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# WAGE GROWTH IN THE EURO AREA: WHERE DO WE STAND?

by Guido Bulligan,\* Elisa Guglielminetti\* and Eliana Viviano\*

## Abstract

One of the key questions about the current economic recovery in the euro area is why the decline in unemployment recorded since the second half of 2013 has been accompanied by subdued growth in nominal wages. In this paper we adopt a Phillips curve framework to assess whether alternative indicators of labour market slack can explain the current modest wage dynamics in the euro area and in its five largest economies. Our results suggest that the intensive margin of labour utilization plays a relevant role in wage growth: our estimates indicate that the shape of the Phillips curve becomes flatter for lower levels of hours per worker, implying that wage growth is less responsive to unemployment. Looking ahead, a significant recovery in the intensive margin appears key to achieve a robust increase in nominal wage growth.

**JEL Classification:** E24, E31, J21.

**Keywords:** wage growth, Phillips curve, intensive margin.

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## 1. Introduction

One of the key questions in the current economic recovery is the relationship between unemployment and wage growth.<sup>1</sup> According to the latest data, in the euro area the unemployment rate was 9.1 per cent in June, 3 points lower than the value recorded at the beginning of the recovery in 2013, when hourly private sector wages increased by around 3 per cent y-o-y. In the first quarter of 2017, by contrast, nominal hourly wages increased by just 1.7 per cent. Part of this difference is explained by lower inflation; in 2013 private analysts interviewed by Consensus Forecast expected prices to grow by 1.6% while expected inflation was only 0.3% in 2016.<sup>2</sup> This is, however, only part of the story, as wage dynamics and inflation expectations are co-determined. Therefore, it is crucial to understand why the decline in unemployment that has been observed since the second half of 2013 is accompanied by subdued nominal wage growth.

The question is extremely important for monetary policy, but the answer entails a lot of conceptual and practical difficulties. In this short note we rely on a Phillips curve framework to assess the impact of a wide range of indicators of labour market slack on nominal wage growth.

Some studies outline the role of downward nominal wage rigidities that hinder wage growth also in post-recession periods, bending the Phillips curve (e.g. Daly and Hobijn, 2014). This explanation, however, is in contrast with the findings of Riggi and Venditti (2015) and Bulligan and Viviano (2017), according to which the Phillips curve in many euro area countries has become steeper after 2008. Other studies emphasize the presence of additional labour market slack, which is not captured by the standard unemployment rate. However, even though the presence of additional slack in the euro area is relatively uncontroversial, the empirical relevance of alternative measures of slack and their impact on wage growth are not well known.

Looking at the euro area as a whole and its five largest economies, we first describe the characteristics (and the pitfalls) of alternative indicators of labour supply: the U6 rate, which accounts not only for the unemployed, but also for the under-utilized workers and the so-called “discouraged workers”; the EC indicator of labour shortage; the intensive margin of labour utilization, i.e., the ratio between the total number of hours worked in the private sector and the number of workers. One striking feature of the post-Global financial crisis period is that euro area firms adjusted not only the extensive margin of labour utilization, but also the intensive one, especially in countries, such as Germany and Italy, where specific schemes, such as the *Kurzarbeitergeld* and the *Cassa Integrazione Guadagni*, allow for subsidized reduction of hours worked (see e.g. Izquierdo et al. 2017; see also Brandolini and Viviano, 2016, for a discussion of how the intensive margin can impact the employment rate). Since 2013 in the euro area total hours worked in the private sector increased by 4 percentage points (real value added in the private sector increased by 8% in the same period), reflecting the increase in the number of people employed, while hours per worker stagnated.

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<sup>1</sup> “We are pretty confident that, as this will proceed, this slack will close, the labour market conditions will improve. We’ll start seeing that wage growth, which is the lynchpin of a self-sustained increase in inflation is the key variable that we should look at; it’s not the only one but it’s certainly key”, Draghi, Press conference, 9 March 2017.

<sup>2</sup> However inflation expectations one year ahead only differed by 0.1 pp between 2013 and 2016 (they were equal to 1.5 and 1.4%, respectively).

We then include all these measures in different specifications of a wage Phillips curve. We find that the inclusion of the cyclical component of the intensive margin improves the fit of the Phillips curve in the euro area, whereas the impact of other indicators is negligible when considered together with hours worked per capita. We also find that the shape of the Phillips curve changes as the intensive margin varies, becoming flatter for lower levels of hours per worker; when the intensive margin is below its trend the Phillips curve is totally flat. We then conclude that the below-trend intensive margin helps explaining the modest wage growth observed since 2013. Moreover, given the current weakness in the intensive margin, a robust increase in nominal wage growth is unlikely in the near future.

While we do not attempt to predict future wage growth, our results suggest that the intensive margin plays a relevant role for wage growth and should be taken into account in order to correctly assess the degree of slack in the labour market.

## 2. Alternative indicators of labour market slack

### 2.1 “Supply-side” indicators

In the US the Bureau of labor statistics (BLS) produces not only a standard measure of the unemployment rate based on ILO standards, but also a set of indicators aimed at measuring (i) the “grey area” between labour market participation and inactivity, and (ii) labour underutilization. The so-called “grey area” includes individuals who do not actively seek for work but would be immediately available for work in case of a job offer. They are often referred to also as “discouraged workers”, as a large share of them do not search actively for work, as they believe that no work is available. Labour underutilization corresponds to part-time workers who would like to have a full time job. The so-called U6 indicator is defined by the BLS as (note that the denominator is re-defined accordingly):<sup>3</sup>

$$[1] \quad U6 = (\text{ILO unemployed} + \text{involuntary part-time workers} + \text{discouraged}) / (\text{employed} + \text{ILO unemployed} + \text{discouraged})$$

Eurostat follows a rather similar approach in order to produce supplementary indicators of labour supply for all the euro area countries since 2008 (even if in some countries, e.g. the Netherlands and France, the series have some discontinuity). In particular Eurostat produces aggregate data on (i) involuntary part time workers (since 2008); (ii) people not looking for a job but immediately available for a job (from 2005 onwards); (iii) people looking for a job but not immediately available (from 2005 onwards). Microdata for some countries (drawn from the Labor Force Survey and from the European Community Household Panel for the period 1994-2000) allow to compute U6, but this is not the case for all the 19 countries of the euro area.

There are two difficulties in the use of U6 (or similar indicators) for monitoring the evolution of labour market slack. The first is conceptual and regards the discouraged workers, who are the largest

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<sup>3</sup> More precisely, the BLS consider two groups: the so-called marginally attached who are those who currently are neither working nor looking for work but indicate that they want and are available for a job and have looked for work sometime in the past 12 months. Discouraged workers, a subset of the marginally attached, have given a job-market related reason for not currently looking for work. Eurostat data refer only to those who did not search for work but are immediately available for work, in case of a job offer. U6 includes all the marginally attached. The indicator including the discouraged workers only is labelled as U5.

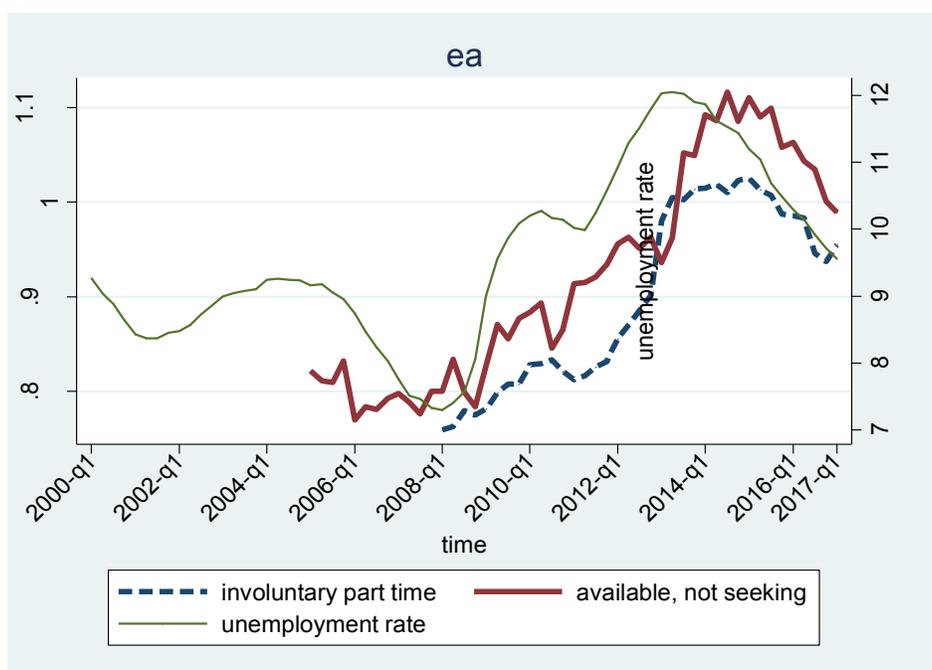
group included in U6 after the ILO unemployed. Are discouraged workers really attached to the labour market? Are they really available to enter the labour market in case of a job offer? To answer this question Brandolini, Cipollone and Viviano (2006) compare the transition probabilities of various groups of discouraged workers in Italy (using the Italian labour force survey). Their test is based on the assumption that the discouraged workers are really similar to the ILO unemployed only if they have similar transition probabilities towards all other labour market states (i.e. employment and inactivity). They find that only a subset of discouraged workers is, using this criterion, comparable with the unemployed: they roughly coincide with those whose last search effort dates back to no more than 6 months before the reference period.<sup>4</sup>

Unfortunately, microdata on transition probabilities are not produced by Eurostat; it is therefore difficult to identify the number of inactive workers that would actually compete with the ILO unemployed to find a job. Based on the results of Brandolini, Cipollone and Viviano (2006) we infer that the U6 indicator is very likely to be a loose indicator of labour market slack (i.e. relevant for wage dynamics).<sup>5</sup>

**Figure 1**

**Unutilized labour in the euro area**

*(indices for involuntary part-time and non-job seekers available for work; 2013-q3=100; % for the unemployment rate)*



Moreover, an additional difficulty stems from the fact that Eurostat produces a sort of U6 indicator (and similar extended indicators of labour supply) only since 2008 (for some countries, such as the Netherlands, the series were discontinued in 2013). Given the short time horizon, it is extremely

<sup>4</sup> In Brandolini, Cipollone and Viviano (2006) the test is conducted separately by gender, age group (15-34 and 35-64) and macro-area of residence (North-Centre and South).

<sup>5</sup> For Italy it is also possible to calculate a sort of U6 indicator based on the test of Brandolini et al. (2006), which includes also involuntary part-time workers and workers involved in wage supplementation schemes (see Bank of Italy, 2010).

difficult to assess the cyclical properties of U6 and other similar indicators. With this caveat in mind, Figure 1 reports the evolution of involuntary part-time workers, persons not actively seeking for employment but immediately available (index: 2013-Q4=100) and the unemployment rate for the euro area. It shows that in spite of a sharp decline in the number of the ILO unemployed, both non-active job seekers and involuntary part-time workers kept increasing until 2015.<sup>6</sup>

## 2.2. “Demand-side” indicators of slack

### 2.2.1 *The survey measure of labour shortage*

The EC indicator of labour shortage is taken from the quarterly business survey coordinated by the European Commission and consists of the share of firms indicating labour shortage as one of the factors limiting production. This can be regarded as a measure of labour market slack: high values of the EC indicator may signal that firms are keen to offer higher wages to attract workers. We consider the indicator related to the industrial sector, for which data are available for a longer time span, and perform the analysis on the sample period 2000Q1 – 2017Q1 for the euro area and its five largest economies. In the euro area as a whole the EC indicator is negatively correlated with the unemployment rate (-0.29) and considerably anticipates wage dynamics (Figure 2): in particular, the correlation between the indicator of labour shortage and y-o-y wage growth one-year ahead ranges from 0.25 in France to 0.71 in Spain (0.42 in Netherlands, 0.50 in Italy, 0.51 in the euro area and 0.61 in Germany).

In the euro area the EC indicator peaked in the early 2000s and before the beginning of the Global financial crisis, when unemployment was at its lowest levels. After reaching its historical minimum at the end of 2009, it started to recover until the start of the sovereign debt crises, during which it resumed declining. Since 2014 the labour shortage indicator has been trending upwards and stood above its historical mean by 3.2 points in 2017Q1. However, wage growth in the euro area remains subdued. The break of the co-movement between the EC indicator and wage growth over the course of the recovery, as also highlighted in the ECB Economic Bulletin,<sup>7</sup> may be explained by the heterogeneity in its national components. Indeed, signals of labour shortage mainly come from German companies and Dutch ones, while the indicator currently stands below its historical average in the other countries (Figure 3). Consistently with the survey results, Germany and the Netherlands’ unemployment rates are among the lowest in the area (3.8 and 4.9%, respectively); Germany also features stronger wage growth than the area average (2.5 against 1.7% y-o-y in 2017Q1), while wages have slightly decreased in the Netherlands.

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<sup>6</sup> If we express the two aggregates as an index which mimics the unemployment rate, the evolution of these indices is not very different from the one of unemployment, given the large weight of the unemployed with respect to the other groups.

<sup>7</sup> ECB Economic Bulletin, Issue 3/2017, box “Assessing labour market slack”.

Figure 2

Labour shortage (EC indicator) unemployment and wage growth in the euro area

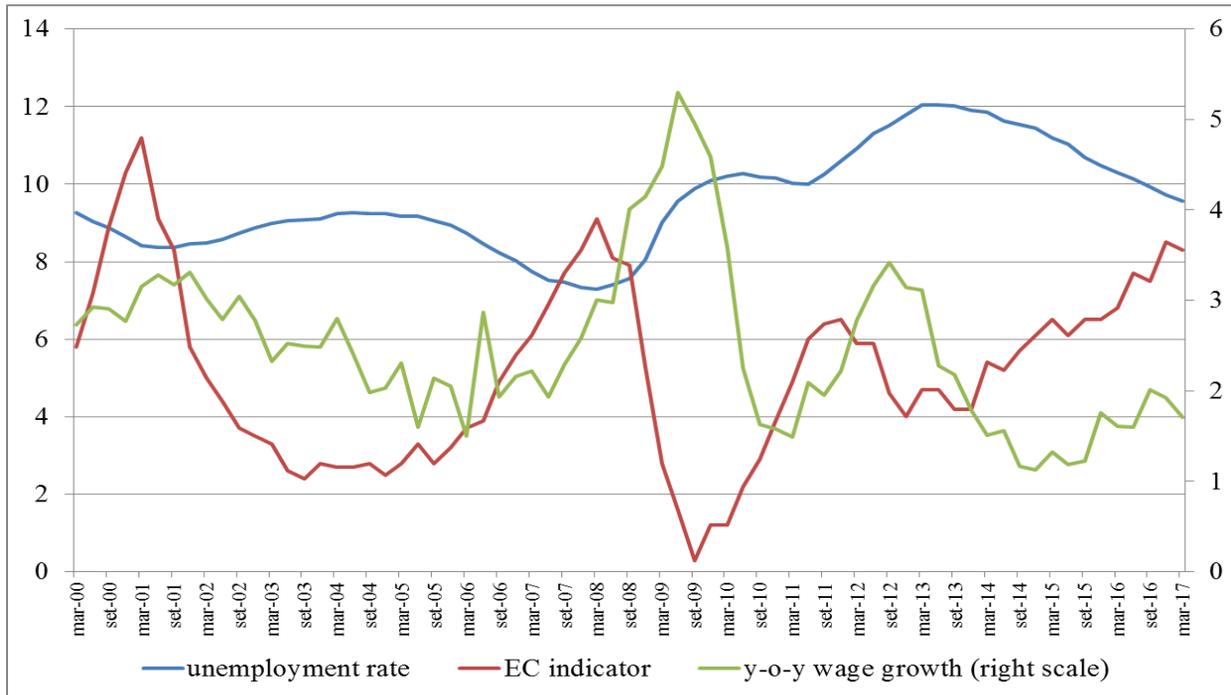
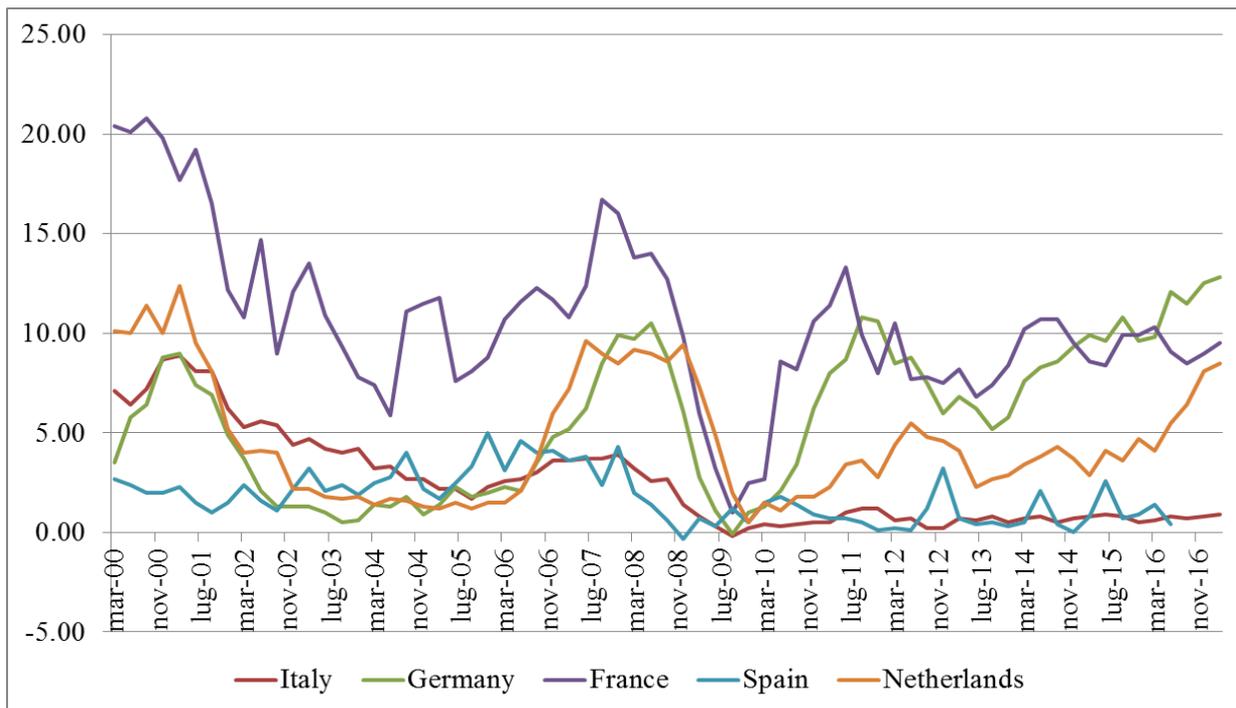


Figure 3

Labour shortage (EC indicator): dynamics in different countries



### 2.2.2 The intensive margin of labour utilization and its interaction with the extensive margin

In the euro area hours per worker follow a secular downward trend (Figure 4). The cyclical component of hours worked (extracted by a band-pass filter;<sup>8</sup> solid line of Figure 4) dropped dramatically in 2008 and in 2012 and started to recover at the beginning of 2013; it then continued to improve until the second half of 2015. It has been declining since then, and in 2017 stood well below previous cyclical peaks. In Germany the recovery in the indicator came to a halt already in 2014 and the cyclical component of hours worked has remained rather stable; in Spain the variable shows a marked decline. In Italy, France and the Netherlands the recovery seems to have lost momentum.

Figure 5 plots the cyclical component of hours worked, the unemployment rate and y-o-y nominal wage growth for the euro area. It suggests that hours worked per capita co-move negatively with the unemployment rate. In fact, in the euro area they anticipate unemployment rate by around 2 quarters. In order to preliminarily examine the interaction between the intensive and the extensive margins, we estimate a VAR model in the following variables: hourly wage growth, HICP inflation, output growth, hours worked per worker (cyclical) and the unemployment rate. We then identify a positive shock to output through a Cholesky factorization, based on the assumption that wages do not react on impact, while the two margins are free to adjust.<sup>9</sup> In Figure 6 we report the response of the intensive and extensive margins to a positive shock to output growth: in all countries hours worked increase significantly, albeit with different intensity, and the unemployment rate declines.<sup>10</sup> Interestingly, in Germany the response of the unemployment rate is not statistically significant, suggesting a more important role for the intensive margin in adjusting to such shocks. On the opposite side of the spectrum, the response of the unemployment rate is significantly stronger in Spain.

Thus, we find that both the intensive and the extensive margins react to a shock that raises output, even though with country specific differences. These differences are probably related, on the one hand, to different institutional settings (for instance, where present, wage supplementation schemes – such as the *Cassa Integrazione Guadagni* in Italy and the *Kurzarbeitergeld* scheme in Germany – allow firms to rapidly reduce the intensive margin in case of a shock) and, on the other, to structurally different sectoral compositions of employment.<sup>11</sup>

Such evidence is in line with models of the labour market, which suggest that under normal circumstances and standard assumptions about firms' adjustment costs, firms hit by a temporary shock prefer to hoard skilled labour and to reduce labour costs by acting on the intensive margin of labour utilization (e.g. IMF 2010). This implies that in case of a recovery, firms first increase the intensive margin, then the extensive one. This behaviour also implies that the unemployment rate reacts with some delay to a positive shock to output. This can explain the dynamics of hours and unemployment in Germany during the recession of 2009 (Rinne and Zimmermann, 2011) and the subsequent recovery in

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<sup>8</sup> We follow the approach adopted by the OECD consisting in using the H-P filter twice in order to replicate a bandpass filter. This approach delivers a trend-cycle decomposition which extends up to the latest available data without requiring any forecasting.

<sup>9</sup> While the identification does not guarantee that the shock we identify is a demand shock, for every country the response of inflation is either positive or zero, suggesting that the identified shock resembles a typical demand shock.

<sup>10</sup> In the euro area and in most countries real wage growth stagnates or declines in response to the shock.

<sup>11</sup> E.g. in Spain less human capital intensive sectors like construction and retail explain a larger fraction of total employment.

2010-11, when the (cyclical component of) the intensive margin improved again. The current phase, however, is rather different, as the reduction in unemployment since 2013 is not accompanied by a (leading) recovery in hours worked.

What are the determinants of these recent dynamics? In principle, they could be due to a characteristic of labour supply: workers could be inclined to work less than in the past. This hypothesis, however, can be easily rejected, as Figure 1 shows an increase in the number of involuntary part-time workers until the third quarter of 2014. Therefore, it seems that so far labour demand from firms has adjusted to improved cyclical conditions by exploiting the extensive margin of labour utilization rather than the intensive one. This could be rationalized along several dimensions: (i) firms expect the recovery to intensify and be long-lasting, and want to avoid costly future labour shortages; (ii) in some countries, past labour market reforms have reduced hiring costs – also, as in the case of Italy, by introducing temporary fiscal incentives towards new permanent hirings – and have thus made the relative costs and benefits of the intensive versus the extensive margins more similar. This implies that it is more convenient for euro area firms to hire new workers, as unemployment is still quite high, instead of increasing the intensive margin of those already employed in the firm (probably more expensive than unemployed workers). This also implies that the aggregate nominal wage dynamics are currently determined, at least in part, by composition effects. Indeed, using microdata for Italy, D’Amuri (2014) finds that composition effects help explaining a sizeable part of aggregate wage growth in recent years (see also Daly and Hobijn, 2017, for the US).

The mechanisms described above imply also that the interaction between the intensive and extensive margins may have implications for wage dynamics, through at least two channels. First, very high levels of labour utilization should boost wages. This relationship should be even stronger in countries where extra-time working hours are paid more than standard hours of work. Second, the intensive margin can affect wage growth also because of its interaction with the unemployment rate. If a reduction in unemployment occurs during a period of very low labour utilization, the presence of additional slack (in hours worked) could slow down wage dynamics.

Figure 4

**Hours per worker in the euro area and the 5 largest economies:  
evolution over time and cyclical component**

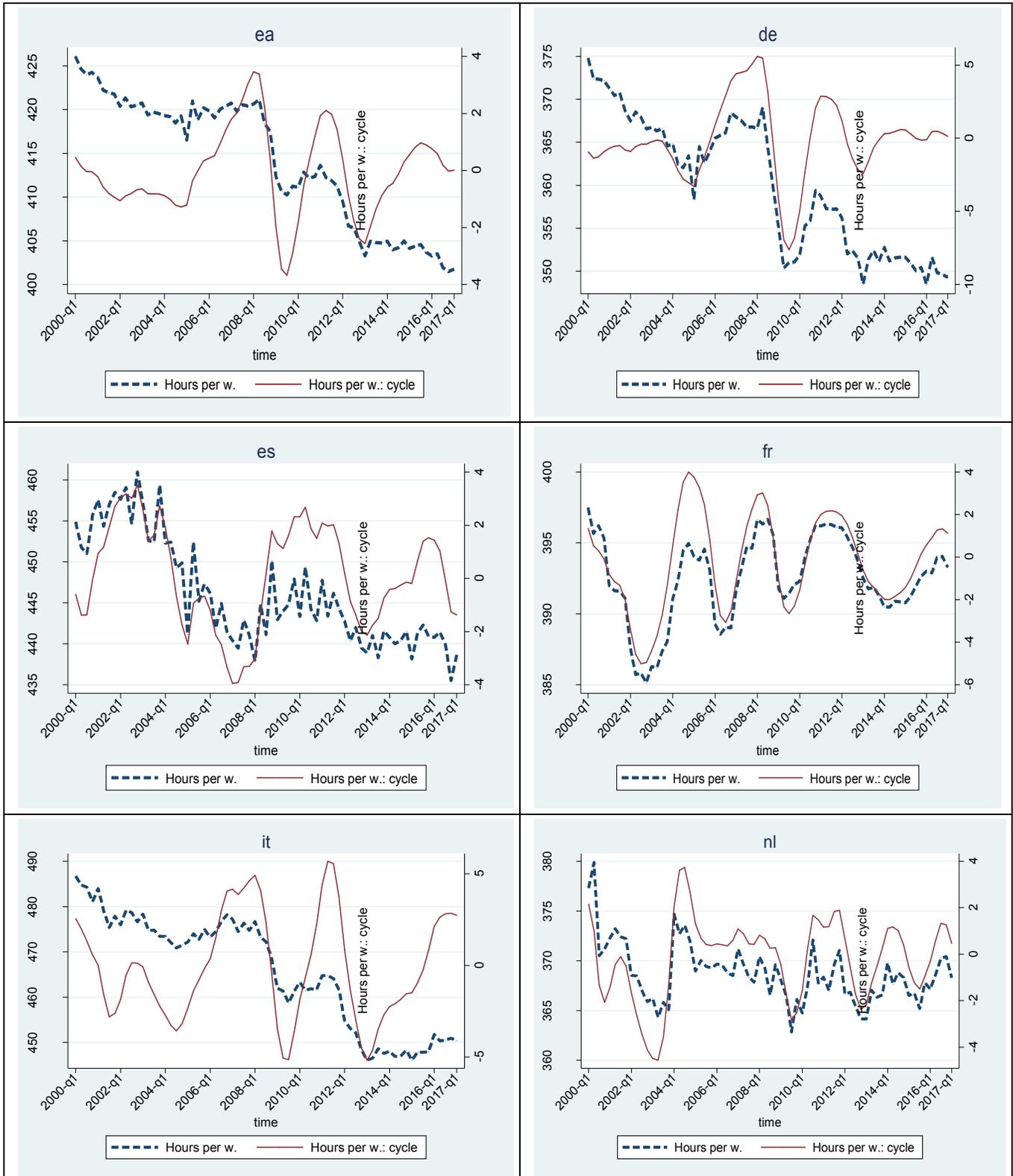


Figure 5

**Hours per worker (cyclical component), unemployment and wage growth in the euro area**

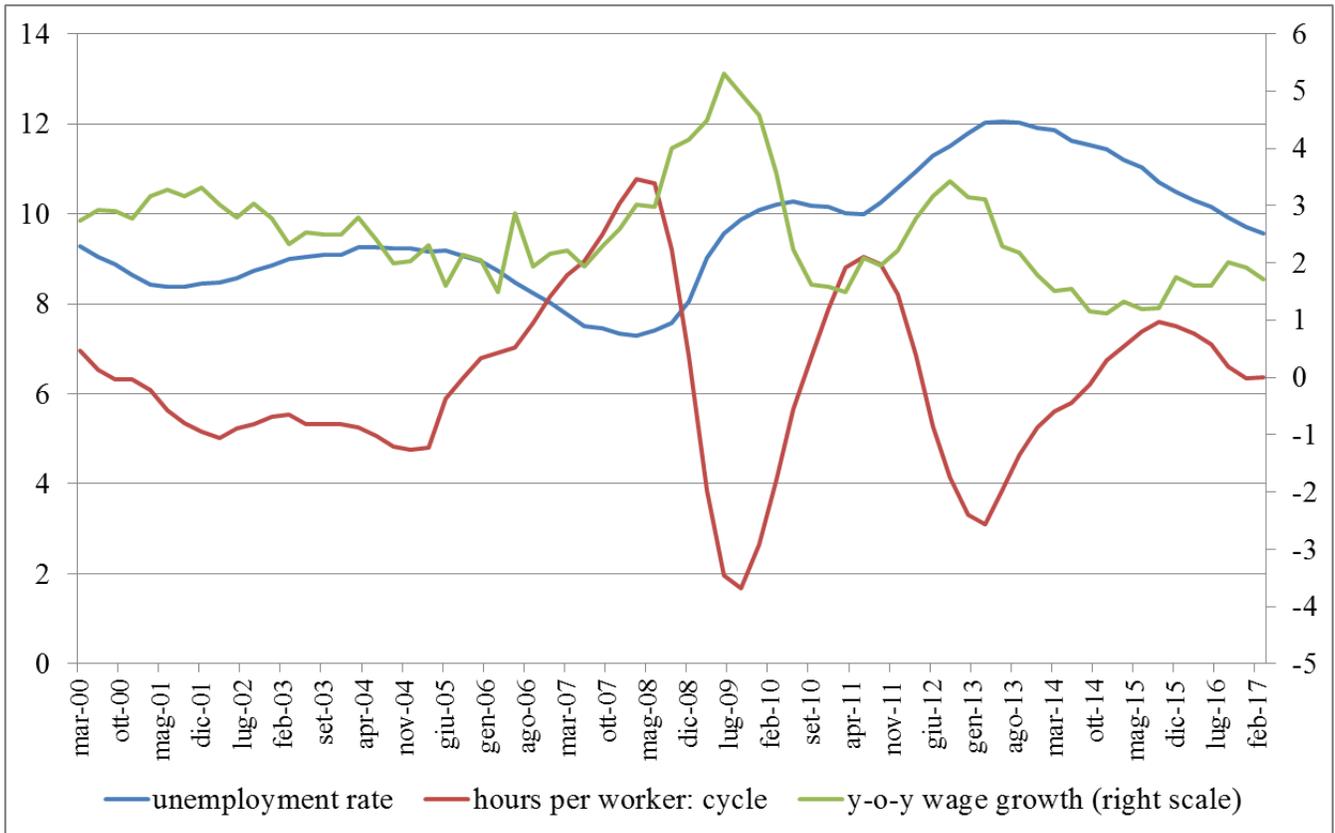
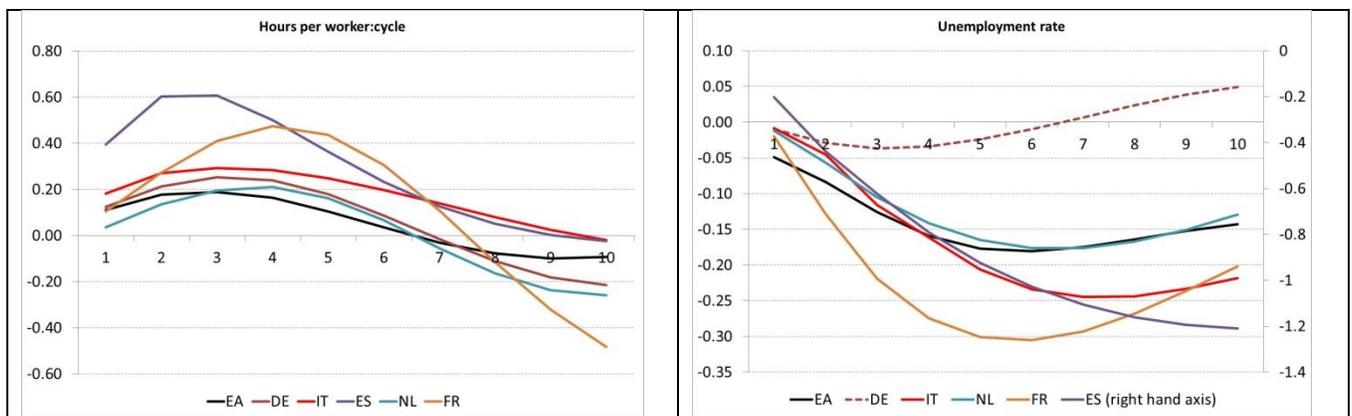


Figure 6

**Response of hours per worker (left-hand panel) and of the unemployment rate (right-hand panel) to a positive shock to output**



### 3. Testing the impact of alternative measures of labour market slack

We test the role of different measures of labour market slack within a Phillips curve framework for the euro area and its five largest economies over the period 2000q1-2017q1. We estimate various versions of the following general specification:

$$\Delta^4 w_t = \alpha + \sum_{j=1}^k \beta_{1j} \Delta^4 w_{t-j} + \beta_2 U_t + \beta_3 U_t D_{H<0} + \beta_4 H_{t-4} + \beta_5 EC_{t-4} + \beta_6 \pi_{t-1} + \epsilon_t$$

The term  $\Delta^4 w_t$  is the y-o-y nominal hourly wage growth. We consider y-o-y variations since for some euro area countries, such as France, seasonally adjusted hourly wages are not available.<sup>12</sup> We use compensation per employee (National accounts) because negotiated wages, even if unaffected by composition effects, are still not very comparable across the euro area. Wage growth is regressed on its lagged values to account for autocorrelation in the residuals. The number of lags  $k$ , for each country, is chosen according to the AIC criterion.  $U_t$  is the ILO unemployment rate, the variable  $U_t D_{H<0}$  corresponds to an interaction term between the unemployment rate and a dummy variable equal to 1 if the intensive margin is below its trend. While the former captures the direct impact of the ILO unemployment rate on wages, the latter allows the unemployment rate to affect wage growth differently, depending on the cyclical position of hours per worker. The terms  $H_{t-4}$  and  $EC_{t-4}$  measure the direct impact of the intensive margin and labour shortage indicators, respectively. We use the fourth lag for each variable as it better fits the data. Finally,  $\pi_{t-1}$  is lagged price inflation. Long term productivity is captured by the constant term  $\alpha$ .

In Table 1 we report the estimated coefficients for the euro area. In the first column we report a very basic specification of the Phillips curve (benchmark). The coefficient of the unemployment rate is negative but not significant at standard levels (the p-value is 0.14). In column 2 we include the EC indicator of labour shortage, which has a positive and significant impact on wage growth. The significance of this index, however, vanishes when we include the variables measuring the intensive margin  $H_{t-4}$  and the term  $U_t D_{H<0}$ . The level of per capita hours worked at time  $t-4$  is positively correlated with wage growth. The coefficient of the term  $U_t D_{H<0}$  is positive and lower in absolute value than that of  $U_t$ , suggesting that the Phillips curve is flatter when hours worked are below their trend. The empirical specifications are all supported by good statistical properties.

The estimates presented in column 3 imply that the decline in the cyclical component of the intensive margin observed between 2015 and 2016 (amounting to 0.4) lowers nominal wage growth by around 0.15 pp after one year and 1 pp in the long run. A 1 pp decline in the unemployment rate has a negligible impact on nominal wage growth (0.06 pp), but its long run contribution is 0.4. However, if the intensive margin remains below its historical trend the long run impact of a 1 pp reduction in unemployment rate is lowered by 0.2 pp.

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<sup>12</sup> To ease comparison, we prefer to use the same specification for all the economies here considered. It is important to stress, however, that the use of q-o-q change in countries where this series is available, does not affect the main results of this note.

In some exercises we also include both the number of involuntary part-time workers and of people not seeking for work but immediately available. Since we do not find any significant impact of these additional regressors on wage dynamics, because of their strong correlation with the unemployment rate, we do not report them.

**Table 1**

**Phillips curve-type correlation of nominal wage growth and various measures of slack in the euro area**

	Benchmark	EC indicator	Intensive margin (cyclical component)	EC indicator + intensive margin (cyclical component)
$\Delta^4 w_{t-1}$	0.82635*** [0.0000]	0.73348*** [0.0000]	0.26640** [0.0338]	0.26668** [0.0335]
$\Delta^4 w_{t-2}$	0.25522 [0.132]	0.22791 [0.104]	0.14204 [0.165]	0.14145 [0.169]
$\Delta^4 w_{t-3}$	0.09378 [0.573]	0.11580 [0.430]	0.31140** [0.0212]	0.30898** [0.0216]
$\Delta^4 w_{t-4}$	-0.59259*** [0.00175]	-0.53984*** [0.00328]	-0.23075 [0.108]	-0.23072 [0.109]
$\Delta^4 w_{t-5}$	0.19560 [0.121]	0.22114** [0.0774]	0.27289*** [0.00271]	0.27490*** [0.00252]
$U_t$	-0.05055 [0.140]	-0.04524 [0.189]	-0.06115** [0.0423]	-0.05864* [0.0657]
$U_t D_{H<0}$			0.02588*** [0.00459]	0.02435* [0.0148]
$\pi_{t-1}$	0.10069* [0.0866]	0.11891** [0.0459]	0.02371 [0.560]	0.02951 [0.493]
$H_{t-4}$			0.3703*** [0.000]	0.3594*** [0.000]
$EC_{t-4}$		0.0598** [0.0251]		0.01097 [0.514]
$\alpha$	0.87410 [0.0371]	0.54007 [0.221]	1.0013*** [0.008]	0.9222** [0.0360]

Robust standard errors. Robust standard errors. (\*\*\*) Significant at 1%; (\*\*) Significant at 5%; (\*) Significant at 10%. P-value within brackets.

These results suggest that: a) in the euro area, per-capita hours worked correlate with wage growth even after controlling for the level of the unemployment rate; b) their impact is quantitatively large; c) the impact of the unemployment rate depends of the level of the intensive margin. The Phillips curve is flatter when the intensive margin is below its trend. Finally, in all specifications residuals in 2016 and 2017Q1 are never systematically negative, being smaller for the models that include the intensive margin and its interaction with the unemployment rate.

Table 2 reports the same specification as in column 4 of Table 1 for the five largest euro area economies. The estimates for Germany are similar to those for the euro area. The impact of the unemployment rate is relatively high (the effect of a 1 pp decline in the unemployment rate is 0.4 on impact), but when per capita hours worked are below their trends the Phillips curve flattens considerably. In 2016, as per capita hours worked stagnated, their contribution to wage growth was negligible: for a comparison, consider that the cyclical component of the intensive margin increased by 2 between 2006 and 2007, contributing to wage growth by around 0.3 pp after 1 year.

The same model estimated for Spain confirms the flattening of the Phillips curve when hours worked are below their trend, but the coefficients are not precisely estimated; the impact of labour shortage is instead significant and large. Also in France the Phillips curve relationship flattens for low levels of the intensive margin, but as in Spain, this model specification has little explanatory power. Estimates for Italy confirm the considerable flattening of the Phillips curve when per capita hours worked are below trend. The direct impact of the intensive margin is instead negligible. The results for the Netherlands are very similar to those for Germany and the euro area.

Table 2

**Phillips curve-type correlation of nominal wage growth and various measures of slack  
Germany, Spain, France, Italy and the Netherlands**

	Germany	Spain	France	Italy	The Netherlands
$\Delta^4 w_{t-1}$	0.32983** [0.0236]	0.28711** [0.0326]	1.075*** [0.000]	0.48031*** [0.001]	0.33801*** [0.001]
$\Delta^4 w_{t-2}$	-0.07667 [0.557]	0.32605** [0.0219]	-0.446*** [0.000]	0.44582*** [0.001]	
$\Delta^4 w_{t-3}$	0.09281 [0.508]	0.19711 [0.120]		-0.01002 [0.946]	
$\Delta^4 w_{t-4}$	-0.24188* [0.0654]	-0.19102 [0.212]		-0.6699*** [0.000]	
$\Delta^4 w_{t-5}$				0.37497*** [0.000]	
$U_t$	-0.40766*** [0.000]	-0.07731** [0.0192]	-0.24057** [0.0157]	-0.16679** [0.0256]	-0.5147*** [0.000]
$U_t D_{H<0}$	0.15779*** [0.000]	0.00737 [0.665]	0.01438 [0.281]	0.04817** [0.0141]	0.13424** [0.00447]
$\pi_{t-1}$	0.12774 [0.243]	0.22112 [0.122]	0.01027 [0.900]	0.01412 [0.880]	0.20185 [0.129]
$H_{t-4}$	0.13118** [0.00148]	-0.07077 [0.466]	0.01536 [0.596]	0.01700 [0.685]	0.17291** [0.0101]
$EC_{t-4}$	-0.17914 [0.182]	0.29993** [0.0194]	-0.00773 [0.937]	0.12126 [0.156]	-0.10864 [0.253]
$\alpha$	4.08874*** [0.000]	1.7096*** [0.007]	2.9641** [0.00526]	2.09268*** [0.0378]	3.51143*** [0.000]

Robust standard errors. (\*\*\*) Significant at 1%; (\*\*) Significant at 5%; (\*) Significant at 10%. P-value within brackets.

#### 4. Discussion and conclusions

We use various indices of labour market slack in order to check whether the subdued dynamics of wages observed during the current recovery can be attributed to additional slack not captured by the ILO unemployment rate.

We discuss the properties of indices of labour supply that account for certain groups of inactive people who may potentially affect labour market tightness. Even if a complete analysis is not possible, due to the lack of long time series, we argue that these groups are unlikely to affect wage growth in a significant way.

We also discuss the potential impact of alternative “demand-side” variables such as labour shortage<sup>13</sup> (produced by the European Commission) and the intensive margin in the use of labour, measured by the ratio between hours worked and the number of people employed. In particular, we show that the inclusion of a variable capturing adjustments along the intensive margin considerably affects Phillips curve estimates, whereas the EC labour shortage indicator helps explaining nominal wage growth only if the variable capturing the intensive margin is omitted.

Our results suggest that the dynamics of nominal wage growth and the shape of the Phillips curve in the euro area are strongly affected by the intensive margin. Not everywhere in the euro area firms actively adjust the intensive margin, however. Among the countries that we consider, adjustments of the intensive margin are frequent in Germany, Italy and the Netherlands; in these countries, Phillips curve estimates improve considerably if changes in per capita hours worked are included. Our results can also explain the flattening of the Phillips curve observed in the last two years.

As regards prospects for euro area nominal wage growth in the near future, our results imply that the further slowdown of labour utilization observed in the last months of 2016 and at the beginning of 2017 will negatively impact on nominal wage growth in the next quarters.

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<sup>13</sup> The indications of labour shortage captured by the EC indicator can be also due to lack of participation in the labour market by workers. However, we classify it as a “demand-side” indicator since it reflects the firm’s view about the slack of the labour market.

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