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The Wage Growth Puzzle and the Philips Curve Explained: Recent Developments

ABSTRACT

Is the Philips Curve Still Applicable in Today's Financial Environment?

The relationship between wage inflation and unemployment, is not only considered by Gali and Gambetti (2018:2) to be a “a key link of the relation between prices and economic activity” but also regarded as the focus of Phillips (1958) original work, is widely perceived to be at the heart of the "twin puzzle.”

Further they add that, “the failure of wage inflation to respond sufficiently to the tightening of the labor market in recent years is generally viewed as one of the main factors behind the extremely accommodating monetary policies” at central banks like the Federal Reserve or the ECB.”

Why can some economic indicators still be considered to be applicable and relevant – even in an environment where so many advancements and financial instruments have significantly altered the financial landscape which existed over the years?

In particular, why can the Philips Curve still be considered applicable and relevant – with reference to wage inflation and productivity? More importantly, what economic indicators can serve to provide more reliable indicators of inflationary levels once more temporary elements, as induced by import prices, have diminished?

Key words: exchange rates, inflation targeting, monetary policy, interest rates, Philips Curve, wage rate

The Wage Growth Puzzle and the Philips Curve Explained: Recent Developments

Jim Di Gabriele and Marianne Ojo¹

Introduction

The Wage Growth Puzzle

The Philips Curve: Is it Still Applicable in Today's Financial Environment?

The relationship between wage inflation and unemployment, is not only considered by Gali and Gambetti (2018:2)² to be a “a key link of the relation between prices and economic activity” but also regarded as the focus of Phillips (1958) original work, is widely perceived to be at the heart of the "twin puzzle.”

Further they add that, “the failure of wage inflation to respond sufficiently to the tightening of the labor market in recent years is generally viewed as one of the main factors behind the extremely accommodating monetary policies” at central banks like the Federal Reserve or the ECB.”

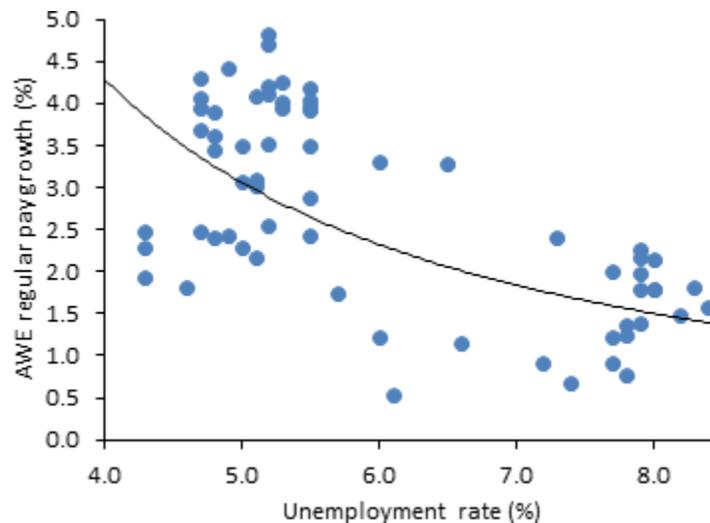
This paper not only highlights why the Philips Curve is still relevant and applicable in the current financial environment, but also illustrates those developments that have significantly altered the present global financial landscape and which to a large extent, account for some of the inflation and wage growth puzzles.

¹ Email: jim@dmcpa.com and marianneojo@hotmail.com

² See Jordi, G. and Gambetti L. (2018). Has the U.S. Wage Phillips Curve Flattened? A Semi-Structural Exploration October 2018. Concerns also relating to the fact “that despite wide and persistent fluctuations in unemployment, inflation remained surprisingly stable during the same period.”

The ensuing section introduces concepts and the background to the topic – highlighting main issues and areas to be addressed. More importantly, it accentuates the rationale for, as well as the means of addressing and mitigating existing gaps in the literature.

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- *“The original Phillips curve was drawn as a simple (negative) relationship between unemployment and wage growth. It captures the basic forces of demand and supply in the labour market. If demand for labour exceeds the supply of labour, the unemployment rate will fall, and this will put upward pressure on wage inflation. The following chart reflects such negative relationship between unemployment and wage growth in the UK since 2001.”³*



³ See Bank of England (2018). “From asymmetry to symmetry: changing risks to the economic outlook” Speech given by Gertjan Vlieghe, External MPC member, Bank of England Confederation of British Industry, Birmingham 23rd March 2018 at page 8

Source: ⁴

Bank of England (2018). “From asymmetry to symmetry: changing risks to the economic outlook”

De Ridder and Pfajfar (2016:30)⁵, on the other hand conclude that : “ that monetary policy shocks affect state-level unemployment and output only if wages are rigid.” Further, their estimates not only point to the evidence “that states with high rigidities experience significantly greater output reductions and unemployment increases after an interest rate shock than states with low rigidities, but that multipliers of fiscal spending shocks are considerably larger in states with high wage rigidities than states with low rigidities.”

Vlieghe is a proponent of the argument that “the unemployment rate is still an important driver of wages, - given the necessity of other considerations.”

Five different factors that, in his, opinion, may have been keeping wage growth low despite falling unemployment are as follows (2018:13):

- 1) **Change in the structural unemployment rate** – under which further sub headings, namely attributable causes of these, are addressed, namely:
 - - i) the UK workforce is ageing and has a higher education attainment now than in the past, which would lead to a lower equilibrium unemployment rate as older and more highly educated workers tend to spend less time out of work;
 -
 - -ii) Tax and benefit changes might have increased the incentives to find work, which would also lead to less time spent in unemployment;
 -
 - -iii) Changes to work patterns such as increased part-time work and zero hours contracts that may mean that the unemployment rate is a less reliable guide to overall slack in the labour market, because such workers can find themselves underemployed even if they have a job.

He adds (2018:15), that the above considerations may imply that “the unemployment rate can fall further than it did in the past before pushing up wages.”

- 2) **Public sector wage restraint:** To which it is furthermore observed that “ in the recovery, public sector wage growth has remained generally below private sector wage growth, and public sector employment has contracted.”

⁴ See ibid

⁵ M. De Ridder and.D. Pfajfar (2016) .Policy Shocks and Wage Rigidities: Empirical Evidence from Regional Effects of National Shocks at page 30

- 3) **The “lingering effect” of downward nominal wage rigidity.**
- 4) **Weak inflation expectations**
- 5) **Productivity growth**

In concluding, he not only accentuates his argument that the Philips Curve is still very relevant and applicable (2018:18), but also observes that the first four factors “keep overall inflationary pressures down for a given unemployment rate, i.e. both wage and price inflation” whilst the fifth, namely, weak productivity, does not – by drawing attention to the point that “Weaker productivity growth implies weaker wage growth for the same inflationary pressure.”

In contrast, Daly (2019:4) argues that there are new forms of wage compensation which are not being accounted for⁶ under traditional measures used to track wages and salaries and consequently, this “creates a wedge between the strong labor market we observe and our available indicators of wage growth.”

In drawing attention to the reliability of economic indicators as measures of economic activity, a further and unlikely source of the “weakening the link between economic activity and inflation” is referred to, by way of “the Fed Wedge”, namely, a phenomenon attributed to the weakening link between economic activity and inflation – impacted by the Federal Reserve’s inflation target function of adjusting interest rates correspondingly to levels of inflation.

She concludes that “When the Federal Reserve is doing its job well, the link between economic activity and inflation is weaker – as is the case today - the essence of the “Fed wedge.”⁷

In view of the recognition that existing monetary policy kit may have to be expanded, reference has been made to further tools which had to be deployed to facilitate monetary policy objectives – particularly in the aftermath of the Financial Crisis, namely, an adjustment of its monetary policy tools through the federal funds rate. In particular :⁸

- The FOMC’s primary means of changing the stance of monetary policy is by adjusting its target range for the federal funds rate;
- The FOMC cut that target to just above zero in response to financial turmoil and deteriorating economic conditions in December 2008;

⁶ “Free transportation, flexible workweeks, unlimited time off, and help with things like student loan repayment and even housing, which have become meaningful part of employee compensation packages.” See page 4

⁷ *ibid*

⁸ See Remarks by Richard H. Clarida , Vice Chair Board of Governors of the Federal Reserve System at “The Bank of Finland Conference on Monetary Policy and Future of EMU [Economic and Monetary Union]” Helsinki, Finland at page 9. “The FOMC altered the size and composition of the Fed’s balance sheet through a sequence of three large-scale securities purchase programs, via a maturity extension program, and by adjusting the reinvestment of principal payments on maturing securities.”

- Since the U.S. economy required additional policy accommodation after the ELB was reached;
- the FOMC deployed two additional tools in the years following the crisis: balance sheet policies and forward guidance about the likely path of the federal funds rate.”

Global Developments Which have altered the Current Financial Landscape

According to reports by the Bank for International Settlements,⁹ “ two factors in particular, amongst several other factors, have contributed to low wage growth – as well as “long-term forces behind labour’s declining pricing power”, namely:

- i) “The dramatic **expansion of the global labour force**: In the 1990s and early 2000s, the opening-up of Asia and the former Soviet bloc roughly doubled the effective labour force involved in world trade and more recently, further economic integration and increasing participation in GVCs have boosted international competition in labour markets.
- ii) **industrial automation**. New technologies have long been a significant influence on production processes and demand for skilled labour in advanced economies. With the quickening pace and growing versatility of current robotic technologies, manufacturing labour pools face new challenges. At the same time, service sector employment, traditionally less exposed to the increased efficiency of robotics, has also become more vulnerable.

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Financial Cycle Risks and Financial Cycle Indicators

The prominent role assumed by financial indicators which are geared towards detecting financial cycle busts, is further highlighted by the BIS – who also suggest that “main cause of the next recession will perhaps resemble more closely that of the latest one – a financial cycle bust” – with reference to the fact that “the recessions in the early 1990s in a number of advanced economies, without approaching the depth and breadth of the latest one, had already begun to exhibit similar features: they had been preceded by outsize increases in credit and property prices, which collapsed once monetary policy started to tighten, leading to financial and banking strains.”¹⁰

⁹ BIS (2017). “Exploring the Wage Phillips curve”, Bank for International Settlements 87th Annual Report, Box IV.A. at page 64

¹⁰ BIS (2017). BIS 87th Annual Report at pages 11 and 12. “...for EMEs, financial crises linked to financial cycle busts have been quite prominent, often triggered or amplified by the loss of external funding; recall, for instance, the Asian crisis some 20 years ago. Leading indicators of financial distress constructed along the above lines do point to potential risks (Chapter III). Admittedly, such risks are not apparent in the countries at the core of the GFC, where domestic financial booms

The variation in financial cycles between different countries is furthermore, illustrate by the Bank for International Settlements (BIS,2017:12) :

- Financial cycles in this group occur at different stages. In some cases, such as China, the booms are continuing and maturing; in others, such as Brazil, they have already turned to bust and recessions have occurred, although without ushering in a full-blown financial crisis.”

It (BIS, 2017: 13) also adds that whilst interest rates matter for investment, a bigger role is played by profits, uncertainty and cash flows.

In addition to financial cycle risks, references are also made by the BIS (2017: 28-30) to “the changing nature of market risks” – a phenomenon which is referred to, not only by way of shifts in a number of relationships which had been characteristic of the markets over the years, but also exemplified by reference to shifts in the fall in correlations of asset returns across sectors and regions; and the growing divergence between measures of market risk and of policy uncertainty.

Rise in level of Protectionist Risks¹¹

This is evidenced by recent ongoing trade wars, potential for increased retaliatory measures between major advanced trading economies, blocs and partners, as well as recent introduction of digital tax on major tech firms.

collapsed, such as the United States, the United Kingdom or Spain. There, some private sector deleveraging has taken place and financial cycle expansions are still comparatively young. The main source of near-term concerns in crisis-hit economies is the failure to fully repair banks’ balance sheets in some countries, notably in parts of the euro area, especially where the public sector’s own balance sheet looks fragile (Chapter V). Political uncertainties compound these concerns. Rather, the classical signs of financial cycle risks are apparent in several countries largely spared by the GFC, which saw financial expansions gather pace in its aftermath. This group comprises several EMEs, including the largest, as well as a number of advanced economies, notably some commodity exporters buoyed by the long post-crisis commodity boom. In all of these economies, of course, interest rates have been very low, or even negative, as inflation has stayed low, or even given way to deflation, despite strong economic performance.”

¹¹ See BIS (2017).at pages 53 -55;

See also WSJ, “Facebook, Google May Face Billions in New Taxes Across Asia, Latin America”

https://www.wsj.com/articles/countries-push-digital-taxes-on-tech-giants-1540742400?mod=article_inline

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Conclusion

Hence in the event that the link between economic activity and inflation has become weaker, as evidenced by recent figures, what options exist for federal regulators, as well as national regulatory authorities across the globe?

The need for greater reliance on macro prudential policy tools – intended to serve as complements to monetary policies, becomes the more likely point of focus. Since the introduction of the Basel leverage ratios in 2010, supplementary leverage ratios, enhanced supplementary leverage ratios, liquidity standards – as evidenced by the Net Stable Funding Ratio and the Liquidity Coverage Ratio – in addition to a more robust risk capital adequacy framework which incorporates countercyclical, conservative buffers – and greater focus on globally active systemic institutions (GSIBs), as some of its key objectives, serves to ensure that periods requiring greater accommodative monetary policies, do not unduly compel federal and national regulators to resort merely to monetary policy tools, but also to Core PCE inflation, which is considered to “exclude consumer food and energy prices that are often quite volatile, and therefore, typically provides a better indication than the total measure of where overall inflation will be in the future.” , the trimmed mean PCE price index, survey based measures of inflation – which are considered to be more reliable than market based measures; as well as macro prudential policy tools.

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APPENDIX

Sources for:

Appendices

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And particularly pages 62 -68

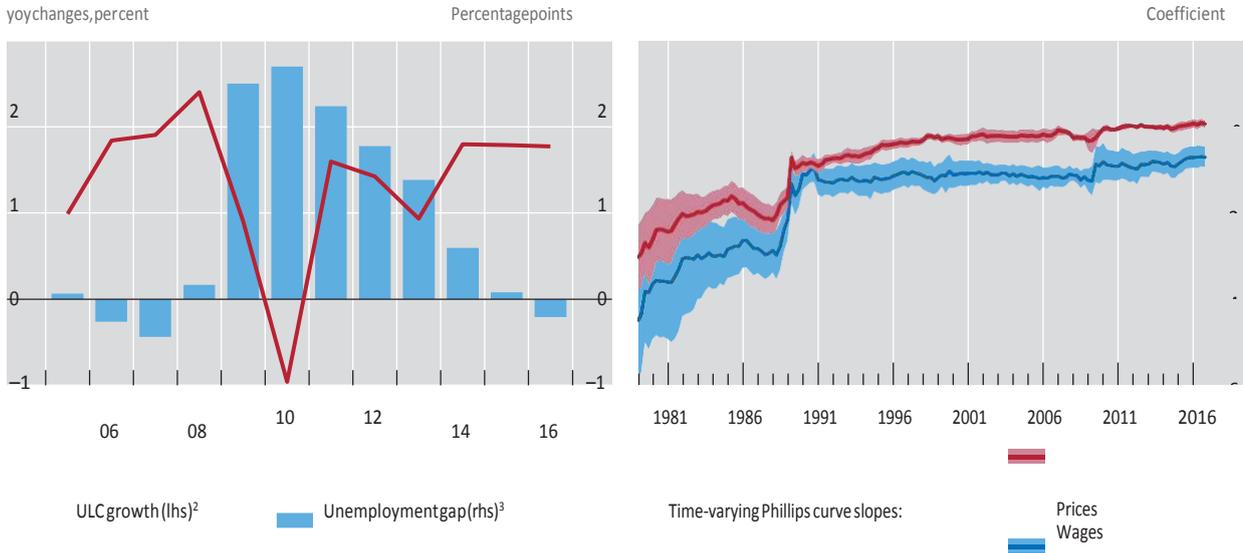
Tighter labour markets pointing to upside inflation risks?

Graph 1.3 As unemployment falls, wage pressures rise¹

While

wages remain sensitive to unemployment, prices

are not⁴



¹ For CA, DE, GB, JP and US; forecasts after 2015. ² ULC = unit labour cost. Weighted average based on rolling GDP and PPP weights. ³ Unemployment rate less non-accelerating inflation rate of unemployment; weighted average based on labour force levels. ⁴ Rolling 15-year window estimates and confidence bands from a panel of G7 economies. See Chapter IV for details.

Sources: IMF, *World Economic Outlook*; OECD, *Economic Outlook*; BIS estimations.

Financial cycle risks

“In light of the above, the potential role of financial cycle risks comes to the fore. The main cause of the next recession will perhaps resemble more closely that of the latest one – a financial cycle bust. In fact, the recessions in the early 1990s in a number of advanced economies, without approaching the depth and breadth of the latest one, had already begun to exhibit similar features: they had been preceded by outside increases in credit and property prices, which collapsed once monetary policy started to tighten, leading to financial and banking strains. And for EMEs, financial crises linked to financial cycle busts have been quite prominent, often triggered or amplified by the loss of external funding; recall, for instance, the Asian crisis some 20 years ago.

Leading indicators of financial distress constructed along the above lines do point to potential risks (Chapter III). Admittedly, such risks are not apparent in the countries at the core of the GFC, where domestic financial booms collapsed, such as the United States, the United Kingdom or Spain. There, some private sector deleveraging has taken place and financial cycle expansions are still comparatively young. The main source of near-term concerns in crisis-hit economies is the failure to fully repair banks’ balance sheets in some countries, notably in parts of the euro area, especially where the public sector’s own balance sheet looks fragile (Chapter V). Political uncertainties compound these concerns.

Rather, the classical signs of financial cycle risks are apparent in several countries largely spared by the GFC, which saw financial expansions gather pace in its aftermath. This group comprises several EMEs, including the largest, as well as a number of advanced economies, notably some commodity exporters buoyed by the long post-crisis commodity boom. In all of these economies, of course, interest rates have been very low, or even negative, as inflation has stayed low, or even given way to deflation, despite strong economic performance. Financial cycles in this group are at different stages. In some cases, such as China, the booms are continuing and maturing; in others, such as Brazil, they have already turned to bust and recessions have occurred, although without ushering in a full-blown financial crisis.

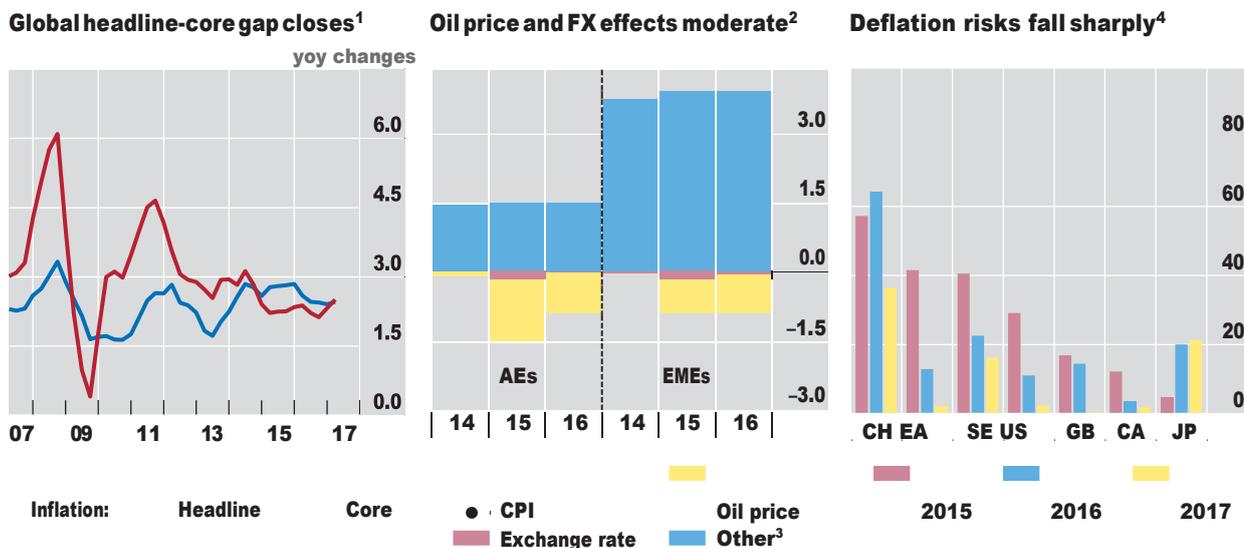
EMEs face an additional challenge: the comparatively large amount of FX debt, mainly in US dollars (Chapters III, V and VI). Dollar debt has typically played a critical role in EME financial crises in the past, either as a trigger, such as when gross dollar-denominated capital flows reversed, or as an amplifier. The conjunction of a domestic currency depreciation and higher US dollar interest rates can be poisonous in the presence of large currency mismatches. From 2009 to end-2016, US dollar credit to non-banks located outside the United States – a bellwether BIS indicator of global liquidity – soared by around 50% to some \$10.5 trillion; for those in EMEs alone, it more than doubled, to \$3.6 trillion.

Compared with the past, several factors mitigate the risk linked to FX debt. Countries have adopted more flexible exchange rate regimes: while no panacea, these should make currency crashes less likely and induce less FX risk-taking ex ante. Countries have also built up foreign currency war chests, which should cushion the blow if strains emerge. And the amounts of FX debt in relation to GDP are, on balance, still not as high as before previous financial crises. Indeed, several countries have absorbed large exchange rate adjustments in recent years. Even so, vulnerabilities should not be taken lightly, at least where large amounts of FX debt coincide with outside domestic financial booms. This is one reason why a tightening of US monetary policy and a US dollar appreciation may signal global financial market retrenchment and higher risk aversion, with the dollar acting as a kind of “fear gauge”.²

Transitory inflation headwinds ease and deflation risks fade

In percent

Graph IV.4



¹ Consumer prices; weighted averages based on rolling GDP and PPP exchange rates. ² Based on the model in M Jašová, R Moessner and E Takáts, "Exchange rate pass-through: what has changed since the crisis?", *BIS Working Papers*, no 583, September 2016, using an unbalanced panel of nine AEs and 16 EMEs. ³ Inflation developments not explained by the oil price or exchange rate. ⁴ Deflation tail probabilities estimated from the distribution of historical forecast errors collected from up to 20 years of survey data.

Sources: IMF, *World Economic Outlook*; OECD, *Economic Outlook and Main Economic Indicators*; CEIC; Consensus Economics; Datastream; national data; BIS calculations.

In spite of the reflation, long-run inflation expectations remained well anchored. As in earlier years, survey-based measures ran well within most central banks' target ranges (Graph IV.5, right-hand panel). In addition, market-based measures of long-run inflation expectations recovered somewhat from lows in the previous year, suggesting that concerns about deflation risks have faded. As discussed in the *86th Annual Report*, questions were raised about the reliability of these market measures, owing to significant time-varying liquidity and term premia as well as an undue sensitivity to short-term oil price fluctuations (Chapter II). Nevertheless, central banks took some comfort in seeing these measures turn upwards.

Despite the moderate near-term and cyclical reflationary forces at work, secular factors, such as globalisation and technology, seemingly continued to work in the opposite direction. The *86th Annual Report* raised the possibility that improvements in technology and expanding global value chains (GVCs) have held down price pressures in past decades. These supply side forces generate "good" disinflationary headwinds. The levelling-off of globalisation in recent years, as documented in Chapter VI, has raised the question whether the headwinds have moderated, possibly contributing to the upward tilt in the inflation outlook.

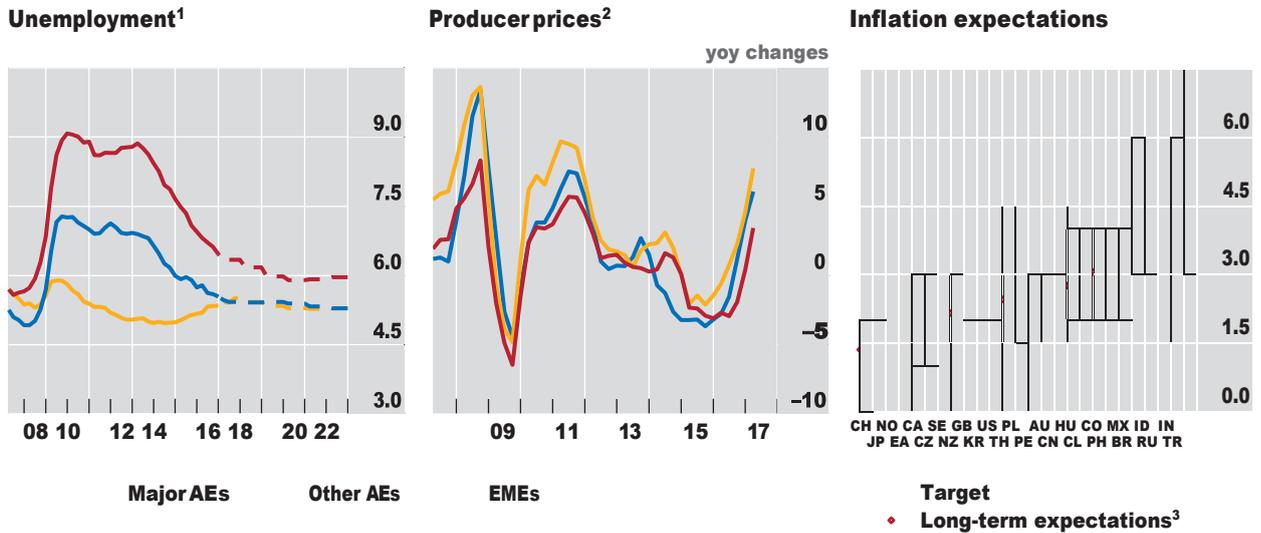
Are labour markets signalling rising inflationary pressures?

Global labour markets have seen profound changes over the past decades, with significant implications for wage and price formation. As labour market slack diminishes, wage growth is expected to rise. But wage demands have lagged the cycle more than in the past. Rather than a purely cyclical phenomenon, this wage behaviour appears to reflect long-term forces that are reshaping the global

Labour markets tighten, producer prices pick up as long-term inflation expectations remain well anchored

In percent

Graph IV.5



Major AEs = EA, JP and US; other AEs = AU, CA, CH, DK, GB, NO, NZ and SE.

¹ Weighted averages based on rolling labour force levels; definitions may vary across countries; EMEs excluding IN. After 2016 (dashed lines), forecasts. ² Weighted averages based on rolling GDP and PPP exchange rates. ³ Forecasts for six- to 10-year-ahead inflation.

Sources: Eurostat; IMF, *International Financial Statistics* and *World Economic Outlook*; OECD, *Economic Outlook* and *Main Economic Indicators*; CEIC; Consensus Economics; Datastream; national data; BIS calculations.

economy. The question for many central banks is whether these developments have so weakened the relationship between inflation and labour market slack that the recent tightening of labour markets poses little threat of an inflation overshoot.

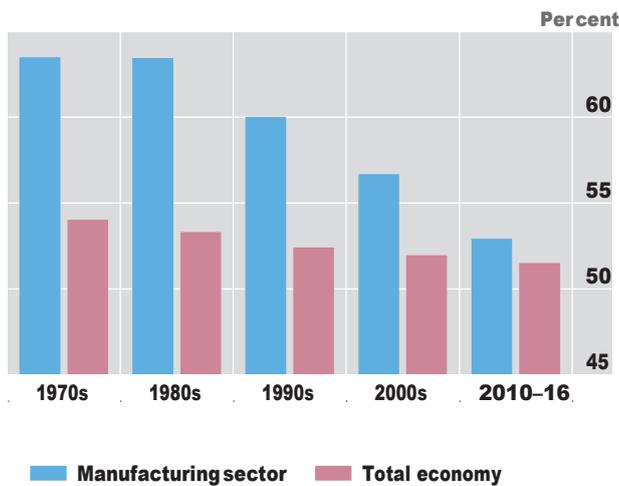
Long-term forces behind labour’s declining pricing power

Subdued wage growth is a sign of labour’s declining “pricing” power. While a number of factors have contributed to this development, two deserve special attention.

One factor has been the dramatic expansion of the global labour force. In the 1990s and early 2000s, the opening-up of Asia and the former Soviet bloc roughly doubled the *effective* labour force involved in world trade.¹ More recently, further economic integration and increasing participation in GVCs have boosted international competition in labour markets.

A second factor has been industrial automation. New technologies have long been a significant influence on production processes and demand for skilled labour in advanced economies. With the quickening pace and growing versatility of current robotic technologies, manufacturing labour pools face new challenges. At the same time, service sector employment, traditionally less exposed to the increased efficiency of robotics, has also become more vulnerable. Automating knowledge work through software advances and new information technologies has continued to boost the size and scope of *global* service providers, broadening the range of service jobs that are threatened with obsolescence.²

Labour’s lower pricing power is consistent with the decline in labour’s income share in many advanced economies (Graph IV.6, left-hand panel). And it may also help explain why wages have not always kept up with productivity trends

Labour share has declined...²

...as wages have lagged productivity gains



¹ G7 economies; weighted averages based on rolling GDP and PPP exchange rates. For total economy, forecasts after 2015. Manufacturing sector data for Japan up to 2015. ² Ratio of compensation of employees to nominal output; measured by GDP and gross value added for the total economy and manufacturing sector, respectively. ³ Real gross value added per total number of hours worked.

Sources: European Commission, AMECO database; Eurostat; IMF, *World Economic Outlook*; OECD, *Economic Outlook*, *National Accounts Statistics* and STAN database; Datastream; national data; BIS calculations.

(Graph IV.6, right-hand panel). At the same time, of course, these trends have not affected all sectors equally, and reflect a multiplicity of other factors, too.³

Implications for wage growth and inflation

These profound changes in labour markets may also have far-reaching implications for inflation. One reason why labour markets have traditionally been regarded as key for inflation is that wage increases lead to rising production costs and hence higher prices, which may in turn reinforce wage demands – so-called second-round effects. After all, wage costs account for the bulk of production costs, especially in the service sector. The more workers can strengthen their pricing power, the more likely it is that wage demands will be accommodated. Thus, a secular decline in pricing power can shed light on the question of how far the recent tightening of global labour markets points to a build-up in inflation momentum.

Analysing this question requires a number of links to be considered: the relationship between wage pressures and production costs, ie unit labour costs (ULCs); that between labour costs and measures of economic slack; and finally that between ULCs and inflation. The picture that emerges is a mixed one.

Wage growth is not necessarily inflationary: whenever it is supported by productivity gains, it will not lead to rising production costs. This is why ULC growth is a better, if still imperfect, measure of incipient inflationary pressures. At the current juncture, advanced economy ULCs are expected to be held in check by somewhat faster productivity growth, despite stronger earnings growth (Graph IV.7, left-hand panel).

There is also some evidence that the link between ULC growth and *domestic* labour market slack has weakened over the years (centre panel in Graph IV.7), but remains significant. The secular decline in labour's pricing power appears to have played a role (Box IV.A). Other evidence points to the real economy's globalisation as a force behind this decline: a country's ULC growth has become more correlated with global ULC growth, weighted by the country's value added trade (Box IV.B).

This also suggests that an exclusive focus on domestic developments could underestimate inflationary pressures, now that ULCs are rising globally.

The consequences of ULC developments for prices are somewhat less clear. To be sure, ULC growth and inflation appear to co-move closely in the long run.⁴ In addition, there is evidence of a link at cyclical frequencies (Graph IV.7, right-hand panel). That said, the link has become weaker and has been, at times, unstable and elusive. Given the predictive content of ULC growth for future price inflation, the empirical evidence points to a weak pass-through of labour costs to inflation.⁵ This impression is reinforced by the difficulties in finding a significant response of inflation to domestic output or labour slack – the price Philips curve looks rather flat.⁶

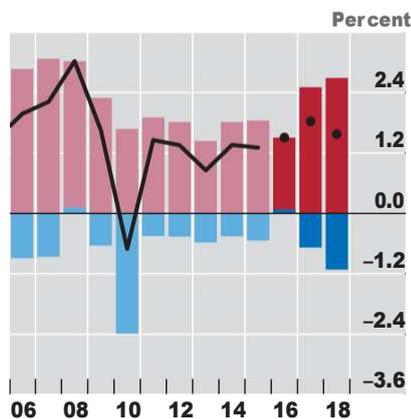
Since the GFC, a number of factors may have clouded the picture further. Some of them suggest that underlying wage cost pressures may have been overestimated. For instance, previously discouraged workers may have re-entered the labour force and hence expanded the ranks of job-seekers (officially unemployed), suggesting that more slack may exist in the labour market than headline figures indicate. Indeed, over the past decade not all of the decline in the participation rate in some countries can be attributed to secular demographic trends, such as ageing.⁷

Other factors may have weakened the relationship between slack and wage growth only temporarily. Wage gains may have been unusually weak simply because of the depth of the recession and nominal wage rigidities.⁸ With inflation having eroded real wage gains since then, wage pressure might revive if inflation continues to increase as slack diminishes. For instance, wage norms, which provide an orientation for such demands, fell to roughly 2% post-crisis, well below the 3–4% that was typical pre-crisis.⁹ Indeed, early signs of such a return are visible in the more cyclically sensitive sectors, eg the rise in part-time wage growth.

Cyclical ULC developments around the globe may pose upside risk to inflation

Graph IV.7

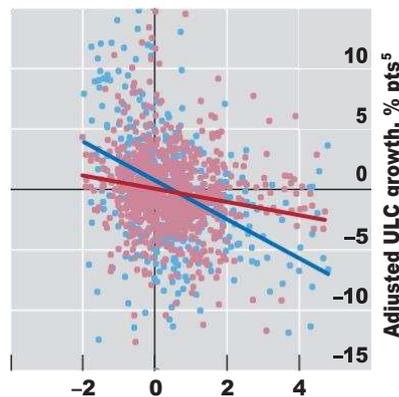
ULC growth in AEs¹



— / ● Unit labour cost growth²

■ / ■ Compensation/hours worked
■ / ■ Labour productivity (inverse)³

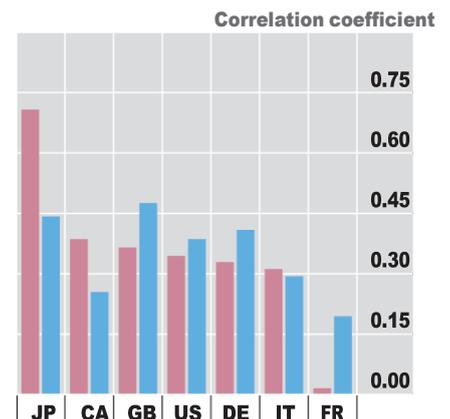
Falling unemployment rates point to a further pickup in ULC growth⁴



Unemployment gap, % pts⁶

● Before 1985 ● Since 1985

Rising ULC growth historically correlated with higher inflation⁷



■ Since 1985 ■ 1985–2006

¹ Weighted averages based on rolling GDP and PPP exchange rates; forecasts after 2015. ² Compensation of employees per real GDP. ³ Total number of hours worked per real GDP. ⁴ G7 economies; quarterly data from Q1 1970 to Q3 2016. A few outliers exceeding 15% in absolute value were omitted from the graph but included in the regression analysis. Estimated slopes are equal to -1.6119 and -0.5471 with robust p-values of 0.008 and 0.003, respectively. ⁵ See Box IV.A for details. ⁶ Unemployment rate less NAIRU. ⁷ Contemporaneous cross-correlations of quarterly ULC growth and inflation (measured by the GDP price deflator), less four-quarter moving average of changes in the GDP price deflator, aggregated at annual frequency.

Sources: IMF, *World Economic Outlook*; OECD, *Economic Outlook*; BIS calculations.

Exploring the wage Phillips curve

Ever since William Phillips published his seminal paper in 1958,^① a wide body of research has emphasised the role of economic slack in driving inflation in prices and wages. However, recent evidence suggests that the ability of price Phillips curves to explain inflation has declined (see Chapter III of the *84th Annual Report*). What about the impact of economic slack on wages?

A conventional wage Phillips curve specification embodies the view that unit labour cost (ULC) growth (wage inflation, $\otimes w_{i,t}$, adjusted for labour productivity growth, $\otimes p_{i,t}$) is driven by labour market slack, $x_{i,t}$ with a sensitivity β :^②

$$(\otimes w_{i,t} - \otimes p_{i,t}) = k + c_i + \bar{n}_{i,t-1} + \beta x_{i,t} + e_{i,t}.$$

For a G7 panel from 1960 to 2016, the relationship between ULC growth and slack (proxied by the unemployment gap (Graph IV.A, right-hand panel)) is found to be negative and statistically significant. The estimate of β indicates that a 1 percentage point decline in slack increases ULC growth by roughly 0.9 percentage points (red line, Graph IV.A, left-hand panel).

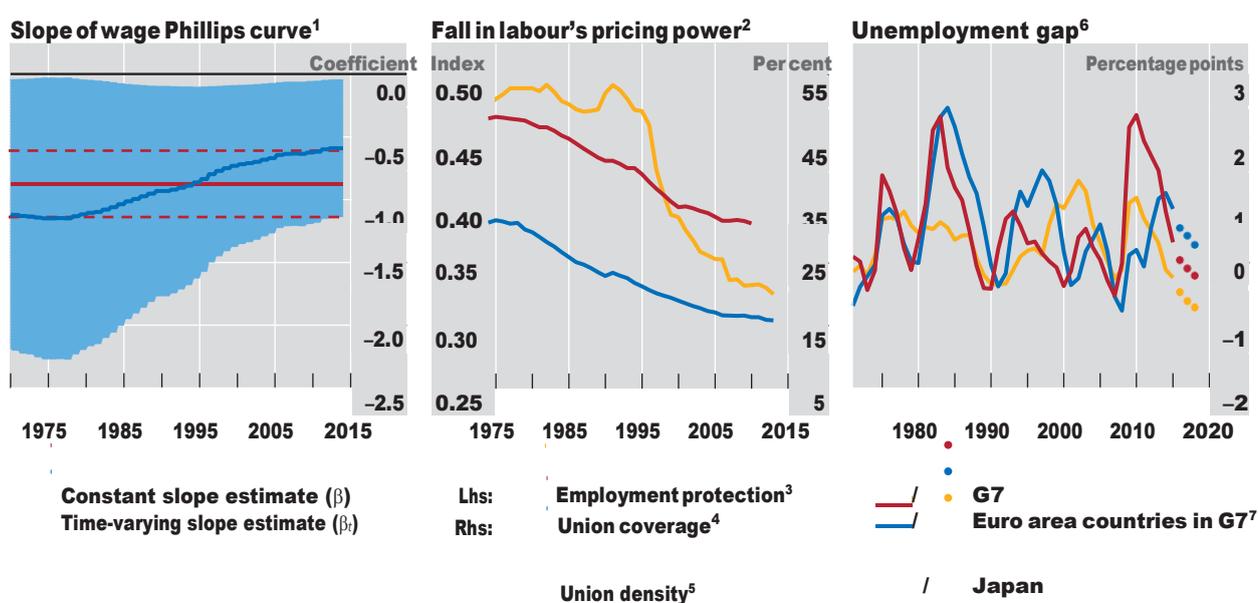
One possible driver of a changing sensitivity of ULCs to slack conditions is the increased contestability of markets associated with the trend decline in workers' pricing power. To explore this possibility, a measure of pricing power (denoted $z_{i,t}$) is constructed by applying the method of principal components to changes in three indicators of relevant labour market conditions: employment protection, union coverage and union density (Graph IV.A, centre panel). An augmented Phillips curve model is then estimated, where the sensitivity of ULC growth to slack conditions, $\beta_{i,t}$ depends on each country's $z_{i,t}$:

$$(\otimes w_{i,t} - \otimes p_{i,t}) = k + c_i + \bar{n}_{i,t-1} + \beta_{i,t} x_{i,t} + e_{i,t}, \text{ with } \beta_{i,t} = \beta(1 + \gamma z_{i,t}).$$

The estimated parameter γ is positive and significant, indicating that the lower pricing power has indeed reduced the sensitivity of ULCs to domestic labour slack – the average slope of the wage Phillips curve has become flatter across countries (blue line, Graph IV.A, left-hand panel). Even so, the time-varying Phillips curve slope has

Wage Phillips curves still relevant

Graph IV.A



¹ G7 average; the blue area and red dashed lines indicate 90% confidence interval. ² Weighted averages based on rolling GDP PPP weights for G7 economies. ³ Strictness of employment protection legislation; higher values indicate more strictness. ⁴ Number of workers covered by collective agreements normalised on employment. ⁵ Ratio of union membership to employment. ⁶ Unemployment rate less NAIRU; weighted averages based on rolling labour force levels; forecasts after 2015. ⁷ France, Germany and Italy.

remained statistically significant, indicating that tighter labour markets continue to lift ULC growth, albeit by somewhat less than in the past. Taken at face value, the slope flattened from around 1.1 in 1974 to 0.6 in 2014.

① A Phillips, “The relationship between unemployment and the rate of change of money wages in the United Kingdom, 1861–1957”, *Economica*, vol 25, no 100, November 1958. ② Each country’s unemployment rate less its NAIRU (non-accelerating inflation rate of unemployment); in the panel regression, k is a constant, c_i is a country fixed effect, $e_{i,t}$ is an error term and $\bar{\pi}_{i,t-1}$ is an inflation expectation proxy (measured by a four-quarter change in the GDP price deflator; see eg A Atkeson and L Ohanian, “Are Phillips curves useful for forecasting inflation?”, *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 2001).

All told, these considerations point to some reflationary tilt in the inflation outlook but not to major inflationary risks. At the same time, domestic *and* global labour market conditions deserve close monitoring, as purely domestic indicators of slack, be it in the labour or goods markets, do not appear to be fully adequate in gauging inflationary pressures.¹⁰

Start of the Great Unwinding?

Policy normalisation has never been a question of “if” but rather of “when, how fast and to what level”. These questions gained prominence in the past year, as the case for prolonged accommodation weakened and several central banks turned their attention to the process of normalisation. Currently, markets expect rates to rise very gradually (Graph IV.8, left-hand panel), as bloated central bank balance sheets are trimmed. Yet such expectations contrast sharply with past episodes of rising rates, which were typically much less gradual (Graph IV.8, second panel).

In determining the pace of normalisation, central banks must indeed strike a delicate balance. On the one hand, there is a risk of acting too early and too rapidly. After a series of false dawns in the global economy, questions linger about the durability of this upswing. And the unprecedented period of ultra-low rates heightens uncertainty about reactions in financial markets and the economy. On the other hand, there is a risk of acting too late and too gradually. If central banks fall behind the curve, they may at some point need to tighten more abruptly and intensively to keep the economy from overheating and inflation from overshooting. And even if inflation does not rise, keeping interest rates too low for long could raise financial stability and macroeconomic risks further down the road, as debt continues to pile up and risk-taking in financial markets gathers steam. How policymakers address these trade-offs will be critical for the prospects of a sustainable expansion.

Views about the end-point and initial economic conditions will naturally influence the shape and pace of the normalisation process. It is worth considering in more detail the issues that each of these aspects raises.

A key question about the end-point is the level towards which the policy rate should be expected to gravitate. Central banks use a number of approaches to form a judgment about this, rather than simply extrapolating the decline in rates over time (Graph IV.8, third panel). One approach is to interpret what financial markets are pricing in, by deriving from bond yields what “markets think” the appropriate rate will be in the future (Chapter II). Another is to use modelling tools to estimate the end-point, defined as the “equilibrium” interest rate that balances the economy – sometimes also known as the “natural rate”.¹¹ Both approaches would generally point to real (inflation-adjusted) short-term rates in the region of 0 to 2%. With the addition of target inflation of around 2%, this results in nominal rates of between 2 and 4%.¹² Alternative yardsticks, for example, based on the trend in *global per*

