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Understanding low wage growth in the euro area and EU countries

Insights from the work of the ESCB Wage Expert Group (WEG)

European Central Bank Conference

Inflation in a changing economic environment
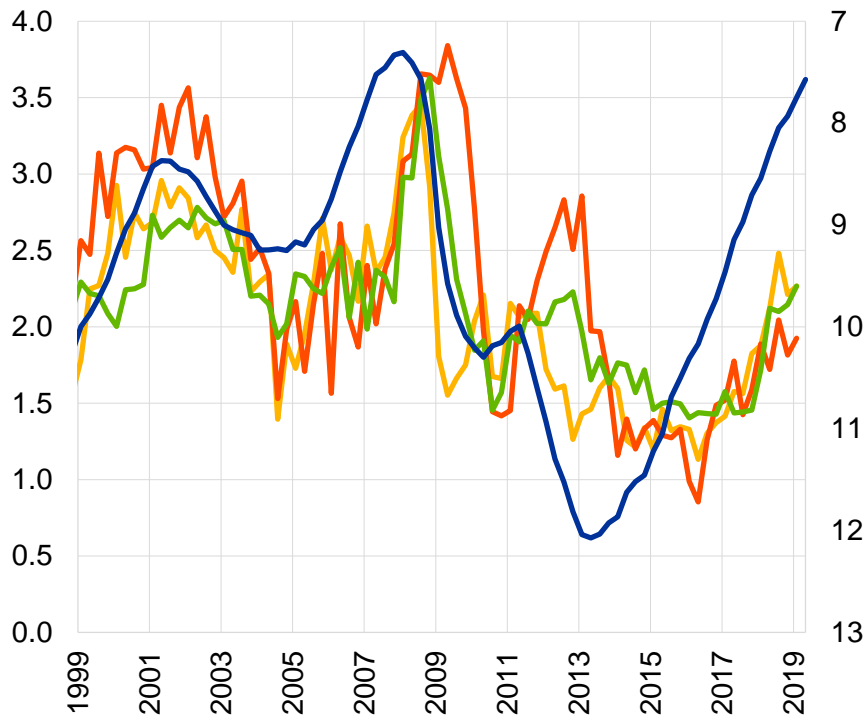
Frankfurt am Main, 23 September 2019

- Motivation: wage growth low and over-predicted

- Wage growth in the euro area and EU countries through the lens of a standard Phillips curve

- Beyond the standard wage Phillips curve: compositional effects, trends, non-linearities

- Real-time forecasting evaluation and establishing cross-checking tools for wage projections

- Conclusions

Wage growth has been low and over-predicted – especially in 2013-2017

Measures of wage growth over the cycle
(lhs: annual percentage changes, rhs: percentage points)

- Unemployment rate (inverted, rhs)
- Compensation per hour (lhs)
- Compensation per employee (lhs)
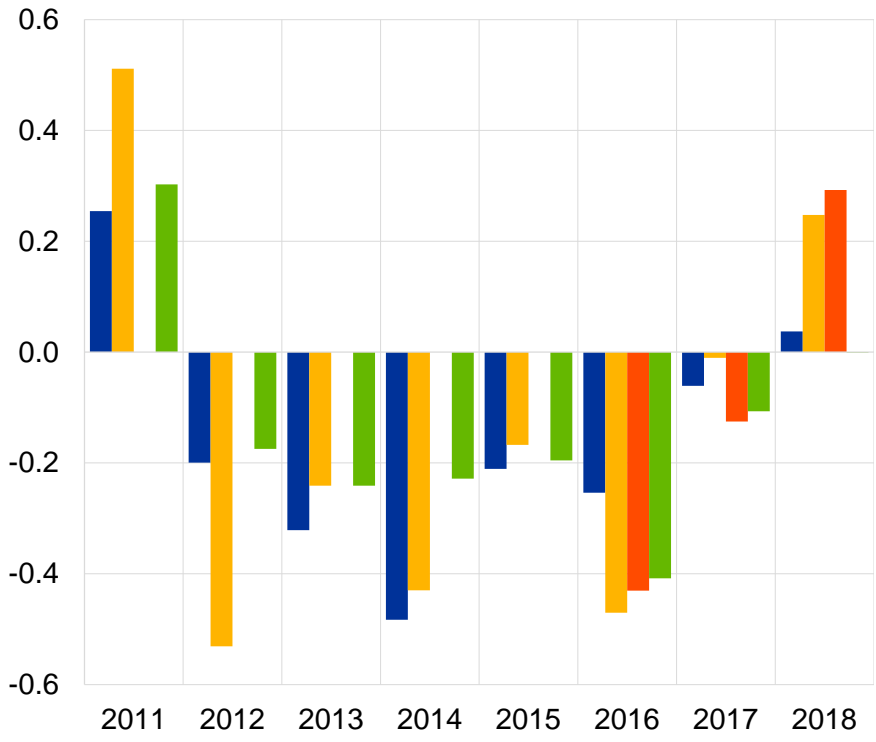- Negotiated wages (lhs)

Source: Eurostat, National Accounts.
Latest observations: 2019Q2 for unemployment rate, and negotiated wages and 2019Q1 for the rest.

Wage forecast error comparison for one calendar year ahead (autumn forecasts)
(percentage points)

- Eurosystem/ECB staff
- OECD
- SPF
- EC

Source: Eurostat , ECB calculations, Survey of Professional Forecasters (SPF), OECD and European Commission (data included as available – e.g. OECD forecast data only available from 2016 onwards).

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Standard specification for the wage Phillips curve

$$\pi_t^w = c + \rho(L) \cdot \pi_t^w + \beta(L) \cdot y_t + \gamma(L) \cdot prod_t + \delta(L) \cdot \pi_t^e + \varepsilon_t$$

Lagged wage growth

Slack:
-(Mis-)measurement of slack?
-Time-variation in the slope?

Productivity:
- More of a cyclical or trend driver?

Inflation expectations:
- Backward-/ forward-looking behaviour of wage negotiators?

Note: The chosen lag structure reflects goodness-of-fit criteria and can vary from country to country.

Actual euro area wage growth versus Phillips curve predicted range

(annual percentage changes)

Range of best 5 models

Range of all model estimates
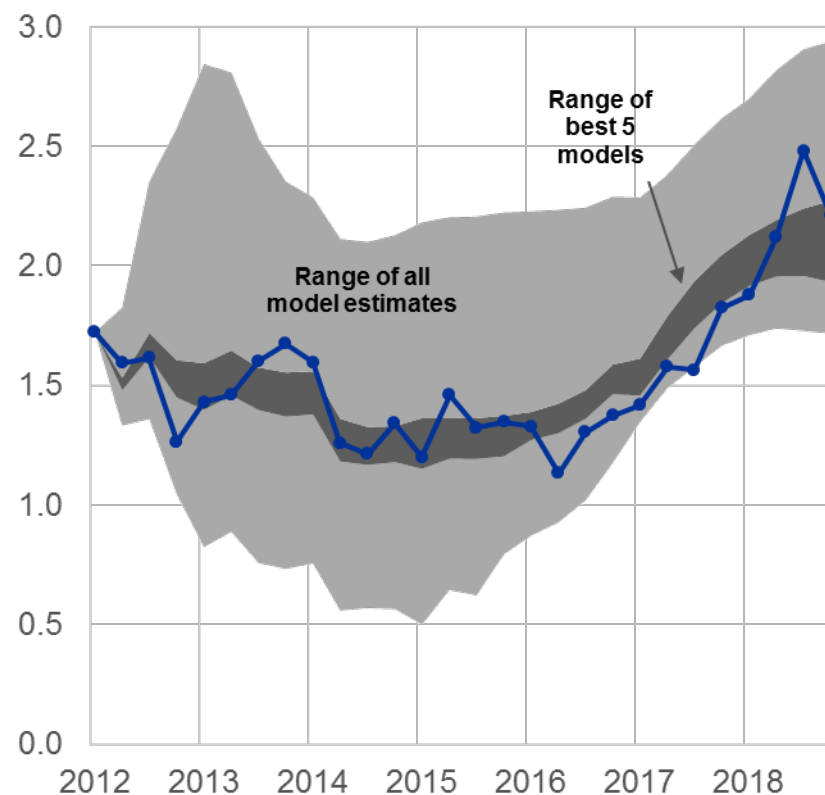
Sources: ECB calculations.
Notes: The range includes out-of-sample dynamic forecasts conditional on the actual outcomes of the labour market indicators, labour productivity and inflation expectations. The estimation sample is Q1 1995 to Q1 2012. Among all possible specifications, only the plausible were considered, based on the statistical significance of the slope and on the plausibility of the sign of the explanatory variables. The best five models were chosen based on their explanatory power over the period shown in the chart. Latest observation: Q4 2018

Decomposition of wage growth into its main drivers in the euro area
(deviations from mean in year-on-year growth terms, percentage point contributions)

Legend:
- Labour market slack (unemployment rate)
- Productivity
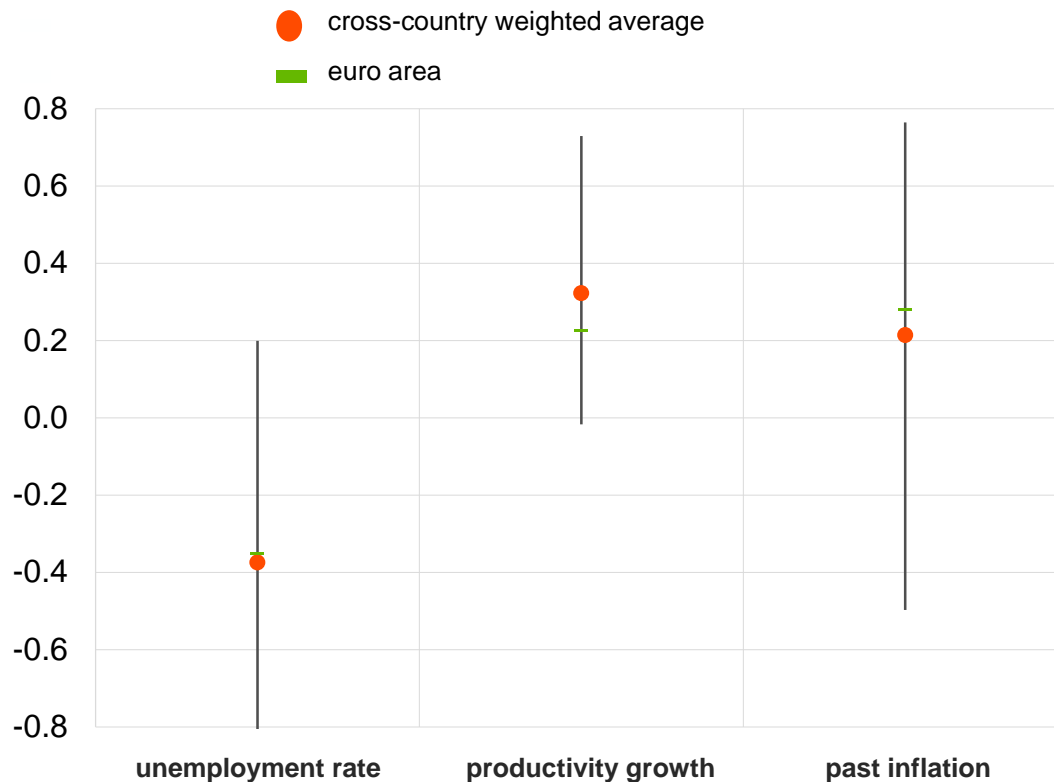- Past inflation
- Residual
- Compensation per employee

Decomposition of wage growth into its main drivers across EU countries over 2013-2017
(deviations from mean in year-on-year growth terms, percentage point contributions)

Legend:
- Slack
- Productivity
- Inflation expectations
- Other
- Unexplained
- Wage measure
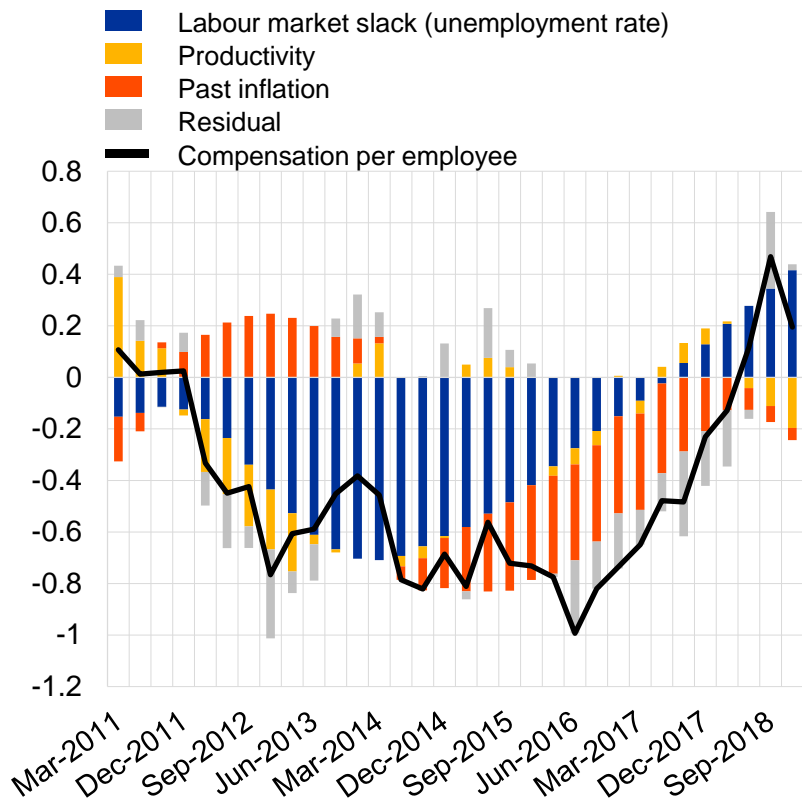
Sources: Eurostat and ECB staff calculations.
Notes: Sample: Q1 1995-Q4 2018. The light blue line shows deviations of compensation per employee growth from its model-implied mean. Contributions (including residuals) are also shown as deviations from their model-implied mean. Contributions are derived as in Yellen, J.L. (2015). Benchmark specification: annualised quarterly compensation per employee is regressed on its own lag, the lagged unemployment rate, 4 quarters moving average of previous year–on–year inflation rates, annualised quarterly productivity growth and a constant.

Sources: Eurostat and ECB/NCB staff calculations.
Notes: The dark blue dots show changes in the selected wage growth measure. 'Other' includes additional country specific relevant factors that some countries deem as relevant regressors for the Phillips curve (see also Table 1 in OP 232). Contributions are derived as in Yellen, J.L. (2015). For CZ the period is 2013-15 and for CY the period is 2014-17.

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Estimated coefficients of the considered drivers of wage growth

🔴 cross-country weighted average

🟩 euro area

unemployment rate   productivity growth   past inflation
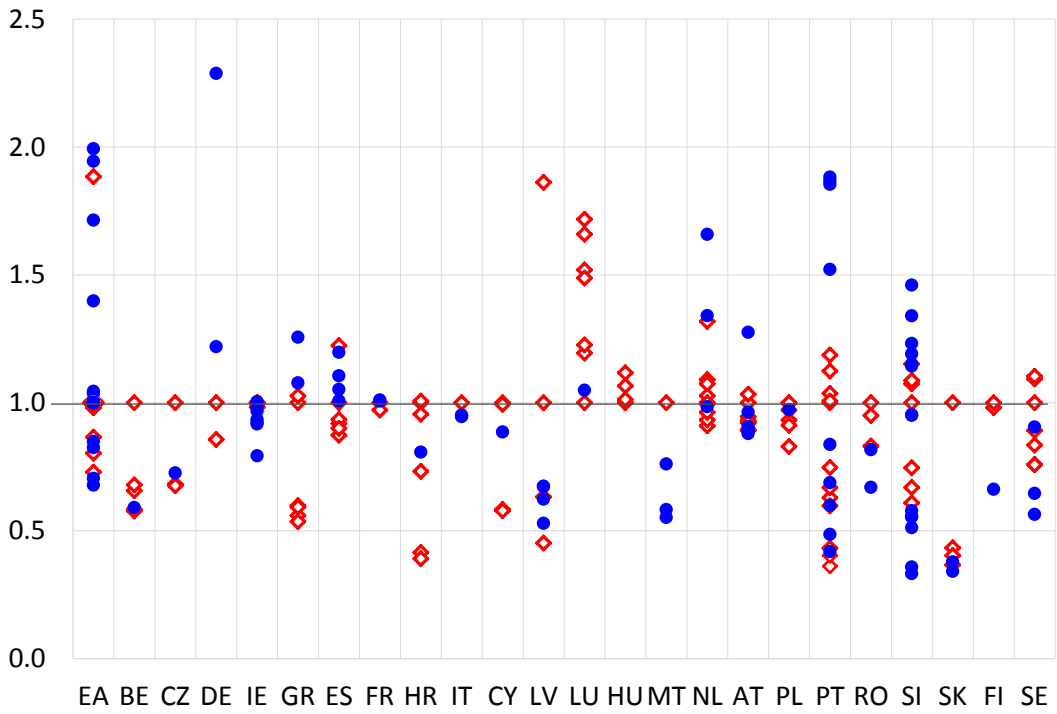
Sources: Eurostat, ECB and NCB calculations.
Notes: Red markers show the simple average of the estimated country-by-country Phillips curve coefficients based on a benchmark specification (annualised quarterly compensation per employee is regressed on its own lag, the lagged unemployment rate, 4 quarters moving average of previous year-on–year inflation rates, annualised quarterly productivity growth and a constant). Lines display interquartile ranges of the cross-country dispersion. The cross-country average is weighted and weights are based on the proportion of employment of each country being considered over the total countries' employment. All countries' results are included but for Ireland, which conducted the PC exercises based on wage per hour measures. Green markers show the coefficients for the euro area based on the benchmark specification. Some countries estimate the benchmark specification in y-o-y terms.

The role of unconventional slack measures

(RMSE of conditional wage growth forecast relative to that of a specification based on the unemployment rate, 2012Q2 to 2018Q4, y-axis: relative RMSE)

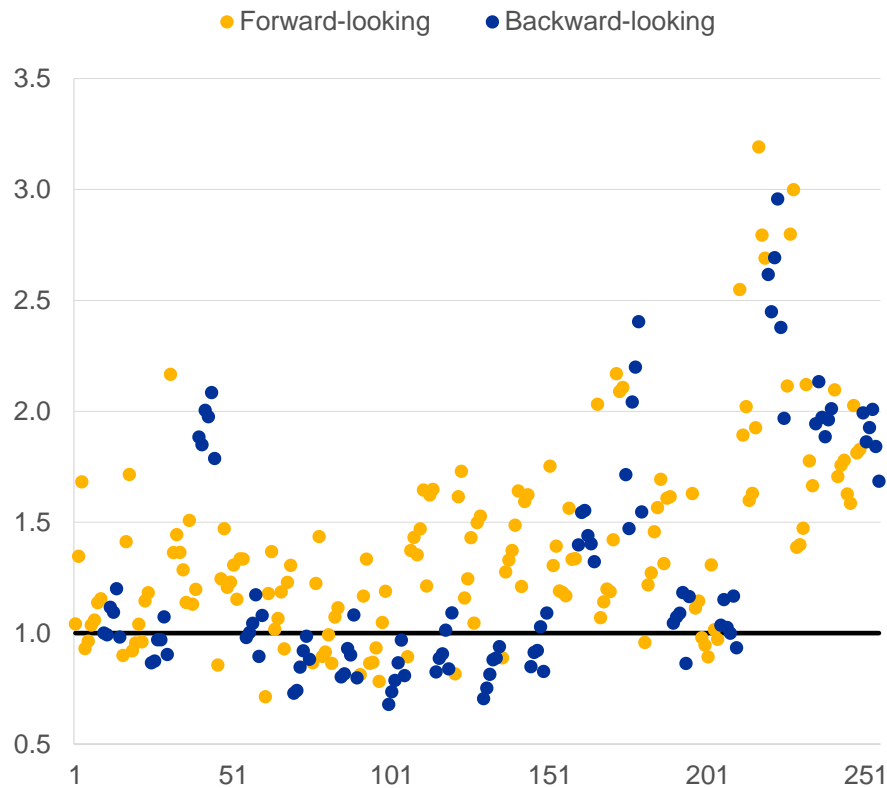◇ conventional
● unconventional

Conventional
1. Unemployment rate [benchmark]
2. Model-based unemployment gap
3. EC unemployment gap
4. IMF unemployment gap
5. OECD unemployment gap
6. UCM unemployment gap

Unconventional
1. Short term UR
2. Broad UR (U6)
3. Broad UR gap
4. The rate of unemployed and underemployed
5. Underemployment rate
6. Narrow broad UR
7. UCM narrow broad UR gap
8. UCM intensive margin gap
9. Labour shortage
10. UCM participation rate gap
11. Common DFM cycle

Sources: Eurostat and ECB/NCB staff calculations.
Sources: Eurostat and ECB staff calculations. Notes: Wage = selected wage measure of each country. The relative RMSE is presented as a ratio of all the plausible specifications with different slack to the RMSE associated with the Phillips curve model including the unemployment rate and the selected inflation expectations measure. The estimation sample is1995:2012Q1 (CY 1995:2013Q4). Plausible specifications are based on the statistical significance of the slope and on the plausibility of the sign of the explanatory variables.

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The role of backward- vs. forward-looking inflation expectations for the euro area

(x-axis: all plausible specifications; y-axis: relative RMSE of conditional forecast of wage growth, 2012Q2 to 2018Q4)

● Forward-looking   ● Backward-looking

Backward-looking

1. Average of the past four quarters of annual headline inflation [benchmark],
2.-6. Average of the past four quarters of annualized quarterly rate of HICP, HICP excluding energy and food, HICP excluding energy, GDP deflator, private consumption deflator

Forward-looking

1. DG ECFIN consumer survey – annual growth rate of balance of responses;
2.-7. Consensus expectations with a horizon from 2 to 7 quarters ahead
8. SPF 1 year ahead
9. SPF 2 years ahead

Source: ECB calculations.
Notes: The RMSE is presented as a ratio of all the plausible specifications with different slack and inflation expectations measures to the RMSE associated with the benchmark Phillips curve model including the unemployment rate and average of the past four quarters of annual headline inflation. The estimation sample is 1995:Q1 2012. Plausible specifications are based on the statistical significance of the slope and on the plausibility of the sign of the explanatory variables. Dots above the black line indicate worse performance and below the line better performance

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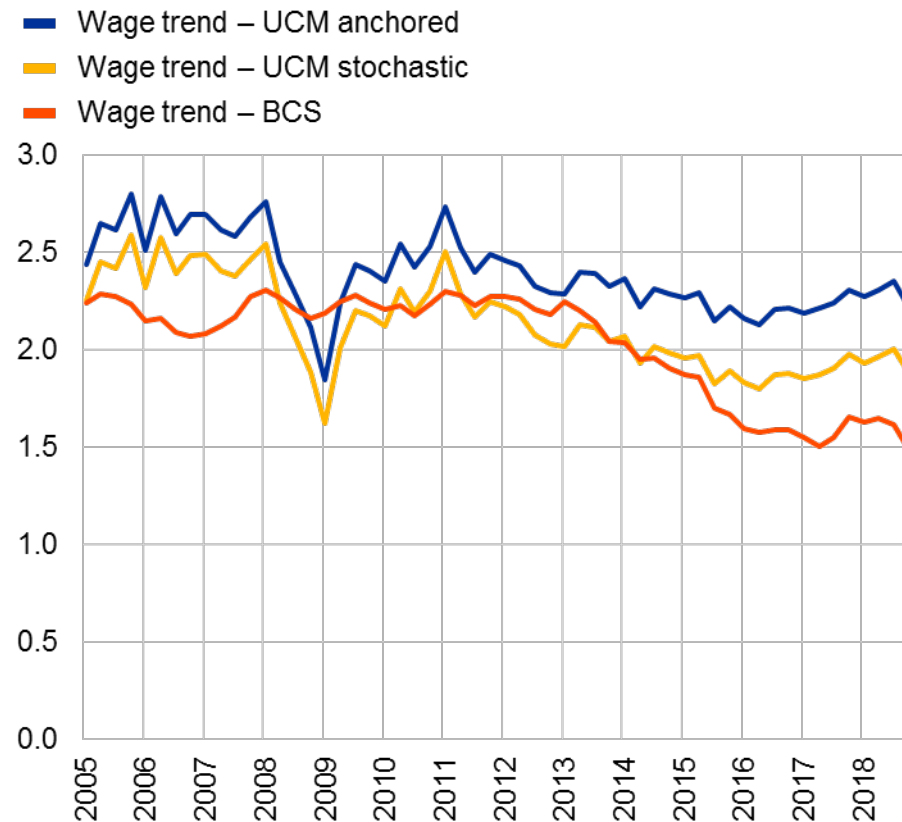
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Compositional effects on wage growth – euro area
(percentage points)
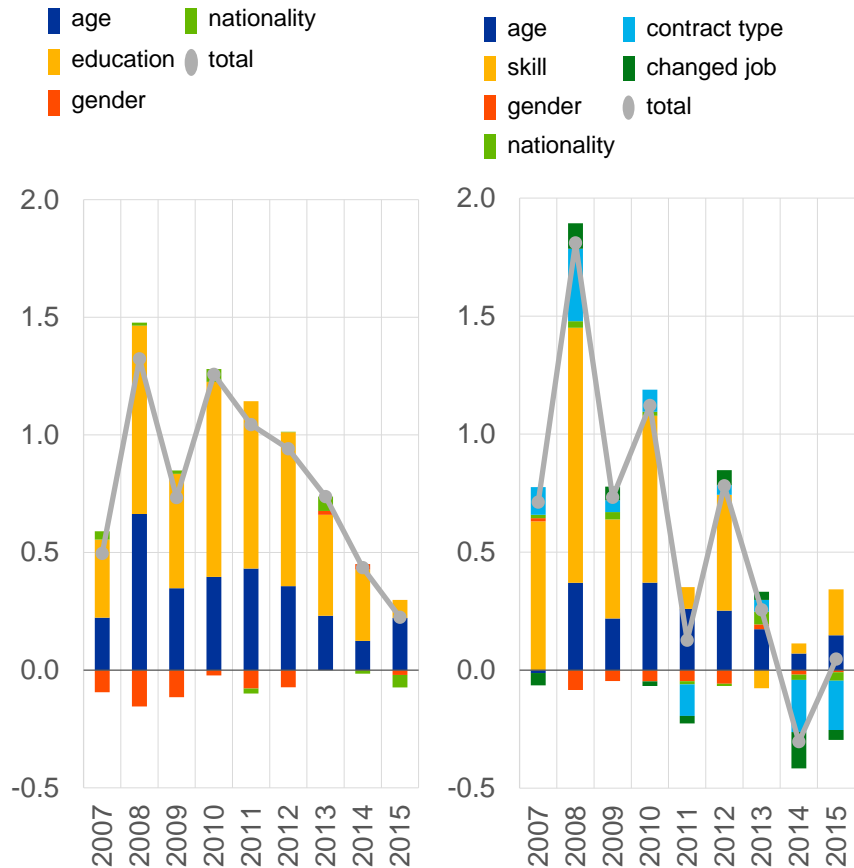
Estimated trend component of wage growth for the euro area
(annual percentage changes)


Sources: EU SILC (Eurostat) and ECB calculations.
Notes: The charts show the contribution of compositional effects to the annual rate of change in hourly wages derived based on EU-SILC data. The results on the left-hand side are derived based on a specification taking age, education, gender and nationality into account. For the specification underlying the results on the right-hand side the variables "contract type" (permanent/temporary) and "changed job" since the last year are also included.

Sources: Eurostat and ECB calculations.
Notes: "UCM" stands for an Unobserved Components Model and "BCS" stands for an extended version of the Blanchard, Cerutti and Summers (2015) model. See Box 4 of the Occasional Paper 232 for more details on these models. Latest data: Q4 2018.

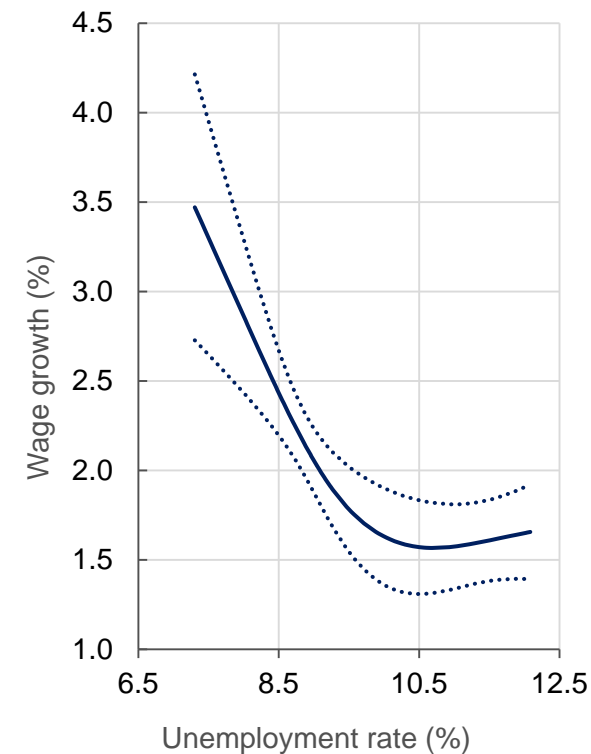# Three explorations of non-linearities in the wage PC

The PC slope in a model with continuously varying parameters
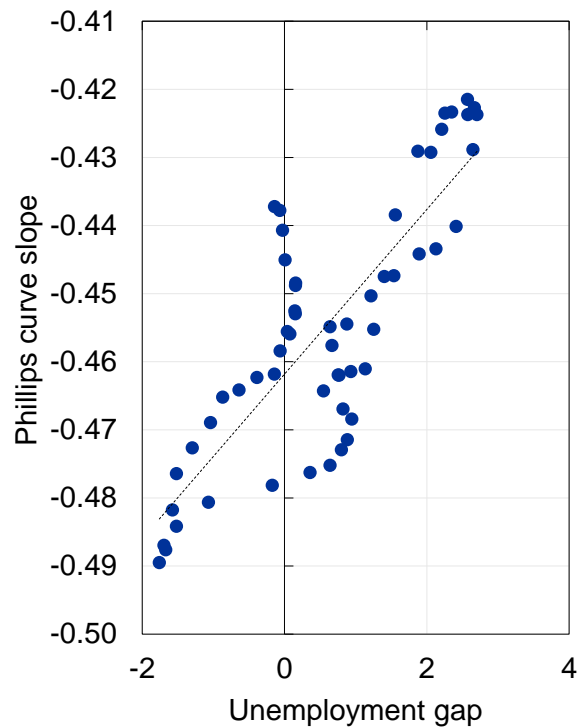
The probability of a regime with a flat PC in a Markov switching model
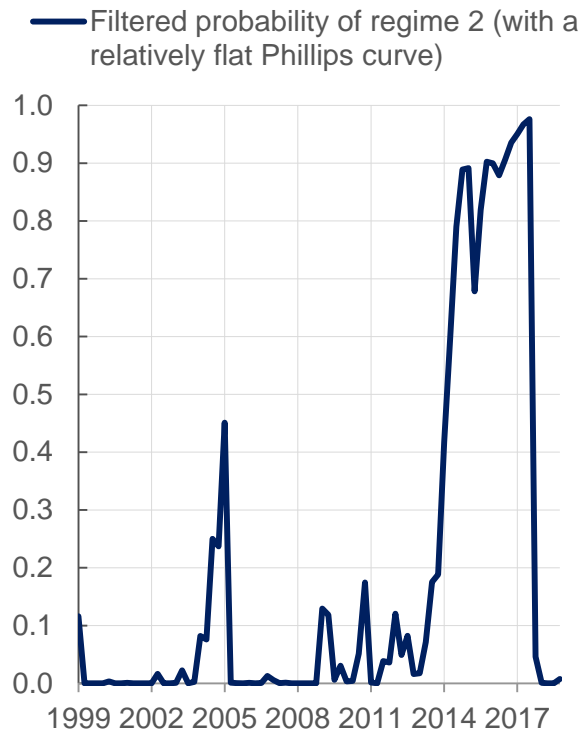
### The PC slope in a wage PC with a term accounting for the distribution of slack

Sources: ECB and authors' calculations (Dennis Bonam (DNB), Gabriel Perez Quiros (ECB), Byrne and Zekaite (CBI; 2018).
Notes: Left panel: The slope is derived from a time-varying model where all the coefficients and the log-variance of the residuals are assumed to follow a random walk. Estimation sample: 1995Q1 – 2018Q4. Middle panel: Based on a MS model where three parameters are allowed to switch across two regimes: the intercept, the slope and the variance. Estimation sample: 1999Q1 – 2018Q4. Right panel: PC analysis with a term accounting for the distribution of slack. Non-linearity in labour market slack variables is captured by using restricted cubic spline functions. Estimation sample: 1999Q1 - 2018Q2

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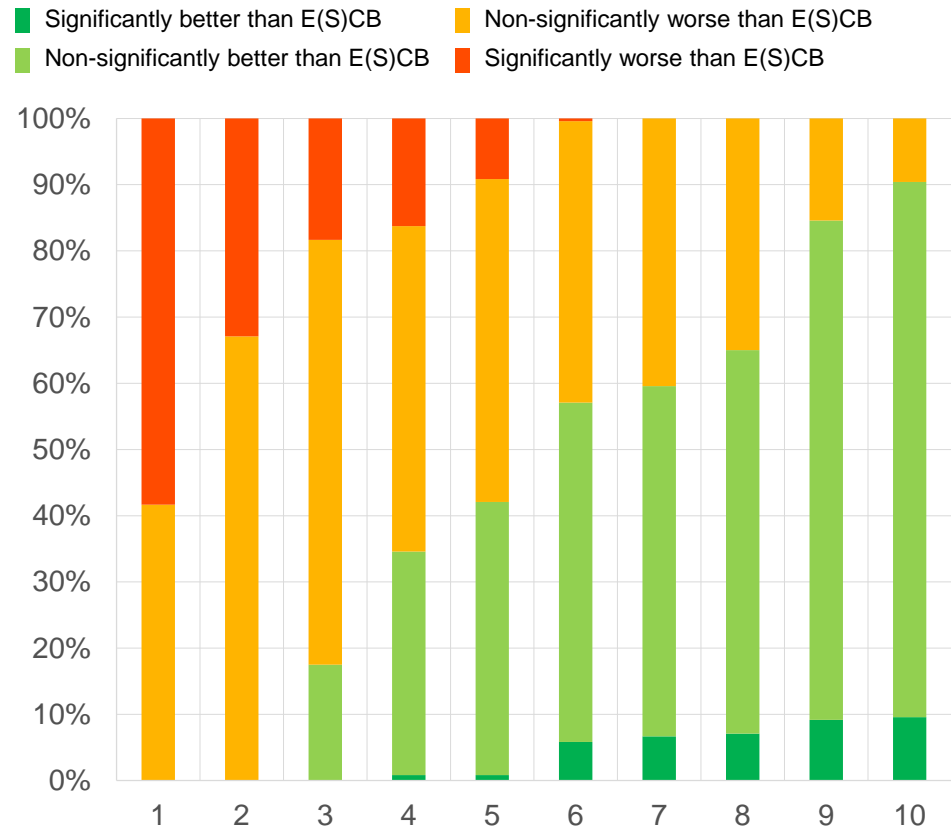
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Eurosystem/ECB staff projections of total compensation per employee growth in the euro area
(annual percentage changes)
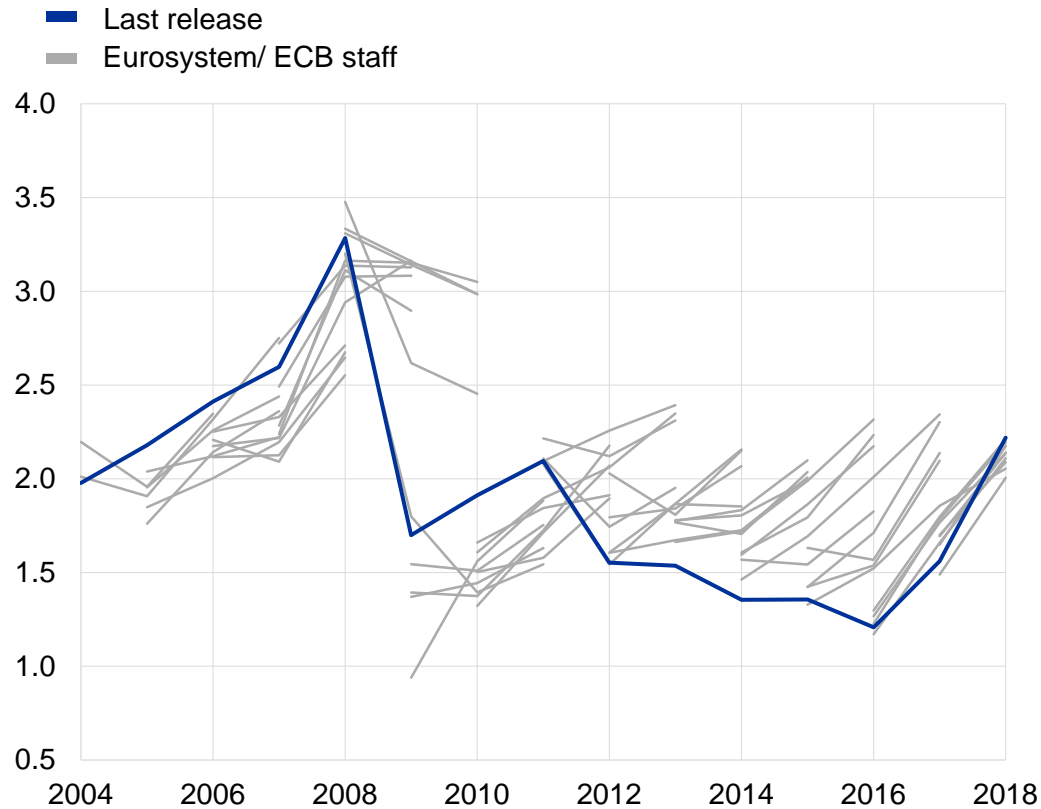
Notes: Eurostat and Eurosystem and ECB staff projections

## Performance of PC specifications vs. Eurosystem/ECB – Diebold-Mariano tests
(shares in percent)

- 🟩 Significantly better than E(S)CB
- 🟧 Non-significantly worse than E(S)CB
- 🟩 Non-significantly better than E(S)CB
- 🟥 Significantly worse than E(S)CB

Six quarters ahead projections for the euro area
(annual percentage changes)

- ▬ Eurosystem/ ECB staff
- ▬ PC benchmark (with UR and past inflation)
- ▬ Actual

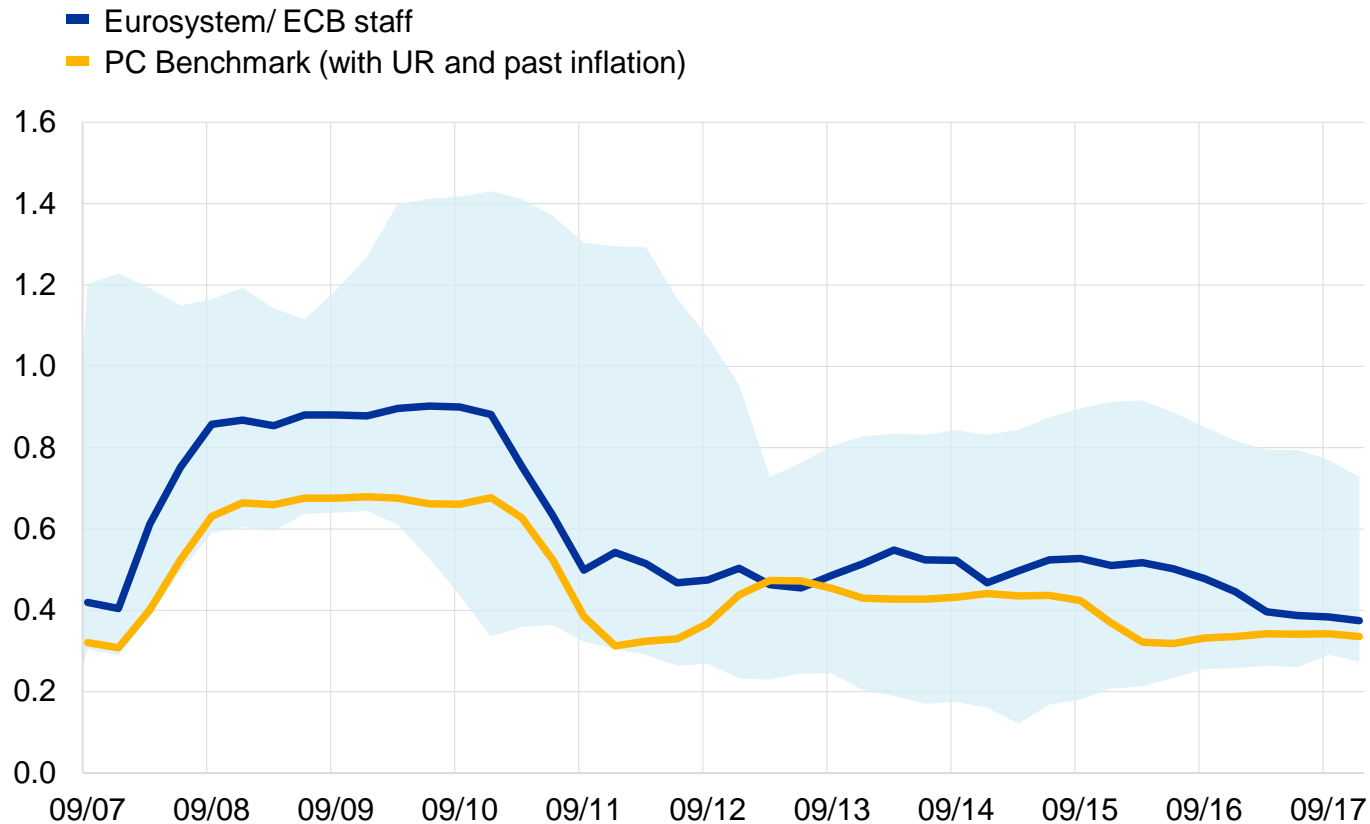Notes: ECB calculation based on Eurosystem and ECB staff projections. Percentages refer to the full set of 240 Phillips curve models.
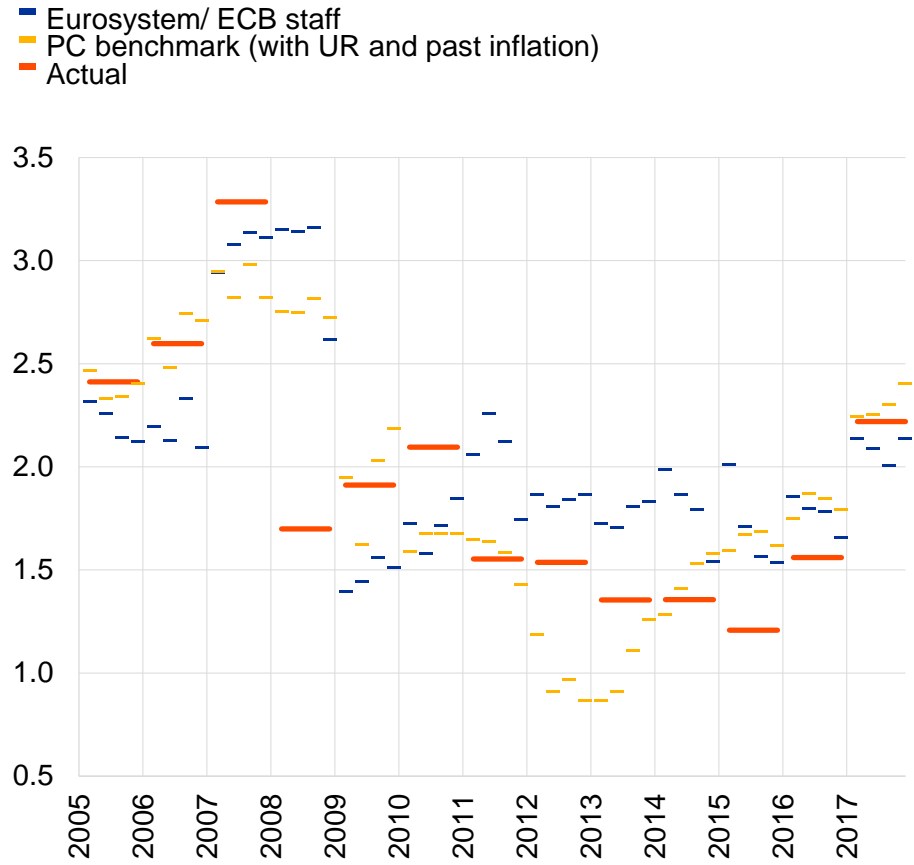
Sources: ECB calculations based on Eurosystem and ECB staff projections.
Notes: Values on the x-axis refer to vintages of projection rounds. Each observation reflects the forecast for annual wage growth between the current and the next year at one of the quarterly projections vintages. As an example the forecast shown for December 2011 refers to expected annual wage growth in 2012.

Comparison of RMSE for six quarters ahead forecast over time
(RMSE in terms of 12 quarters moving average)

Legend:
- Eurosystem/ ECB staff
- PC Benchmark (with UR and past inflation)

Sources: ECB calculations based on Eurosystem and ECB staff projections.
Notes: The shaded area shows the range across all 240 Phillips curve specifications.

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- Wage expert group aimed at a comprehensive analysis of the drivers of low wage growth and the persistent negative wage forecast errors in the euro area and EU countries.

- Traditional drivers of wage growth as captured by a standard Phillips curve explain much of the weakness in wage growth in most European countries, still country idiosyncrasies are very important.

- Main drivers of low wage growth → slack in the labor market (*unconventional measures can add some value sometimes*), low inflation (via *backward-looking expectations*), but also institutional and structural factors as well as compositional effects. Trend wage growth moved downwards, reflecting mainly *secular productivity movements*.

- Based on a rich battery of models, a real-time forecasting evaluation exercise identifies valuable cross-checking tools for the Eurosystem/ECB staff euro area wage growth forecasts.

- Overall threefold contribution: (i) *country-specific analyses based on a consistent methodology*, (ii) analyses of *cyclical, structural and institutional drivers*, (iii) *ready-to-use tools for cross-checking* wage growth forecasts.