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Why is nominal wage growth so low?

- Nominal wage growth has been low since 2010, albeit with decent real wage growth in recent years. This also applies to Denmark's most important export markets, e.g. Germany. A lower average replacement ratio for unemployment benefits and weak inflation have been contributing to low nominal wage growth in Denmark since 2013.

- At present, Danish firms' competitiveness is good, and there is scope for slightly higher wage growth in the coming years as labour market pressures intensify. A period of higher wage growth in Denmark than abroad will lead to an internal revaluation, which may dampen demand pressures on Danish output.

- Gradual wage increases are appropriate as the labour market tightens to ensure that the subsequent wage adjustment is not too abrupt.

2.0 per cent

has been the average annual wage growth since 2010.

Read more

1.4 per cent

has been the average wage growth since 2015, adjusted for price inflation.

Read more

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2

Nominal wage growth is low

Nominal wage growth has been low in recent years. This is true both compared with the past 40 years and when considering only the period since 1990 with inflation expectations anchored near 2 per cent, cf. Chart 1. The same applies in a number of other countries, which has triggered considerable attention among international organisations and rekindled the discussion of whether the Phillips curve has flattened, i.e. whether the empirical relationship between wage inflation and unemployment has weakened, cf. for instance Bulligan and Viviano (2017), IMF (2017), Leduc and Wilson (2017) and Deutsche Bundesbank (2018).

In a small, open economy like Denmark, the labour market and especially wage flexibility are key in ensuring that the economy is flexible and adaptable. Flexible wage formation contributes to achieving external balance. For instance, heavy pressure on demand in Denmark will cause Danish industrial wages to outpace foreign wage growth for a period of time, which will imply higher imports and lower exports.

This analysis examines to what extent the wage growth of recent years can be explained by macroeconomic factors such as labour market slack and consumer price inflation. It also examines which measure of labour market slack best explains wage growth.

In contrast to nominal wage growth, real wage growth (with adjustment for general consumer price inflation) has been above the historical average for most of the period since 2015, reflecting weak price inflation, cf. Chart 2.
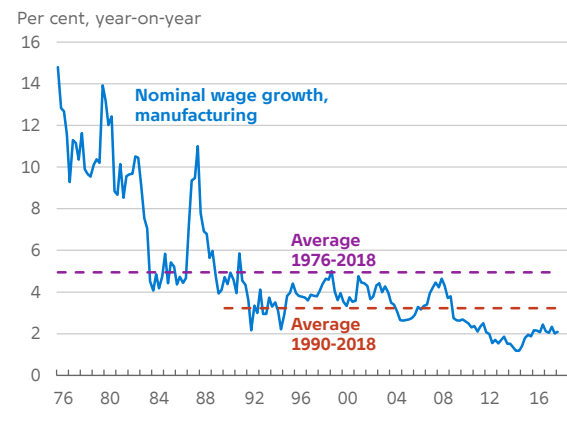
Do wage developments follow a simple wage Phillips curve?

The original Phillips curve describes the (short-term) empirical relationship between wage growth and unemployment, cf. Phillips (1958). The basic mechanism is that higher unemployment leads to lower wage growth, given greater labour market slack – and vice versa for lower unemployment.

As far as Denmark is concerned, a negative relationship can be detected between unemployment and quarterly wage growth in manufacturing for the period 1975-2018 as a whole, cf. Chart 3. But there are clear indications of a weaker relationship since the 1990s.

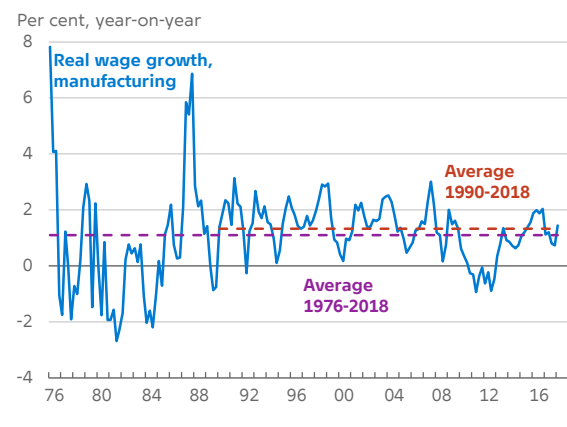Low nominal wage growth in recent years ...   Chart 1

Per cent, year-on-year

Source: Statistics Denmark and own calculations.

... but good real wage growth since 2015   Chart 2

Per cent, year-on-year

Note: Annual growth rate for real wages in manufacturing, with the consumer price index used as the deflator.
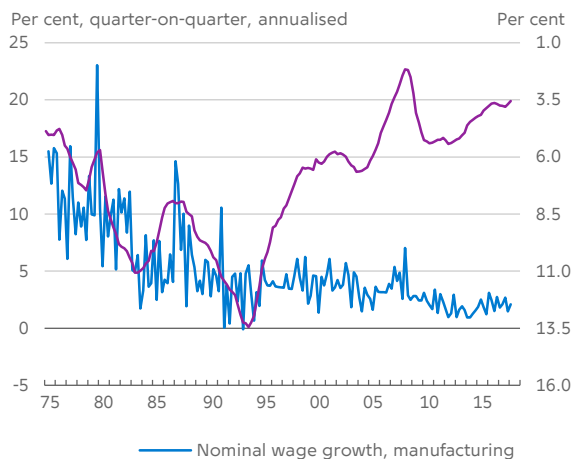Source: Statistics Denmark and own calculations.

Earlier attempts at estimating a Phillips curve for Denmark has shown mixed results. Hansen (1998a,b) finds that wage developments can be described using a Phillips curve, but a key determinant of the sensitivity of wage growth to unemployment is whether the period prior to the first oil crisis is included in the estimation. Storgaard (2011) finds that wage growth is better described as an adjustment towards a long-run relationship between consumer prices and wages (a real wage curve) than as a Phillips curve, and unemployment is not a significant factor in the estimated relation.
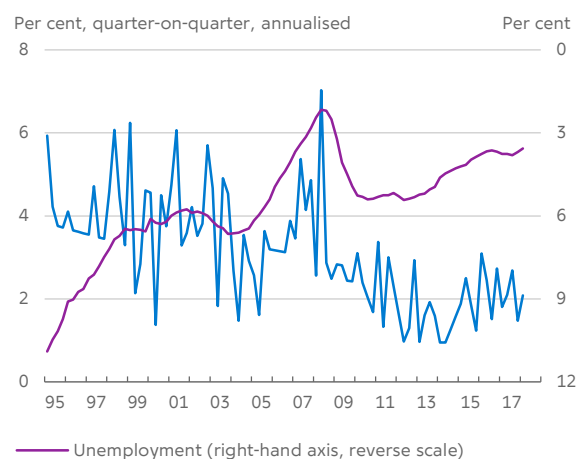
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Negative relationship between wage inflation and unemployment?   Chart 3

1975-2018

Per cent, quarter-on-quarter, annualised   Per cent

Nominal wage growth, manufacturing   Unemployment (right-hand axis, reverse scale)

1995-2018

Per cent, quarter-on-quarter, annualised   Per cent
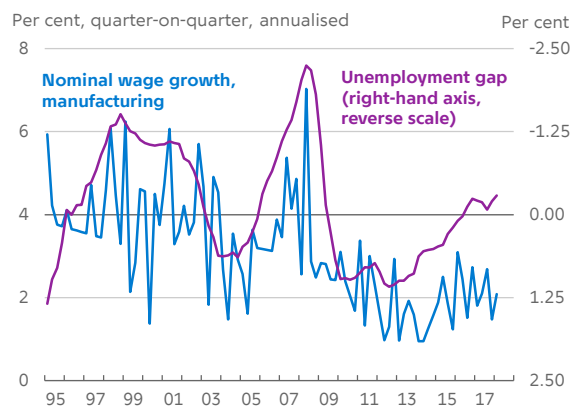
Note: Quarterly wage growth is seasonally adjusted. Wage growth in manufacturing. The pronounced fluctuations can be related to factors
        such as a number of changes in agreed working hours since late 1986. See Hansen and Storgaard (2011) for a historical review of wage
        developments in Denmark.
Source: Statistics Denmark and own calculations.

The simple Phillips curve is based on a number of restrictive assumptions, for instance about constant mark-ups. Part of the explanation for the lack of re-lationship between wage growth and labour market slack could also be that the level of unemployment is not the best measure of labour market slack. The sharp drop in unemployment in the 1990s coincided with a steep decrease in structural unemployment, i.e. the level of unemployment that is consistent with stable wage and price growth. Thus, the gap be-tween actual and structural unemployment, i.e. the unemployment gap, is a better measure of labour market slack. Quarterly wage growth seems to bet-ter reflect the unemployment gap than the level of unemployment, cf. Chart 4.[1] The momentum of wage growth picked up considerably with the sharp decline in the unemployment gap in the period 2005-07, subsequently falling back when actual unemployment again exceeded structural unemployment. In the years 2010-12, the unemployment gap was relatively flat, while the upswing in recent years has led to a new de-cline in the gap, and, by extension, increased labour market pressures. So far, nominal wage growth seems to have responded to a limited extent only.

Wage growth reflects the unemploy-ment gap to a greater extent   Chart 4

Per cent, quarter-on-quarter, annualised   Per cent

Nominal wage growth, manufacturing

Unemployment gap (right-hand axis, reverse scale)

Note: Quarterly wage growth is seasonally adjusted. Wage
        growth in manufacturing. The unemployment gap was
        estimated by Danmarks Nationalbank in the March 2018
        projection, cf. Danmarks Nationalbank (2018).
Source: Statistics Denmark, Danmarks Nationalbank and own
        calculations.

1   However, this reflects, to some extent, that structural unemployment
    is estimated based on real wage growth, cf. Danielsen et al. (2017).

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Estimated wage relation

Box 1

The estimated relationship is based on the wage relation of Danmarks Nationalbank's macroeconomic model, MONA. This relation has been developed over a number of years, cf. e.g. Knudsen (1992), Hansen (1998a) and Danmarks Nationalbank (2003). The estimation period is 2nd quarter 1975 to 1st quarter 2018, and seasonally adjusted quarterly series are applied. Given that the focus of this analysis is on current wage growth, the following relation for wage dynamics is estimated[1]

$$\Delta \log lna_t = \alpha + \beta_1 past\ infl._t + \beta_2 \Delta unempl_t + \beta_3 unempl_{t-1}$$
$$+ \beta_4 \Delta \log agreed\ working\ hours_t$$
$$+ \beta_5 replacement\ ratio_{t-1}$$

where lna is Statistics Denmark's manufacturing wage index, and $\Delta \log x$ denotes the quarterly change in the natural logarithm of the variable x. Past inflation, $past\ infl._t$, is an adaptive measure of short-term inflation expectations and compiled as in MONA, i.e. they reflect the adaptive inflation expectations of the previous quarter and the annual growth rate for the consumption deflator from the national accounts.

The wage relation is a simple Phillips curve extended to include adaptive inflation expectations as a further explanatory factor. Higher expected price growth leads to higher costs of living and thus higher wage demands from employees.[2] The quarterly change in unemployment, the average replacement ratio for unemployment benefits and agreed working hours are also included, for instance to explain wage growth in the mid-1980s.

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1. Storgaard (2011) estimates a cointegrated VAR model in which the long-run relationship is significant in the estimated relation. But the coefficient is numerically small, meaning that adjustment to the long-run equilibrium is not strong. See also Hansen et al. (2013).
2. Lipsey (1960) showed that a larger share of the fluctuations in the rate of wage growth could be explained by including inflation in the Phillips model. See also Friedman (1968) and Phelps (1968).
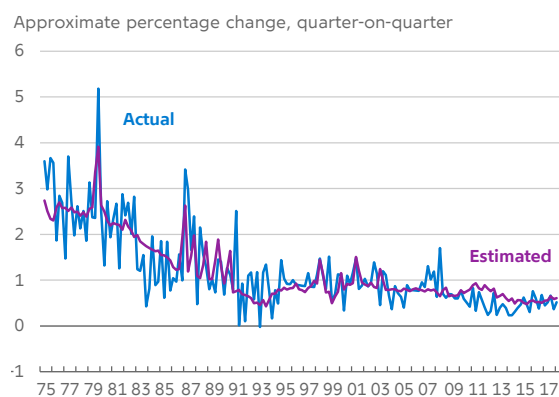

Can the wage growth of recent years be explained empirically?

This section examines to what extent the wage growth of recent years can be explained by macroeconomic factors such as labour market slack and consumer price inflation. The estimated equation for wage dynamics is described in more detail in Box 1. Estimated wage growth follows actual wage growth with an explanatory power of about 66 per cent, primarily due to first part of the period from the 2nd quarter of 1975 to the 1st quarter of 2018, which saw large fluctuations in quarterly wage growth, cf. Chart 5.

The estimated relationship performs less well after 1995, whether or not the first 20 years are included in the estimation period, cf. Chart 6. The explanatory power decreases to 28 per cent if the wage equation is estimated only for the period from the 1st quarter of 1995 to the 1st quarter of 2018. This should be seen in the context that the quarterly fluctuations in wage inflation have declined substantially from the period 1975-94.[2] The wage equation cannot explain the increase in wage growth during the overheating of the

Actual and estimated wage growth 1975-2018

Chart 5

Approximate percentage change, quarter-on-quarter

Note: The chart shows the quarterly change in the natural logarithm of the manufacturing wage index. See Box 1 for a specification of the estimated relation.
Source: Statistics Denmark and own calculations.

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2 Wage equations estimated based on annual data also have difficulties fully explaining the wage growth of recent years, cf. e.g. Knudsen (2017) on the wage equation in Statistics Denmark's model ADAM.

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Actual and estimated wage growth 1995-2018

Chart 6

Approximate percentage change, quarter-on-quarter

Note: The chart shows the quarterly change in the natural logarithm of the manufacturing wage index. See Box 1 for a specification of the estimated relation.

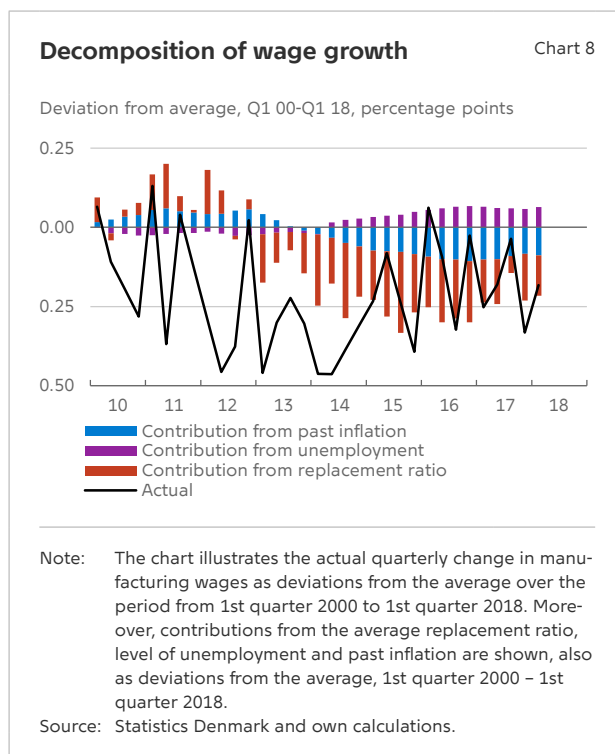Source: Statistics Denmark and own calculations.

Recursive estimation, coefficient on unemployment

Chart 7

Coefficient

Note: The chart shows the coefficient on unemployment from the previous quarter of a wage relation as described in Box 1, estimated recursively. The broken lines show the coefficient ± twice the standard error.

Source: Statistics Denmark and own calculations.

2000s, and, on the other hand, wage growth was over-estimated in the years immediately following the most recent financial crisis. Since 2015, the wage relation has not systematically overestimated wage growth.

As seen repeatedly, cf. for instance Hansen (1998b), an international discussion is currently ongoing about a possible flattening of the Phillips curve, i.e. a reduction of the marginal response of wage growth to changes in unemployment. There are no immediate indications of (an additional) flattening of the wage Phillips curve in Denmark in recent years, cf. Chart 7. But the estimated relationship between wage growth and unemployment is relatively weak. The final sections of this analysis discuss other possible causes of low nominal wage growth.

Chart 8 illustrates how, according to the estimated wage equation, key components have been contributing to wage inflation since 2010 compared with the average wage growth from 2000 onwards. Since 2013, a lower average replacement ratio for unemployment benefits and weak inflation have been contributing to low nominal wage growth. The decline in the average replacement ratio reflects that wages per employee have increased more than unemployment benefits per unemployment benefit recipient. Viewed in isolation, a lower replacement ratio will reduce employees' alternative to employment, which will exert a downward pressure on

Decomposition of wage growth

Chart 8

Deviation from average, Q1 00-Q1 18, percentage points

Contribution from past inflation
Contribution from unemployment
Contribution from replacement ratio
Actual

Note: The chart illustrates the actual quarterly change in manu-facturing wages as deviations from the average over the period from 1st quarter 2000 to 1st quarter 2018. More-over, contributions from the average replacement ratio, level of unemployment and past inflation are shown, also as deviations from the average, 1st quarter 2000 – 1st quarter 2018.

Source: Statistics Denmark and own calculations.

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wages in wage negotiations, cf. standard search models of the labour market as described in Pissarides (2000).

Viewed in isolation, unemployment developments have contributed to higher wage growth during the period from 2014 until today, while unemployment contributed (marginally) negatively during the period 2010-12. However, the decomposition should be interpreted with caution, given that the estimated contributions of explanatory variables are highly dependent on the estimation period chosen and the variables included in the estimation.
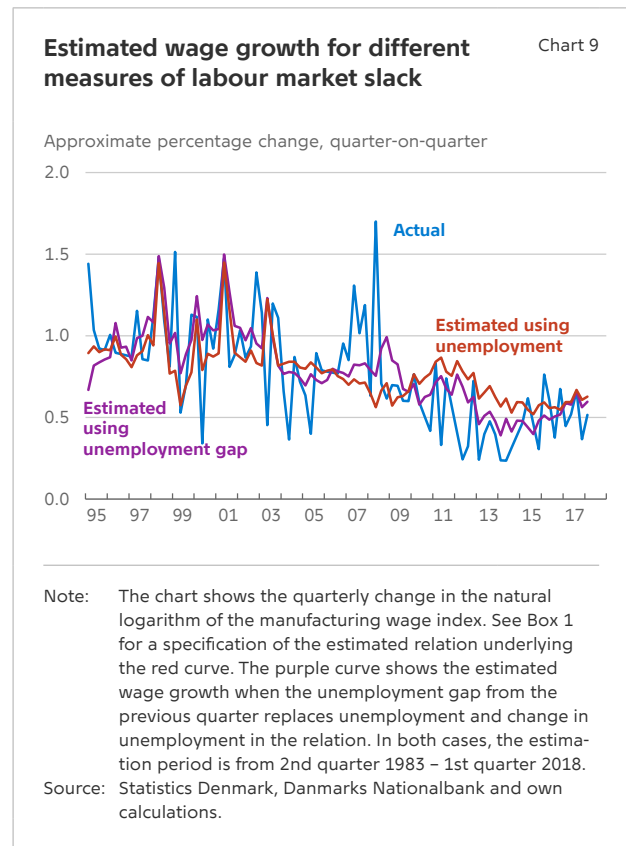
If the unemployment gap rather than the level of unemployment is used to measure labour market slack, the wage equation is better able to explain the wage growth of recent years, cf. Chart 9. However, wage growth during the overheating in the 2000s is not better explained by the unemployment gap, given the lagged response of the estimated relationship relative to actual wage growth.

Which measure of labour market slack best explains wage growth?
There are other measures of labour market slack than registered unemployment and the unemployment gap. The employment gap and Labour Force Survey, LFS, unemployment are best at explaining wage growth among the reviewed measures of labour market slack, cf. Chart 10. The employment gap combines the unemployment gap and the labour force gap, thereby – in contrast to the unemployment gap – allowing for inflows to and outflows from the labour force.

All measures of labour market slack contribute more to explaining wage growth when wage equations are estimated from 1999 onwards than when estimated all the way back to 1983. This reflects, inter alia, that the explanatory power of consumer price inflation is much lower in the short estimation period during which price inflation has been far more stable and inflation expectations better anchored.

The coincidence of low wage growth and low unemployment could also be due to the labour market being less tight than would immediately be indicated by the unemployment figures. Both in the USA and in the euro area, the focus has thus been on a broader measure of labour market slack, which includes people involuntarily employed on a part-time basis and people willing to work, but not actively seek-

| Estimated wage growth for different measures of labour market slack | Chart 9 |

Approximate percentage change, quarter-on-quarter

Note: The chart shows the quarterly change in the natural logarithm of the manufacturing wage index. See Box 1 for a specification of the estimated relation underlying the red curve. The purple curve shows the estimated wage growth when the unemployment gap from the previous quarter replaces unemployment and change in unemployment in the relation. In both cases, the estimation period is from 2nd quarter 1983 – 1st quarter 2018.

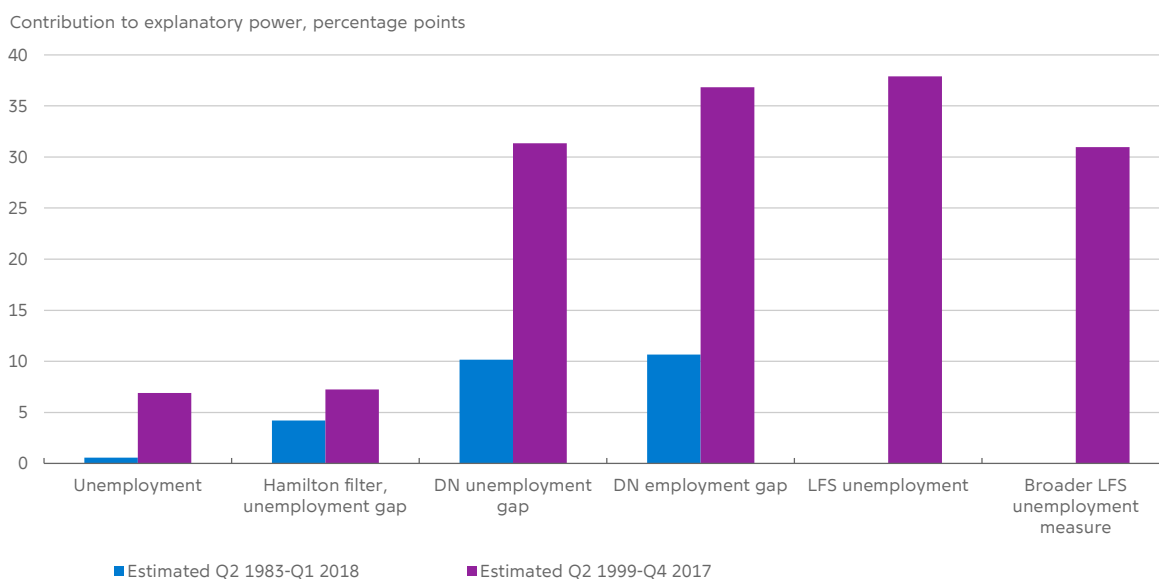Source: Statistics Denmark, Danmarks Nationalbank and own calculations.

ing jobs. The ECB (2017) argues that the euro area labour market is not as tight as indicated by official unemployment figures, which helps to explain the low nominal wage growth.

It is also possible to construct a similar measure of labour market slack based on the Danish LFS, cf. Chart 11. The broader measure of labour market slack is not better at explaining wage growth in manufacturing than LFS unemployment, cf. the last two columns of Chart 10. LFS unemployment explains wage growth better than registered (gross) unemployment, but should be interpreted with caution, given that LFS unemployment is survey-based and thus subject to greater statistical uncertainty and given that no attempt has been made to adjust for breaks in the LFS unemployment series. The outcome may reflect that LFS unemployment is a broader measure which includes groups of job seekers that are not captured by register-based unemployment concepts, but which could potentially impact wage formation. This applies, for instance, to students looking for jobs and self-supporting unemployed individuals. The employment gap (in principle) allows for these groups in the measure of the labour force gap, and this could be one

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Employment gap and LFS unemployment best explain wage growth

Chart 10

Contribution to explanatory power, percentage points

Note: The chart shows the contribution to the explanatory power, the partial R^2, for various measures of labour market slack. The contributions were identified by separate regressions as specified in Box 1 for each of the measures; the change in unemployment has been excluded. All measures of labour market slack are included with one lag. The Hamilton filter is described in more detail in Hamilton (2017). The broader LFS unemployment measure includes people involuntarily employed on a part-time basis and people willing to work, but not actively seeking jobs. Please note that no attempt has been made to adjust for breaks in the LFS unemployment series.

Source: Statistics Denmark, Eurostat, Danmarks Nationalbank and own calculations.

reason why the employment gap is better than the unemployment gap at explaining wage growth.

International factors play a significant role
In a small, open economy like Denmark, the international element in wage formation is strong, for instance in terms of measuring labour market slack and the potential influx of foreign labour.[3]

Structural factors such as immigration have been mentioned in the international debate. In Denmark, the number of foreign employees has been growing sharply since 2010, which may have helped to alleviate labour market pressures and thus curb wage growth, cf. Chart 12.

Broader measure of labour market slack

Chart 11

1,000 persons

Note: The number of people involuntarily employed on a part-time basis is based partly on an interpolation of annual data. Own seasonal adjustment.

Source: Eurostat and own calculations.

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3 According to Borio and Filardo (2007), price developments can be better explained if global factors, such as a global output gap, are taken into account. Especially for internationally traded products, global production and demand are determinants of price formation rather than country-specific production and demand.
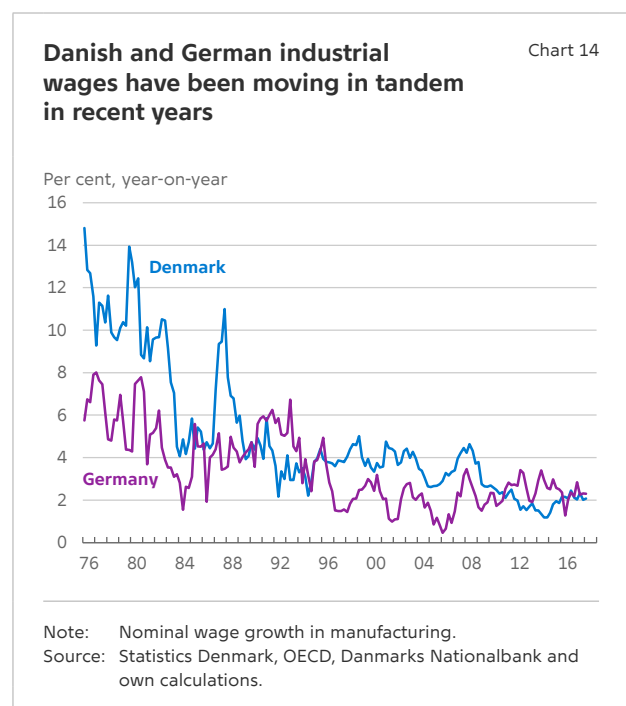
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Foreign employees   Chart 12

1,000 full-time employees

Note: Total number of full-time foreign nationals. Own seasonal
        adjustment.
Source: Jobindsats.dk.

**Unemployment has dropped
sharply in most foreign
employees' home countries**   Chart 13

Per cent

Note: EU11 covers Bulgaria, Croatia, the Czech Republic, Esto-
        nia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia
        and Slovenia. Unemployment (LFS) is presented here as
        a weighted average of these countries, relative to their
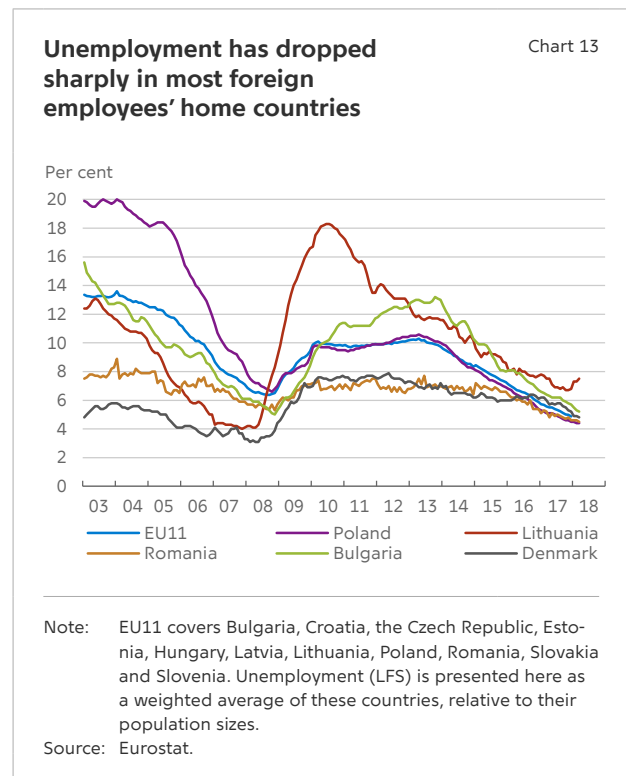   population sizes.
Source: Eurostat.

However, there are indications that it may become more difficult to attract foreign labour in the coming years. The home countries of foreign employees increasingly seem to be affected by capacity pressures. Unemployment has plunged in the home countries of many foreign employees – in some instances to levels below the Danish unemployment level (LFS measure), cf. Chart 13. Add to this that pressures in Denmark may be reinforced by competition from other countries attracting foreign labour. The wage level in Denmark remains well above those of most other countries.

Germany is Denmark's most important trading partner, and consequently wage growth in Germany plays a key role in the competitiveness of Danish firms. In recent years, Danish and German wages have been showing roughly the same trend, cf. Chart 14.

According to the German central bank, Deutsche Bundesbank, net immigration from other EU member states, subdued inflation and moderate productivity growth have contributed to dampening German wage growth in recent years, cf. Deutsche Bundesbank (2018). It is also emphasised that growing labour market competition following the expansion of global value chains has a dampening effect on wage growth, cf. Weidmann (2018) and Auer et al. (2017).

For Danish firms, trade with low-wage countries such as China is playing an increasingly important role,

**Danish and German industrial
wages have been moving in tandem
in recent years**   Chart 14

Per cent, year-on-year

Note: Nominal wage growth in manufacturing.
Source: Statistics Denmark, OECD, Danmarks Nationalbank and
        own calculations.

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especially taking global value chains into account, cf. Andersen et al. (2015). Viewed in isolation, this may have helped to contain wage growth in Denmark.

**Other possible explanations of
low nominal wage growth**
Weak productivity growth has been mentioned as a possible explanation of low nominal wage growth in a number of countries in recent years, cf. e.g. IMF (2017). However, it has not been possible to identify a significant relationship between quarterly wage growth and quarterly productivity growth using Danish data. This may reflect, to some extent, that quarterly productivity growth based on quarterly national accounts is noisy. But estimating a significant relationship between wages and productivity growth is difficult – even using annual data. This does not entail that there is no relationship between wages and productivity, but rather that the adjustment takes place gradually over time – making it difficult to identify empirically.

In the case of the USA, it has also been stated that lack of downward adjustment of wages in the wake of the financial crisis has been holding down subsequent wage growth, i.e. ″pent-up wage deflation″, cf. Yellen (2014). This is viewed as being less prevalent in Denmark, given that wages are relatively downward flexible compared with other countries, cf. e.g. Kristoffersen (2016).

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