. In line with the improvement in the business climate in the sector, transport equipment output bounced back in spring 2009. The business climate for capital goods, in contrast, did not start to pick up until H2 2009 and the production of capital goods did not recover until the end of 2009. Overall, therefore, the business climates made it possible to anticipate the scale of the crisis and the differences in pace of recovery, depending on the industry sub-sectors.

Similarly, the differences in dynamics between service branches can also be seen in the sub-sector business climates. The business climate in services reached its lowest point (68) in March 2009, illustrating the significant drop in activity in the branch between 2008 and 2009 (*Graph 6*). However, sub-sectors were not all affected to the same extent. For the sectors that were most affected – professional, scientific and technical activities and administrative and support service activities – business climates plummeted at the same time as those in the industrial sectors and reached their lowest levels in April 2009 (*Graph 7*). In the national accounts too, the corresponding sub-branch suffered particularly from the sharp slowdown in the economy as a whole and especially from the very strong industrial recession. In contrast, the composite indicator for the information and communication sub-sector remained fifteen points above the business climate for services as a whole and the branch stood up fairly well, thanks to the good performance of investment in software and the growth in mobile phones.

5 - Production and business climates in capital goods and transport equipments



Note: the production (year-on-year) and business climate series are normalised to give an average of 100 and a standard deviation of 10 over the period 1990-2016.
Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

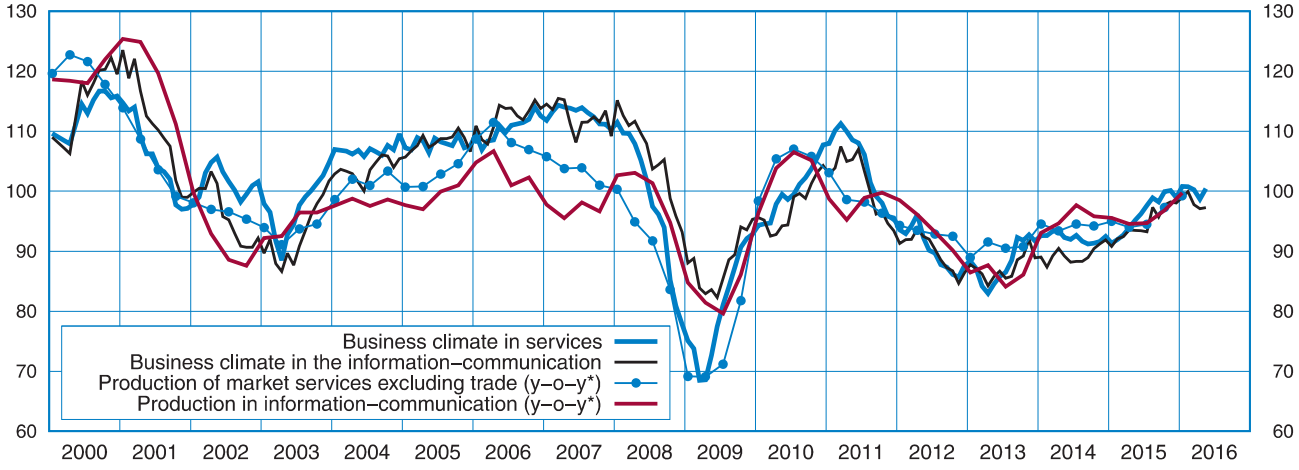
The business climate in real estate activities is in phase with growth in housing prices

Real estate activities also have their own specific dynamics. The business climate in this sub-sector is less well correlated with the other climates and its specific feature is that it is better correlated with second-hand housing prices than with production (*Graph 8*). In particular, this climate clearly reflects the remarkable change in second-hand housing prices in France during the 2008-2009 crisis (Clévenot, 2011). As in most of the advanced economies, house prices in France plummeted at the end of 2008 and the beginning of 2009, but their decline eased from spring onwards and they picked up from Q3 2009; the business climate likewise recovered from February 2009 until it reached a level higher than its long-term average in October 2009.

Forecasting models by sub-branch which clarify forecasts and enhance analysis

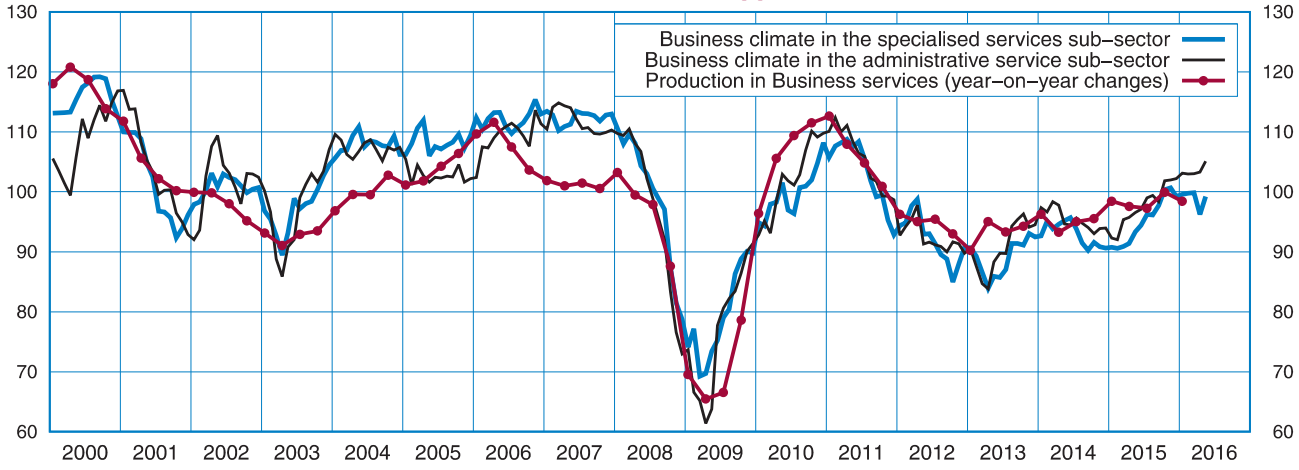
The industry and services sub-sectors follow their own trend. The composite business climate indicators for the sub-sectors generally mirror the change in production in the branches concerned. It would clearly be relevant to use them in sub-sector forecasting models, especially to forecast change in manufacturing output.

6 - Production and business climate in services and in information and communication



Note: the production and business climate series are normalised to give an average of 100 and a standard deviation of 10 over the period 1989-2016.
*y-o-y: year-on-year
Source: INSEE

7 - Production and business climate in professional, scientific and technical activities and in administrative and support services



Note: the production and business climate series are normalised to give an average of 100 and a standard deviation of 10 over the period 1989-2016.
Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

Three data sources are used to forecast output by sub-branch

In addition to balances of opinion from INSEE's business tendency surveys and the associated composite indicators (sub-sector business climate indicators, surprise indicators[5]), other detailed data sources that are available help to forecast the sub-sector outlook. In particular, the monthly Industrial Production Indices (IPI) generally improve forecasts for the industrial branches. Balances of opinion from economic outlook surveys by the Banque de France can also provide additional information. However, the short timescale of the Banque de France series of surveys on services means that they cannot yet be incorporated satisfactorily into the models.

Models testing the contribution of each sub-sector business climate

A model has been produced using these data sources to forecast quarterly output in each sub-branch. In it, the contribution of the corresponding business climate is tested (*Appendix 2*). In all sub-sectors where a business climate is constructed, with the exception of transportation services, using it does not detract from the forecasting ability of the model and even improves it in some cases.

Good quality forecasts for industry and services as a whole

A forecast was established of the change in output in each sub-branch giving priority to the models incorporating the sub-sector business climates. Output forecasts were produced by aggregation, for the whole of industry or of services. These proved to be of the same or better quality than forecasts from the models currently used (*Appendix 2*).

In addition, using sub-sector information resulted in a significantly improved quality of the forecast of manufacturing output. The resulting forecast was more accurate and of better quality than that obtained by directly calibrating manufacturing output from the balances and indicators calculated at manufacturer level. In the services sector, the quality of forecasts obtained by sub-sector aggregation was no more than equivalent to the forecasts obtained by direct calibration.

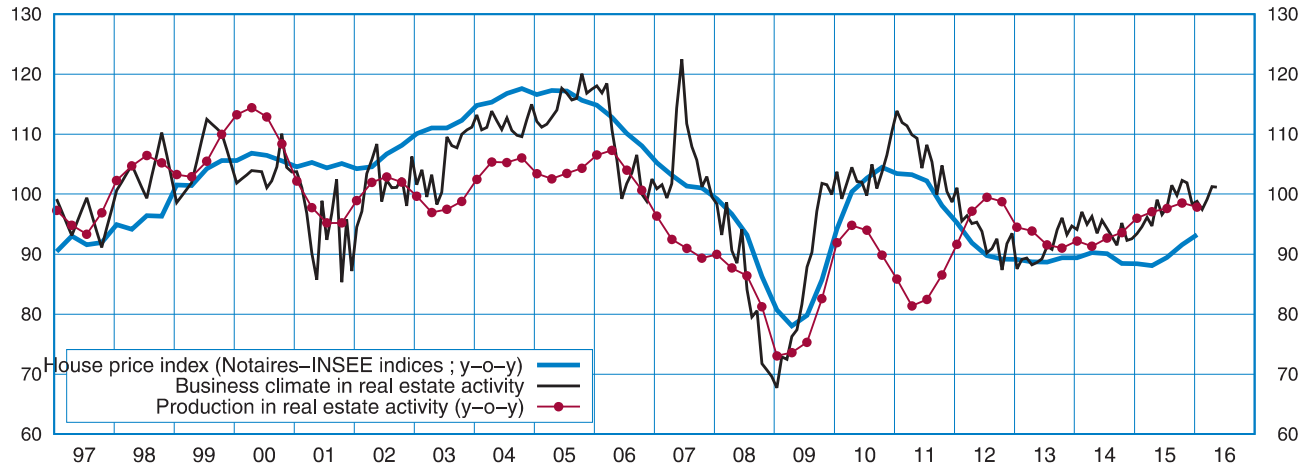
For services, an intermediate level of aggregation was also tested. The sub-sectors were grouped to form homogenous blocks: mainly business services versus mainly services to households or services exposed to international competition versus protected services. However, the forecasts obtained in this way did not improve forecasting overall for market services excluding trade (Glotain, 2016).

By preparing sub-sector forecasts the economic outlook analysis is improved

The sub-sector breakdown provided invaluable help in preparing the economic scenario in industry and services. On the one hand, it provided new forecasting models for manufacturing output and production in services, which can be pitted

5. For the presentation of surprise indicators, see Bortoli *et al.* (2015).

8 - Business climate and production in real estate activities and changes in housing prices



Note: the series are normalised to give an average of 100 and a standard deviation of 10 over the period 1996-2015 (INSEE French Notaries index) and 1989-2016 (business climate and production).
*y-o-y: year-on-year
Source: INSEE

against the direct forecasting models. On the other hand, these aggregated models use additional information from the various sub-branches and therefore give a better understanding of sub-sector situations by anticipating with more accuracy the effects of occasional events on production. For example, this may be the effect of a strike on a given branch or the effect on production of refinery shutdowns for maintenance in the coke and refined petroleum products branch.

Going down to an even more detailed level does not systematically improve forecasts. In fact, the smaller the number of businesses that respond, the more inaccurate the associated balances of opinion and the more volatile the associated business climates. Potential forecasting errors are then all the more dispersed. In manufacturing industries, for example, producing distinct forecasts for the automobile industry and other transport equipment slightly degrades the quality of the forecast overall, compared with that of a model targeting the aggregated transport equipment branch directly (Quartier La Tente, 2015).

A new less volatile business climate in retail trade

As a result of the studies described in this report, new business climate indicators are proposed by sub-sector which are also able to prove or disprove the suitability of existing sector business climates. In services for example, the indicator calculated for the sector as a whole has been overhauled: it is constructed in the same way as for the sub-sectors, and appears to be smoother and slightly more efficient than the indicator published previously. Similarly for retail trade, a new indicator constructed from additional balances of opinion compared with the current indicator has proved more suitable than the one published currently (*Appendix 3*). It is less volatile, and therefore more readily accessible, and can significantly improve production forecasts in trade. The new business climate indicators for services and retail trade will be published by INSEE from June 2016.

Table 2 - Production forecasts for manufacturing industry sub-branches

Sector	Weightings (%)	2015			2016	
		Q2	Q3	Q4	Q1	Q2
Manufacturing industry	**100**	**–0.5**	**0.4**	**0.7**	**0.1**	**0.0**
Food products and beverages (C1)	21	0.6	–0.2	–0.3	–1.1	–0.1
Coke and refined petroleum products (C2)	6	–7.3	–0.9	5.2	–2.8	–9.0
Capital goods (C3)	11	1.3	0.0	–0.3	–0.9	–0.2
Transport equipments (C4)	16	–1.5	1.8	1.3	3.7	2.5
Other manufacturing (C5)	46	–0.1	0.5	0.5	0.1	0.4

Forecast

Source: INSEE

Table 3 - Production forecasts for market services sub-branches excluding trade

Sector	Weightings (%)	2015			2016	
		Q2	Q3	Q4	Q1	Q2
Market services excluding trade	**100**	**0.0**	**0.5**	**0.9**	**1.0**	**0.5**
Transportation (HZ)	12	–0.1	0.8	0.6	1.3	0.2
Accommodation and food services activities (IZ)	6	0.6	0.4	0.6	1.2	0.6
Information-communication (JZ)	12	0.4	0.8	1.0	2.3	0.4
Financial activities (KZ)	14	–0.5	0.5	1.0	0.6	0.3
Real estate activities (LZ)	19	0.3	0.4	0.4	0.3	0.4
Business services (MN)	31	–0.1	0.4	1.3	0.8	0.8
Other activities of services (RU)	6	–0.2	1.0	0.9	1.8	–0.3

Forecast

Source: INSEE

What growth can be expected in Q2 2016?

From the models produced for sub-branches, a detailed scenario can be produced for activity in Q2 2016 in industry (*Table 2*) and services (*Table 3*).

In Q2 2016, activity is likely to stagnate in the manufacturing industry

After a slowdown in Q1 2016 (+0.1% after +0.7%), industrial activity looks set to stagnate in Q2. On the one hand, production in the coke and refined petroleum products branch (–9.0% expected after –2.8%) is affected by strikes that started in late May. In addition, activity is likely to decline once again in capital goods (–0.2% after –0.9%), linked with the drop in the business climate in May. It should be virtually stable in food products and beverages (–0.1% after –1.1%) : the quarterly growth overhang in the IPI was low at the end of April but the business climate was above its average in May. On the other hand, activity should pick up slightly in "other manufacturing" (+0.4% after +0.1%), according to its business climates: already above its average in April, it improved further in May, reaching 104. In transport equipment, the business climate is well above its average (106 in May after 110 in April). As a result, activity is likely to remain dynamic in Q2 (+2.2% after +3.7%), sustained by a favourable quarterly growth overhang in the IPI at the end of April in that branch.

Activity will probably be sustained in market services excluding trade

In market services excluding trade, activity looks set to slow in Q2 (+0.5%) after increasing strongly in Q1 2016 (+1.0%). Growth should remain fairly sustained in business services (+0.8%), as the business climate remains favourable in administrative and support service activities and is recovering in professional, scientific and technical activities. In accommodation and food service activities, there is likely to be considerable progress once again in Q2 (+0.6% after +1.2%), especially during the Euro 2016 football competition. However, activity in "other services activities" will probably slip back after benefitting from the sale of tickets for this event (–0.3% after +1.8%) and in information-communication it is likely to slow after the sharp rise in Q1 2016 (+0.4% after +2.3%). ■

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Appendix 1 – Preparing new business climate indicators in activity sub-sectors

Sub-sector business climates are constructed using the static factor analysis method with one factor. This statistical technique is currently used to estimate the business climate in industry in particular. It is able to summarise the behaviour of several variables in a single non-observed variable, constructed by combining the original variables. This composite variable is called the common factor. In the context of business tendency surveys, the common factors calculated from balances of opinion represent the general opinion of business leaders about the economic outlook in their sector (Doz and Lenglart, 1995). This is why they are called composite business climate indicators.

Static factor analysis assumes that at each date t, the balance of opinion (s_{it}) is represented by the sum of a term proportional to the common factor (F_t) and a component specific to each balance (u_{it}):

$$s_{it} = \lambda_i F_t + u_{it}$$

The common factor is therefore written as a linear combination of balances of opinion:

$$F_t = \sum_i \omega_i s_{it}$$

The terms ω_i are the coefficients associated with the balances of opinion and the terms λ_i are called *loadings*.

Choice of level of classification

For industry, the sub-sector business climates are established at level "A17" of the aggregated classification (NA 2008). In some cases, climates can be calculated at a more detailed level, "A38" of this classification.

For services, the sub-sector balances are usually studied and disseminated at level "A21", the international level of the classification of activities, which differentiates professional, scientific and technical activities (M) and administrative and support service activities (N). Sub-sector business climates in services can also be calculated at this level.

Estimation periods

In industry, most monthly sub-sector balances are available from 1990, apart from balances on employment, which have been monthly only since 2003. Because these balances are not available for the period before 2003 and the fact that using them since that time has not improved the quality of the business climate obtained, they were not used to calculate sub-sector climates.

In services, surveys were quarterly at first, and only became monthly from June 2000. In addition, the balance for general business outlook, one of the best correlated with output from market services excluding trade, is available only from this same date. Sub-sector climates for services were therefore estimated over two sub-periods: from June 2000, monthly and using the balance with general business outlook; before this, quarterly and without this balance, with monthly business climates estimated by linear interpolation between two quarterly estimates.

The balances and aggregation level were chosen according to the quality of the resulting business climates. This was assessed basically according to two criteria: ability to summarise the information from the balances being considered and the volatility of the business climate created which determined its readability. Subsequently, the climates should also be analysed with respect to the relevance of the messages delivered, i.e. according to their ability to forecast the associated quantitative indicators (*Appendix 2*).

Choice of balances and ability to summarise information from the selected balances

To assess whether a sub-sector climate provides a good summary of the information contained in the balances of opinion, all loadings associated with the balances have to be sufficiently high. The loading associated with a balance represents the contribution of the common factor in the behaviour of this balance. The higher the loading associated with a balance, the more information the balance brings to the estimate of the common factor. In practice, the balances selected usually have loadings with an absolute value of at least 0.3.

In industry, the loadings associated with balances on the general and personal outlook on prices have proved to be tangential in the majority of sub-sectors. As the questions asked about activity relate more to volumes or quantities than to invoicing or turnover, the link between the different balances and those on prices is basically ambiguous and it was preferable not to use these when calculating the common factor. In addition, the same calculation method isused as for the climate of the manufacturing sector as a whole. The same concern for homogeneity resulted in selecting the balance for the level of stocks even though its loading was tangential in some sub-sectors. The business climates of sub-sectors in industry were calculated from a combination of six balances in all (*Table 1*).

Business climates can be calculated at an even more detailed level of the classification (level "A38"). This is suggested when volatility is not too great (*see below*). They are built based on the same principle, with the same balances, and appear to be coherent: the overall business climate and the aggregation of the sub-sector business climates show no major difference (*Graph 1*).

However, inconsistencies in level and in evolution can sometimes be seen between business climates built at level "A17" and those at level "A38" (especially between the transport equipment sub-sector and the motor vehicles and other transport equipment sub-sectors). These inconsistencies derive from two different sources: the coefficients associated with balances between the two levels studied can differ; the normalisation of balances of opinion and business climates results in the climates being non-summable. An alternative when building the sub-sector indicators would be to constrain the same coefficients as those found at the aggregated level. This would distort the principle behind the construction of the business climate indicators, but would ensure greater coherence in results between aggregated sub-sector business climates and the climate as a whole. The small number of apparent inconsistencies and the close proximity, on average, of the business climates obtained without this constraint show that it is not necessary.

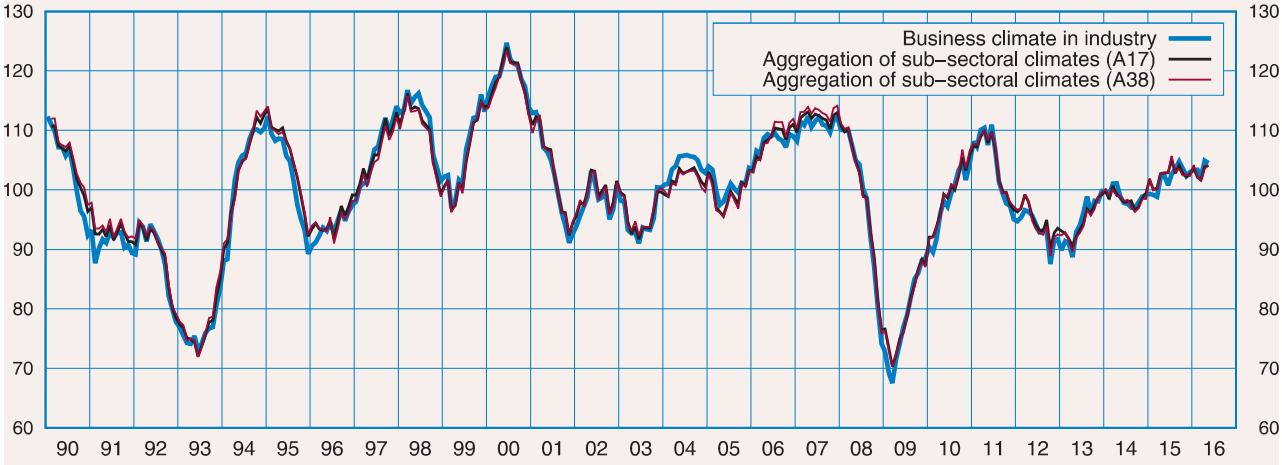
New sub-sector business climate indicators to improve economic outlook analysis

Table 1 - Coefficients and loadings of business climates in industry

		General production expectations	Global order books	Export order books	Inventories	Past production	Expected production
Industry	**Coefficients**	**0.09**	**0.34**	**0.21**	**–0.04**	**0.23**	**0.16**
	Loadings	84%	95%	92%	–64%	93%	90%
Food products and beverages (C1)	**Coefficients**	**0.08**	**0.46**	**0.19**	**–0.07**	**0.24**	**0.11**
	Loadings	55%	89%	76%	–51%	81%	62%
Coke and refined petroleum products (C2)	**Coefficients**	**0.00**	**0.01**	**0.99**	**0.00**	**0.00**	**0.00**
	Loadings	–1%	64%	100%	–1%	16%	6%
Capital goods (C3)	**Coefficients**	**0.05**	**0.39**	**0.40**	**–0.01**	**0.11**	**0.07**
	Loadings	81%	97%	97%	–42%	91%	85%
Computer, electronic and optical products (CI)	**Coefficients**	**0.09**	**0.48**	**0.34**	**–0.01**	**0.09**	**0.07**
	Loadings	71%	94%	92%	–21%	72%	66%
Electrical equipments (CJ)	**Coefficients**	**0.17**	**0.30**	**0.23**	**–0.03**	**0.22**	**0.15**
	Loadings	82%	89%	86%	–39%	86%	80%
Machinery and equipment n.e.c. (CK)	**Coefficients**	**0.02**	**0.38**	**0.55**	**0.00**	**0.04**	**0.02**
	Loadings	72%	98%	99%	–20%	88%	79%
Transport equipments (C4)	**Coefficients**	**0.05**	**0.56**	**0.25**	**–0.04**	**0.09**	**0.07**
	Loadings	63%	96%	92%	–62%	79%	75%
Motor vehicles, trailers and semi-trailers (CL1)	**Coefficients**	**0.13**	**0.43**	**0.22**	**–0.07**	**0.15**	**0.12**
	Loadings	75%	92%	84%	–61%	79%	74%
Other transport equipments (CL2)	**Coefficients**	**0.01**	**0.51**	**0.44**	**–0.01**	**0.03**	**0.03**
	Loadings	41%	98%	98%	–41%	73%	68%
Other manufacturing (C5)	**Coefficients**	**0.07**	**0.28**	**0.39**	**–0.02**	**0.18**	**0.09**
	Loadings	86%	96%	97%	–58%	94%	89%
Textiles, wearing apparel and leather products (CB)	**Coefficients**	**0.05**	**0.49**	**0.29**	**–0.03**	**0.14**	**0.08**
	Loadings	66%	96%	93%	–53%	86%	78%
Wood, paper and printing products (CC)	**Coefficients**	**0.18**	**0.41**	**0.17**	**–0.02**	**0.19**	**0.09**
	Loadings	90%	95%	90%	–41%	91%	82%
Chemicals (CE)	**Coefficients**	**0.08**	**0.36**	**0.49**	**–0.02**	**0.07**	**0.03**
	Loadings	82%	96%	97%	–50%	80%	65%
Pharmaceuticals (CF)	**Coefficients**	**0.07**	**0.47**	**0.42**	**–0.01**	**0.08**	**0.08**
	Loadings	45%	88%	86%	–5%	51%	49%
Rubber and plastics products (CG)	**Coefficients**	**0.11**	**0.27**	**0.21**	**–0.03**	**0.28**	**0.16**
	Loadings	86%	94%	92%	–54%	94%	90%
Basic metals and other metal products (CH)	**Coefficients**	**0.07**	**0.38**	**0.45**	**–0.01**	**0.08**	**0.05**
	Loadings	84%	97%	97%	–37%	86%	80%
Other manufacturing industries (CM)	**Coefficients**	**0.10**	**0.36**	**0.14**	**–0.04**	**0.30**	**0.18**
	Loadings	67%	89%	74%	–37%	87%	79%

Source : INSEE

1 - Business climate in industry and aggregation of sub-sector climates



Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

In the services sector, the eight balances selected had high loadings in all sub-sectors (*Table 2*). The price balances were used as they seemed to be much more closely linked to the common factor than in the industry sector, which can be explained by the fact that for the services sector, questions on activity dealt explicitly with turnover. Balances relating to employment, both past and future, which are available from 1989, were also selected.

To ensure consistency between sub-sector business climates and the composite indicator for business climates across all services, these same balances were selected to construct the composite indicator for all services; compared to the indicator estimated until now, four balances have been added (past and expected prices and employment) and two quarterly balances are no longer used (past and expected operating balances). The new indicator seems to be very similar to the one disseminated so far (*Graph 2*). It is calculated conceptually like the sub-sector business climates, and also seems very similar to the aggregation of these indicators.

Relevance of sub-sector climates and volatility criterion

The volatility of sub-sector business climates is measured by the standard deviation of their variation.

Some business climates appear significantly more volatile than others, which makes them very difficult to interpret (*Table 3*). This is particularly the case for coke and refined petroleum products and for pharmaceuticals. This volatility is due to the volatility of balances of opinion in these highly concentrated sectors. For example, in 2013 there were 56 legal units in coke and refined petroleum products compared with 59,000 in food products and beverages. It did not seem relevant to publish composite indicators for sub-sectors where the balances show too much volatility.

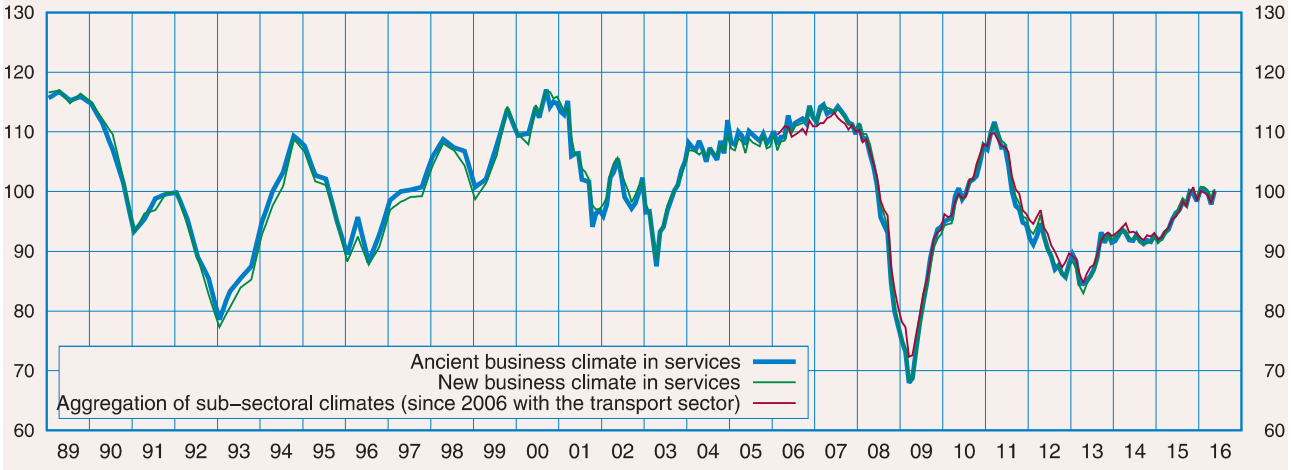
Business climates are also slightly more volatile in food products and beverages, accommodation and food service activities and real estate activities than in other sectors. However, these composite indicators are much less volatile than the balances from which they have been calculated. For example, in food products and beverages, the volatility of the balances is 6.9 on average, compared with 4.6 for the business climate obtained.

Table 2 - Coefficients and loadings of business climates in services

		Past activity	Expected activity	Expected demand	General outlook	Past prices	Expected prices	Past employment	Expected employment
Services	**Coefficients**	**0.10**	**0.24**	**0.19**	**0.35**	**0.02**	**0.04**	**0.04**	**0.06**
	Loadings	93%	97%	96%	98%	73%	84%	83%	89%
Transportation (HZ)	**Coefficients**	**0.07**	**0.38**	**0.28**	**0.09**	**0.01**	**0.03**	**0.06**	**0.09**
	Loadings	94%	99%	98%	95%	73%	85%	93%	95%
Accommodation and food services activities (IZ)	**Coefficients**	**0.10**	**0.23**	**0.28**	**0.32**	**0.03**	**0.04**	**0.05**	**0.06**
	Loadings	81%	91%	92%	93%	45%	58%	67%	70%
Information-communication (JZ)	**Coefficients**	**0.12**	**0.14**	**0.10**	**0.31**	**0.03**	**0.02**	**0.10**	**0.27**
	Loadings	85%	87%	83%	94%	53%	44%	83%	93%
Real estate activities (LZ)	**Coefficients**	**0.11**	**0.21**	**0.18**	**0.20**	**0.11**	**0.16**	**0.10**	**0.10**
	Loadings	75%	86%	84%	85%	74%	81%	72%	72%
Specialised, scientific and technical activities (M)	**Coefficients**	**0.07**	**0.31**	**0.23**	**0.27**	**0.04**	**0.06**	**0.03**	**0.05**
	Loadings	87%	97%	96%	96%	77%	84%	67%	83%
Administrative and support service activities (N)	**Coefficients**	**0.10**	**0.24**	**0.28**	**0.29**	**0.02**	**0.03**	**0.04**	**0.06**
	Loadings	87%	95%	95%	96%	47%	66%	74%	80%

Source : Insee

2 - Business climate in services and aggregation of sub-sector climates



Source: INSEE

In services, the scope of the business tendency survey does not include the financial activities sector (KZ) and covers only a small part of "other service activities" (RU), which in itself accounts for a very small proportion of market services excluding trade overall in terms of production (6%). Therefore no business climate could be calculated for these two sectors.

The transportation sub-sector is processed in a specific way. Firstly, because the survey is only available in its present form from 2006. In addition, the scope of the business tendency survey for the services sector does not include all transport activities, but only covers freight road transport with no information provided on other modes of transport (rail, air, sea) or on passenger road transport. The business climate for transportation therefore reflects only part of the branch as defined in the national accounts. The same is true for the real estate activities sub-sector: the survey is only carried out with related businesses (real estate agencies, etc.) whereas a large proportion of production in the national accounts derives from owner-occupier households, whether their rents are real or imputed. ■

Table 3 - Volatility of sub-sector business climates and correlation with the climate for France

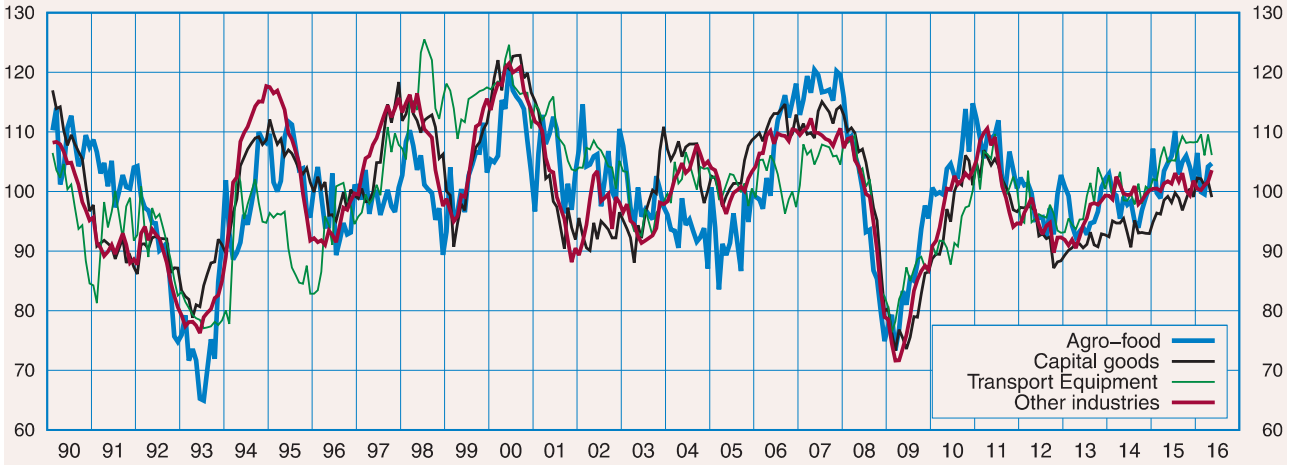
	Volatility of business climate	Correlation with the climate for France (%)
Industry	**2.1**	**95**
Food products and beverages (C1)	4.6	73
Coke and refined petroleum products (C2)	10.9	20
Capital goods (C3)	2.7	91
Computer, electronic and optical products (CI)	5.2	71
Electrical equipments (CJ)	3.2	87
Machinery and equipment n.e.c. (CK)	2.4	87
Transport equipments (C4)	3.4	75
Motor vehicles, trailers and semi-trailers (CL1)	3.7	77
Other transport equipments (CL2)	3.7	47
Other manufacturing (C5)	2.2	92
Textiles, wearing apparel and leather products (CB)	4.1	69
Wood, paper and printing products (CC)	2.7	85
Chemicals (CE)	4.0	83
Pharmaceuticals (CF)	7.0	47
Rubber and plastic products (CG)	2.7	94
Basic metals and other metal products (CH)	2.7	88
Other manufacturing industries (CM)	3.9	79
Services	**2.0**	**97**
Transportation (HZ)	2.4	98
Accommodation and food services activities (IZ)	4.0	82
Information-communication (JZ)	2.2	87
Real estate activities (LZ)	4.1	65
Specialised, scientific and technical activities (M)	2.4	92
Administrative and support service activities (N)	2.9	92

Note: in services, volatility was calculated from June 2000, when balances of opinion became monthly. Correlations with the climate for France as a whole were calculated for 1990-2016 for industry and 1989-2016 for services (except 2006-2016 for transportation).

Source: INSEE

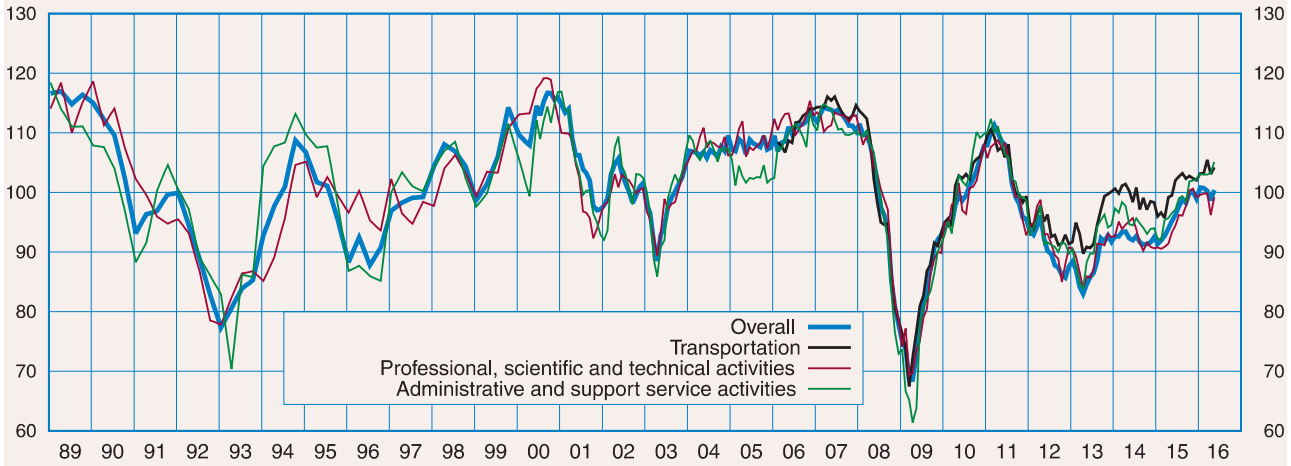
New sub-sector business climate indicators to improve economic outlook analysis

3 - Sub-sector business climates in industry



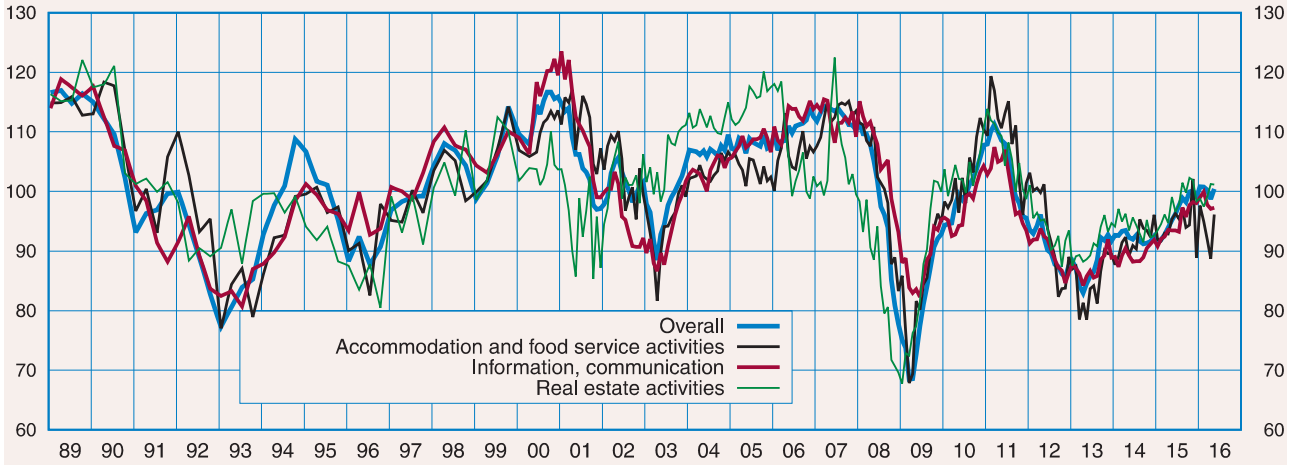
Source: INSEE

4 - Sub-sector business climates in services



Source: INSEE

5 - Sub-sector business climates in services



Source: INSEE

Appendix 2 – Forecasting performances of forecasting models by sub-branch

The forecasting performance of a model is assessed according to its ability to persistently produce a low level of forecast error. To do this, two types of forecast are made:

- a static forecast from the estimated model across all of the known period ("in-sample");

- a dynamic forecast which assesses the behaviours of the models during the different forecasting exercises by recalculating the coefficients of the model at each quarter ("out-of-sample" or "pseudo real-time").

The forecast performance indicator selected is the root mean square error (RMSE), which must be minimised as far as possible. The RMSE associated with the static forecasts, called the "in-sample" RMSE , estimates the variation in forecast errors. The RMSE obtained with the dynamic forecasts, called the "out-of-sample" RMSE, takes account, among other things, of the uncertainty associated with estimating coefficients. These indicators are also to be compared with the standard deviation of the variable being predicted: in fact, they must be lower than this amount, otherwise better results are obtained by producing a constant forecast equal to the long-term average.

The models were built in order to be used in practice, i.e. taking into account the publishing calendar for Conjoncture in France for which the scenarios are usually planned at the end of the second month of the quarter. The balances of opinion and the associated composite indicators were quarterly-adjusted according to the place of the last known month in the quarter (Dubois and Michaux' approach, 2004). This was the first month of the quarter for the Banque de France surveys and the second month of the quarter for indicators derived from INSEE surveys. For the industrial production indices, it was the quarterly growth overhang "at month 0" that was used, which is the quarterly growth obtained by extending the level of the series to the last month of the preceding quarter.

Not all the business climate indicators were tested; the scope of the analyses was limited to the level of publication of the quarterly accounts of manufacturing branches and market services (excluding trade), which corresponds to level "A17" of the aggregated Classification (NA 2008).

Of the twelve sub-branches studied, the forecast of the quarterly production growth rate included the sub-sector business climate for eight of them (*Tables 1* and *2*). The other four sub-branches

Table 1 - Quality of calibrations of industry sub-branches

	Variables used in the forecasting model	Standard deviation of production	RMSE in-sample	RMSE out-of-sample
Food products and beverages (C1)	- late production - balances by Banque de France - climate	0.9	0.9	0.9
Coke and refined petroleum products (C2)	- late production - IPI overhang in month 0 - balances by Insee	5.5	3.1	4.4
Capital goods (C3)	- balances by Insee - balances by Banque de France - climate	2.4	1.6	1.6
Transport equipments (C4)	- balances by Banque de France - indicator of surprise - climate	4.2	3.0	3.1
Other manufacturing (C5)	- balances by Banque de France - indicator of surprise - climate	1.4	0.6	0.9

Source : INSEE

Table 2 - Quality of calibrations of services sub-branches (market services excluding trade)

	Variables utilisées dans le modèle de prévision	Standard deviation of production	RMSE in-sample	RMSE out-of-sample
Transportation (HZ)	- late production - balances by Insee - balances by Banque de France	1.5	0.6	
Accommodation and food services activities (IZ)	- balances by Insee - climate	0.8	0.7	0.7
Information-communication (JZ)	- late production - balances by Insee - climate	1.1	0.8	0.9
Financial activities (KZ)	- late production - services climate	0.9	0.5	0.6
Real estate activities (LZ)	- late production - climate	0.3	0.2	0.2
Business services (MN)	- late production - climate of sectors M and N - balances by Insee	1.0	0.6	0.7
Other services activities (RU)	- late production - services climate	0.7	0.9	0.7

Source : INSEE

were those for which no business climate had been constructed as they were not covered by the business tendency surveys (financial activities), or not covered sufficiently ("other service activities") or the climate was basically not of sufficient quality (coke and refined petroleum products), and also transport services. In this sub-branch, using balances of opinion (INSEE and Banque de France) produced a model of a significantly higher quality than a model using the business climate, which may be the result of a shorter timescale than the others. Nevertheless, in order to obtain aggregated forecasts, calibrations were tested for these branches based on other available sources.

To produce output forecasts in industry and services, changes in the sub-branches were aggregated by weighting them according to their weight in terms of output.[1] In this way, forecasts were obtained that were concurrent with those obtained by calibrating industry and services output directly using indicators calculated at this level (*Tables 3* and *4*). In the case of industry, the forecasting performance was improved substantially by aggregating the sub-sector forecasts. In the case of services, on the other hand, the performances of the models were similar. ■

1. In services, because of the few time periods known for the transport sub-sector, this was omitted when aggregating dynamic forecasts.

Table 3 - Forecasting quality of manufacturing output by the model obtained by aggregating sub-branches and a reference model

	Standard deviation of production	RMSE in-sample	RMSE out-of-sample
Reference model[1]	1.6	0.9	1.0
Model obtained by sub-sector aggregation[2]	1.5	0.7[3]	0.9[4]

1. The reference model calibrates quarterly growth in manufacturing output from IPI overhang in month 0 and balances by INSEE and Banque de France.
2. The forecasts for this model are obtained by weighting the sub-sector forecasts according to their weight in terms of production.
3. According to the Diebold-Mariano test (1995), the "in-sample" RMSE is reduced significantly (to the threshold of 2%) by aggregating the sub-sector forecasts.
4. The "out-of-sample" RMSE is also reduced but not significantly.

Source: INSEE

Table 4 - Forecasting quality of output in market services excluding trade by the model obtained by aggregating sub-branches and a reference model

	Standard deviation of production	RMSE in-sample	RMSE out-of-sample
Reference model[1]	0.7	0.4	0.5
Model obtained by sub-sector aggregation[2]	0.7	0.4	0.5

1. The reference model calibrates quarterly growth in production in market services excluding trade from its lagged value and from the business climates in services by INSEE and Banque de France.
2. The forecasts for this model are obtained by weighting the sub-sector forecasts according to their weight in terms of production. For out-of-sample forecasts, the aggregation does not take into account the transport sub-sector, as too few time periods are known.

Source: INSEE

Appendix 3 – A new business climate indicator for retail trade

The business climate in retail trade published until May 2016 shows higher volatility (3.4 since 1991) than business climate in industry (2.3 since 1991) or services (2.0 since 2000). This can make it difficult to interpret from one month to the next. This volatility is a result both of the volatility of the balances used to construct it and because these are few in number. A new calculation method was therefore tested.

The current business climate is established from four monthly balances of opinion: ordering intentions, general business outlook, recent sales and workforce size: future trend. Other monthly balances are available, notably, workforce size: recent trend, expected selling prices, and stocks, from 1991. The balance of opinion on expected sales is also available, but only from 2003.

A new business climate indicator was calculated from the seven monthly balances available from 1991. This appears to be considerably less volatile than the business climate published up until May 2016 (volatility indicator 2.8 against 3.4, *Table 1*), and all the loadings associated with the balances are satisfactory (*Table 2*). As in the case of the services and industry sectors, sub-sector climates can also be constructed by differentiating between retail trade excluding automobiles and trade and repair of automobiles.

Generally speaking, this new business climate indicator follows the same developments as the current climate indicator but the levels differ across several periods (*Graph 1*). For example, from 2015, the business climate estimated to date has been above the long-term average (100) and even reached 110 in October 2015. However, the new business climate does not exceed 107 and even dropped below its average level in February 2016 (99) when the current indicator was 101.

Table 1 - Volatility of business climates in retail trade and correlation with the climate for France

	Volatility of climate	Correlation with the climate for France (%)
Retail trade (old climate)	**3.4**	**91**
Retail trade (new climate)	**2.8**	**91**
Trade and repair of motor vehicles (CA)	3.8	83
Retail trade except motor vehicles (CHA)	2.9	87

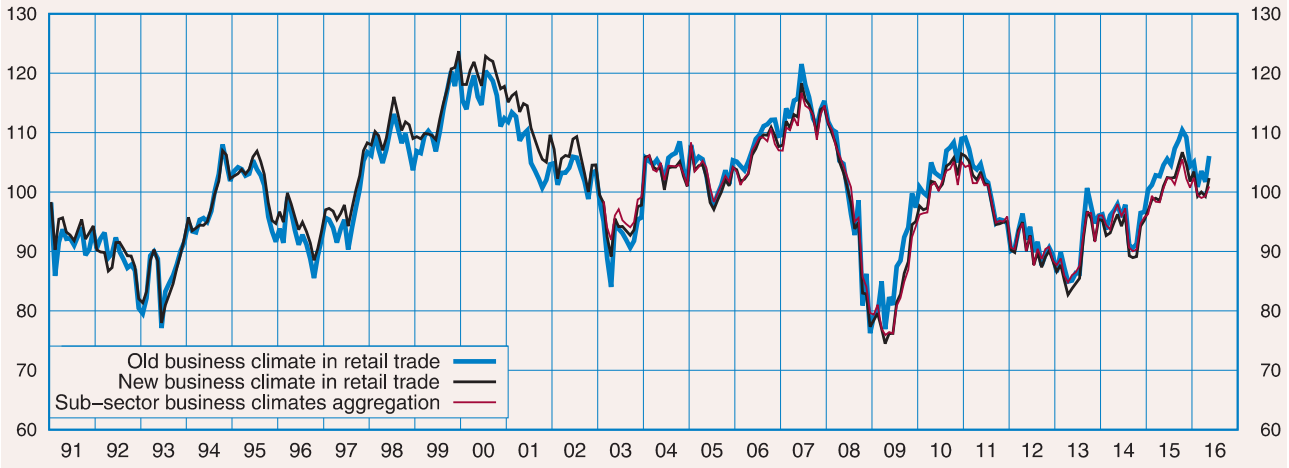
Source : INSEE

Table 2 - Coefficients and loadings of business climates in retail trade

		Ordering intentions	General outlook	Recent sales	Expected employment	Past employment	Expected selling prices	Inventories
Retail trade (old climate)	**Coefficients**	**0.39**	**0.39**	**0.11**	**0.18**			
	Loadings	89%	89%	68%	78%			
Retail trade (new climate)	**Coefficients**	**0.21**	**0.35**	**0.09**	**0.29**	**0.15**	**0.03**	**0.03**
	Loadings	81%	88%	61%	86%	74%	33%	28%
Trade and repair of motor vehicles (CA)	**Coefficients**	**0.29**	**0.33**	**0.19**	**0.17**	**0.07**	**0.06**	**–0.01**
	Loadings	89%	90%	83%	82%	62%	56%	–19%
Retail trade except motor vehicles (CHA)	**Coefficients**	**0.14**	**0.23**	**0.07**	**0.42**	**0.22**	**0.03**	**0.05**
	Loadings	72%	82%	54%	89%	81%	28%	43%

Source : INSEE

1 - Business climates in retail trade and aggregation of sub-sector business climates



Note: the business climate series are normalised to give an average of 100 and a standard deviation of 10 over the period 1991-2016.

Source: INSEE

New sub-sector business climate indicators to improve economic outlook analysis

Both composite indicators (the current and the new) are correlated identically with trade production (correlation of 0.5 in month 2)[1]. To assess the forecasting quality of the new business climate, calibrations used to forecast commercial production were compared, according to whether the current or the new retail trade business climate was used. Two reference models, which also use the wholesale trade business climate with dummy variables for atypical quarters, were estimated in parallel:

Model 1 estimated with the current indicator:

$$prod\_com_t = \underset{(-4.12)}{-3.09} + \underset{(2.32)}{0.09}(facgros_{m1,t} - facgros_{m3,t-1}) + \underset{(4.99)}{0.04}\,facdét_{m2,t} - \underset{(-4.28)}{2.74}\,ind2008Q4 - \underset{(-4.37)}{2.73}\,ind2009Q1 + \varepsilon$$

Model 1 estimated with the new indicator:

$$prod\_com_t = \underset{(-4.41)}{-2.97} + \underset{(2.79)}{0.10}(facgros_{m1,t} - facgros_{m3,t-1}) + \underset{(5.39)}{0.04}\,facdét_{m2,t} - \underset{(-4.02)}{2.55}\,ind2008Q4 - \underset{(-4.44)}{2.71}\,ind2009Q1 + \varepsilon$$

Model 2 estimated with the current indicator:

$$prod\_com_t = \underset{(-2.53)}{-1.98} + \underset{(2.02)}{0.17}\,prod\_com_{t-2} + \underset{(4.24)}{0.06}(facgros_{m3,t} - facgros_{m3,t-1}) + \underset{(3.11)}{0.02}\,facdét_{m3,t} - \underset{(-3.36)}{2.09}\,ind2008Q4 - \underset{(-3.79)}{2.32}\,ind2009Q1 + \varepsilon$$

Model 2 estimated with the new indicator:

$$prod\_com_t = \underset{(-3.14)}{-2.36} + \underset{(1.35)}{0.12}\,prod\_com_{t-2} + \underset{(4.52)}{0.06}(facgros_{m3,t} - facgros_{m3,t-1}) + \underset{(3.74)}{0.03}\,facdét_{m3,t} - \underset{(-3.40)}{2.06}\,ind2008Q4 - \underset{(-3.39)}{2.05}\,ind2009Q1 + \varepsilon$$

(Student's t coefficients given in brackets)
Estimation period: 1993Q1-2013Q4

Where:
- $prod\_com_t$ is the quarterly growth rate of trade production in quarter t;
- $facgros_{mi,t}$ is the business climate for wholesale trade in month i of quarter t;
- $facdét_{mi,t}$ is the business climate for retail trade in month i of quarter t;
- $ind2008Q4$ is the dummy with value 1 in Q4 2008, otherwise 0;
- $ind2009Q1$ is the dummy with value 1 in Q1 2009, otherwise 0.

In each model, the RMSE was significantly lower according to the Diebold-Mariano test when the new business climate indicator was used (*Table 3*). Calibrations were therefore improved.

The new overall business climate was at around its average in May 2016. This was due mainly to the favourable outlook in the automobile trade (*Graph 2*), where the business climate reached a very high level (112). On the other hand, the business climate in retail trade excluding automobiles was much lower (96), below its long-term average (100).

The new business climate indicator replaces the previously published version from June 2016. ■

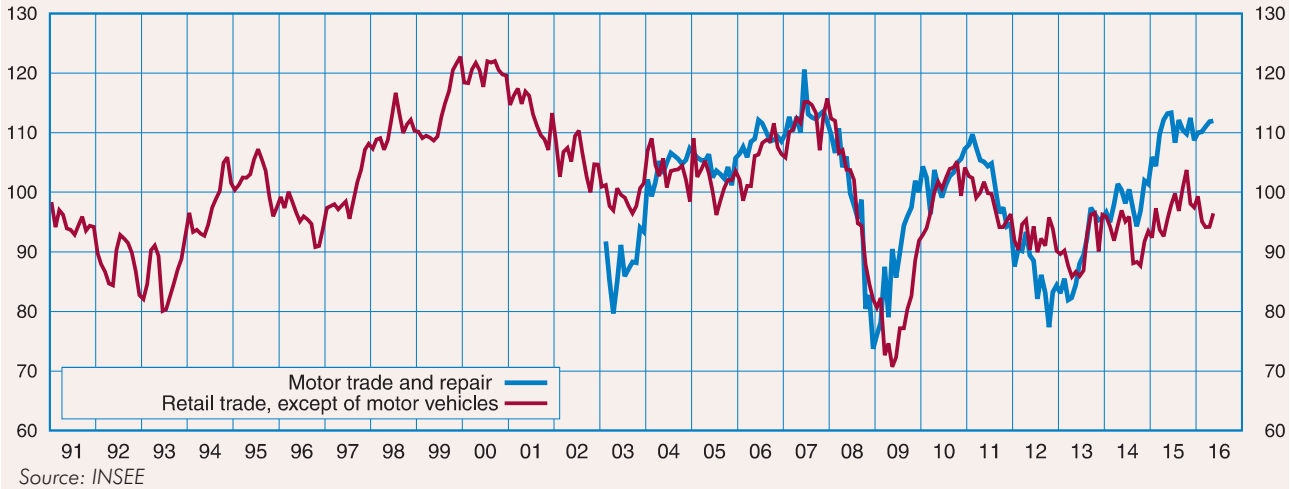
Table 3 - Performance of bridge models in forecasting trade production

RMSE "out-of-sample" of the different models	With the current indicator	With the new indicator
Model 1	0.73	0.69
Model 2	0.65	0.62

Note : according to the Diebold-Mariano test (1995), the "out-of-sample" RMSE is reduced significantly with the new indicator of business climate, to the threshold of 3% for the model 1 and 9% for the model 2.

Source: INSEE

2 - Sub-sector business climates in retail trade



Source: INSEE

1. Correlation between quarterly evolutions in trade production in volume at chained prices and the quarter-adjusted business climate in retail trade taking its value in the second month of the quarter.