One of the features of current economic growth in the euro area has been the strength of job creation. Thus, despite considerable cross-country differences, in mid-2016 the euro area as a whole had already recovered pre-crisis employment levels - even though the number of hours worked is still lower than before the crisis - and the labour force surveys published by the European Commission are showing signs of shortages in certain sectors and countries. Against this background, unemployment levels have continued to fall, despite the increasingly buoyant labour force participation rate.

In contrast to this improvement in employment, nominal wage growth - measured both in terms of compensation per employee and negotiated wage settlements - was persistently subdued in most sectors and countries, except for Germany (see Chart 1), with rates of change far removed from the figures of almost 2.5% posted in the pre-crisis boom.

Chart 2 presents the contributions of the traditional determinants of wage growth estimated using a Phillips curve which shows the relationship between the rate of change of wages and productivity growth, past inflation and labour market slack measured as the difference between the rate of unemployment observed and the structural rate of unemployment (NAIRU). As can be seen, all these factors contribute to explaining lower wage growth with respect to its historical average. The negative contribution associated with the low levels of inflation observed in the past is particularly noteworthy insofar as the negative contribution of labour market

Chart 1
NOMINAL REMUNERATION GROWTH PER EMPLOYEE AND SECTOR (2015-17) (a)

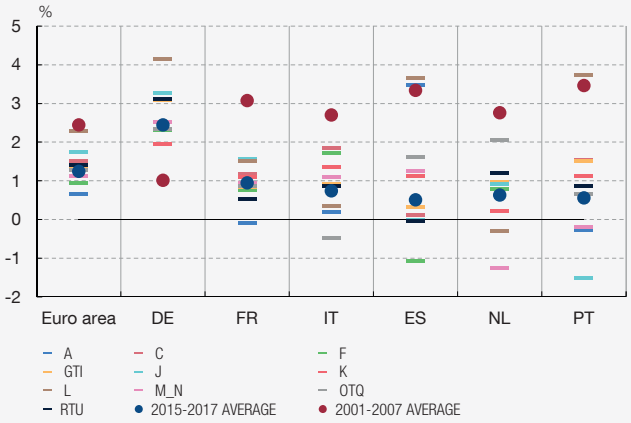


Chart 2
REMUNERATION GROWTH BY EMPLOYEE
(Deviations from period average)
Breakdown based on Philips curve (a)

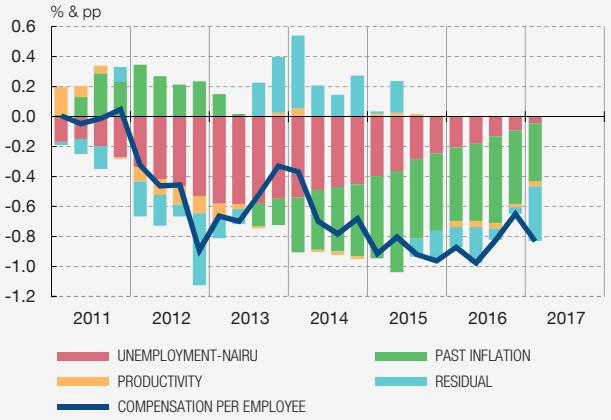


Chart 3
BROADER ESTIMATIONS OF LABOUR UNDERUTILISATION IN THE EURO AREA

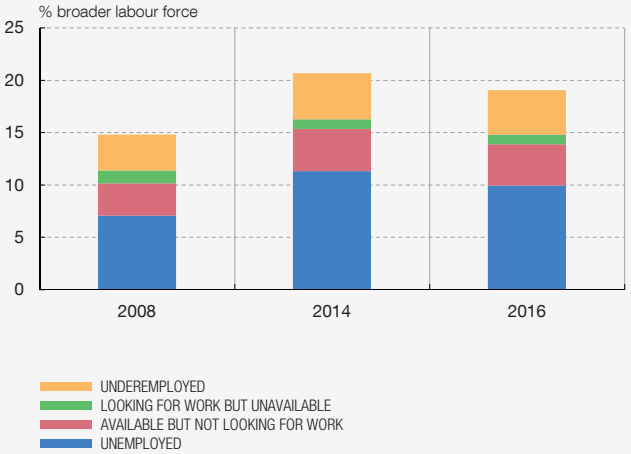
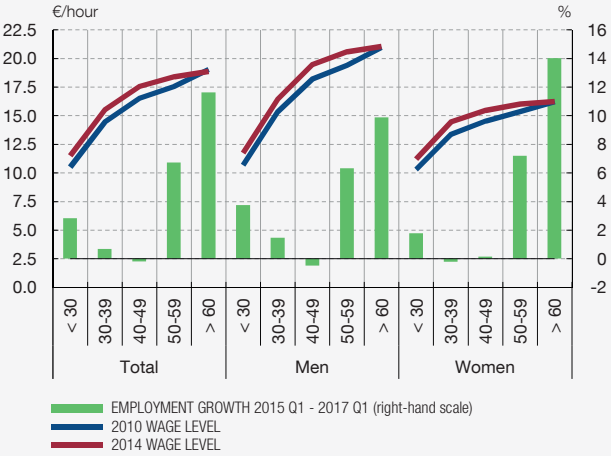


Chart 4
EURO AREA. WAGE LEVELS AND EMPLOYMENT GROWTH BY AGE GROUP



SOURCES: Encuesta de Estructura Salarial, Labour Force Survey and National Statistics Offices.

a A: agriculture; C: manufacturing; F: construction; GTI: commerce, transport and catering; J: information and communication; K: financial activities; L: real estate activities; M_N: administrative activities; OTQ: general government; RTU: recreational activities and other services.

slack decreased notably in recent quarters as a result of the positive performance of employment. Similarly, low productivity growth also puts downward pressure on wages, although the magnitude of this factor's contribution is lower.

That said, persistent negative residuals suggest that, besides the conventional determinants, other factors could be exerting downward pressure on wages. Noteworthy among these factors are the higher immigrant inflows in recent years and the structural reforms implemented in certain Member States which could have been conducive to trade unions, in certain countries and sectors, giving more priority to job creation and better working conditions than to wage increases during negotiations. However, there is limited evidence of this.

There are some developments shared with other advanced economies, such as the United States which could explain wage moderation that are not related to the usual determinants of this variable. First, there is evidence that the labour market slack may be higher than that inferred by conventional unemployment rates which may put downward pressure on wages. Indeed, when broader measures of unemployment are considered, which include not only the proportion of the unemployed actively seeking work but also those individuals who are discouraged from looking for work, those who are looking but are not available to work and, especially, part-time workers who want to work more hours, unemployment levels are estimated to virtually double during the period of the crisis[1] (see Chart 3).

Second, the changes in the composition of employment could likewise be playing a role in the moderation of wage growth. In the absence of up-to-date information from the Structure of Earnings Survey to corroborate this diagnosis (the 2014 edition is the latest one available), certain signs seemingly point in this direction. For instance, as shown in Chart 4, since 2013 the recovery of employment has been particularly buoyant in older population groups and, to a much lesser degree, in younger ones. Although older employees generally earn higher wages, the 2014 Survey reveals that it is precisely among these groups that wage growth has stalled. Insofar as older cohorts, who are at present increasingly relevant in the labour force composition mainly due to population ageing, begin to reach retirement age, the fraction of employment outflows from above-median compensation scales will be greater, thus contributing to reinforcing wage moderation[2].

Lastly, another factor which may be contributing to wage moderation is the process of technological change which has been taking place over the last two decades. In general, technological developments generate labour substitution effects, but also complementarities which may boost job creation and wage growth through productivity improvements. There is some evidence in economic literature that technological progress in the past such as the automation of agriculture[3] or the introduction of automated teller machines[4], among others, have shown a greater prevalence of the positive complementary effects. However, recent papers[5] suggest that the latest technological advances in information processing, the development of artificial intelligence and the perfecting of robotics could ultimately have a negative impact on employment and wages owing to the greater magnitude of the substitution effect.

In short, the moderation of wage growth could be explained by a series of variables that have recently gone beyond what the usual determinants would suggest, although the evidence available is not conclusive when determining their respective contributions.

1 See also Box 6 "Alternative measures of unemployment for the Spanish economy" in the Banco de España's *Economic Bulletin 02/2017* and "Assessing Labour Market Slack" *ECB Economic Bulletin* Issue 3/2017.

2 M. Daly et al (2016), "What's Up with Wage Growth?" FRBSF Economic Letter 2016-07.

3 D. Autor (2015), "Why Are There Still So Many Jobs? The History and Future of Workplace Automation" Journal of Economic Perspectives. Vol. 22(3).

4 J. Bessen (2015), "Toil and Technology" Finance and Development 52(1).

5 D. Acemoglu and P. Restrepo (2017), "Robots and Jobs: Evidence from US Labor Markets" NBER Working Paper 23285.