Article

1 The employment-GDP relationship since the crisis

The continued employment growth seen across the euro area since the onset of the recovery in 2013 has been stronger than expected. Differences in the responsiveness of employment growth to GDP growth between the pre- and post-crisis periods suggest a possible structural change in the underlying employment-GDP relationship. This article explores the factors driving the employment-GDP relationship. It suggests that the changing sectoral composition of GDP growth towards a larger services sector, a shift in the composition of employment towards part-time employment, and structural labour market reforms and fiscal measures in some countries underlie some strengthening in the underlying employment-GDP relationship since the start of the recovery.

The relationship between euro area employment and GDP

The recovery in euro area GDP since the second quarter of 2013 has been accompanied by higher than expected employment growth. This article assesses the extent to which the stronger than expected employment growth seen over the recovery is likely to persist and examines some of the factors likely to be contributing to this. From a central bank perspective, this topic is important because the labour market recovery is crucial for the strength of confidence and consumption in the aftermath of the crisis. While the earlier weakening of the relationship between GDP growth and the unemployment rate (Okun's law), or between GDP and employment growth, has been documented and explained in the literature[31], much less attention has, so far, been paid to the strong "reconnection" between employment and GDP growth over the recovery.

To some extent, it is surprising that the employment-GDP relationship over the recovery has been as strong as in the pre-crisis years. Before the onset of the Great Recession in 2008, euro area employment growth co-moved closely with GDP. In retrospect, however, the strong employment growth experienced in some countries in the pre-crisis period had been associated with the emergence of sectoral imbalances, which were later viewed as unsustainable in the longer term. Nevertheless, since the onset of the euro area recovery in GDP, employment responses to GDP growth have been at least as strong as in the pre-crisis period.

Both cyclical and structural changes are likely to have contributed to the higher than expected responsiveness of euro area employment to GDP since the rebound. The cyclical reasons include strong rebounds following large

[31] See, for example, Klinger, S. and Weber, E., "On GDP-Employment Decoupling in Germany", Institute for Employment Research, *IAB-Discussion Paper*, 21/2014, and Burggraeve, K., de Walque, G. and Zimmer, H., "The relationship between economic growth and employment", *National Bank of Belgium Economic Review*, June 2015.

decreases in employment in some countries and the introduction of short-term fiscal measures, which have boosted employment growth in the aftermath of the crisis in some Member States. However, ongoing structural changes and structural reforms in some countries are also likely to have played a more persistent role.[32]

This article considers the factors underlying the employment-GDP relationship and assesses their role in explaining the strong employment growth observed since the start of the euro area recovery. The remainder of this article is organised as follows: Section 2 provides an overview of euro area employment-GDP dynamics over the course of Economic and Monetary Union (EMU), focusing on developments since the crisis. Section 3 provides a quantification of the employment-GDP relationship and includes a box examining the evidence of changing employment dynamics from a statistical perspective. Section 4 assesses the importance of sectoral dynamics in explaining the recent strength in the employment-GDP relationship. A second box compares the patterns observed in the euro area with those seen in the United States since the Great Recession and considers the implications of recent strong employment growth in both economies for productivity measurement. Section 5 examines the country dimension of the euro area aggregate and assesses the role of policy measures in shaping recent euro area developments. A third box examines the impact of structural reforms on country-level changes in employment reactions to output growth. Section 6 concludes.

A longer-term overview of euro area employment dynamics

The global economic and financial crisis brought about a major "disconnect" in the employment-GDP relationship. Before the crisis – between the first quarters of 1999 and 2008 respectively – euro area employment and GDP growth had co-moved closely (see Chart 1). This relationship, however, broke down with the onset of the Great Recession in 2008, although persistent job losses and subsequent weak job creation during the interim recovery[33] and a further very strong shake-out of employment in the euro area's second (double-dip) recession helped to restore the underlying relationship. Since the recovery in activity that began in early 2013, employment and GDP appear to have reconnected strongly. These distinct phases are illustrated in Chart 2 and are briefly discussed below.

[32] Statistical and measurement issues may have also played a role; however, these are not the focus of this article.

[33] The term "interim recovery" refers to the initial rebound in euro area GDP following the Great Recession of 2008-09.

Chart 1

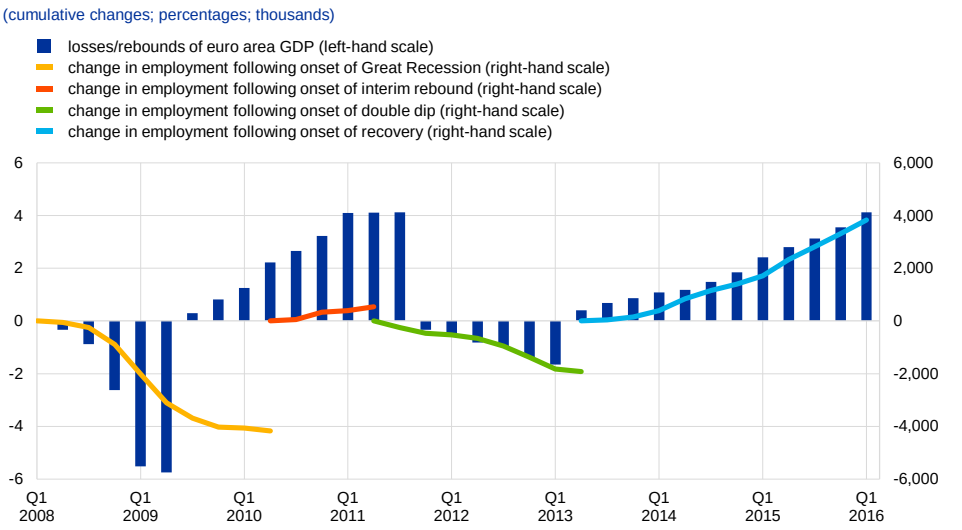
Growth rates of real GDP and employment in the euro area since 1999

Sources: Eurostat and ECB calculations.

When the global Great Recession hit the euro area economy in 2008, euro area employment initially contracted relatively moderately, given the sharp decline in GDP growth, but this was to some extent countered over the course of the interim rebound. While euro area employment initially contracted only modestly in the first quarters of the Great Recession, the employment decline continued for several quarters into the interim rebound in activity, which lasted from the third quarter of 2009 until the third quarter of 2011 (as shown by the yellow line in Chart 2). Moreover, despite a marked recovery in euro area GDP over the subsequent interim rebound, euro area employment barely rose, in part reflecting the delayed effects of earlier labour hoarding (see the red line in Chart 2). The marked disconnect in the relationship between employment and GDP has been widely reported and analysed in the literature.[34]

Chart 2

Cumulative changes in euro area GDP and employment since the start of the crisis



Sources: Eurostat and ECB calculations.

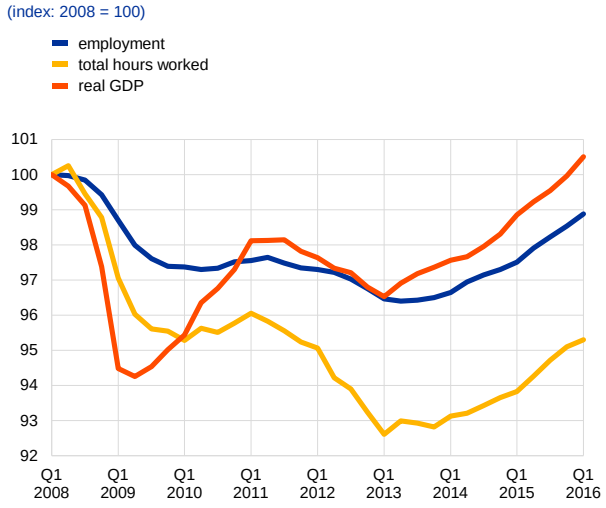
Since the start of the second euro area recession and over the subsequent recovery, the euro area employment-GDP relationship appears to have "reconnected". As the euro area slid back into recession (from the fourth quarter of 2011), employment developments followed the decline in GDP closely (as shown by the green line in Chart 2). Thereafter, with the rebound in activity (from the second quarter of 2013), employment also quickly returned to positive growth – within one

34 See, for instance, *Euro area labour markets and the crisis*, Structural Issues Report, ECB, October 2012, and the updated version, published as "Comparisons and contrasts of the impact of the crisis on euro area labour markets", *Occasional Paper Series*, No 159, ECB, February 2015.

quarter of the GDP rebound – and has since expanded strongly in line with GDP dynamics (see the light blue line in Chart 2).

Chart 3

Evolution of real GDP, employment and total hours worked since the start of the crisis



Sources: Eurostat and ECB calculations.

Despite the strengthening of the employment-GDP relationship of late, euro area employment remains slightly below pre-crisis levels. As Chart 3 shows, in the first quarter of 2016[35] euro area employment was still around 1% below the pre-crisis peak seen in the first quarter of 2008. However, the slight shortfall in headcount employment contrasts markedly with developments in total hours worked. In the first five years of the crisis, developments in headcount employment and total hours worked diverged substantially, with the latter remaining considerably below pre-crisis levels, following a further significant reduction in total hours worked over the course of the second euro area recession. Following this strong decline, it had been expected that subsequent increases in activity would be met by increases in working hours of existing headcount (resulting in increases in measured average working hours per person employed).[36] In practice, however, average hours worked per person employed have barely changed since 2013. Instead, the evolution of total hours worked has merely reflected the expansion in employment (see also the box entitled "Factors behind developments in average hours worked per person employed since 2008" in this issue of the Economic Bulletin).

Over the recovery, employment forecasts for the euro area have been continually revised upwards by a wide range of forecasters. It seems that forecasters had also anticipated that firms would expand the working hours of their incumbent employees, rather than expand headcount. Chart 4 shows that Eurosystem and ECB staff projections consistently underestimated euro area employment growth over the 2013-15 interval, even as the recovery was under way. Similar errors are evident in the forecasts for the euro area from other institutions, such as the European Commission, the IMF and the OECD, as forecasters there also were caught out by a stronger than expected employment response to GDP growth, rather than forecast errors for GDP. [37]

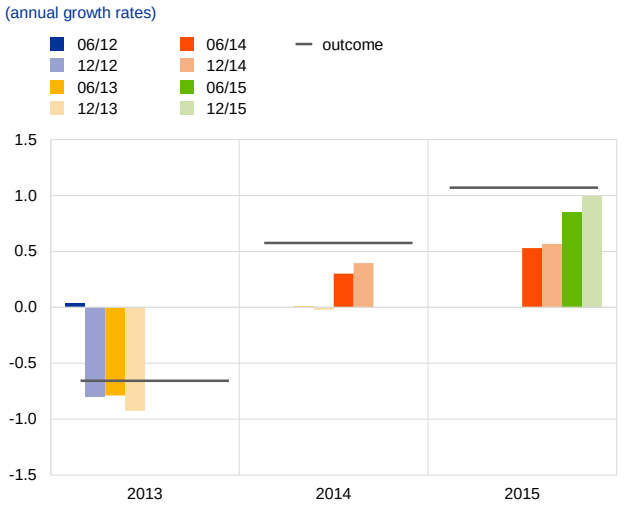
35 This article is based on data available up to the end of June 2016.

36 For example, the European Commission held the view that "the current low level of average hours worked does not represent necessarily a *new normal*, as it is accompanied by a significant increase in involuntary part-time employment, which has a clear cyclical pattern and can be expected to be reabsorbed during the recovery". *Labour Market and Wage Developments in Europe 2015*, European Commission, 2015, p.24.

37 Indeed, GDP growth was lower than projected in 2014 and – at the time – similar to the projections in 2015, while employment growth was higher than anticipated in both years. The recent substantial revisions to Irish GDP were not taken into consideration in this assessment.

Chart 4

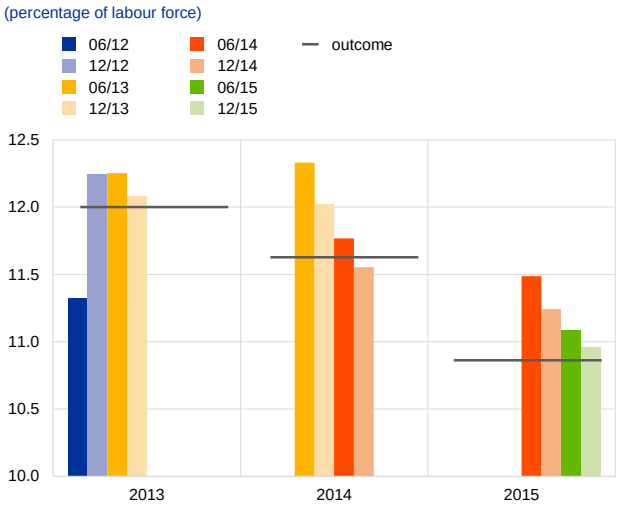
Projected annual employment growth between 2013 and 2015 from Eurosystem projections and outcomes



Sources: BMPE projections database and ECB calculations.

Chart 5

Projected annual average unemployment rates between 2013 and 2015 from Eurosystem projections and outcomes



Sources: BMPE projections database and ECB calculations.

The strong employment growth also helped bring down the euro area unemployment rate more quickly than expected. Chart 5 shows a marked acceleration in the speed of the unemployment declines which accompanied the growth in employment as the euro area recovery took hold. By 2015, the rate at which unemployment was declining continued to surprise forecasters even at the end of the projection horizon (as data on unemployment outcomes typically arrive with a lag of around two months). Moreover, the euro area unemployment rate declined despite recent increases in labour supply (including both population and participation effects[38]), as employment growth exceeded the labour force expansion.

Quantifying the employment-GDP relationship

Developments in euro area employment and activity suggest post-crisis elasticities at least as strong as those of the pre-crisis period. National accounts data for the euro area show that between the first quarter of 1999 and the eve of the crisis in the first quarter of 2008 – a period of particularly employment-rich growth during which total employment increased by around 18 million – euro area headcount employment grew by around 13%, linked to an increase in output of around 23%, yielding a ratio of around 0.55 (see Chart 6). In the early part of the crisis, commentators looked back on the pre-crisis period as a time of exceptional employment growth, fuelled in part by an unsustainable construction bubble and thus not likely to be repeated or permanent. Nevertheless, over the interval since the start

38 See the box entitled “Recent developments in the labour force participation rate in the euro area”, *Economic Bulletin*, Issue 1, ECB, 2015 and the earlier box on wider labour supply effects entitled “Recent labour supply developments”, *Monthly Bulletin*, ECB, June 2010.

of the recent recovery in activity which began in the second quarter of 2013, euro area GDP has increased by around 4.1%, while employment has since risen by 2.5%, slightly *increasing* the observed ratio to around 0.62.[39] Similar results are suggested using econometric techniques based on short-term reactions between employment and GDP (see Box 1).

Box 1
A quantitative investigation of the euro area employment-GDP relationship

Econometric analysis finds that the euro area employment-GDP relationship is at least as strong in the recovery period as in the years leading up to the crisis. Attempts to assess the degree to which euro area employment cyclicality may have changed since the post-crisis recovery are, however, severely restricted by the small number of post-crisis observations. Table A summarises the results of a simple model designed to identify the changing cyclicality of euro area employment over the course of the crisis and the subsequent recovery period.

Table A
Euro area employment cyclicality at different intervals

(OLS regression results)

Variable	Coefficient	Standard error
Employment t-1	0.2826***	0.15
GDP t	0.2283**	0.05
GDP t-1	0.1014**	0.04
GDP t-2	0.0380	0.04
GDP t-3	0.0135	0.03
GDP t-4	0.0347	0.03
RECN*GDPt	0.2118***	0.09
0811*GDPt	-0.2818***	0.08
RECOV*GDPt	0.0812	0.10
C	-0.0001	00

Sources: Eurostat and ECB calculations.
Notes: OLS refers to ordinary least squares. The dependent variable is employment. Both employment and GDP are log-differenced. The sample for the estimation is Q1 1999-Q4 2015 (68 observations). *** and ** denote statistical significance at the 1% and 5% level respectively.

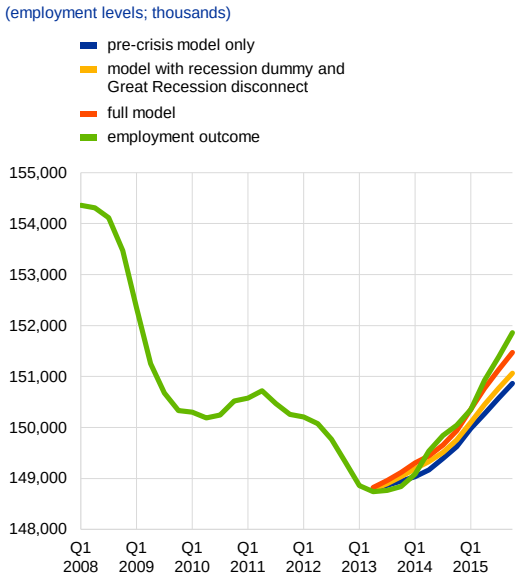
The results suggest an average pre-crisis elasticity equal to around 0.58 – which is similar to the 0.55 observed on a trough-to-peak basis, as reported in the main text. The specification was selected to assess the different phases of the employment-GDP relationship since the onset of the crisis. In particular, the model seeks to explain quarter-on-quarter growth in euro area total employment using contemporaneous real GDP growth and several lags of GDP (see Table 1), alongside interactions of quarterly GDP growth with: (i) a dummy variable, RECN, designed to capture the well-known asymmetries during recession periods, taking a value of 1 when the euro area was in recession, and 0 otherwise; (ii) a dummy variable, 0811, assigned a value of 1 between the second quarter of 2008 and the third quarter of 2011 to capture the strong disconnect in employment and GDP developments seen over the first crisis phase[40] (as suggested by Chart 2 in the main text); and (iii) a "recovery" dummy, RECOV, reflecting the recovery in euro area GDP from the second quarter of 2013 to the end of the sample in the fourth quarter of 2015.

39 Computations are made relative to the local troughs in both variables.

40 A variety of time dummies capturing the crisis periods were tested, for instance: *0809*, capturing only the effects of the Great Recession period (as measured by quarterly developments in euro area GDP) and taking a value of 1 for the five quarters of the Great Recession, which the euro area experienced between the second quarters of 2008 and 2009 respectively; *CRISIS*, taking a value of 1 between the second quarter of 2008 and the first quarter of 2013, thus covering both euro area recessions and the intervening interim rebound. The results reported above reflect the strongest of the three models, as measured by adjusted R^2 and root mean square error criteria.

Chart A

Estimated euro area rebound in employment since the crisis compared with actual developments



Sources: Eurostat and ECB calculations.
Notes: Comparison of actual employment outcomes (green line) with forecasts for the period from Q2 2013 to Q4 2015 based on: (i) the pre-crisis relationship only (blue line); (ii) interaction terms for recession asymmetries (RECN) and the Great Recession disconnect (0811), shown by the yellow line; and (iii) interaction terms for recession asymmetries (RECN), the Great Recession disconnect (0811) and the recovery dummy (RECOV), as illustrated by the red line.

Moreover, the results show a marked and statistically significant disconnect in the longer-term employment-GDP relationship following the start of the Great Recession. Recession asymmetries were generally found to be strongly positive and significant (see the strong positive coefficient on the interaction term, RECN*GDP$_t$). This suggests that euro area employment typically falls at an accelerated rate during recessions, rather than at the same rate at which it grows during periods of GDP expansion. However, the model finds a strong reduction in the employment-GDP relationship over the period of disconnect following the onset of the Great Recession (see the strong negative coefficient on the interaction term 0811), reflecting a marked *moderation* in employment losses (as a consequence of well-documented labour hoarding in some euro area countries[41]) over this period – and to an extent large enough to fully offset typical recession asymmetries.

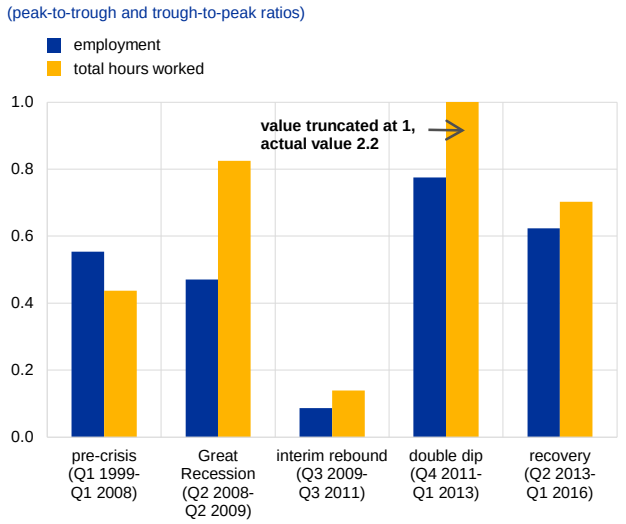
In the recovery phase, the term aiming to capture any increase in euro area employment cyclicality in the aftermath of the crisis is positive, but statistically insignificant. Leaving aside the significance issues, which may be attributable in part to the low number of observations since the recovery, the implied euro area employment elasticity rises from around 0.58 pre-crisis to almost 0.70 with the inclusion of a post-crisis interaction dummy, RECOV.[42] Clearly, it is too early to be certain whether the stronger increase in employment growth seen over the recovery reflects merely an ongoing cyclical response to the previous strong decline in euro area employment seen over the crisis or the emergence of a stronger employment-GDP relationship. Nevertheless, over the Q2 2013-Q4 2015 period, the inclusion of the recovery term markedly improves forecasts of euro area employment, compared either with forecasts based solely on pre-crisis relationships or those which simply take account of recession asymmetries and the Great Recession disconnect (see Chart A). Given the wide-reaching changes under way in many euro area countries – including in the sectoral composition of output and employment, as well as to labour market institutions as a consequence of structural reforms – further careful monitoring of the employment-GDP relationship as the recovery unfolds seems warranted.

41 See, for example, the article entitled “The impact of the economic crisis on euro area labour markets” in the October 2014 issue of the ECB Monthly Bulletin.

42 Long-term implied elasticities are reported (i.e correcting for the impact of the lagged dependent variable).

Chart 6

Elasticities of euro area employment and total hours worked to GDP since the start of EMU



Sources: Eurostat and ECB calculations.
Notes: Dates refer to intervals defined by developments in euro area GDP. The ratios are computed on the basis of the full peak-to-trough declines/trough-to-peak increases in the respective variables in response to GDP developments. Hours worked response to GDP over the double dip truncated to 1.0 (computed as 2.2).

The disconnect between labour market variables and real GDP over the crisis was also seen in total hours worked. To some extent, the disconnect of the employment-GDP relationship in the first phase of the crisis, reflecting strong labour hoarding in several euro area economies, was countered by developments in total hours worked as firms made extensive use of short-time working and other adjustments to average working hours of their employees. This explains the stronger reaction of total hours worked to GDP than employment over the Great Recession and the interim rebound shown in Chart 6. During the double-dip recession, when total hours worked fell more strongly (see again Chart 3) – and proportionately by a much greater degree than employment – the hours elasticity increased considerably (to around 2.2 – considerably above its theoretical upper limit of 1 and around three times the size of the employment reaction to GDP). Over the recovery, however, total hours worked have rebounded only in line with employment – resulting in similar employment elasticities for both variables – albeit with both the employment and total hours worked series apparently exhibiting slightly stronger cyclicality over the recovery than in the pre-crisis period.

The strong "reconnect" seen between euro area employment and GDP growth in the aftermath of the crisis has also been observed in other advanced economies, such as the United States. While the rebound in US output from the Great Recession began rather earlier than in the euro area, a marked realignment between employment growth and GDP growth is evident there also – yielding a post-crisis trough-to-peak employment-to-GDP elasticity of around 0.71, following a proportionately much stronger peak-to-trough decline in employment. Further similarities and differences between the employment rebounds seen in the two economies and their implications for measured productivity growth are discussed in Box 2.

Sectoral developments as a potential source of the strong employment-GDP relationship

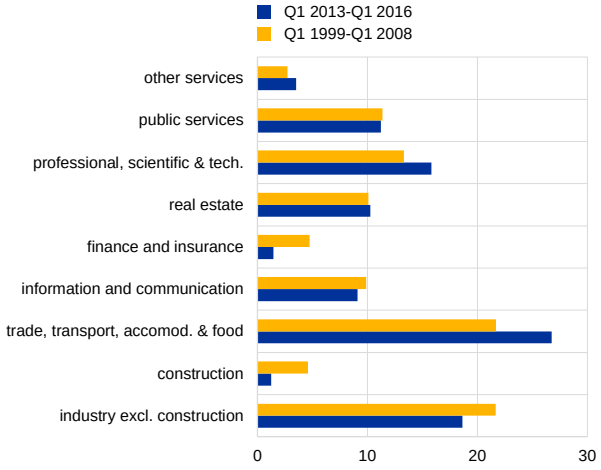
Part of the strong employment reaction observed over the recovery period is likely to reflect the heavy sectoral concentration of the recovery in services – particularly market services. To a large extent this reflects the marked concentration of euro area output growth in these sectors (see Chart 7), with almost four-fifths of the total expansion in euro area output seen over the recovery attributable to market services alone. In terms of employment, the concentration has been greater still, with (as shown in Chart 8) almost all of the 3.2 million additional euro area headcount seen since the recovery in the euro area generated by the

services sector – more than 70% of it in just two branches of market services: (i) the trade and transport sector; and (ii) business and administrative services.[43] Whilst the proportional increases in market services are thus not so different from their historical averages (also shown in Charts 7 and 8, computed for the pre-crisis period between the first quarters of 1999 and 2008 respectively), three segments – business services (where part of the employment growth may also reflect broader tendencies towards outsourcing in other sectors), trade and transport and non-market services – appear to have generated disproportionately large increases in employment and to a greater extent than in the pre-crisis period.[44] Meanwhile in industry, which has contributed around one-fifth of the rebound in euro area value added seen since the first quarter of 2013, employment has risen only modestly.

Chart 7

Cumulative value added growth by sector over the recovery and pre-crisis

(sectoral share of the increase of total value added; percentages)

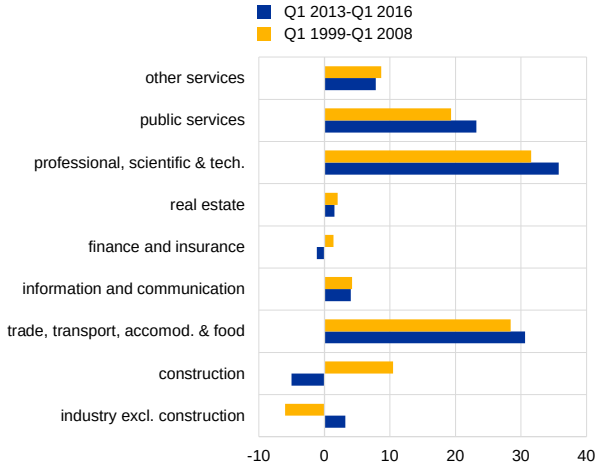


Sources: Eurostat and ECB calculations.

Chart 8

Cumulative employment growth by sector over the recovery and pre-crisis

(sectoral share of the increase of total employment; percentages)



Sources: Eurostat and ECB calculations.

The composition of GDP growth matters, as the services sectors tend to be characterised by a relatively higher employment intensity of growth. A 1% increase in GDP generated by market services results in stronger aggregate employment growth than in industry, as shown in Chart 9, which displays estimated employment intensities for industry and construction, alongside estimates for the two services sub-sectors with the strongest contribution to value added growth over the recovery. While the construction sector typically exhibits a higher employment intensity still, over the recovery its contribution to euro area activity growth has been marginal, while its contribution to employment growth remains modestly negative.

43 For more on this aspect, see the recent article entitled "What is behind the recent rebound in euro area employment?", *Economic Bulletin*, Issue 8, ECB, 2015.

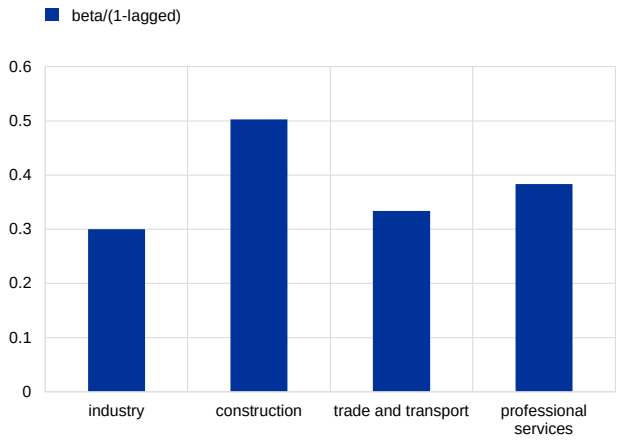
44 The sectoral patterns of output growth help to explain the lack of a rebound in hours worked over the recovery. Within the services sector, the main thrust of the expansion has been heavily concentrated in sectors where average weekly hours worked have tended to remain unchanged (e.g. in business services, public services and other services) or even declined (trade and transport, real estate). Meanwhile, employment has decreased in sectors where average working hours have expanded (i.e. construction). See the box entitled "Factors behind developments in average hours worked per person employed since 2008" in this issue of the Economic Bulletin.

There is a further way in which the changing sectoral composition helps to explain the employment surprise, in that the strong-growth sectors tend also to be those where the part-time work ratio is typically higher than in other sectors. The ongoing increase in part-time employment has been driven by an expansion of market services. In part, the generally higher employment intensities found in services – and in business services, in particular – reflect a higher reliance on part-time working in the services sectors (particularly in market services), also implying, on average, a somewhat shorter hourly working week, compared with industry.[45] (See the box entitled "Factors behind developments in average hours worked per person employed since 2008" in this issue of the Economic Bulletin.) Since the start of the recovery, around one-third of the total net increase in employment represents part-time jobs.[46] This suggests that, with the total hours worked as a given, employment growth was 6% higher than it would have been with the part-time employment rate of 19% seen before the crisis.

Chart 9

Employment elasticity of growth by sector

(long-term employment intensities)

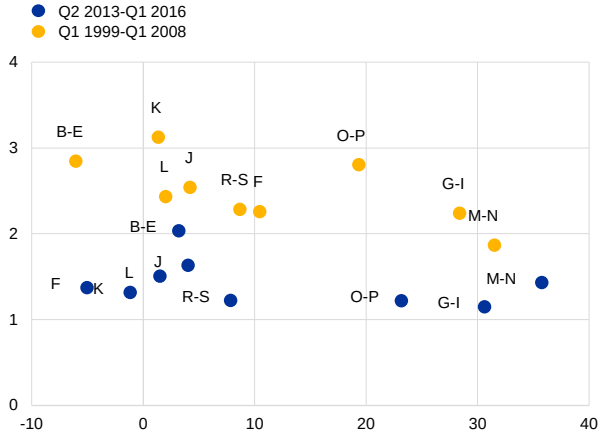


Sources: Eurostat and ECB calculations.
Note: Estimated employment intensities from regressions of sectoral employment equations.

Chart 10

Euro area employment and wage growth by sector

(x-axis: percentage share of total employment expansion by sector; y-axis: average annual wage growth by sector)



Sources: Eurostat and ECB calculations.
Note: B-E refers to industry excluding construction; F construction; G-I trade, transport, accommodation and food; J information and communication; K finance and insurance; L real estate; M-N professional, scientific and technical services; O-P public services; and R-S other services.

To some extent, the strong sectoral concentration of employment growth in business services and trade and transport over the rebound may be related partially to the lower wage growth seen over recent years. Chart 10 shows that the bulk of the employment growth seen since the recovery has been concentrated in sectors with lower than average wage growth or those in which average wage growth has fallen most markedly, while sectors with higher wage growth have typically expanded only modestly (or contracted).

45 In part, it also reflects higher capital intensities in industry, enabling (or reflecting) a stronger substitution of capital for labour in this sector. An absence of timely data prevents further exploration of this feature in the recovery period.

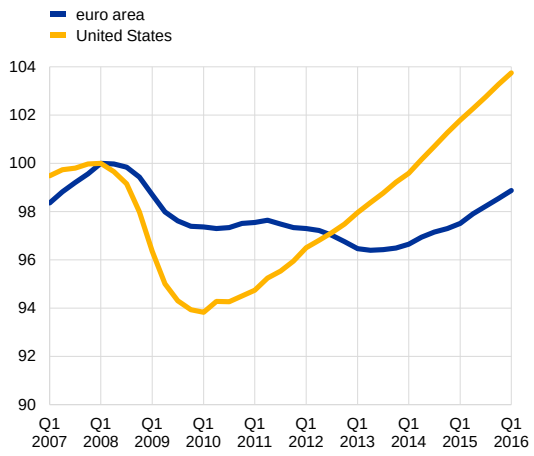
46 See also the recent article entitled "What is behind the recent rebound in euro area employment?", *Economic Bulletin*, 2015, op. cit.

Box 2
Employment-GDP dynamics in the euro area and the United States since the crisis

The Great Recession had a significant impact on labour markets on both sides of the Atlantic, leading to substantial job losses in both the euro area and the United States. However, following a more rapid decline in employment during the Great Recession, the post-crisis rebound in employment occurred much faster in the United States than in the euro area. Chart A shows that, following the 2008-09 Great Recession, US employment took around 26 quarters to rebound to pre-crisis levels.[47] Since the employment trough was reached in the first quarter of 2010, an additional 13.7 million jobs have been created – almost 5.2 million over and above pre-crisis employment levels. By contrast, eight years (some 32 quarters) after the onset of the global economic and financial crisis in the first quarter of 2008, euro area employment remains slightly below its pre-crisis peak – despite a rebound in euro area employment of the order of 3.8 million since the trough was reached in the second quarter of 2013. In part, the delayed return to pre-crisis levels of employment in the euro area reflects different GDP dynamics in the two economies, as the United States did not experience a second recession linked to the sovereign debt crisis. However, GDP dynamics alone do not fully explain the different employment dynamics seen in the two economies.

Chart A
Employment profile for the euro area and the United States in the aftermath of the Great Recession

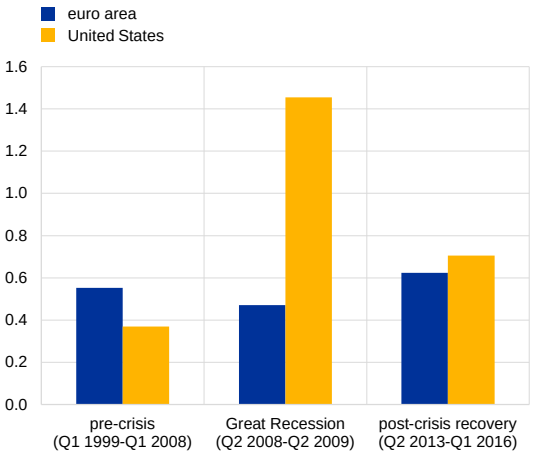
(pre-crisis peak = 100)



Sources: Eurostat, US Bureau of Labor Statistics and ECB calculations.

Chart B
Employment responsiveness to GDP since the crisis

(ratios of peak-to-trough and trough-to-peak developments in employment and GDP)



Sources: Eurostat, US Bureau of Labor Statistics and ECB calculations.
Notes: Dates show the periods for the euro area. For the United States, the following periods were used: pre-crisis: Q2 2003-Q1 2008, Great Recession: Q1 2008-Q1 2010, recovery: Q1 2010-Q1 2016.

In relation to GDP, the employment decline during the crisis was much larger in the United States, and the rebound rather stronger, than in the euro area. Peak to trough, US GDP contracted by 4.2% over the Great Recession, while employment declined by 6.2% – yielding an

[47] The long-lived nature of the decline reflects in part the stronger and more persistent nature of the financial crisis, compared with non-financial recessions. See, for example, Reinhart, C. M. and Rogoff, K. S., *This Time Is Different: Eight Centuries of Financial Folly,* Princeton University Press, 2011.

"elasticity" of employment to GDP losses of around 1.45. While to some extent this is likely to reflect the greater labour market flexibility which typically characterises the US labour market – in part as a consequence of notably lower employment protection legislation there[48] – the reaction was clearly stronger than in many earlier US recessions, when employment losses were generally proportionately smaller than output losses.[49] Given the severity and duration of the recession, it is likely that US firms hoarded considerably less labour than usually seen across post-war recessions.[50] Chart B shows the estimated elasticities of the employment response to GDP developments for the two economies over the crisis period and into the recovery. The US experience stands in marked contrast to the strong disconnect between employment and GDP developments that was evident in the euro area in the early phases of the crisis (see the section entitled "A longer-term overview of euro area employment dynamics" and Chart 2). As has been shown, following the onset of the Great Recession, euro area GDP fell by some 5.7%, while employment initially declined by 2.7% (peak-to-local trough, reached in the first quarter of 2010), yielding a ratio of around 0.47. Over this period, institutional support – in particular from widespread reliance on short-time working schemes and other job-saving measures in many euro area countries[51] – helped cushion the impact of the strong GDP losses on euro area employment to a greater degree than in the United States.

The expansion in US employment relative to GDP has also been proportionately stronger in the upturn than in the euro area. Chart B demonstrates that following the respective troughs in GDP reached after the Great Recession, the employment response to GDP has been more muted in the euro area than in the United States, yielding an elasticity of around 0.62, compared with 0.71 in the United States. In advance of the crisis, it seems that the elasticity in the euro area had been somewhat stronger than in the United States, reflecting in part the protracted period of "jobless growth" following the bursting of the dot-com bubble in the early 2000s.

The rebound in employment in the United States has been somewhat more broadly spread across economic sectors than that in the euro area. In both regions, the business services sector and the trade and transport sector have contributed the bulk of the employment increase since their respective recoveries started. But the expansion in euro area employment has also been driven to a significant extent by ongoing growth in non-market services (including public administration, health services and education), while this sector contributed much less to US employment creation over its respective recovery (see Chart C).[52] In addition, the industrial and construction sectors added around 15% to the US employment expansion seen since 2010, while their contribution was marginal in the case of the euro area. This shows that these sectors rebounded more quickly in the United States than in the euro area. In the euro area, by contrast,

48 See the box entitled "A tale of two crises: recent developments in euro area and US employment" in "What is behind the recent rebound in euro area employment?", *Economic Bulletin*, 2015, op. cit.

49 Increasingly since the 1990s, however, falls in output resulted in commensurate or even larger percentage reductions in employment. See Freeman, R., "Failing the test? The flexible US job market in the Great Recession", *NBER Working Paper*, No 19587, October 2013.

50 A contribution by Chinn, M., Ferrara, L. and Mignon, V. entitled "Explaining US employment growth after the Great Recession: The role of output-employment non-linearities", *Journal of Macroeconomics*, Vol. 42, 2014, pp. 118-129, suggests that the decline in employment exceeded the level predicted by standard econometric models of employment elasticity. By contrast, the subsequent upturn in US employment was stronger than suggested by their model.

51 See "Unemployment Dynamics during Recessions and Recoveries: Okun's Law and Beyond", *World Economic Outlook: Rebalancing Growth*, IMF, April 2010, Chapter 3.

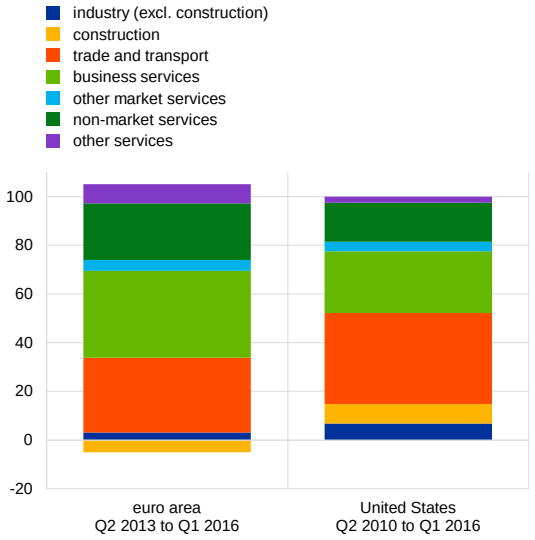
52 In the United States, in particular the expansion of public sector employment (which is part of non-market services) has been less supportive of economic growth than usual during downturns; see also Freeman, R., op. cit.

while industrial employment has expanded modestly (by around 3%) since the second quarter of 2013, this has been more than offset by further employment losses in the construction sector over the euro area employment rebound.

Chart C

Sectoral composition of the cumulative rebound in employment: euro area and United States

(percentage breakdown of cumulative non-farm employment growth over recovery period)

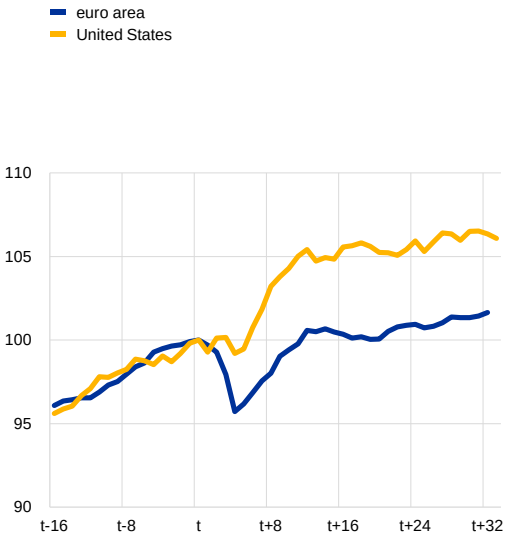


Sources: Eurostat, US Bureau of Labor Statistics and ECB calculations.
Note: Employment rebound since post-crisis trough (reached in the United States in Q1 2010 and in the euro area in Q2 2013).

Chart D

Labour productivity relative to pre-recession levels

(index: country-specific pre-crisis peak in GDP = 100)



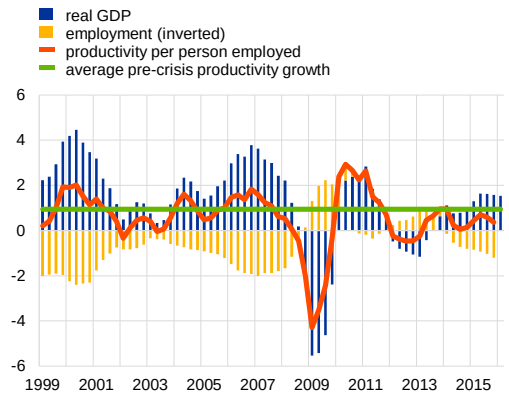
Sources: Eurostat, US Bureau of Labor Statistics and ECB calculations.
Note: Pre-crisis peaks are Q1 2008 in the euro area and Q4 2007 in the United States.

The different employment reactions relative to GDP in the two economies have also resulted in divergent productivity dynamics. The decline in productivity levels as a result of the crisis was rather pronounced in the euro area, but marginal and short-lived in the United States (see Chart D), in large part as a consequence of the strong job shedding seen over the course of the Great Recession. As a result, US productivity levels suffered barely any long-term damage (albeit at the expense of employment) from the crisis, before recovering promptly and then levelling off more than 5% above pre-crisis levels. The US profile stands in marked contrast to that of the euro area, where productivity levels – despite a considerable rebound – remain virtually stagnant at pre-crisis levels.

Chart E

Growth in productivity per person employed and contributions: euro area

(annual percentage changes; percentage point contributions)

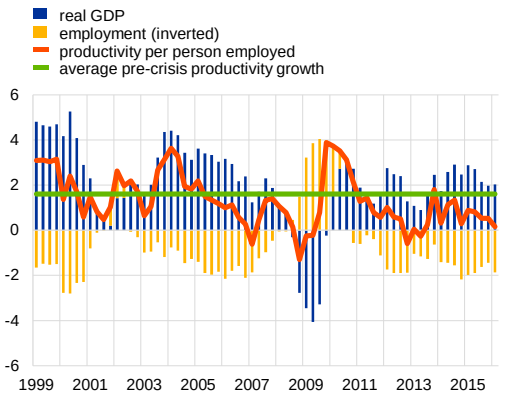


Sources: Eurostat and ECB calculations.

Chart F

Growth in productivity per person employed and contributions: United States

(annual percentage changes; percentage point contributions)



Sources: US Bureau of Labor Statistics and ECB calculations.

Productivity growth, however, slowed markedly for both economies compared with pre-crisis averages. Following the trough reached in GDP in the second quarter of 2009, US annual productivity growth slowed to 0.9% year on year – more than halving its pre-crisis average rate of growth since 1999. In the euro area, where lower productivity growth has long been of concern to policymakers[53], productivity growth slowed less (by around a third), but from a lower starting point, to just 0.6% year on year. More recently, since the euro area post-crisis rebound in GDP in the second quarter of 2013, the US productivity slowdown has been more marked still[54] and is now virtually indistinguishable from the 0.4% year-on-year annual productivity growth seen in the euro area over this interval. In part, these slowdowns reflect a tendency towards stronger employment growth relative to GDP growth compared with the pre-crisis period – as shown in Charts E and F. Moreover, they reflect a notable and broadly-based decline in within-sector productivity growth across all economic sectors in both the euro area and in the United States.

The strong employment growth seen in both the euro area and the United States since the rebound in activity has been broadly welcomed by policymakers. Stronger employment growth has doubtless provided support to household incomes, but has also further weakened aggregate productivity growth, which was already notably weaker – even at the sectoral level – than in the pre-crisis period on both sides of the Atlantic. These common trends in productivity growth may imply risks to the long-term growth outlook in both economies.

53 See, for example, “On the importance of policy alignment to fulfil our economic potential”, 5th Annual Tommaso Padoa-Schioppa Lecture by Mario Draghi, President of the ECB, at the Brussels Economic Forum 2016, 9 June, or the earlier special lecture at the 22nd Annual Congress of the European Economic Association entitled “Productivity in the euro area and monetary policy” by former ECB President, Jean-Claude Trichet (Budapest, 27 August 2007).

54 See also the box entitled “The slowdown in US labour productivity growth – stylised facts and economic implications”, *Economic Bulletin*, Issue 2, ECB, 2016.

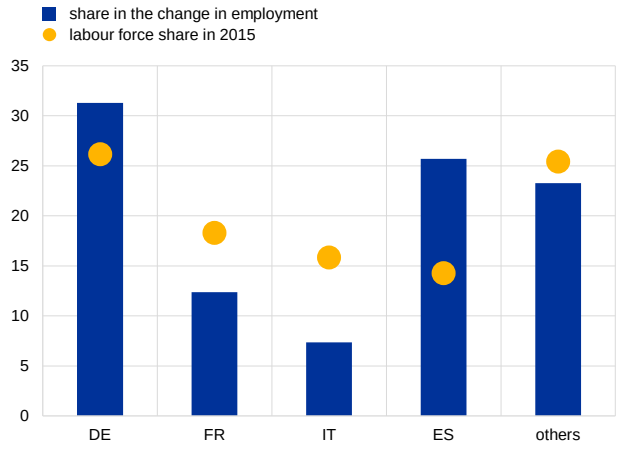
The country dimension and the role of policy measures

So far, the rebound in euro area employment has been driven mainly by two large countries: Germany (where employment barely declined, even in the Great Recession) and Spain. These two countries have together accounted for around two-thirds of the cumulative increase in euro area employment since the trough in euro area employment reached in the second quarter of 2013 (31% and 25% respectively – see Chart 11).[55] France and Italy have contributed much less to the euro area's employment expansion (together accounting for just 13% of the expansion in employment seen since the first quarter of 2013), though in the past four quarters employment growth has also been gaining momentum in Italy. Meanwhile, employment growth has been relatively strong in several of the smaller – and formerly stressed – economies (most notably in Ireland and Portugal).

Chart 11

Country shares in cumulative euro area employment increase over the recovery

(share in euro area employment increase; percentages)

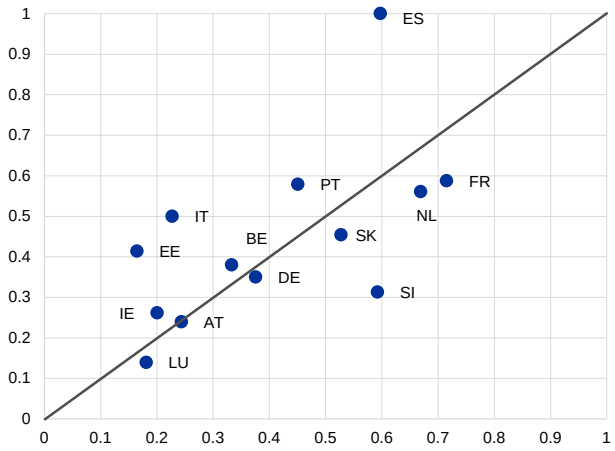


Sources: Eurostat and ECB calculations.
Note: Country shares in the cumulative increase in euro area employment between Q1 2013 and Q1 2016 and 2015 share in euro area labour force.

Chart 12

Employment elasticities: pre-crisis and to 2016

(estimated pre-crisis elasticities and post-crisis elasticities; x-axis: elasticity 1999-2008; y-axis: elasticity 1999-2016)



Sources: Eurostat and ECB calculations.
Notes: Elasticities are computed by regressing quarter-on-quarter employment growth on quarter-on-quarter GDP growth (contemporaneous and up to four lags). All equations include an interaction term to account for the typical asymmetries associated with recessions (interacting a dummy variable, taking a value of 1 when the respective country was in recession, with the rate of quarter-on-quarter GDP growth), lagged dependent variables (to take account of the typical high degree of persistence in employment growth in many countries) and a constant. Country models were selected on the basis of their explanatory power (F-stat, R2) and the statistical significance of the estimated coefficients on GDP.

In the aftermath of the crisis, policy priorities have turned to means of spurring job growth, enhancing labour market flexibility and reducing long-standing labour market dualities. The aim is to aid reallocation and rebalancing – particularly in those countries most affected by strong job losses. Partly by design, these measures are likely to have influenced the elasticity of the response of employment to GDP growth in the recovery. In some countries, elasticities have peaked significantly during their respective recovery phases, reflecting the impact of ongoing

[55] See also "What is behind the recent rebound in euro area employment?", *Economic Bulletin*, 2015, op. cit.

structural reforms and shorter-term fiscal incentives to hiring. Chart 12 shows a broadly based increase in employment elasticities across most euro area countries since the crisis. The exploratory analysis in Chart 12 compares estimated employment elasticities at country level over the pre-crisis period with their post-crisis equivalents. Observations above the 45 degree line show those countries where post-crisis elasticities (estimated for the full Q1 1999 to Q1 2016 period) are significantly higher than their pre-crisis level (estimated from Q1 1999 to Q1 2008). Slightly more than half of the countries featured here show post-crisis employment elasticities notably higher than in the pre-crisis period.

The extent to which the drivers of recent increases in employment creation reflect ongoing structural changes or temporary fiscal measures will influence the likely persistence of the strong employment growth seen over the recovery. While a definitive assessment of their role is not yet possible given the short interval of the recovery in some countries[56], structural changes – including the impact of structural reforms in several euro area economies (see Box 3 on "Recent employment dynamics and structural reforms") – are likely to play a larger, sustained and more persistent role, also in those countries where temporary fiscal stimuli have helped to further boost employment creation over the recovery.[57] Ongoing sectoral changes (in particular, the growing role of services in the national output of most euro area economies) and compositional effects leading to an increasingly flexible workforce[58] are likely to result in a persistently stronger employment reaction to changes in output in most euro area economies in the post-crisis period.

Box 3
Recent employment dynamics and structural reforms

Structural reforms have the potential to alter the reaction of growth in employment to output growth.[59] This may imply a direct change in the implied elasticities which capture the response of employment to GDP growth during the ongoing recovery – albeit one which is hard to isolate econometrically, given lags between the introduction and impact of reforms. This box presents some preliminary evidence regarding the impact of structural reforms on employment dynamics in euro area countries, with a particular focus on those countries which have implemented important product and labour market reforms.[60]

56 In Italy, for instance, the recovery in GDP has been evident for only five quarters (from the first quarter of 2015 to the first quarter of 2016).

57 See also Sestito, P. and Viviano, E., "Hiring incentives and/or firing cost reduction? Evaluating the impact of the 2015 policies on the Italian labour market", *Banca d'Italia Occasional Paper*, No 325, March 2016.

58 Arising from growing shares of part-time employment and self-employment and, in several economies, temporary employment.

59 For a description of the main transmission channels of structural reforms, see "Progress with structural reforms across the euro area and their possible impacts", *Economic Bulletin*, Issue 2, ECB, 2015.

60 At the same time, wage rigidities also seem to be present in a number of euro area economies and sectors, suggesting that firms' capacity of adjustment to macroeconomic shocks may be limited across various dimensions. For recent evidence on wage rigidities, see the box entitled "Downward wage rigidity and the role of structural reforms in the euro area", *Economic Bulletin*, Issue 8, ECB, 2015, or Anderton, R., Hantzsche, A., Savsek, S. and Tóth, M., "Sectoral Wage Rigidities and Labour and Product Market Institutions in the Euro Area", *CFCM Discussion Paper*, 2016/01, Nottingham University, 2016.

Structural measures may have contributed to an increase in the responsiveness of employment to GDP during the recovery in several euro area countries. These include measures which increase labour market flexibility by decreasing excessive employment protection, for example by reducing severance payments or making wages more flexible. In consequence, firms in stressed economies may now consider it easier to adjust employment (Chart A). Firms in Greece and Spain appear to attribute easier employment adjustment mostly to labour market reforms.[61] Meanwhile, product market reforms – including reforms which aim to reduce red tape or make it easier for new firms to enter the market, as well as those which reduce the protection of incumbent firms or professions – may also help to increase the speed or strength of employment adjustment of firms. All of these reforms are at least partly reflected in the change in product market regulation and employment protection legislation indicators which are plotted against recent changes in employment elasticities[62] in Chart B. Overall, we see that countries which have implemented stronger structural reforms have also witnessed an increase in the responsiveness of employment to GDP over the course of the recovery.[63]

In countries where wide-ranging reforms were carried out earlier in response to the crisis, there is already some evidence of positive impacts on employment dynamics. For example, the 2012 labour market reform in Spain seems, at least partly, responsible for the country's recent strong employment growth performance.[64] At the same time, other factors – such as sectoral differences in growth rates and job creation, as well as a more pronounced rebound owing to previous substantial job losses in Spain – are also likely to have played a role. In Ireland, a package of effective active labour market policies has helped to significantly reduce the unemployment rate and get people back into work.[65] In Greece, structural reforms in product and labour markets[66]

61 For details, see the results of the latest survey of the Wage Dynamics Network (WDN) in the box entitled "Firms' perceptions of changes in the ease of labour market adjustment and the role of reforms in stressed euro area countries during the period 2010-13 (based on the WDN3 survey)" in "New evidence on wage adjustment in Europe during the period 2010-13", *Economic Bulletin*, Issue 5, ECB, 2016. See also the box entitled "Episodes of unemployment decline in the euro area and the role of structural reforms" in "Increasing resilience and long-term growth: the importance of sound institutions and economic structures for euro area countries and EMU", *Economic Bulletin*, Issue 5, 2016, which shows that unemployment absorption episodes are often associated with a preceding period of structural reforms.

62 Elasticities are taken from a baseline model regressing quarter-on-quarter employment growth on quarter-on-quarter GDP growth (contemporaneous and up to four lags, according to the best-fit country lag structures suggested by the data). All equations include an interaction term to account for the typical asymmetries associated with recessions (interacting a dummy variable, taking a value of 1 when the respective country was in recession, with the rate of quarter-on-quarter GDP growth), up to two lagged dependent variables (to take account of the typical high degree of persistence in employment growth across many countries) and a constant. Country models were selected on the basis of their explanatory power (F-stat, R^2) and the statistical significance of the variables of interest (estimated coefficients on GDP). The values reported in Chart A are corrected long-term values (i.e. adjusted for the lagged dependent variables).

63 This increased responsiveness seems particularly noteworthy given that the high levels of involuntary part-time employment during the crisis might have resulted in a weaker relationship between employment and output during the recovery if the additional working hours of part-timers had increased as well as employment (see, for example, "Comparisons and contrasts of the impact of the crisis on euro area labour markets", *Occasional Paper Series*, op. cit., Section 2.4).

64 See Izquierdo, M., Lacuesta, A. and Puente, S., "The 2012 labour reform: an initial analysis of some of its effects on the labour market", *Economic Bulletin*, Banco de España, September 2013, or Font, P., Izquierdo, M. and Puente, S., "Real wage responsiveness to unemployment in Spain: asymmetries along the business cycle", *IZA Journal of European Labor Studies*, Vol. 4(13), June 2015.

65 At the same time, Ireland was considered a flexible economy already before the crisis. A quantification of the impact of the reforms can be found in "Quantification of the Economic Impacts of Selected Structural Reforms in Ireland", *IGEES Working Paper*, July 2014.

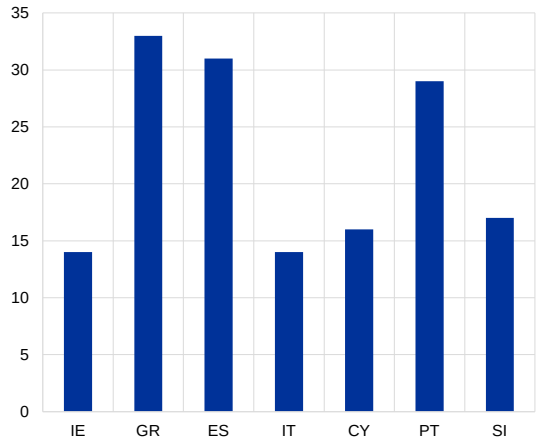
66 For the impact of reforms in Greece, see for example IMF Country Report No 13/155, *Selected Issues* paper, June 2013, or "Assessing the Macroeconomic Impact of Structural Reforms in Greece", Foundation for Economic & Industrial Research, March 2014.

seem to have strengthened the employment-GDP relationship in an environment of fiscal consolidation, tighter financial conditions and a high level of uncertainty. The Cypriot Government has introduced reforms to promote the employment of the young and long-term unemployed and incentivise youth entrepreneurship, as well as schemes to attract people into the labour market via flexible forms of employment. Portuguese reforms of employment protection, unemployment insurance policies and collective agreements have had beneficial effects on productivity and employment and have also had an impact on the sensitivity of employment to GDP.[67] By contrast, countries which have implemented important labour market reforms more recently[68] might see the employment benefits emerge somewhat later.[69]

Chart A

Percentage of firms that found it easier to adjust employment (2013 vs. 2010)

(average across channels of adjustment; percentage of firms; firm-weighted values)

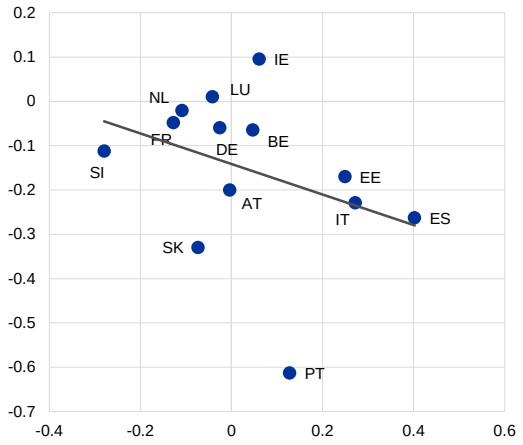


Source: ECB calculations on the basis of the third Wage Dynamics Network survey.
Notes: The Wage Dynamics Network is an ESCB research network. The third survey of European firms was carried out in 2014. (See: https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_wdn.en.html) Firms with fewer than five employees are excluded from the calculations. Figures are weighted to reflect overall firm population and rescaled to exclude non-response. Figures for Ireland are unweighted. Channels of adjustment include collective and individual dismissals of employees for economic reasons, dismissals of employees for disciplinary reasons, temporary dismissals, employee hires, adjustment of working hours and employee reallocation.

Chart B

Change in employment elasticities and structural indicators

(x-axis: change in employment to GDP elasticity; y-axis: change in regulations)



Sources: OECD and ECB calculations.
Notes: Changes in synthetic indicators of the strictness of product market regulation (PMR) and employment protection legislation (EPL) are weighted equally. Reported changes in EPL and PMR are plotted for countries for which both indicators are available for 2008 and 2013.

In summary, the evidence suggests that recent reforms have helped to increase employment. In practice, there have been a number of examples of successful labour market reforms across the euro area countries, which are likely to have contributed to higher employment creation than expected given the historical relationship between employment and GDP. Nevertheless, in the light of persistently high structural unemployment and low potential output

67 See "Portugal: Reforming the State to promote growth", *Better Policies Series*, OECD Publishing, May 2013 and, for more information on specific types of labour market reforms carried out across several euro area countries, the box entitled "Labour market reforms in Ireland, Spain and Portugal", in "What is behind the recent rebound in euro area employment", *Economic Bulletin*, 2015, op. cit.

68 For example, an important labour market reform was introduced in Italy in 2015. Employment growth accelerated that year, at least partly as a result of the reform. See, for example, Sestito, P. and Viviano, E., 2016, op. cit.

69 For more information on the specific labour market reforms implemented, see the LABREF database, available at https://webgate.ec.europa.eu/labref/public/.

growth in the euro area, the momentum of reforms needs to be stepped up in all euro area economies. Further product and labour market reforms will facilitate output and employment growth, while at the same time improving the capacity of euro area firms to adjust and thereby making the euro area more resilient to shocks.

Concluding remarks

The recovery in euro area activity has been accompanied by considerable employment creation. However, just 12 quarters after the post-crisis rebound in euro area GDP, it is still too early to tell whether the recent strong growth in employment is likely to remain a long-term feature of euro area labour markets. Nevertheless, it is worth noting that the two countries where output and employment growth have been the strongest since the recovery began – Germany and Spain – are among those which have carried out the widest-ranging reforms to their labour markets since the mid-2000s.[70] The 2015 labour market reform in Italy has also helped spur renewed employment dynamism in the country over recent quarters. These observations may encourage other euro area countries to pursue further reforms.

To some extent, the recent strong employment growth seen in the euro area has been something of a positive surprise – to forecasters and policymakers alike. With the onset of the Great Recession in 2008, many had looked back at the strong pre-crisis rates of euro area employment growth as being the result of unsustainable sectoral imbalances in some countries, and thus unlikely to be repeated. However, over the post-crisis recovery, the euro area employment response to GDP growth appears to have been at least as strong as in the pre-crisis period – both at the aggregate level and in many of the euro area countries. This article suggests that the recent strong employment performance relative to GDP developments is partly due to structural changes under way across the euro area, including ongoing sectoral shifts and compositional changes to the workforce, which have resulted in a labour market that is more flexible and more responsive to cyclical dynamics.

[70] In Germany, wide-ranging labour market reforms were enacted some years before the Great Recession. These Hartz reforms have been widely credited for turning around the German labour market (see Dustmann, C., Fitzenberger, B., Schönberg, U., Spitz-Oener, A., "From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy", *Journal of Economic Perspectives*, Vol. 28, No 1, 2014). In Spain, reforms were first introduced in 2010, followed by a further and wider-reaching round in 2012. See *The 2012 Labour Market Reform in Spain: A Preliminary Assessment*, OECD, December 2013.