European
Business
Cycle
Indicators

3rd Quarter 2015

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European Business Cycle Indicators

3rd Quarter 2015

Special topic:

Re-assessing the construction of the Consumer Confidence Indicator (CCI) - A comparison with three alternative indices

CONTENTS

OVERVIEW

Recent developments in survey indicators

- Both the EU and the euro-area Economic Sentiment Indicator (ESI) increased over the third quarter of 2015. At 107.6 (EU) and 105.6 (euro area) in September 2015, the ESI stood at its highest level since March (June) 2011, markedly above the long-term average of 100.

- At sector level, confidence improved markedly in the services and retail trade sectors. Albeit to a lesser extent, confidence improved also in the industry sector. By contrast, confidence among consumers and, for the EU, in the construction sector worsened over the quarter. The euro area saw confidence in construction improving.

- Compared to June's readings, the ESI brightened in all the seven largest EU economies (Germany, France, Italy, Spain, the Netherlands and the UK) except for Poland, where the indicator decreased slightly.

- Capacity utilisation in the manufacturing sector decreased fractionally in the third quarter and currently stands close to its long-term average in both the EU and the euro area. Also in the services sector, capacity utilisation decreased slightly in both areas.

Special topic: Re-assessing the construction of the Consumer Confidence Indicator (CCI) - A comparison with three alternative indices

The highlight section provides a comparative analysis of the established CCI for the euro area vis-à-vis alternative indices of consumer confidence using wider information sets and based on formal statistical techniques explicitly designed to handle large datasets. The evaluation investigates the weight structure of the alternative aggregation schemes, the evolution over time of the alternative indicators, as well as their degree of directional accuracy in tracking real private consumption growth rates and predictive power to detect turning points in real private consumption. Overall, the evidence shows that despite its deliberate simplicity, the official CCI performs quite similarly to the proposed alternative consumer confidence measures, giving further assurance to the reliability of the established CCI as a timely indicator of developments in real private consumption.

1. RECENT DEVELOPMENTS IN SURVEY INDICATORS

1.1. EU and euro area

After the broadly flat development over the second quarter of 2015, the EU and the euro-area Economic Sentiment Indicators (ESI) embarked on an upward trend in the third quarter of 2015, thanks mostly to increases in July and September. At the end of the third quarter of 2015, the ESI scored rather comfortably above the long-term average of 100 in both the EU (at 107.6) and the euro area (at 105.6).

Graph 1.1.1: Economic Sentiment Indicator
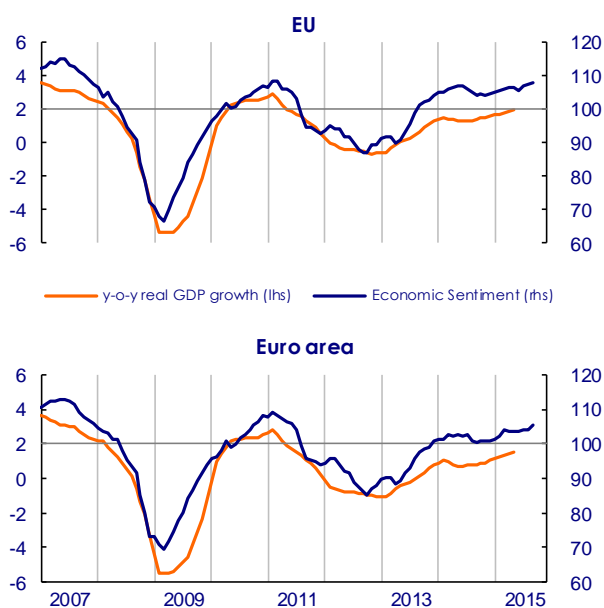
Note : The horizontal line (rhs) marks the long-term average of the survey indicators. Confidence indicators are expressed in balances of opinion and hard data in y-o-y changes. If necessary, monthly frequency is obtained by linear interpolation of quarterly data.

Compared to the readings at the end of the second quarter of 2015, the ESI registered increases by 2.1 points in both the EU and the euro area. The positive signals were echoed by the Ifo Business Climate Index (for Germany), which also picked up over the third quarter of 2015, and Markit Economics' Composite PMI for the euro area which, though moving broadly sidewards, remained well above the threshold of 50 signalling growth.

At EU sector level, the positive development of the sentiment indicator over the third quarter was fuelled by marked confidence increases in the services and retail trade sectors. Sentiment in industry improved as well, but less strongly. By contrast, confidence among consumers and in the construction sector is at a lower level now than in June 2015. In the euro area, sectoral developments paralleled those in the EU, except for confidence in the construction sector, which improved compared to the end of the second quarter of 2015 in line with the other business sectors. In terms of levels, all sectoral indicators currently score well above their corresponding historical means, except for construction confidence that is just below its long-term average in the EU and remains well below it in the euro area.

At country level, sentiment improved in all but one of the seven largest EU economies compared to June, namely in Germany (+2.7), France (+2.5), Italy (+2.7), Spain (+1.1), the Netherlands (+1.3) and the UK (+1.3). Only Poland (-0.6) saw sentiment worsening.

Sector developments
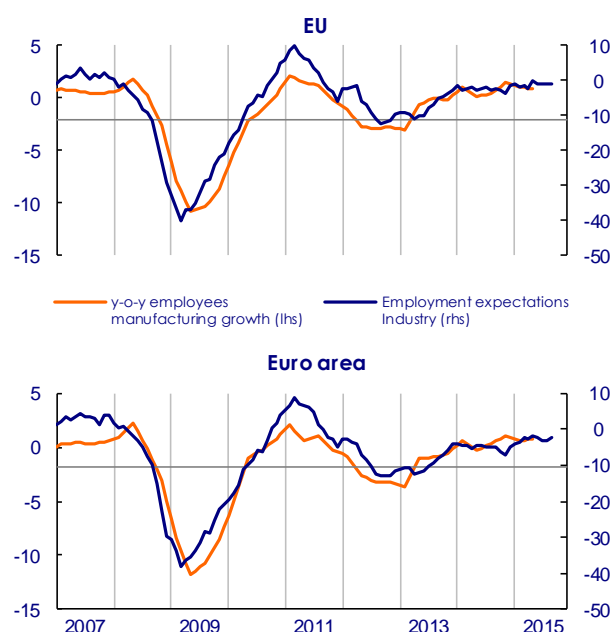
In both the EU and the euro area, confidence in the **manufacturing industry** improved over the third quarter of 2015. Increases in July were followed by decreases in August and a renewed pick-up in September. On balance, a comparison of September's readings to those of June shows a slight increase of 0.7 points for the EU and a more marked increase of 1.2 points for the euro area.

Graph1.1.2: Industry Confidence indicator

EU

— y-o-y industrial production growth (lhs) — Industrial Confidence (rhs)

Euro area
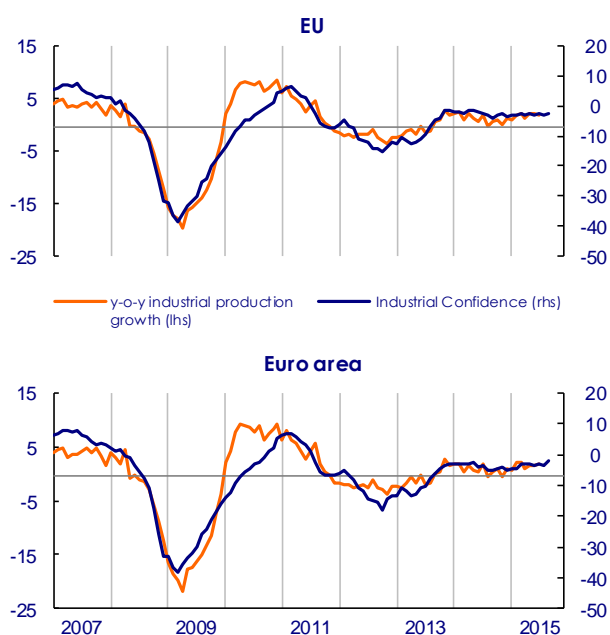
Graph1.1.3: Employment - Industry Confidence indicator

EU

— y-o-y employees manufacturing growth (lhs) — Employment expectations Industry (rhs)

Euro area

Over the quarter, managers' production expectations improved in both regions and their assessments of order books remained broadly stable, while their assessment of the stocks of finished products improved slightly in the EU, but worsened somewhat in the euro area. In both areas, managers' appraisals of past production trends brightened, while their views on export order books worsened. Due to downward revisions in the last two months of the quarter, managers' selling price expectations were at a lower level in September than in June in both areas.

In both areas, industry managers' employment expectations remained broadly unchanged in September compared with June. However, while in the EU the intra-quarter development was rather flat, the euro-area indicator decreased in June but then improved in August and September.

In the seven largest EU countries, compared to the end of the second quarter, industry confidence increased in Germany, France and Poland (between 1.1 and 2.6 points), while it remained broadly unchanged in Italy, Spain and the Netherlands. By contrast, confidence worsened strongly in the UK (by 3.3 points).

The latest readings from the quarterly manufacturing survey (carried out in July) showed that, compared to the second quarter of 2015, *capacity utilisation in manufacturing* decreased fractionally by 0.2 and 0.1 percentage points in the EU and the euro area, respectively. In both areas the level of capacity utilisation stood at 81.1%, roughly corresponding to the long-term averages for both areas (EU 80.9%; euro area 81.2%).

Confidence in the **services sector** increased sharply over the third quarter of 2015. Both the EU and the euro-area indicators currently score above their historical averages. In the EU, the indicator increased markedly in July and August and stabilised in September, while in the euro area, confidence improved strongly for three months in a row, continuing the upward trend already visible since the beginning of the year.

EU

— y-o-y services value added growth (lhs) — Service Confidence (rhs)
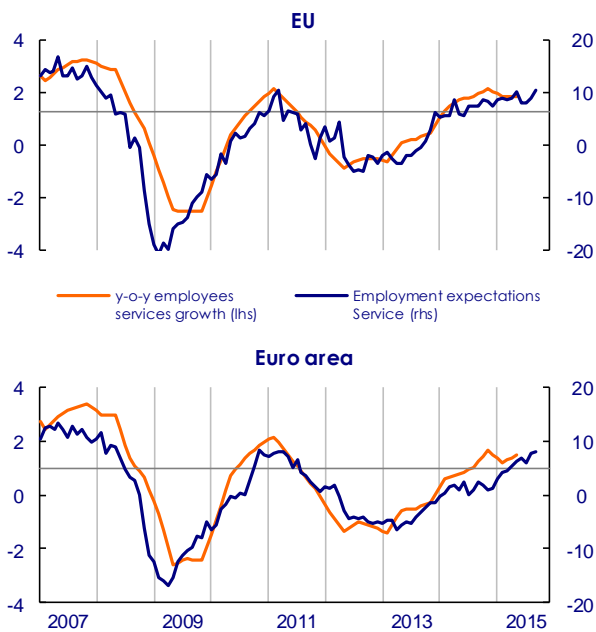
Euro area
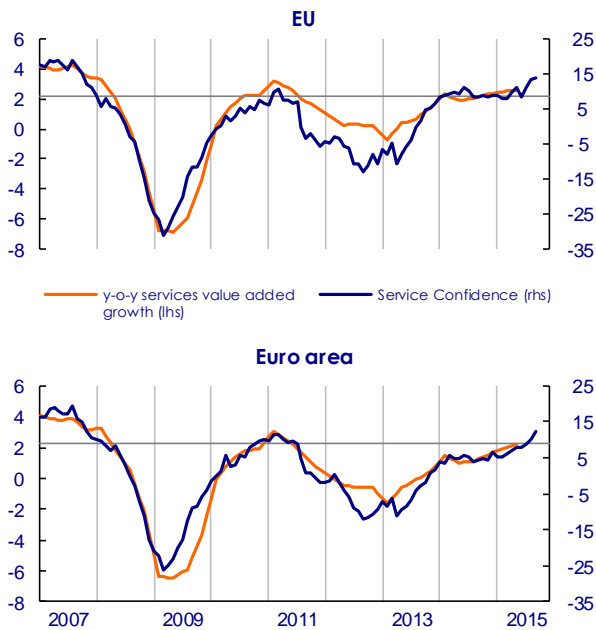
Looking at the largest EU countries, compared to June 2015, confidence surged in Germany (+7.1), Italy (+7.7) and the UK (+10.6), improved markedly in France (+2.5) and Spain (+3.9), improved only slightly in the Netherlands (+0.6) and remained broadly unchanged in Poland.

The latest readings on *capacity utilisation in services* (from the July survey) indicated a pause in the upward tendency that had started in early 2013, with both the EU and the euro area indicator decreasing slightly (by 0.6 and 0.4 points, respectively) from the heights reached in April. The indicator stands at 88.4% and 88.1%, respectively.

Retail trade confidence increased strongly in the third quarter of 2015. In the EU and the euro area, the improvement resulted from three increases in a row. In September the indicator was well above its long-term average in both areas, and even scoring its historical maximum in the EU.

As for the individual components of services confidence, in both areas all three components (managers' views on the past business and past and expected demand) improved substantially over the third quarter of 2015. Also managers' employment expectations, not included in the confidence indicator, increased over the third quarter.

Graph1.1.6: Retail Trade Confidence indicator

EU

— y-o-y consumption growth (lhs) — Retail Confidence (rhs)

Euro area

Graph1.1.5: Employment - Services Confidence indicator

EU

— y-o-y employees services growth (lhs) — Employment expectations Service (rhs)

Euro area
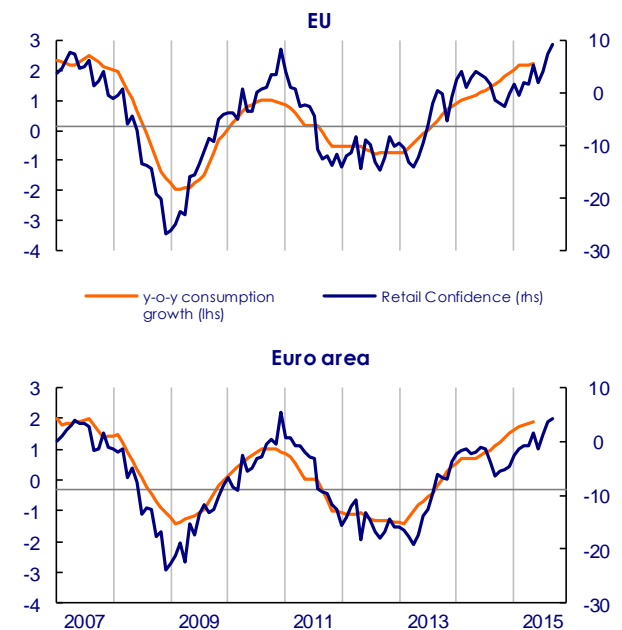
Improved confidence in both areas resulted from positive developments in all three components of the indicator, i.e. managers' appraisals of the past and expected business activity, where improvements were particularly pronounced, as well as their views on the adequacy of the volume of stocks. From a country perspective, confidence improved

markedly in Germany, France, Italy and the UK (+9.7, +6.7, +4.6 and +18.3 points compared to June), and, less so, in the Netherlands (+2.2) and Poland (+0.6). By contrast, it decreased in Spain (-2.1).

Compared to the end of the second quarter of 2015, confidence in **construction** worsened in the EU, while it improved in the euro area. The monthly profile for the EU saw a decrease in July, an increase in August and another decrease in September, while in the euro area confidence increased in July and August but dropped somewhat in September.

Graph1.1.7: Construction Confidence indicator
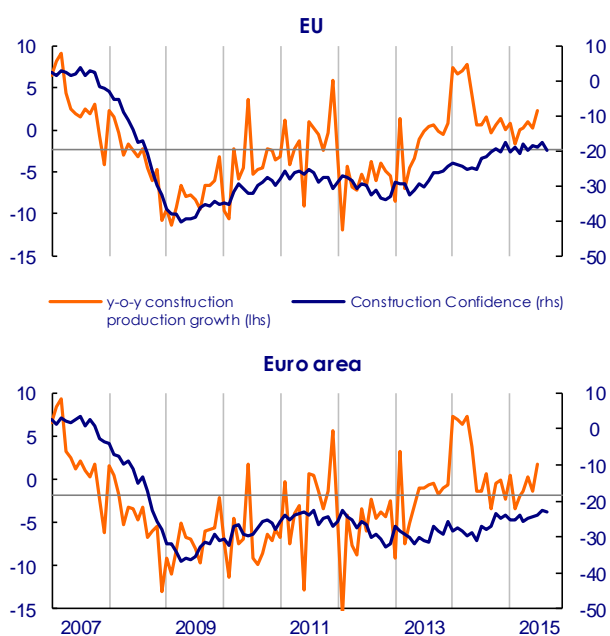
In the EU, both components of the indicator - managers' views on current order books and their employment expectations – declined. By contrast, in the euro area both components improved.

Focusing on individual countries, the indicator picked up markedly in Germany (+3.4), France (+2.3) and the Netherlands (+1.8) and, to a lesser extent, in Italy (+0.7) and Poland (+0.4). By contrast, it deteriorated strongly in Spain (-5.1) and the UK (-10.8). In the UK, in spite of particularly strong losses, the indicator remained at relatively high levels.

Confidence among **consumers** worsened in the third quarter of 2015, resulting mainly from an important decline in July. In the EU, the indicator remained broadly stable in August but recorded another decrease in September, while in the euro area it remained broadly stable over the remainder of the quarter.

Graph1.1.8: Consumer Confidence indicator
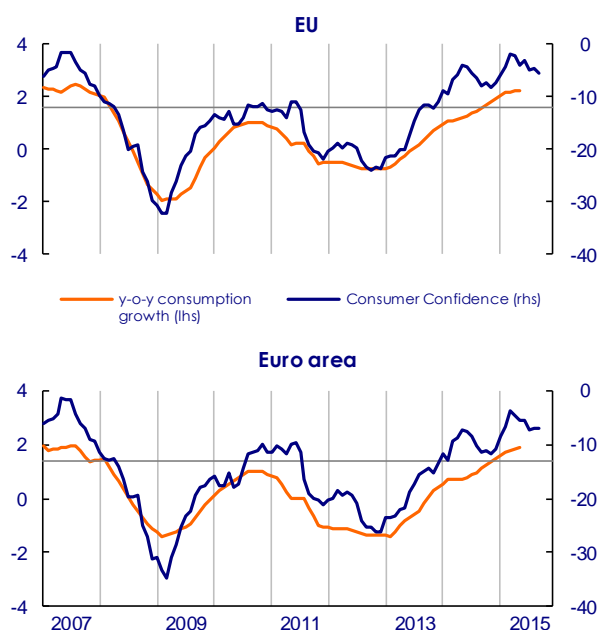
These patterns resulted from a substantial worsening of consumers' unemployment expectations and, albeit to a lesser extent, expectations about the general economic situation. By contrast, consumers' expectations about their personal financial situation and, in particular, their savings improved over the quarter. The fall in confidence was particularly important in Germany (-5.7), Poland (-3.6) and the UK (-4.7). To a lesser extent, the indicator decreased also in Spain (-2.2) and the Netherlands (-1.2), while it improved in Italy (+2.0) and, more strongly, France (+4.1).

EU and euro-area confidence in **financial services** (not included in the ESI) worsened over the third quarter of 2015, interrupting for the time being the volatile upward trend observed since the end of 2012. The decline was particularly important in the EU and resulted from managers' more negative answers to all questions feeding into the indicator (managers' views on past demand and business situation and expected demand).

EU

Financial Services Confidence

Euro area

the downswing area, but remains very close to the border between the two quadrants. By contrast, owing to its still subdued level, the climate tracer for construction moved from the upswing area towards the border with the contraction quadrant.

Also for the euro area, the overall economic climate tracer is now located deeper in the expansion quadrant.

Graph 1.1.11: Euro area Climate Tracer

Climate tracers

The developments in survey data over the first quarter are illustrated by the evolution of the **climate tracers.** The economic climate tracer for the EU moved further into the expansion quadrant.

Graph 1.1.10: EU Climate Tracer
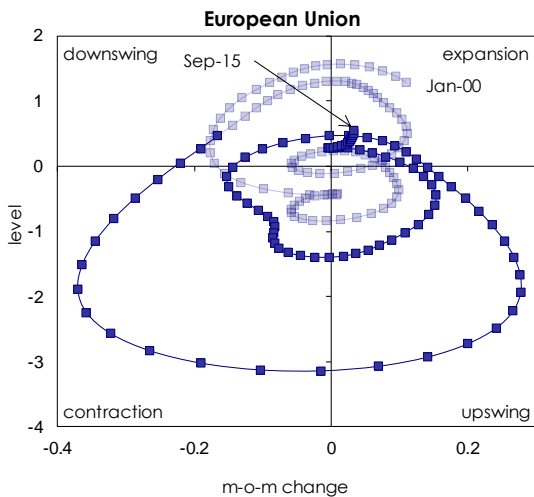
This movement was driven mainly by the climate tracers for services and the retail trade sectors, which moved deeper into the expansion area. The tracer for consumers also remains in the expansion quadrant but is pointing towards the downswing border. The climate tracer for industry re-entered into expansion directly from

In contrast to the EU, the euro-area climate tracer for the industry sector is more clearly in the expansion area and the construction climate tracer is in the upswing quadrant and pointing towards the expansion area.

Graph 1.1.12: Economic climate tracers across sectors

EU

Euro area
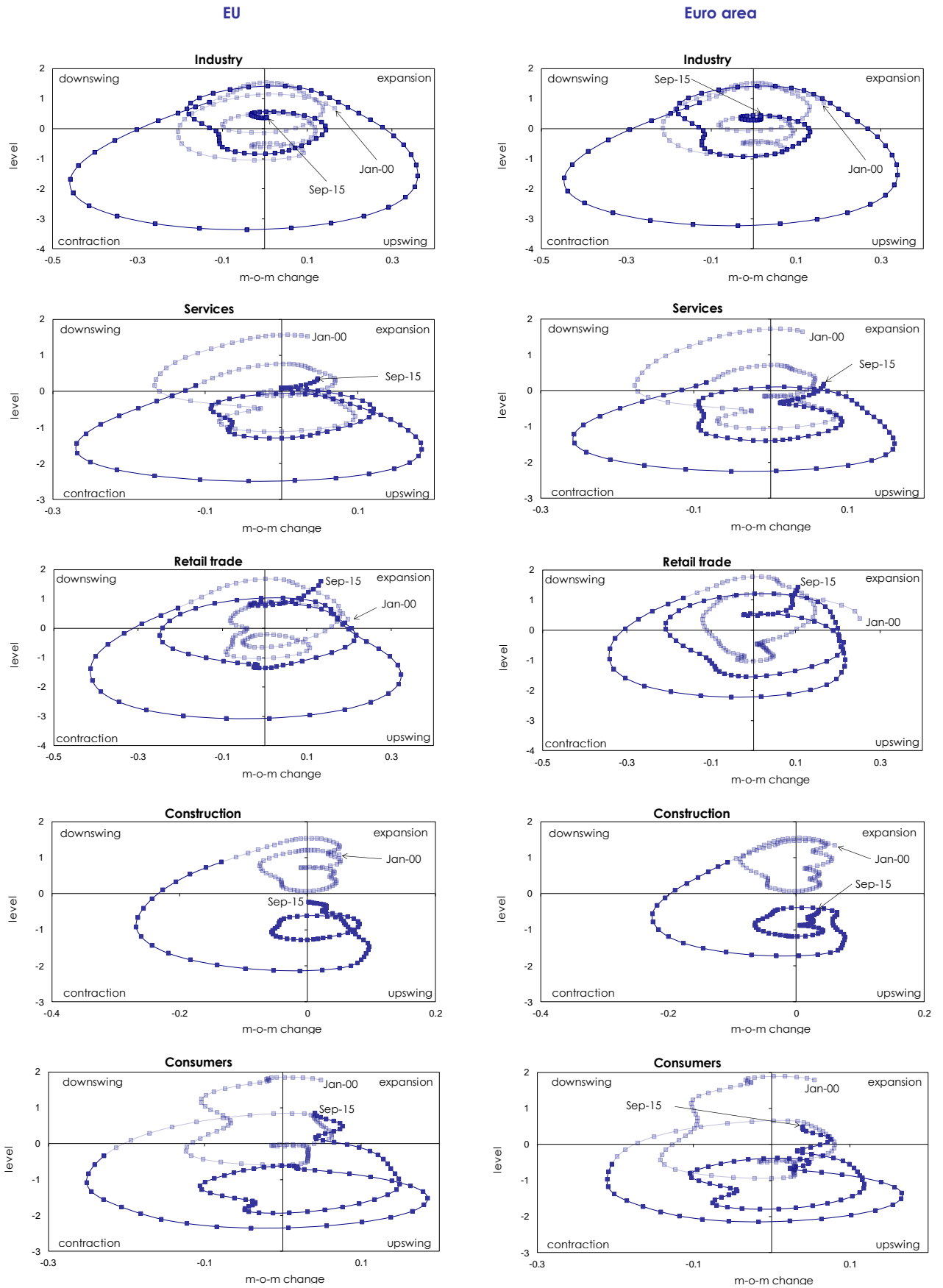
1.2. Selected Member States

During the third quarter of 2015, sentiment has improved strongly in all the seven largest Member States, except in Poland where the indicator decreased slightly. The economic sentiment indicator scored below its long-term average only in Poland.

In **Germany,** the ESI increased in the third quarter of 2015 compared to June (+2.7), thanks to two sizeable increases in July and September. The indicator is now well above its long-term average of 100, at 107.7 points. Over the quarter, confidence improved in all business sectors, while it dropped among consumers; consumer confidence is now 5.7 points lower than at the end of the second quarter of 2015. In terms of the climate tracer, Germany is moving deeper into the expansion quadrant, indicating firm growth.

Economic sentiment in **France** rose in all three months of the quarter, resulting in a marked increase compared to June 2015 (+2.5). Still, at 101.0, the sentiment index is now only slightly above its long-term average of 100. Confidence improved among consumers and across all business sectors. Testifying to these developments, the climate tracer entered into the expansion quadrant, pointing to positive growth dynamics.

Graph 1.2.1: Economic Sentiment Indicator and Climate Tracer for Germany

Graph 1.2.2: Economic Sentiment Indicator and Climate Tracer for France
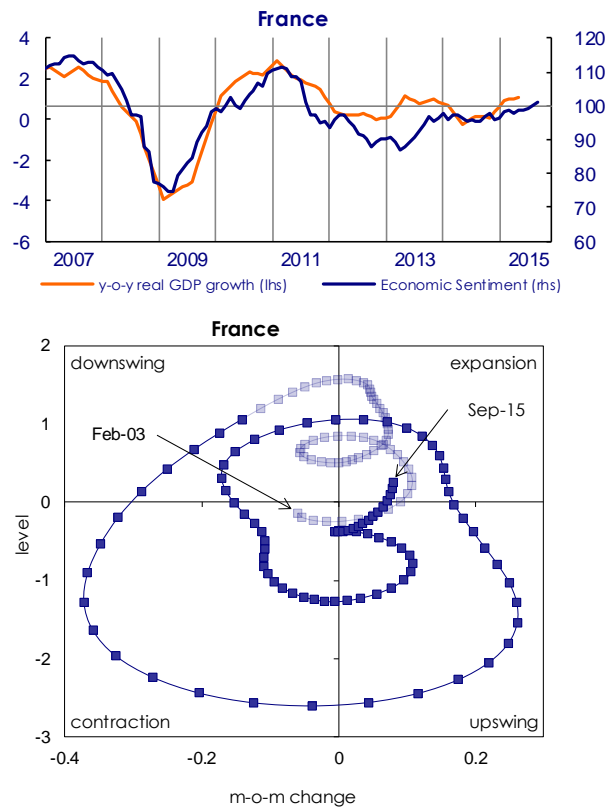
Sentiment in **Italy** improved markedly compared to June 2015 (+2.7) thanks to an important increase registered in September. The sentiment index is now well above its long-term average of 100, at 109.2 points. At sector level, confidence improved among consumers and in all business sectors except for industry where confidence remained broadly at its June level. Improvements were particularly strong in services and in retail trade. The climate tracer is moving vertically in the expansion area, pointing to steady growth dynamics.

The ESI in **Spain** improved moderately compared to June 2015 (+1.1) thanks to a marked gain registered in August which more than withstood the decrease in September. At 109.5 points, the sentiment indicator is well above its long-term average of 100. Confidence registered solid gains only in the services sector, while it remained stable in industry and decreased in the retail trade and construction sectors as well as among consumers. While the climate tracer for Spain remains in the expansion area, it is approaching the border to the downswing quadrant, indicating a possible deceleration in the pace of growth.

Graph 1.2.3: Economic Sentiment Indicator and Climate Tracer for Italy

Graph 1.2.4: Economic Sentiment Indicator and Climate Tracer for Spain
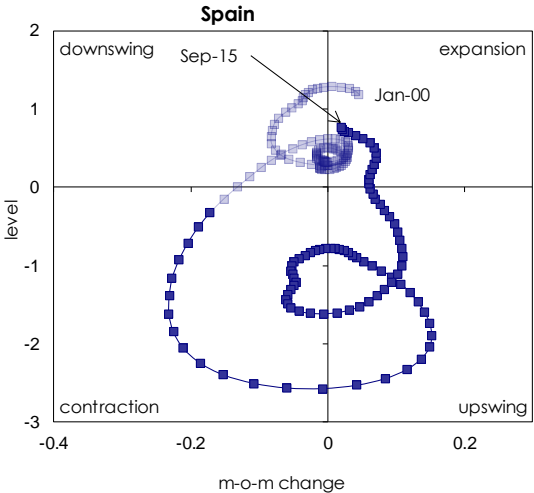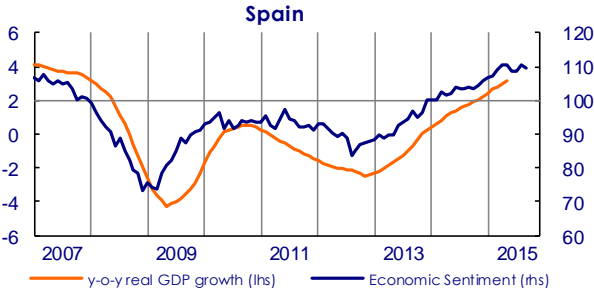
Also in the **Netherlands** sentiment improved over the third quarter of 2015 (+1.3). The ESI increased in July and September, while it declined marginally in August. At 106.1, the indicator is well above its long-term average. At sector level, sentiment remained stable in industry and increased in services, retail trade and construction. By contrast, it dropped among consumers. The climate tracer is moving vertically in the expansion area, indicating slow but steady growth dynamics.

In the **United Kingdom**, sentiment increased in the third quarter compared to June 2015 (+1.3), thanks mostly to a marked increase in July that was only partly offset by an important decrease booked in September. The indicator is significantly above its long-term average of 100, at 110.7. Improved sentiment resulted from substantial upward revisions in services and retail trade confidence, which were only partially diminished by marked losses in industry, construction and among consumers. The climate tracer in the downswing quadrant suggests still high but decelerating growth.

Graph 1.2.5: Economic Sentiment Indicator and Climate Tracer for the Netherlands

Graph 1.2.6: Economic Sentiment Indicator and Climate Tracer for the United Kingdom
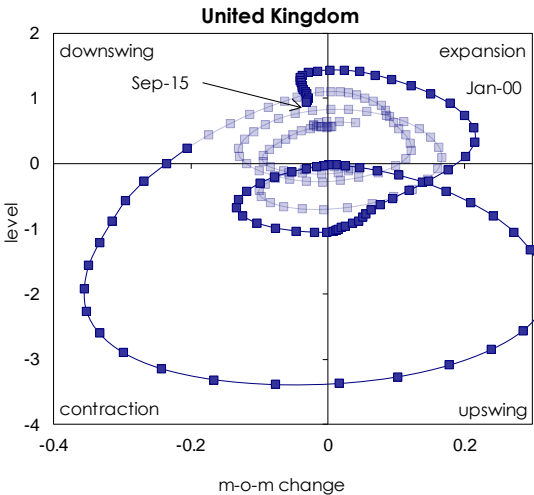
Sentiment in **Poland** worsened in July, improved in August and registered another decrease in September, resulting in an overall decline compared to June 2015 (-0.6). The ESI thus continues to score below its long-term average, at 97.7. At sector level, confidence worsened markedly among consumers, remained broadly stable in services, while it improved in industry and – albeit to a lesser extent – in retail trade and construction. Notwithstanding very robust GDP growth in the last two years, the Polish climate tracer has reached the border to the contraction quadrant.

Graph 1.2.7: Economic Sentiment Indicator and Climate Tracer for Poland
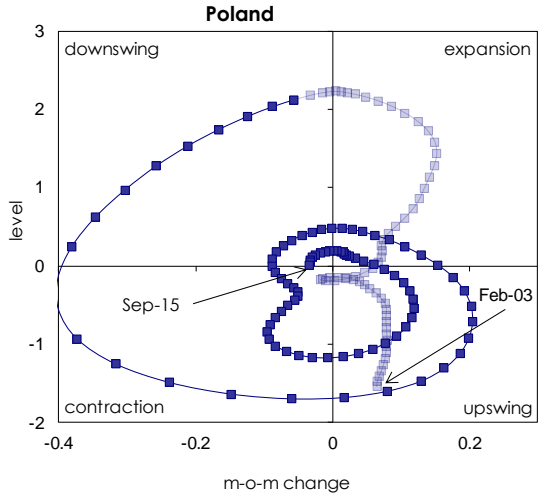
2. SPECIAL TOPIC: RE-ASSESSING THE CONSTRUCTION OF THE CONSUMER CONFIDENCE INDICATOR - A COMPARISON WITH THREE ALTERNATIVE INDICES

Consumer confidence readings are closely monitored by analysts and policy-makers to get a timely grasp of the future evolution of the economy, and the link between confidence and economic developments has also received extensive attention in academic circles.

While theoretical models based on the rational expectations hypothesis do not see a role for consumer confidence in explaining consumer decisions, allowing for market imperfections (like frictions in capital markets) makes it possible to interpret observed changes in consumer confidence as reflections of future income changes and, thus, consumption developments.[1] Whether or not consumer confidence may be conceived as a (timely) proxy for future consumption is an issue that has been investigated from a more empirical perspective as well. In this respect, the literature has focused on whether survey-based confidence indicators convey any information beyond economic fundamentals (or at least, have any predictive power on its own) when forecasting future consumption expenditures.[2]

There is also a methodological viewpoint which deserves discussion. Although survey-based confidence indices are usually assumed to be a good proxy of individuals' perceptions about their economic environment (and to be informative about agents' behaviour), the measurement of confidence is subject to controversy. Consumer sentiment indicators might indeed be subject to measurement errors (for instance if the survey questions are too ambiguous for respondents) or offer an overly subjective assessment of agents' (general/private, current/future) economic environment with limited relevance for quantitative analyses.[3]

Notwithstanding its relevance for both practitioners and scholars, the consumer confidence indicator (CCI) regularly published by DG ECFIN of the European Commission, within the Joint Harmonised EU Programme of Business and Consumer Surveys (BCS), is constructed in an ad-hoc way, by averaging the results of a pre-selected subset of questions taken from the consumer survey questionnaire.

The lack of a genuine statistical background of the CCI calls for a close scrutiny of its performance. For instance, Jonsson and Lindén (2009) and ECB (2015) highlight how some questions underlying the CCI are more correlated with the developments of private consumption than the CCI itself.[4] This highlight section contributes to the assessment of the role of the CCI in tracking real private developments by comparing it against a number of competing indices built using statistical methods specifically designed to efficiently handle large datasets (such as the complete set of questions

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[1] See, Hall, R.E. (1978), "Stochastic implications of the life-cycle/permanent income hypothesis: Theory and evidence", *Journal of Political Economy* 96, pp. 971-987; Acemoglu, D. and Scott, A. (1994), "Consumer confidence and rational expectations: Are agents beliefs consistent with the theory?", *The Economic Journal* No 104, pp. 1-19.

[2] See, Dées, S. and Soares Brinca, P. (2013), "Consumer confidence as a predictor of consumption spending: Evidence for the United States and the Euro area", *Economie Internationale* 134, pp. 1-14; Bruno, G. (2014), "Consumer confidence and consumption forecast: a non-parametric approach", *Empirica* 41, pp. 37-52.

[3] See, Dominitz, J. and Manski, C.F. (2004), "How should we measure consumer confidence", *Journal of Economic Perspectives* 18, pp.51-56.

[4] ECB (2015), Economic Bulletin, Issue 5, Box 2, pp. 18-19; Jonsson, A. and Lindén, S. (2009), "The quest for the best consumer confidence indicator", European Economy – Economic Papers 372.

per country from DG ECFIN's consumer survey).

As discussed below, the comparison embraces several dimensions and concerns (i) the weight structure of the alternative aggregation schemes; (ii) the evolution over time of the indicators and the degree of directional accuracy in tracking real private consumption growth rates; (iii) the predictive power of the different indicators to detect turning points in real private consumption in a timely way.

Overall, the results show that the official CCI performs quite similarly to the proposed alternatives, lending support to the role of the CCI as a timely indicator of developments in real private consumption.

Data

The analysis is based on data taken from the Joint Harmonised EU Programme of BCS. The data published by DG ECFIN every month are derived from surveys conducted by partner institutes (such as statistical offices, central banks, research institutes, business associations or private companies) in the EU and candidate countries.[5]

The purpose of the consumer survey is to (a) collect information on households' spending and savings intentions, and (b) assess their perception of the factors influencing these decisions. To this end, the questions are organised around four topics: the households' financial situation (Q1, Q2, Q12), savings (Q10, Q11) and intentions with regard to major purchases (Q8, Q9), as well as the general economic situation (Q3, Q4, Q5, Q6, Q7). The questions are both backward-looking (over the last 12 months: Q1, Q3, Q5, Q8, Q9, Q12) and forward-looking (over the next 12 months: Q2, Q4, Q6, Q7, Q11). Answers obtained from the surveys are aggregated in the form of balances,

i.e. differences between the percentages of respondents giving positive and negative replies.[6]

All of DG ECFIN's confidence indices are built as arithmetic means of (seasonally adjusted) balances of a selection of questions which are likely to be closely related to the reference variable they are supposed to track (year-on-year private consumption growth in the case of consumer survey). Specifically, the official consumer confidence indicator (CCI) released by DG ECFIN is calculated as the arithmetic mean of four balances derived from four forward-looking questions: two of them relate to consumers' personal situation (financial position, Q2, and savings, Q11) and the other two relate to the economic situation of their country (general economic situation, Q4, and unemployment in the country, Q7). Finally, DG ECFIN calculates the euro-area aggregate on the basis of the national results by way of a weighted average.[7]

Data for the alternative aggregate indicators also uses balance series taken from the consumer questionnaire. However, they are built using data for selected European countries – namely, Austria (AT), Belgium (BE), Germany (DE), Greece (EL), Spain (ES), Finland (FI), France (FR), Italy (IT), the Netherlands (NL), and Portugal (PT). These economies have the longest available time-series and cover about 97% of euro-area real private consumption over the period 1985q1-2014q4. Contrary to the CCI, which is based on a subset of only four questions, all monthly questions of the consumer questionnaire have

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[5] The surveys are conducted according to a common methodology, which consists essentially of harmonised questionnaires and a common timetable. For more details see the methodological user guide of the BCS Programme: http://ec.europa.eu/economy_finance/db_indicators/surveys/documents/bcs_user_guide_en.pdf

[6] In the consumer survey, respondents can usually choose among six options ("got/get a lot better" (PP), "got/get a little better" (P), "stayed/stay the same" (E), "got/get a little worse" (M), "got/get a lot worse" (MM), don't know (N)), (with PP+P+E+M+MM+N=100). Balances are calculated as $B=(PP+\frac{1}{2}P)-(\frac{1}{2}M+MM)$, so that their values range from −100, when all respondents choose the (most) negative option to +100, when all respondents choose the (most) positive option.

[7] The weights are the shares in euro-area consumer private final consumption expenditure at constant prices of each of the Member States, and are smoothed by calculating a two-year moving average.

been included in the panel of alternative indicators, for a total of 110 series.[8]

Finally, euro-area quarterly year-on-year private consumption growth taken from Eurostat and reconstructed backward by using the growth rates taken from Fagan et al. (2001) is used as the reference series for the analysis.[9]

Constructing the three alternative indicators

This section describes the procedure to derive the competing methods for constructing an aggregate consumer confidence indicator for the euro area. Specifically, the indicators have been computed using Principal Component (PC), Partial Least Squares (PLS) and Ridge Regression (RR) techniques.

It is well known that when the number of explanatory variables is relatively large in comparison to the sample size, the least squares (LS) estimator fails. Also when predictors are (near) collinear, the LS give unsatisfactory results since the variance of the estimated parameter is inflated.

In this context, both PC and PLS are proven to be valid methods, since they aim at condensing the relevant information in the panel of predictors in a limited number of (mutually orthogonal) latent variables. Specifically, the PLS method is based on a recursive computing scheme to get a sequence of underlying factors from a set of (standardised) indicators. It aims to incorporate information on both the target variable and the set of predictors to describe as much as possible of the *covariance* between the dependent variable and the regressors. Likewise, PC deals with the issue of reducing the dimension of the panel of indicators, although it takes into account only the information contained in the panel of indicators, so that it concentrates on the *variance* of the set

of predictors.[10] In turn, both PC and PLS methods perform very similar to RR, an alternative method to handle regressions with many (collinear) predictors. The RR is a form of regularised (i.e. constrained) regression which seeks to impose a threshold on the values taken by the coefficients. RR works properly even when the number of predictors exceeds the number of available observations; moreover, although biased, the resulting estimator has lower variance than the standard LS one.[11]

The proposed indicators are computed in a (pseudo) real-time setup which takes into account the release calendar of both real private consumption and the survey questions. While DG ECFIN releases the full set of BCS results at the end of the reporting period to which they refer (with a flash estimate of the EU and euro-area CCI even available one week earlier than that), private consumption is available with a considerable delay (65 days or more). It implies that for each period, only information which is available at that point in time is included in the calculation of the current weights.

The key assumption is that survey readings should provide an indication of the tracked variable for the current calendar quarter Q(t). It follows that three different values of the indicators are available for each quarter. Table 2.1 illustrates the resulting sequence, where dark grey cells represent the availability of survey (*svy*) and real private consumption (*rpc*) data at the middle and towards the end of each month of a calendar quarter Q(t).

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[8] Country-specific Q10's were excluded from the analysis due to imperfect harmonisation across countries.

[9] See, Fagan, G., Henry, J. and Mestre, R. (2001), "An Area-wide Model (AWM) for the Euro Area", ECB Working Paper Series 42.

[10] As in Gelper, S. and Croux, C. (2010), "On the Construction of the European Economic Sentiment Indicator", *Oxford Bulletin of Economics and Statistics* 72, pp. 47-62, it is assumed there is one single driving force influencing all economic sentiment components in all countries, so that only the first factor extracted via PLS or PC is considered as the most useful in tracking the response variable.

[11] For a technical overview of the algorithms see Li, Y. (2010), "A Comparison Study of Principle Component Regression, Partial Least Squares Regression and Ridge Regression with Application to FTIR Data", mimeo, Uppsala Univesitet.

Table 2.1: Release calendar of survey and real private consumption data

			Q(t-2) m1	Q(t-2) m2	Q(t-2) m3	Q(t-1) m1	Q(t-1) m2	Q(t-1) m3	Q(t) m1	Q(t) m2	Q(t) m3
[A]	mid	svy									
		rpc									
	end	svy									
		rpc									
[B]	mid	svy									
		rpc									
	end	svy									
		rpc									
[C]	mid	svy									
		rpc									
	end	svy									
		rpc									

For each quarter Q(t), the first computation is conducted towards the end of month 1 of that quarter (case [A] in Table 1). At that point in time, survey data cover the first month while private consumption data refer to Q(t-2). It means that the weighting schemes derived from the regression-based methods (namely, PLS and RR) are based on information for Q(t-2); subsequently, these weights are applied to survey readings of month 1 of Q(t) to get a value of the indicator for that month. The second monthly value is computed at the end of month 2 (case [B]). At that date, the same publication lags of the previous case apply, with the only difference being that weights are applied to survey data referring to month 2 of Q(t). As shown in the Table, case [C] differs slightly from the previous ones, with the private consumption figure of the preceding quarter (Q(t-1)) being available. It implies that weights from PLS- and RR-based indicators can be computed by exploiting that additional piece of information. Again, the value of the indicator for month 3 is derived by applying the computed weights to the latest survey readings. It is worth highlighting that the computation of the PC-based index is less affected by the publication calendar since the weighing scheme for a given month of Q(t) is not affected by the release of the target series.

All methods are applied to the component series in differences, as preliminary analyses suggest that the series are non-stationary in levels. Survey indicators are expressed in terms of quarterly differences (by subtracting from the figure for a given month the value which refers to three months before - for instance April's

reading minus January's one). Regarding year-on-year quarterly private consumption growth rates, the first difference operator is applied to achieve stationarity. The resulting series (in first differences) are such that the first quarterly one (*fd1*) collects observations from the first months of each quarter (i.e. January, April, July and October); the second one (*fd2*) collects observations from the second months (i.e. February, May, August and November), while the last one (*fd3*) assembles the observations from the third months (i.e. March, June, September and December).

The final stage consists in reconstructing an overall monthly consumer confidence indicator (*cc* = PC, PLS or RR) by (a) cumulating the series in first differences to get their counterparts in levels (*l1*, *l2*, *l3*) and (b) allocating these series to each month of a given calendar quarter. While point (a) is straightforward, point (b) deserves some illustration.

Table 2.2: Construction of a monthly version of an indicator starting from quarterly values

		l1	l2	l3	ind
Q1	m1	*			*
	m2		**		**
	m3			***	***
Q2	m1	*			*
	m2		**		**
	m3			***	***
Q3	m1	*			*
	m2		**		**
	m3			***	***
Q4	m1	*			*
	m2		**		**
	m3			***	***

In practice, the three series in the levels (*l*'s) provide the relevant figure for the month they refer to. For a given calendar year, entries of *l1* correspond to January, April, July and October (and marked with a single asterisk in Table 2.2); values of *l2* (identified by a double asterisk) cover February, May, August and November, while *l3* (triple asterisk) refer to March, June, September and December.

The final monthly index is then obtained by sorting and combining these values into one series according to the reference calendar month, as shown in the last column of Table 2.

A first comparative assessment

The three competing indices have been computed using a rolling window of 36 quarterly observations (9 years) over the period 1985q1-2005q1. The analysis refers to the period from 1995 onwards, since the first four data-points are used to compute quarterly year-on-year private consumption growth rates.

As an initial step, Table 2.3 reports the averages of country-specific weights for the four indices over the period considered.

**Table 2.3: Country weights by indicator**

	CCI	PC	PLS	RR
AT	0.029	0.084	0.085	0.096
BE	0.034	0.132	0.126	0.116
DE	0.290	0.135	0.163	0.144
EL	0.026	0.056	0.048	0.062
ES	0.106	0.116	0.104	0.106
FI	0.017	0.081	0.110	0.124
FR	0.209	0.103	0.102	0.100
IT	0.180	0.113	0.079	0.065
NL	0.053	0.086	0.104	0.100
PT	0.021	0.094	0.080	0.088
sum	0.967	1.000	1.000	1.000

As shown in the lowermost left part of the Table, the (partial) set of euro-area countries included in the analysis are economically representative of the regional aggregate, as they cover about 97% of real private consumption. Recalling that CCI-weights are given by country shares in terms of (real) private consumption, while in the PLS, PC and RR methods they are the result of an optimising process, it is conceivable to expect differences across weighing schemes. Overall, it is found that, compared to the CCI case, all alternative indices assign a markedly lower weight to the largest euro-area countries (DE, FR, IT), while the opposite occurs for the remaining countries (and notably for the smallest ones, i.e. FI and PT).

The resulting monthly indicators are plotted in Graph 1, which shows that the three indicators move closely together with the established CCI, though the latter is based on only four out of the other indicators' eleven component series and does not take into account information on the target series (consumption growth). The competing indices show a relatively more pronounced cyclical behaviour (in terms of

amplitude) than the CCI during the years 2004/2005 and 2010/2011. Moreover, it can be observed that, especially in the late nineties, the proposed confidence indices tend to slightly lead the upswing and downswing movements of the CCI.

Graph 2.1: Consumer confidence as measured by CCI and its three proposed alternatives (monthly values)
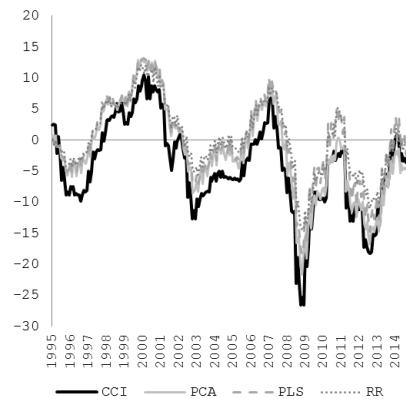
The dynamic relationship between the CCI and its competitors has been investigated also within a Vector AutoRegression (VAR) framework. Three bivariate VAR models (CCI and, alternatively, PC, PLS or RR) have been estimated. In all cases, standard cointegration tests indicate the existence of a long-run relationship between the two variables in the systems at the 1% level of significance. This suggests that the four consumer confidence indices are likely to be integrated series (or, at least, series which exhibit a high degree of persistence). Furthermore, in the estimated long-run relationship cci=$\beta \times cc$+ε, with cc= PC, PLS or RR, the proportionality constraint β=1 cannot be rejected at the usual confidence levels, suggesting that deviations between the two series are merely erratic (and captured by the residual ε). Nonetheless, when considering the structure of the adjustment process towards the long-run equilibrium it emerges that the competing models act as a sort of forcing variables, pointing to a certain leading tendency compared to the CCI.

To evaluate if the *statistically* significant leading behaviour of the alternative indicators entails *economically* relevant implications, the following sections present the results of two forecasting exercises.

Directional accuracy tests

A key requirement for useful confidence indicators is that they should move in the right direction with respect to the series being tracked. While the assessment in first differences is more rigorous from a statistical point of view (given the non-stationary of the series involved in the exercise), looking at the levels is (equally or even more) informative since the usual reading of a confidence index is in terms of deviations from its long-term mean, which should correspond to the average growth rate of the tracked variable.

Directional accuracy tests for the CCI and the three alternative indices have been conducted by means of the analysis of contingency tables. Directional data for the indicators and private consumption growth rates (available ex-post) are thus computed as deviations from their respective long-term averages (when considering levels) or according to the sign of quarterly changes (in the case of first differences).

The resulting binary variables (taking 1 if above the average and 0 otherwise or, alternatively, 1 for positive growth rates and 0 otherwise) are thus arranged in a 2x2 matrix, in which the two columns refer to the tracked variable ($rpc+$, $rpc-$) and the two rows are associated with the four indicators ($ind+$, $ind-$) that have been considered (CCI, PC, PLS, RR):

	$rpc-$	$rpc+$	
$ind-$	$n1$	$n2$	(1)
$ind+$	$n4$	$n3$	

According to condition (1), the following directional accuracy rates can be computed: $\%=(n1+n3)/n$, $\%u=n3/(n2+n3)$, $\%d=n1/(n1+n4)$, where n indicates the total number of observations (240 months from 1995 to end-2014). When the number of cases in the diagonal ($n1$ and $n3$) is sufficiently large compared to n, the forecasts can be considered

to be directionally accurate. To test this feature, a χ^2 independence test was run.[12]

Table 2.4 reports these metrics computed for both levels (Panel A.) and first differences (Panel B.).

Table 2.4: Directional accuracy statistics

	Panel A. -Levels								
	Frequencies				Directional accuracy			χ^2 test	
	Correct		Incorrect						
	n1	n3	n2	n4	%	%-u	%-d	stat	Pval
CCI	73	91	29	47	68%	76%	61%	31.5	0.00
PC	85	101	17	37	78%	86%	70%	72.7	0.00
PLS	78	90	24	48	70%	79%	62%	39.2	0.00
RR	78	89	24	49	70%	79%	61%	37.9	0.00

	Panel B. - First differences								
	Frequencies				Directional accuracy			χ^2 test	
	Correct		Incorrect						
	n1	n3	n2	n4	%	%-u	%-d	stat	Pval
CCI	56	83	61	40	58%	58%	58%	5.3	0.02
PC	61	81	56	42	59%	59%	59%	7.2	0.01
PLS	65	82	52	41	61%	61%	61%	11.1	0.00
RR	59	78	58	45	57%	57%	57%	4.1	0.04

Overall, all indicators in levels provide a good reflection of year-on-year private consumption growth rates (Table 2.4 – Panel A.). The percentage of cases where confidence indices indicate correctly whether consumption growth is above or below average is reasonably high, ranging between 68 (for CCI) and 78 (for PC). Looking at the directional accuracy rates by distinguishing between above- and below-average consumption growth phases (%-u and %-d, respectively), the share of correct cases ranges between 61 and 86%.

Panel B. of Table 2.4 shows that the CCI and the three proposed alternatives track *changes* in year-on-year private consumption growth rates in a satisfactory way as well: the share of changes successfully indicated by CCI (58%) is in line with the results for the other indices (with about 57%-61% of cases that have been predicted correctly).

Finally, the rejection of the null hypothesis of the χ^2-based independence test suggests the existence of statistically significant association

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[12] See Carnot, N., Koen, V. and Tissot, B. (2005), *Economic Forecasting*, Palgrave MacMillan, p. 240.

between *rpc* and all indicators under analysis, both in levels and in first differences. Hence, it can be concluded that both CCI and the proposed alternatives are (practically equally) directionally accurate.

Detecting turning points in a pseudo-real time context

This section aims at assessing the usefulness of the various measures of consumer confidence in forecasting the cyclical turning points of real consumption expenditure.

The dating of the sequence of expansions and contractions of real private consumption is obtained by means of the Harding-Pagan procedure applied to the cycle extracted through the Christiano-Fitzgerald method filtering out fluctuations shorter than 6 quarters and longer than 32 quarters, in a way consistent with the vast majority of analyses on the subject.[13]

A binary time series, where the value one stands for recessions and the value zero for non-recession periods, is thus constructed so as to estimate a probit equation to calculate out-of sample forecasts of the probability that a recession occurs (R_t=1) by using contemporaneous and lagged measures of consumer confidence, both linear and squared:

$$\text{Prob}[R_t=1]=f\{ind_t, ind_{t-1}, ind^2_t, ind^2_{t-1}\} \quad (2)$$

where *ind* is expressed as changes of quarterly averages of the corresponding monthly indicator values. The exercise is conducted under the assumption that the relevant forecast date corresponds to the end of the third month of the current calendar quarter.

The forecasted probabilities together with the realized contraction phases (shaded areas) over the period 2002q3-2014q4 are shown in Graph 2.2.

Graph 2.2: Probit models: out-of-sample recession probabilities
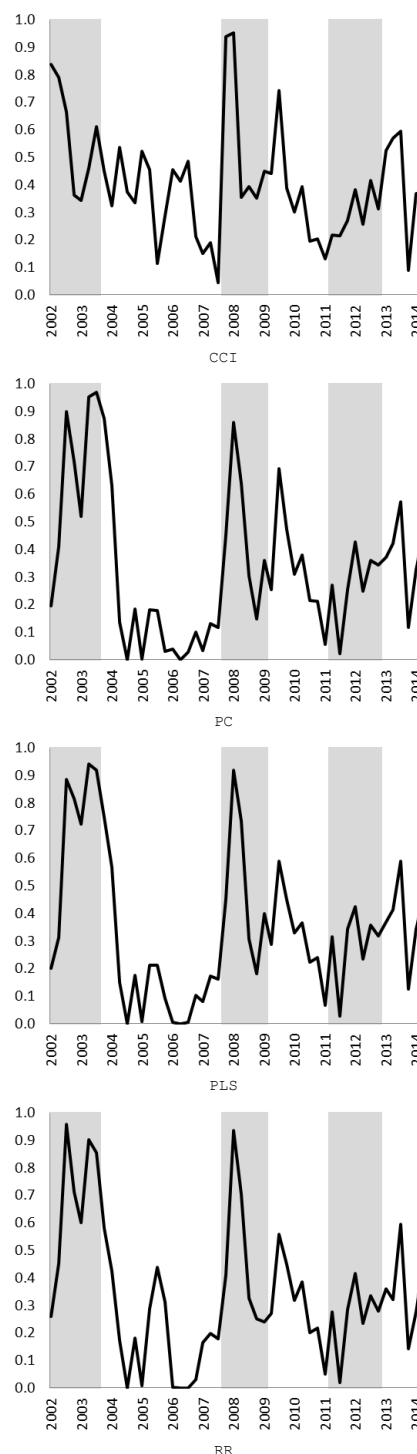
Overall, the visual inspection of the forecasted probabilities shows that the models seem to

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[13] See Harding, D. and Pagan, A. (2002), "Dissecting the Cycle: A Methodological Investigation", *Journal of Monetary Economics* 49, pp. 365–381; Christiano, L. and Fitzgerald, T.J. (2003), "The bandpass filter", *International Economic Review* 44, pp. 435-465; Stock, J.H. and Watson, M.W. (2005), "Understanding Changes in International Business Cycle Dynamics", *Journal of the European Economic Association* 3, pp. 968- 1006.

adequately predict the sequence of positive and negative cyclical deviations from the long-term trend.

In general, the reported evidence stresses the relevance of confidence indicators in predicting periods of strong fluctuations in the economy.[14]

As pointed out by Liu and Moench (2014), a formal comparison of the predictive ability of alternative probit specifications is quite problematic since the probability of a recession implied by the models is rarely exactly zero or one.[15] Thus, a cut-off (e.g. 0.50) is usually adopted such that a predicted probability above the cut-off is classified as a recession. In order to objectively evaluate a model's ability to categorize future time periods into recessions versus expansions over a sequence of different cut-offs, one needs to complement the probit model with a classification scheme like the receiver operating characteristic (ROC) curve.[16]

One method of comparing the predictive ability of competing models across a number of cut-off values is to integrate the area under (AU) the ROC curve, creating the AUROC. A model which delivers a perfect classification of all time periods into recession and expansion would only have true positives and no false positives and an AUROC equal to one. In contrast, a model which is the equivalent of a random guess would have on average an equal number of true and false positives, which corresponds to an AUROC equal to 0.50.

Graph 2.3 reports the ROC curve relative to each model. In all cases the curve (solid line) stands comfortably above the main diagonal (dotted line) corresponding to the naïve

benchmark. All in all, the survey-based probit specifications deliver out-of-sample probabilities that are clearly informative about the future turning points in real private consumption expenditure.

Graph 2.3: Probit models: ROC curves

As shown in the first column of Table 5, the best performing specification is the one based

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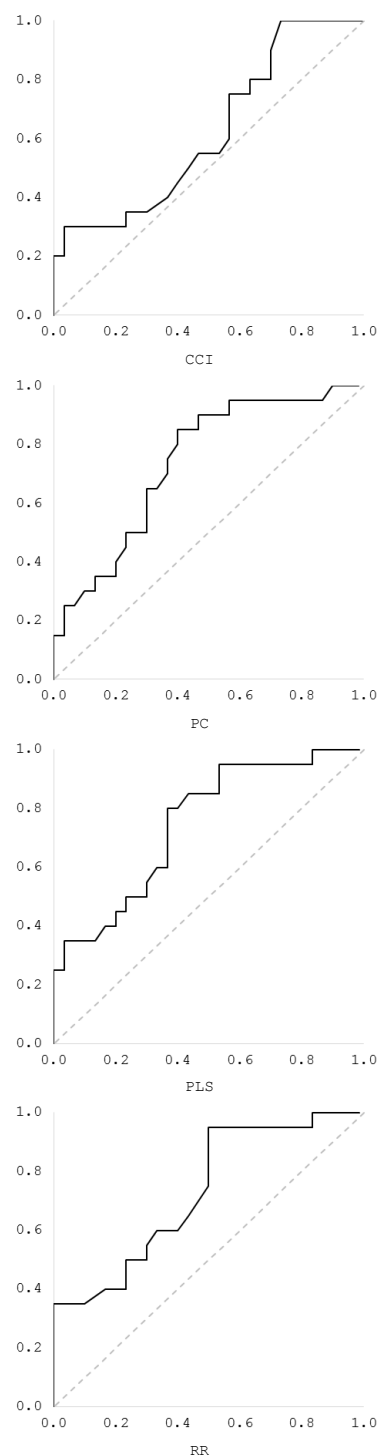
[14] See Garner, C.A. (1991), "Forecasting consumer spending: Should economists pay attention to consumer confidence surveys?" *Economic Review*, pp. 57-71; Howrey, E.P. (2001), "The predictive power of the index of consumer sentiment", *Brookings Papers on Economic Activity* 32, pp. 175-207.

[15] Liu W. and E. Moench, (2014), "What Predicts U.S. Recessions?", Federal Reserve Bank of New York Staff Reports 691.

[16] See, for instance, Jordà, O., and Taylor, A.M. (2011), "Performance evaluation of zero net-investment strategies," NBER Working Paper 17150.

on PLS, with an AUROC of 0.75. PC- and RR-based probit models come close second (AUROC of 0.74 and 0.73, respectively), while out-of sample probabilities obtained from the CCI-based model give a somewhat lower AUROC (0.62), although well above the critical threshold of 0.50.

Table 2.5: Out-of-sample summary of models' AUROC

	AUROC	p-value
CCI	0.62	.
PC	0.74	0.0381
PLS	0.75	0.0320
RR	0.73	0.0473

The pair-wise difference between the AUROC of the baseline case (CCI) and the one for the three alternative models can be tested following the procedure devised by Jordà and Taylor (2011).[17] The resulting p-values associated with the t-statistics for the pair-wise equivalence of the AUROC show that the improvement in signalling future turning points in real private expenditure using the proposed alternative indicators is statistically significant at the 5% (but not at the 1%) level.

Conclusions

This analysis has provided a comparative assessment of the established CCI for the euro area against three alternative consumer confidence indicators which take into account a richer information set and have been built by means of formal data-driven statistical techniques rather than an ad-hoc aggregation approach as in the case of the CCI. Specifically, Principal Component, Partial Least Squares and Ridge Regression methods have been used on a panel of 110 consumer survey questions for ten euro-area countries.

The evaluation has been carried out along several dimensions spanning from the weight structure of the alternative aggregation schemes over the comparison of the evolution over time of the indicators to the degree of directional

accuracy in tracking real private consumption growth rates and the predictive power to early detect turning points in real private consumption.

Overall, the evidence has shown that despite its simple and ad-hoc aggregation scheme, its limited data input (four series only) and the fact that it is not tailored to its target series by design, the official CCI performs quite similarly to the proposed alternative consumer confidence measures. This investigation thus adds assurance to the reliability of the CCI as a timely indicator of developments in private consumption growth.

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[17] Jordà, O., and Taylor, A.M. (2011), *ibid*.

ANNEX

Reference series

Confidence indicators	Reference series from Eurostat, via Ecowin (volume/year-on-year growth rates)
Total economy (ESI)	GDP, seasonally- and calendar-adjusted
Industry	Industrial production, working day-adjusted
Services	Gross value added for the private services sector, seasonally- and calendar-adjusted
Consumption	Household and NPISH final consumption expenditure, seasonally- and calendar-adjusted
Retail	Household and NPISH final consumption expenditure, seasonally- and calendar-adjusted
Building	Production index for building and civil engineering, trend-cycle component

Economic Sentiment Indicator

The economic sentiment indicator (ESI) is a weighted average of the balances of replies to selected questions addressed to firms and consumers in five sectors covered by the EU Business and Consumer Surveys Programme. The sectors covered are industry (weight 40 %), services (30 %), consumers (20 %), retail (5 %) and construction (5 %).

Balances are constructed as the difference between the percentages of respondents giving positive and negative replies. The Commission calculates EU and euro-area aggregates on the basis of the national results and it seasonally adjusts the balance series. The indicator is scaled to have a long-term mean of 100 and a standard deviation of 10. Thus, values greater than 100 indicate above-average economic sentiment and vice versa. Further details on the construction of the ESI can be found at:

Methodological guides - Surveys – DG ECFIN website

Long time series of the ESI and confidence indicators are available at:

Survey database – DG ECFIN website

Economic Climate Tracer

The economic climate tracer is a two-stage procedure. The first stage consists of building economic climate indicators. These are based on principal component (PC) analyses of balance series (s.a.) from the surveys conducted in industry, services, building, the retail trade and among consumers. In the case of industry, five of the monthly questions in the industry survey are used as input variables (employment and selling-price expectations are excluded). For the other sectors the number of input series is as follows: services: all five monthly questions; consumers: nine questions (price-related questions and the question about the current financial situation are excluded); retail: all five monthly questions; building: all four monthly questions. The economic climate indicator (ECI) is a weighted average of the five PC-based sector climate indicators. The sector weights are equal to those underlying the economic sentiment indicator (ESI), i.e. industry 40 %; services 30 %; consumers 20 %; construction 5 %; and retail trade 5 %. The weights were allocated on the basis of two broad criteria: the representativeness of the sector in question and historical tracking performance in relation to GDP growth.

In the second stage of the procedure, all climate indicators are smoothed using the HP filter in order to eliminate short-term fluctuations of a period of less than 18 months. The smoothed series are then standardised to a common mean of zero and a standard deviation of one. The resulting series are

plotted against their first differences. The four quadrants of the graph, corresponding to the four business cycle phases, are crossed in an anti-clockwise movement. The phases can be described as: above average and increasing (top right, 'expansion'), above average but decreasing (top left, 'downswing'), below average and decreasing (bottom left, 'contraction') and below average but increasing (bottom right, 'upswing'). Cyclical peaks are positioned in the top centre of the graph and troughs in the bottom centre. In order to make the graphs more readable, two colours have been used for the tracer. The darker line shows developments in the current cycle, which in the EU and euro area roughly started in January 2008.

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