

Questioni di Economia e Finanza

(Occasional Papers)

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LABOUR MARKET CONDITIONS AND WAGE INFLATION IN CEE ECONOMIES

by Simone Auer*

Abstract

In this paper, we test whether a wage Phillips curve can still be considered a reliable approximation of nominal wage determination in Poland, Hungary and the Czech Republic. The empirical evidence is broadly in favour of the existence of a negative relation between labour market slack and nominal wage inflation in the Central and Eastern European (CEE) economies between 2001 and 2017. However, after 2009 wage inflation was significantly below the value that would have been predicted by an estimated wage Phillips curve. The results of rolling OLS estimations confirm a weakening of the negative relation with the unemployment gap. A closer look at the recent evolution of labour market conditions in Poland, Hungary and the Czech Republic suggests that the composition effects on labour supply, especially those linked to demographic and migration trends, could be particularly relevant. Other possible explanations generally mentioned with reference to advanced economies - such as a large share of long-term unemployment, part-time and temporary workers or workers that are underemployed or marginally attached to the labour market - probably had no role or only a marginal one in the recent weak nominal wage growth in the three countries.

JEL Classification: E24, E31, J21.

Keywords: wage growth, Phillips curve, unemployment, labour supply.

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1. Introduction¹

In recent years, the weak relation between wage inflation and unemployment rate has attracted increasing interest in the economic literature, as it has been considered part of the explanation of the so-called 'growth-inflation disconnect', i.e. the fact that inflation has remained relatively high ('missing deflation') notwithstanding the decline in economic activity during the Great Recession, and unexpectedly low ('missing inflation') after 2012, when the recovery started to consolidate (for a review, see ECB, 2017a). Some recent empirical studies even suggest that the (wage and price) Phillips curve has broken down, a conclusion that would have profound consequences for monetary policymaking (for a review, see Albuquerque and Baumann, 2017). When focusing on labour market conditions, the lack of evidence in favour of a negative relation between wage inflation and unemployment rate has generally been ascribed to difficulties in the measurement of labour market slack (Gordon, 2013; Krueger et al., 2014; Rudebusch and Williams, 2014; Watson, 2014).

While most of this literature covers advanced economies, much less attention has been devoted to emerging economies, particularly the main Central and Eastern European countries that are members of the European Union. Wage inflation in Poland, Hungary and the Czech Republic was relatively high in the years before the outbreak of the global financial crisis. After a sharp slowdown, it failed to recover in line with the previously observed dynamics, notwithstanding a significant decline in the unemployment rate, which rapidly fell below its historical average. Only in recent quarters has wage inflation surged significantly, especially in Hungary and the Czech Republic.

The evolution of nominal wages could be influenced by a series of factors (BOE, 2017; IMF, 2017). Following the traditional wage Phillips curve relation, wage setting is generally affected by the degree of slack in the labour market, and especially by variations in the unemployment rate. The past and expected evolution of prices and the change in workforce productivity could also influence the determination of wages by shifting the inflation expectations incorporated in labour supply and demand. Other structural and institutional factors may provide additional explanations of wage inflation, in some cases interacting with the previously mentioned factors, such as the wage bargaining system, the presence of downward nominal wage rigidity during a recession, advances in the automation process, and international competition through participation in global value chains. In the Central and Eastern European (CEE) economies, the composition effect of working age population and employment, which is also related to migration flows in and out of these countries, could be particularly significant.

In this paper, after a brief description of stylized facts about labour market conditions over the period 2001-2017 in **Section 2**, **Section 3** provides some empirical evidence supporting the view that a wage Phillips

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curve could still be considered a reliable approximation of nominal wage determination in Poland, Hungary and the Czech Republic. In particular, the negative relation between wage inflation and labour market slack seems to hold when other potential factors are properly taken into account. However, after 2009 wage inflation appears to have been considerably below the value that would have resulted from the estimation of a wage Phillips curve, particularly in the Czech Republic and Poland. The results of rolling OLS estimations confirm a weakening of the negative relation with the unemployment gap. **Section 4** takes a closer look at the recent evolution of labour market conditions in order to offer some additional insights into wage behaviour over the last few years.

2. Labour market conditions and wage inflation in Poland, Hungary and the Czech Republic

In this section, we present some stylized facts about labour market conditions in the three countries between 2000 and 2017. The evolution of wage growth and the unemployment/employment rate are gauged together to get some indication about their relation during that period (see **Figures 1**, **2** and **3**). The average monthly hourly earnings of employees in the manufacturing sector, sourced from the OECD Main Economic Indicators Database, are used as a proxy of wages. Unlike the latter, hourly earnings include overtime pay and regularly recurring cash supplements (e.g. bonuses) so as to provide a broader picture of labour income.² This indicator may not perfectly match the evolution in the economy as a whole as its coverage is limited to the manufacturing sector, which is only a portion, albeit a very large one, of the total value added and of the total number of employees. However, it is the best option available because it is comparable across countries and it is less volatile than the Eurostat indicators pertaining to the whole economy (such as wage and salaries and compensation per employee/hour).

The three economies under observation entered the new millennium after a major industrial restructuring and significant adjustments in their labour markets in the 1990s, largely connected to the transition from a planned to a market economy. Generally, this process entails falling employment and increasing unemployment rates (see Lehman et al., 2011). The Czech Republic was a notable exception, with its so-called 'employment miracle', whose main determinants were the good initial condition of the industrial structure, the high skill levels of the workforce and a wage setting process favouring wage moderation and the maximization of employment (see Gitter et al., 1998). In the other two countries, the unemployment gap due to the transition process was already almost closed by the late 90s, but the growth slowdown after the Russian crisis of 1998 revealed that labour market difficulties were more structural in nature. In Poland, the economic recovery that started immediately after that crisis was accompanied, surprisingly, by a decrease in employment and an increase in the unemployment rate: the employment protection legislation and a relatively high minimum wage were part of the problem, but labour market conditions were further harmed

 $^{^{2}}$ As in the case of wages, hourly earnings do not include employers' contributions to social security and social insurance, which are instead included in compensation per employee. Those series are usually heavily influenced by fiscal policy decisions and they may substantially alter the empirical analysis.

by some specific features of the social security and benefit system that had a particularly negative impact on work incentives (OECD, 2004). Similarly, in Hungary the legacy of generous national social assistance schemes, together with a high tax wedge, was one of the determinants of the low activity rate (close to 60 per cent in the early 2000s, compared with an average of 70 per cent in OECD countries) and the low employment rate.

With the exception of the Czech Republic, the aforementioned evolution of labour market conditions contributed to relatively high but declining nominal wage growth rates in the early 2000s. The wage slowdown stopped by the mid-2000s as the three countries took advantage of the favourable economic juncture, partly connected to the large benefits of accession to the European Union, and experienced substantial gains in terms of real productivity owing to their greater participation in global value chains. By the mid-1990s the CEE economies were recording an unemployment rate close to or below the historical minimum since the late 1990s, and nominal wage growth rates were at a new peak when they entered the turbulent times sparked by the global financial crisis.

When the spillover effects from the global crisis propagated to these economies in late 2008, labour market conditions worsened rapidly and slightly more intensely than in the euro area (probably a consequence of weaker social protection systems). Nominal wages slowed markedly and even declined in the Czech Republic. The three CEE economies were instead relatively insulated from the euro area sovereign debt crisis in 2011, and the deceleration of hourly earnings growth appeared to be more limited. Moreover, the subsequent recovery was more rapid than in the euro area, mainly thanks to the surge in demand from other emerging countries and the participation of these economies in the global manufacturing supply chain. Since the second half of 2013, the decrease in the unemployment rate has been impressive, and in all three countries it has now reached the lowest level of the whole period considered, well below that recorded in 2008. The three CEE economies are positioned relatively better than most advanced economies, where even if the unemployment rate is decreasing, it is still somewhat higher than the pre-crisis average. However, up to about end-2016, in all the countries nominal wage growth was still significantly below the average rate recorded before the crisis (between 2000 and 2008, around 7 per cent in Poland and the Czech Republic, 10 per cent in Hungary). Only recently, as domestic demand provided a further boost to the economy, has there been a strong wage acceleration, especially in the Czech Republic and Hungary.

According to the harmonized surveys conducted on a regular basis by the Directorate General for Economic and Financial Affairs, in the CEE economies a rising number of companies are indeed reporting labour availability as a factor limiting the expansion of their activity (see **Figure 4**). Labour shortages seem to have become particularly acute recently as this indicator has reached levels never recorded in the past, even in the years just before the global financial crisis. The situation is particularly severe in the manufacturing sector: at the end of 2017, the share of manufacturing companies indicating labour as a limiting factor in their production was close to 80 per cent in Hungary and 40 per cent in the Czech Republic and Poland (before 2008, the maximum was about 40, 30 and 15 per cent respectively). Job vacancy rates (defined by Eurostat

as the ratio of job vacancies to the sum of occupied posts and job vacancies) are also at high levels and increasing, especially in the Czech Republic and Hungary.

Normally, the evolution of nominal wages should be closely related not only to occupational levels, but also to labour productivity. As productivity increases – for example, owing to technological innovation – the total value of the output each employee can produce for a given combination of other factors of production now exceeds the cost incurred by the firm for his or her services. As a result, firms find it profitable to hire additional workers. Real wages will therefore be bid upwards until a new equilibrium between labour supply and demand is reached, even if individual firms may prefer to leave nominal wages unchanged and to reduce prices or increase their profit share instead. In the CEE economies, between 2003 and 2007 real wages increased significantly but broadly in line with real productivity per employed person (see Figure 5). In this period, the CEE countries benefited from their increased participation in the global value chain and trade relations and from FDI inflows to support their productivity growth. That process came to a halt or was even partly reversed after the crisis, especially in the Czech Republic and Hungary. Real wage growth was then subdued between 2008 and 2012, the phase of most acute economic distress, but since 2013 it has largely outstripped the dynamics of real productivity per employed person, by 4 p.p. in Hungary, 2 in Poland and about 1 p.p. in the Czech Republic. During this period, the economic recovery was indeed associated with low inflation largely imported from abroad owing to weaker global commodity price dynamics and deflationary pressures in a large part of the euro area (see Figure 6). Indeed, on several occasions between 2008 and early 2017 the inflation rate was well below the mid-point of the inflation target ranges defined by the three central banks. The decline in global food and energy prices helped to boost households' purchasing power and possibly reduced the pressure towards an increase in nominal wages even when the labour supply started to become scarce. As labour shortages became more severe and firms started competing among themselves to attract workers, they were still able to keep final prices almost unchanged owing to the buffer on profit margins provided by low imported prices. Only recently have they again started to transfer higher wage costs to domestic prices, which may have resulted in a further boost to nominal wages.³

The impact of past or expected inflation on nominal wage setting depends heavily on wage setting mechanisms in the CEE economies. The three countries are all characterized by relatively low levels of collective bargaining coverage and rather decentralized bargaining systems (see Izquierdo et al., 2017). In particular, wage setting takes place predominantly at the local or company level with some form of coordination at the industry or firm level, especially in the Czech Republic. The government's involvement is fairly minimal and mainly consists in providing an institutional framework for consultation and information exchange, as well as in influencing wage bargaining indirectly through tax measures and minimum wage definition. The tax wedge, i.e. the difference between what employees receive as earnings and what it costs firms to employ them, may have a negative effect on labour demand and hence on wages. The tax wedge was particularly high (and significantly above the OECD average) in Hungary; the Hungarian

³ The combined effect of increased employment and real wages with low productivity produced a rapid erosion of corporate profit margins, especially from end-2015 (IMF, 2016).

government intervened to reduce it in both 2017 and 2018 by cutting social security contributions (and transfers). All the three countries have a statutory minimum wage, which has recently been raised on several occasions, especially in Hungary and Poland, where it was almost doubled to provide better living conditions to the employed workforce. As regards the process for setting the lowest compensation payable by employers to workers, in the CEE economies this is determined unilaterally by the government following a consultation with a tripartite body that includes the social partners (trade unions and employers' organizations). If no consensus is reached, the government may proceed with a unilateral decision. In Hungary, the process is slightly different as the first step, the consultation, basically takes place only between the social partners (Eurofund, 2015).

The fact that in the CEE economies wage bargaining is highly decentralized and characterized by limited coordination could also explain the absence of any explicit form of wage indexation to inflation, which is therefore left to individual wage negotiations. According to the ECB WDN1 Survey (Momferatou et al., 2008), only in the Czech Republic was state-imposed wage indexation limited to the public sector, as it had been in Poland until 2006.⁴ In the ECB WDN3 Survey (Izquierdo et al., 2017), firms were asked whether between 2010 and 2013 they had adapted changes in the base wage to changes in inflation (not clear whether past or expected). The share of companies that gave an affirmative answer was close to 60 per cent in Hungary, 40 per cent in the Czech Republic and 20 per cent in Poland. The expected subdued growth in domestic prices probably had a role in further reducing the role of inflation in influencing nominal wage rate compared with the past.

3. The Wage Phillips Curve

The negative relation between labour market slack and wage inflation was first assessed in Phillips (1958), a seminal paper from which a vast body of theoretical and empirical research originated. More than 50 years later, Galì (2011) provided a theoretical model to recover a similar dynamic relation between wage inflation and the unemployment rate, introducing staggered wage setting within the standard New Keynesian framework (with forward-looking inflation expectations). Moreover, assuming also wage indexation to past inflation (or backward looking inflation expectations), the resulting wage schedule was broadly coherent with other specifications that had been tested empirically in applied works (e.g. Blanchard and Katz, 1999). Yet an explicit reference to the role of the evolution of labour productivity growth in affecting wage determination was still missing. Ball and Moffitt (2001) presented empirical evidence supporting the idea that increases in labour productivity, if not fully matched by variations in the workers' wage aspirations, may cause a favourable shift in the wage Phillips curve. Therefore, labour productivity growth was added to the

⁴ The Wage Dynamics Network (WDN) is a research network consisting of economists from the European System of Central Banks. Its research goal is to identify the sources and features of wage and labour cost dynamics that are most relevant for monetary policy and to clarify the relationship between wages, labour costs and prices at both the firm and the macroeconomic level.

wage equation, in line with the theoretical model proposed in different frameworks by Katz and Krueger (1996) and Blanchard and Katz (1997).

In the light of these considerations, the baseline wage inflation equation to be tested empirically has the following specification:

$$\pi_t^w = \alpha + \beta \pi_{t-1} + \gamma \hat{u}_t + \vartheta \Delta prod_t + \varepsilon_t, \tag{1}$$

where wage inflation π_t^w is defined as the year-on-year percentage change in the hourly earnings index and price inflation π_{t-1} as the year-on-year percentage change in the Harmonised Index of Consumer Prices (HICP).

The unemployment gap \hat{u}_t is used as a proxy for the slack in the labour market; it can be defined in many different ways. In the literature on both the wage and the price Phillips curve, three main methodologies are adopted to derive this variable (see, for example, Albuquerque and Baumann, 2016, or Ball and Mazumder, 2015). The unemployment gap is obtained as the difference between the current unemployment rate and one of the following: (i) the Non-Accelerating Wage (or Inflation) Rate of Unemployment (NAWRU or NAIRU) estimated by Eurostat (OECD); (ii) the natural rate of unemployment estimated by applying the Hodrick-Prescott filter on the time series; or (iii) its historical average. All these alternatives may have some drawbacks. Both the NAWRU and the NAIRU are computed at a yearly frequency so they need to be interpolated in order to be used at a quarterly frequency, as in our baseline estimation. Moreover, these measures have been criticized in the economic literature because of both the large impact of the revisions due to new incoming observations and, more recently, the potential presence of pro-cyclicality (Hristov et al., 2017). The potential flaws in the use of a two-sided Hodrick-Prescott filter to extract the trend component of a time series are well known. Hamilton (2017) recalled and expanded the usual concerns and stated that a simple forecasting regression is a better methodology to remove the cyclical component of a time series. Finally, the definition of unemployment gap as the difference between the unemployment rate and its historical mean, computed over the whole sample, is challenging when applied to converging economies, such as those considered here. In fact, as recalled above, the labour markets went through a series of important structural changes that radically altered the equilibrium conditions over the period under observation; consequently, the long-term mean does not appear to be a proper reference point to define the unemployment gap. Moreover, and partly relating to the latter, the unemployment rate in these economies between 2001 and 2017 turns out to be a non-stationary time series when traditional unit-root testing procedures are performed. Both these issues could be partly solved by defining the unemployment gap as the difference between unemployment rate and a rolling-window average over a period of either five or three years. In the baseline wage Phillips curve regression we opt for the distance from the interpolated NAWRU as a measure of cyclical unemployment and then check the robustness of the results against the other alternatives.

Labour productivity growth $\Delta prod_t$ is generally defined as the change in output per hour worked so as to avoid the potential distortion created by output per person in the case of ample recourse to part-time workers. In this paper we prefer the latter measure because we can get a longer time-span using that OECD series.⁵ In addition, the distortion produced by part-time workers is likely to be minimal in the case of the three CEE countries under observation, where part-time workers are a less frequent phenomenon than in the euro area (about 5 per cent of total employment in Poland, Hungary and the Czech Republic, against almost 20 per cent in the euro area).

3.1. OLS and IV estimation

We start with an OLS estimation for the baseline model with a sample from 2001Q2 to 2017Q2. Looking at Table 1, in the case of Hungary and the Czech Republic all the estimated coefficients show the expected signs and are statistically significant (in most cases at the 1 per cent level of significance).⁶ An increase in the unemployment gap of 1 percentage point produces a decrease in wage inflation of 0.77 p.p. in Hungary and 0.54 in the Czech Republic. The two OLS estimations also provide clear evidence in favour of the relevance of past inflation and labour productivity growth in influencing wage determination. The inverse relation between wage inflation and labour market conditions seems to hold over the period considered in Poland as well, with an estimated coefficient γ equal to 0.41. However, in this case the overall wage Phillips curve does not fit the yearly growth in hourly earnings well, as the other coefficients in the baseline regression are not statistically significant, at a 10 per cent level of significance, and the R^2 is dramatically lower (0.26 vs. 0.60 and 0.59 in the Czech Republic and Hungary respectively). Using different definitions of the unemployment gap, we see that the overall fit in the case of Poland improves considerably if it is computed as the difference between the actual unemployment rate and the value obtained by applying the methodology proposed in Hamilton (2017), i.e. a simple forecasting regression. We therefore consider this one as the baseline for Poland, while maintaining the definition based on interpolated NAWRU for the Czech Republic and Hungary as it is more in line with the prevailing economic literature.⁷

In the baseline equation (1), the presence of reverse causality from wage to price inflation cannot be easily ruled out if we reasonably think that firms usually fix the price of their product taking into account the evolution of their labour costs. In this case, the OLS estimation would be biased and inconsistent, as the strict exogeneity assumption would be violated. An Instrumental Variable (2SLS) estimation is therefore

⁵ In the case of Poland, the OECD real labour productivity time series (defined as output per person) overlaps perfectly with the same series provided by Eurostat when both are available, i.e. since 2002Q1, but it can be extended back to 1999Q4 without discontinuity.

⁶ Here and in the following regressions inference is performed using Newey-West standard errors. A Durbin-Watson statistic significantly below 2 indicates the presence of a (positive) autocorrelation in the residuals in each country estimation. According to the Breusch-Pagan test, the null hypothesis of homoskedasticity is instead accepted in the three specifications.

⁷ The results for the Czech Republic and Hungary are broadly robust to different definitions of unemployment gap, i.e. based on interpolated NAIRU, the HP filtered series of unemployment rate, the forecasting regression or the 5-year/3-year rolling window moving average. The coefficient attached to the unemployment gap becomes not significant in the Czech Republic only when the forecasting regression is used, and in Hungary with the HP filtered series. In Poland, the coefficient attached to the unemployment gap is always significant, while for the others, in addition to the baseline, this is true only in the case of the 5-year rolling window average.

performed using two additional lagged values of inflation as instruments. The results in **Table 2** are broadly similar to our baseline estimation, and the coefficients attached to inflation are only moderately lower in absolute value, but they keep the expected signs and remain statistically significant. In the case of the Czech Republic, the Durbin-Wu-Hausman Regressor Endogeneity Test largely rejects the null hypothesis that lagged inflation is exogenous in the reduced form wage Phillips Curve, and in Hungary the p-value is slightly above, but extremely close to, 0.10 (at 0.11). In these two countries, both the Over-identification J-statistics and the Cragg-Donald F-statistics provide evidence in favour of the selection of lagged inflation as proper instruments.⁸

The endogeneity issue could be raised for unemployment gap and productivity growth as well. Thus, a 2SLS estimation is performed by adding lagged values of these variables as instruments. In these cases, however, the Regressors Endogeneity test null hypothesis is rejected only for the unemployment gap in the case of Poland. The results for this country remain broadly unchanged when performing a 2SLS estimation with unemployment gap at time t instrumented by its own lags or an OLS estimation with a lagged value (at time t-1) as a regressor.

Owing to the broad consistency of the results, the coefficients estimated with OLS are used to assess the contribution of each variable to the recent evolution of wage inflation (i.e. since 2009). In order to simplify the exposition, the average wage inflation between 2002 and 2008 is considered as a reference point and quarterly data are aggregated into annual frequency to avoid excessive noise in the assessment (see **Figure 7**). In all the three countries observed, the unemployment gap contributed negatively to the evolution of wage inflation between 2009 and 2013, but only in Poland did it appear to be the main driver. Indeed, according to our baseline specifications, both in Hungary and (especially) in the Czech Republic the slowdown in hourly earnings was instead mostly influenced by the decline in labour productivity growth. From 2014, labour market conditions became gradually more supportive of higher nominal wage growth, with the unemployment gap turning negative in all three countries. However, both the persistently weak labour productivity growth and, to a greater extent, the low inflation rate were largely offsetting these forces, especially in Hungary, where price increases were well below the pace recorded on average in the period from 2002 to 2008. The Hungarian situation changed radically in 2017, with nominal wage inflation rising above the average value and with a large unexplained positive residual resulting from the baseline regression.

4. Potential explanation of the weak link between wage inflation and unemployment gap

The R^2 in the OLS and 2SLS regressions shows that equation (1) does not explain a significant share of the wage inflation dynamics observed in the three countries in the years from 2001 to 2017 (see **Tables 1** and **2**).

⁸ We have also tried to include oil price y-o-y variation as an additional instrument but the results worsened in Hungary as the test for over-identification was not passed and the oil price growth appeared to be a weak instrument for its price inflation.

In the years after 2009, large negative residuals can be observed, especially with reference to the Czech Republic and Poland: in other words, the wage inflation was considerably below the levels that would have resulted from the estimation of a wage Phillips curve. In order to gather some evidence in favour of a change in the relation between wage inflation and the unemployment gap, we perform rolling OLS regressions with a fixed window of 30 observations. With this time span, the first estimation is performed with data up to 2008Q3, that is, just before the unemployment rate began to increase as a consequence of the global financial crisis. In Poland and the Czech Republic, we have a clear indication of a decrease in the coefficient attached to the unemployment gap as we move towards the end of the sample period (see **Figure 8**). Additionally, in the case of the Czech Republic the coefficient becomes not significant from end-2014.⁹

In the advanced economies, the recent weak relationship between the labour market slack and nominal wage growth has generally been caused by the fact that the unemployment rate could not provide an accurate assessment of labour market conditions, especially during a phase of gradual economic recovery after a deep crisis. Recent research has emphasized that a correct evaluation of labour market slack should adequately take into account the potential role played by:

- The underutilization of the labour force (Yellen, 2014; ECB, 2017b)¹⁰
- The wider use of temporary and part-time contracts (IMF, 2017)¹¹
- The higher share of long-term unemployment (Llaudes, 2015, for Europe; Krueger et al., 2014, and Kiley, 2015, for the US).¹²

However, these possible explanations generally given with reference to advanced economies probably had a marginal or no role in the recent weak nominal wage growth in Poland, Hungary and the Czech Republic.

Between 2008 and 2013, the labour force underutilization rate increased significantly only in Hungary and Poland. However, the share of underemployed and marginally attached workers in the total (extended) labour force was relatively lower than in the euro area, notwithstanding broadly similar unemployment rates

⁹ A similar conclusion is also obtained if we perform rolling OLS estimates extending the sample, observation by observation, from the first estimate made with data up to 2018Q3.

¹⁰ The labour force underutilization rate includes underemployed workers, i.e. those who are employed on a part-time basis but want to work more hours (involuntary part-time workers), and 'marginally attached' workers, i.e. (i) those who are available, but not currently seeking a job (mainly 'discouraged' workers), and (ii) those who are actively seeking a job but are not available to begin working within the next two weeks (for instance, because they have received a job offer with a delayed start date or because they are not able to start working).

¹¹ A higher proportion of part-time workers mechanically lowers the average number of hours worked and thus reduces average growth in compensation per employee. The evidence is more mixed for temporary contracts because the overall effect may depend on several characteristics of the contract itself, including its duration, and on the effective transition to a permanent contract. In addition, both part-time and temporary employees seem to have lower wages than full-time and permanent employees. Therefore, hourly earnings may also show a subdued growth if the share of these types of contract increases significantly over time.

¹² As unemployment duration increases, the perception of human capital depreciation by the prospective employers and the lower search intensity by the unemployed may reduce the probability of being hired again (Kroft et al., 2014). The fact that the long-term unemployed tend to move at the margins of the labour market may explain the reduced downward pressure on wages during the crisis. This should also lead to a higher upward pressure on wages during the recovery owing to its effect on labour supply. However, if the cost of losing a job is particularly high, owing to the long duration of unemployment, then in the first phase of the recovery workers may be particularly unwilling to demand higher wages for fear of being laid off.

(Figures 9 and 10). With the sharp improvement in labour market conditions afterwards, both in Hungary and in Poland the labour force underutilization rate then decreased well below the value initially recorded in 2008.

In the three CEE economies the use of part-time and temporary contracts is still limited compared with the euro area (**Figure 11**). As anticipated above, the share of part-time employment in total employment is very low and has remained broadly constant over recent years, or even decreased as in the case of Poland. In that country, there has instead been wider use of temporary contracts, but the share of part-time and fixed-term in total employment, close to 30 per cent, is still largely below the share in the euro area.

Lastly, in the three CEE economies both the short-term and long-term unemployment rates (i.e. respectively below and above 12 months) are currently lower than those recorded before the crisis, especially in Poland and in Hungary (**Figures 12** and **13**). This suggests that the majority of workers who lost their job during the crisis have been able to move back into work. The share of the workforce in long-term unemployment, which had been increasing up to recent years (therefore possibly exerting less downward pressure on wages and prices), continued to drift down and is now close to or even below its pre-crisis level.

Looking at labour market transitions, the flows of employees from employment to unemployment have decreased significantly in the last few years; in all the three countries under observation, they are currently almost 50 p.p. lower than the maximum recorded after 2011. However, over the same period, the large net positive shift of people from unemployment to employment has also been accompanied by a positive net shift from inactive to active workforce, especially in Hungary and Poland, which may have reduced the pressure on nominal wages.

A possible explanation of the residual variance in wage inflation can therefore be found in the recent evolution of labour supply. In the three CEE economies, the decrease in the unemployment rate has been accompanied by a noteworthy increase in the labour force participation rate, which is the proportion of the working-age population that is either working or actively looking for work (by about 10 p.p. in Hungary, 8 in Poland and 5 in the Czech Republic between 2008 and 2017; see **Figure 14**). In the case of Hungary, the labour force participation rate had been increasing almost uninterruptedly since the late 1990s, while in Poland and the Czech Republic the recent increase has more than offset the reduction that occurred in the previous period. The variation in the share of active population is primarily determined by longer-term structural factors, such as changes in the age composition of the population, school enrolment and educational attainment, pensions and social security systems. This could also be reinforced or offset by a response to the economic cycle. Indeed, when labour market conditions tighten, previously discouraged workers may re-join the labour force.

At the same time, Poland, Hungary and the Czech Republic have recently been facing a decline in the working-age population (see **Figure 15**) as a consequence of both unfavourable demographics, largely associated with low fertility rates and migration flows (see IMF, 2016b and 2016c). Emigration towards OECD, mostly EU, economies has generally been a steady process, with CEE workers attracted by higher

wages and better employment protection legislation. The enlargement of the EU in 2004 and the increase in labour market mobility resulted in a strong increase in outflows of nationals, especially from Poland. In more recent years, the outflows have risen significantly also in Hungary, with migrants mainly directed towards Germany and Austria. However, the overall contribution of net migration to the variation in the working-age population seems to have been partly counterbalanced, probably more so than in the past, by flows of immigrants. For example, a large number of Ukrainians were welcomed in Poland after the recent tensions with Russia. An additional Polish peculiarity, compared with the other two countries, is the phenomenon of return migration that dominates the immigration flows: the share of nationals in total immigrants was close to 60 per cent on average between 2009 and 2015. In the Czech Republic and Hungary the share is lower and close to 30 per cent, but the return migration of Hungarians has been increasing considerably in more recent years, probably on account of better living conditions domestically associated with improved job prospects and higher minimum wages. Overall, only in Poland did net outward migration add to the negative demographic trends and help to trigger the reduction in the working-age population. Since 2000, the number of immigrants has generally been higher than that of emigrants in Hungary and the Czech Republic, but the migration flows have contributed to a large shift in the age composition of the population, with a substantial decrease in the share of people between 16 and 24 years old, especially if their educational attainment was lower than the tertiary level.

The composition effects associated with the relative reduction in young nationals and the increase in foreign workforce could partly explain the huge upturn in activity rates. Indeed, young workers generally show a lower participation rate than prime age workers and, according to OECD International Migration Statistics, the foreign workforce has a higher activity rate than nationals in the CEE economies. Moreover, as in other advanced economies, in Poland, Hungary and the Czech Republic the integration of women and older people of both sexes into the workforce has recently advanced, mainly owing to childcare services, increasing life expectancy and the statutory pension age (see OECD, 2016a, 2016b and 2016c). The margins for improvement are still ample for young and older workers, especially in Poland and Hungary, as these countries' activity rates for the age groups from 15 to 24 and from 55 to 64 years are significantly lower than in euro area economies. When considering labour force participation rates by sex, the differences are instead relatively smaller (see **Figures 16** and **17**). Summing up, the increasing participation in the labour market of older people and women, as well as the waves of net immigration, might have helped labour supply to meet the rising demand during the recent economic recovery, reducing the pressure on wages.¹³

The Beveridge curve is a graphical representation showing the (generally negative) relation between unemployment and job vacancy rates. Movements along the curve are associated with business cycle fluctuations. An economic expansion is typically associated with a movement upwards and to the left (i.e. a

¹³ However, the effect of variations in the age structure of employment on wage inflation is ambiguous. The average hourly wage of older employees is higher than that of young workers, but wage growth tends to decrease with age, working in the opposite direction. The retribution of female employees is instead generally lower and grows less than that of male workers.

reduction in the unemployment rate and an increase in the job vacancy rate), while a recession is associated with a movement downwards and to the right. A shift in the curve reflects, instead, a structural change in the efficiency of the labour market: for example, an outward movement of the curve (implying that a given job vacancy rate is associated with a higher unemployment rate) could be related either to various forms of mismatch between labour supply and demand or to limited labour mobility. For the CEE economies, data on job vacancy rates computed by Eurostat have been available only since 2008. In order to extend the sample and cover the whole period since the early 2000s, the stock of unfilled job vacancies (provided by the OECD) as a share of the total labour force is used as a proxy for the job vacancy rate. Only in the Czech Republic does the evolution of the Beveridge curve seem to indicate that the recent improvement in labour market conditions due to the positive economic cycle has also been associated with a long-term trend towards greater labour market efficiency as the curve clearly shifted downwards (see Figure 18). In the other two countries, the curves still have a negative slope, but they have shifted outwards on several occasions, more evidently in Hungary. This may further suggest that the relation between job vacancies and unemployment rate has worsened owing to some structural and deeper changes in the labour market.

5. Conclusions

The empirical evidence provided in this paper seems to broadly support the existence of a negative relation between labour market slack and nominal wage inflation in the CEE economies between 2001 and 2017, as suggested by a wage Phillips curve. Focusing on the period following the global financial crisis, the unemployment gap contributed negatively to the evolution of wage inflation between 2009 and 2013 in all three countries under observation (Hungary, Poland and the Czech Republic), but only in Poland did it appear to be the main driver. Since 2014, when labour market conditions became gradually more supportive of higher nominal wage growth, the persistently weak labour productivity growth and, to a larger extent, the low inflation rate have largely offset these forces. However, if we focus on the period after 2009, wage inflation was significantly below the value predicted by an estimated wage Phillips curve, especially in the case of the Czech Republic and Poland. The results of rolling OLS estimates confirm a weakening in the relation between wage inflation and unemployment gap, especially if we move towards the end of the sample.

A deeper analysis of the evolution of labour market conditions in Poland, Hungary and the Czech Republic was used to identify the elements that can be of relevance in explaining the weaker link. The overall assessment suggests that the composition effect in employment and working-age population in recent years, especially that relating to demographic and migration flows, could have been particularly relevant in the three CEE countries. Other potential explanations that are generally mentioned for advanced economies, such as the high share of long-term unemployment, part-time and temporary workers or workers that are underemployed or marginally attached to labour market, probably had a marginal or no role in the recently observed weak nominal wage growth in Poland, Hungary and the Czech Republic.

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Figures and Tables





Source: OECD.



Figure 2: Unemployment rate

Source: Eurostat.







Source: Eurostat.



Figure 4: Labour as a factor limiting production in manufacturing companies

Source: European Commission.



Figure 5: Real labour productivity and wages

Source: Based on Eurostat, ECB and OECD data.



Figure 6: Inflation rate

Source: National sources and Eurostat.

Table 1: OLS estimation

	$\hat{u}_t = u_t - u_t^{NAWRU}$			$\hat{u}_t = u_t - u_t^H$		
	Czech Republic	Poland	Hungary	Czech Republic	Poland	Hungary
Lagged inflation	0.6412***	0.2652	0.6585***	0.6765***	0.4894***	0.5902***
Unemployment gap	-0.5409**	-0.4120***	-0.7714***	-0.1899	-0.6826***	-0.8053***
Productivity growth	(0.2167) 0.7044***	(0.1584) 0.2020	(0.2457) 0.3507***	(0.2012) 0.6934***	(0.1558) 0.2906***	(0.1978) 0.2917***
Constant	(0.0828) 0.0188***	(0.1588) 0.0439***	(0.1118) 0.0363***	(0.0882) 0.0183***	(0.1663) 0.0266***	(0.0966) 0.0458***
	(0.0038)	(0.0060)	(0.0055)	(0.0042)	(0.0060)	(0.0053)
Observations	65	65	65	65	65	65
Adj-R ²	0.60	0.26	0.59	0.56	0.41	0.60

Note: Sample from 2001Q2 to 2017Q2. Newey-West standard errors between brackets. *** denotes a p-value < 1%, *** between 5 and 1% and * between 10 and 5%. The unemployment gap is defined as the distance of the unemployment rate from the interpolated NAWRU estimated by Eurostat in the first three columns, from the value obtained by applying the methodology proposed in Hamilton (2017) in the other three columns.

Table 2: IV estimation

	Czech Republic	Poland	Hungary
Lagged inflation	0.5380***	0.4649***	0.5978***
	(0.1350)	(0.1727)	(0.1641)
Unemployment gap	-0.5603**	-0.6746***	-0.7235***
	(0.2321)	(0.1515)	(0.2570)
Productivity growth	0.6876***	0.2867*	0.3745***
	(0.0769)	(0.1684)	(0.1080)
Constant	0.0213***	0.0273***	0.0388***
	(0.0040)	(0.0061)	(0.0065)
J-statistic	1.6819	0.8936	0.0241
Prob(J-statistic)	0.19	0.34	0.88
Durbin-Wu-Hausman statistics	3.4525	0.3080	2.5189
Prob(DWH-statistic)	0.06	0.58	0.11
Cragg-Donald F-statistics	131.5107	219.7017	212.4821
Observations	65	65	65
Adj-R ²	0.60	0.41	0.59

Note: Sample from 2001Q2 to 2017Q2. Newey-West standard errors between brackets. *** denotes a p-value < 1%, *** between 5 and 1% and * between 10 and 5%. The two instrumental variables for lagged inflation rate are its two additional lagged values (at t-2 and t-3). The unemployment gap is defined in as the distance of unemployment rate from the interpolated NAWRU in CZ and HN, from the value obtained by applying the methodology proposed in Hamilton (2017) in PO.



Figure 7: Wage Phillips curve decomposition

Note: The average wage inflation between 2002-2008 is considered as a reference point.



Figure 8: Rolling window estimates of the coefficient attached to the unemployment gap

Note: OLS rolling window estimates performed considering a fixed window of 30 observations.



Figure 9: Underutilization (U6) and unemployment rate (UR)





Source: Based on Eurostat data.



Figure 11: Share of part-time and temporary contracts in total employment, %

Figure 12: Long-term unemployment rate,%



Source: Eurostat.



Figure 13: Share of short- and long-term unemployment rate, %



Figure 14: Labour force participation rate, %

Source: Eurostat.



Figure 15: Working-age population, % variation



2000 2008 2016

Figure 16: Labour force participation rate, by age, %

Source: Based on Eurostat data.



Figure 17: Labour force participation rate, by sex, %







Source: Based on Eurostat and OECD data.