

# CALCULATION OF OUTPUT GAP

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## INTRODUCTION AND SUMMARY

The output gap measures how far Danish output (measured by the gross domestic product, GDP) is from its structural level, corresponding to normal capacity utilisation in the economy. It is regarded as an overall indicator of the current cyclical position and therefore plays a prominent role in the planning of economic policy. For this reason, the output gap should be available as early as possible, but at the same time be calculated as accurately and reliably as possible.

Since 2011, Danmarks Nationalbank has estimated potential output and an output gap for the Danish economy, cf. Andersen and Rasmussen (2011). This article revisits the method in order to assess the reliability of the output gap as an indicator of the cyclical position. Revisions of the output gap have been modest in recent years, indicating that the method provides a relatively reliable view of the economy in real time. This is partly attributable to the fact that the method is linked to economic theory, which reduces the uncertainty associated with estimating unobserved variables.

The Danish Ministry of Finance, the Danish Economic Councils and Danmarks Nationalbank all estimate an output gap. The three institutions generally agree on the cyclical position of the Danish economy, including that there are still spare resources, and also on the recommendations for the economic policy direction. But the as-

sessments differ in terms of the amount of spare resources available. This is particularly the case for spare labour outside the labour force.

The estimation of the output gap will always be subject to uncertainty and should be interpreted with caution. The assessment of the cyclical position should not be based on the gaps alone. The available labour market indicators suggest that there is still some spare capacity in the Danish economy. But increasing wage growth and the survey indicator of labour shortage, among other factors, indicate that the situation in the labour market is gradually being normalised. At the same time, the employment potential may be smaller now than before, because the age composition of the labour force has changed. This supports Danmarks Nationalbank's assessment that the output gap is around -1.5 per cent of GDP this year and will narrow in the coming years.

## ESTIMATION OF THE OUTPUT GAP IS BASED ON THE PRODUCTION FACTORS

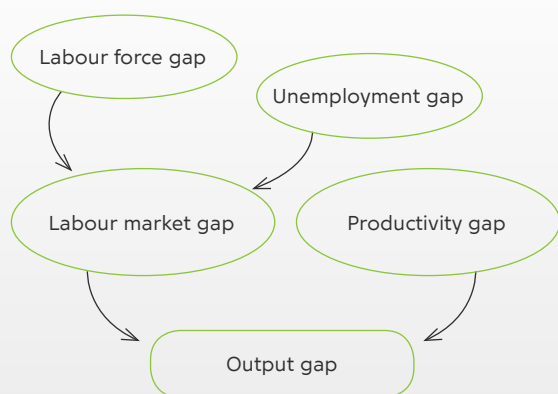
The calculation of the output gap is based on the production factors used in Danish output. For the sake of simplicity, two production factors are used, i.e. capital stock and labour. The capital stock is the buildings, machines and other equipment used in production, while labour is the number of people in employment.<sup>1</sup> In addition to the

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<sup>1</sup> As such, labour input should be the total number of hours. The estimation of the output gap takes this into account, cf. Box 1.

**The output gap is calculated on the basis of the gaps in labour and productivity**

Chart 1



two production factors, output is also determined by productivity, i.e. the efficiency of utilisation of the two factors.

In principle, the output gap is estimated by calculating separate gaps for the production factors and productivity, cf. Box 1. However, the calculations assume that the capital stock is always at its structural level, e.g. because adjustments to the capital stock at the aggregated level are typically slow, cf. Andersen and Rasmussen (2011). In practice, the output gap is therefore calculated on the basis of gaps in productivity (the TFP gap<sup>2</sup>) and labour (the labour market gap). The labour market gap reflects spare capacity both in the labour force (the unemployment gap) and outside the labour force (the labour force gap), cf. Chart 1. Overall, the various gaps are referred to as cyclical gaps in the following sections.

Several other economic institutions, e.g. the Danish Economic Councils, the Ministry of Finance, the OECD and the European Commission, also calculate an output gap for Denmark based on the production factors. But even though the basic approach is generally the same, the assessments of potential output and the output gap may still be relatively different. For example, in the assessments of Danmarks Nationalbank and the Danish Economic Councils, the boom in the 2000s was somewhat stronger than assessed by the Ministry of Finance, cf. Chart 2. Similarly, in the Danish Economic Councils' assessment, the

output gap is currently considerably larger than it is according to Danmarks Nationalbank and the Ministry of Finance.

Even though the strength of the economy (measured by the size of the output gap) varies according to the institutions, there is generally agreement on the sign, i.e. whether output is above or below its structural level.

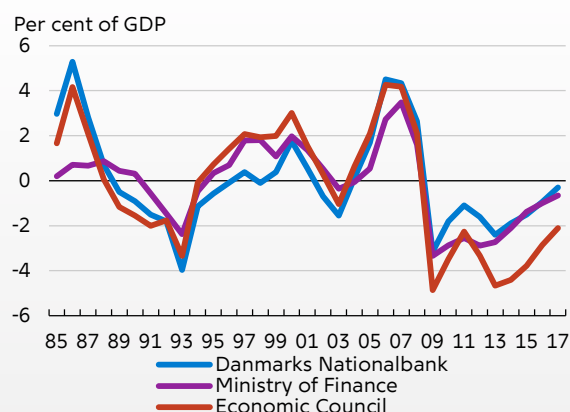
Recognising that the estimation of cyclical gaps in output and in the labour market is subject to considerable uncertainty is vital. While, in principle, it is possible to calculate uncertainty intervals for the individual gaps, the individual uncertainties cannot be directly combined into an overall uncertainty for e.g. the output gap. The uncertainty means that caution should be exercised in drawing firm conclusions about the exact size of the cyclical gaps.

## ASSESSMENT OF THE CYCLICAL POSITION OVER TIME

Overall, the cyclical gaps constitute an indicator of the cyclical position and against that background they play a fundamental role in the planning of economic policy. For this reason, it is important that the cyclical gaps can be estimated so that they are available as early as possible, but at the same time are estimated as accurately and reliably as possible. There is particular focus on the esti-

**Output gap estimates**

Chart 2



Note: The Ministry of Finance has a technical projection for 2017.

Source: Danish Economic Councils (October 2015), Ministry of Finance (September 2015) and own calculations.

2 See Box 1 for a description of TFP.

## Estimation of cyclical gaps

Box 1

The output, labour market and productivity gaps are referred to as cyclical gaps and reflect the difference between actual and structural levels. The structural levels reflect an unobserved, underlying potential from which the economy will not persistently deviate. If the economy deviates from its potential, there are forces that will bring it back. For example, if unemployment is below its structural level, shortages of labour may push up wages relative to productivity development. In time, this will have a negative impact on competitiveness and sales opportunities, thereby reducing output. Labour is adjusted to the lower output, and unemployment returns to the structural level.

The output gap, i.e. the difference between actual and structural unemployment, is composed of three gaps: the unemployment gap, the labour force gap and the TFP gap.

The unemployment gap reflects the spare capacity in the labour force, i.e. how much unemployment can fall without leading to unsustainable development in wages and prices. The development in wages and prices per se does not give an indication of labour market pressures, the reason being that in a longer perspective, growth in real wages will reflect labour productivity. Hence, the unemployment gap is estimated by using e.g. signals from the relative position and movement of real wages in relation to productivity. If real wages are substantially above productivity, and/or if growth in real wages exceeds productivity growth, this indicates that unemployment is below its structural level.

Information about the development in wages and prices is also included in the estimation of the labour force gap. In addition, Statistics Denmark's indicator of labour shortage is also used in the estimation. Together the unemployment gap and the labour force gap make up a labour market gap, which indicates how much employment can rise without causing wage and price pressures.

The total volume of labour input is also determined by the working hours of those in employment. It is difficult to identify cyclical fluctuations in working hours due to opposite cyclical effects. For example, many students will enter the labour market during booms, which will reduce the average number of working hours. On the other hand, the increased need for labour will push working hours up for full time employees. Moreover, calculation of the number of hours worked is subject to great uncertainty. Consequently, a specific working hours gap is not calculated. It is included in the estimated productivity gap instead.

Total factor productivity, TFP, is an overall expression of the production factors' utilisation efficiency in the production process. TFP captures the factors that contribute to increasing production, in addition to capital and labour, including any measuring errors in the calculations for capital and labour, respectively, and, as previously mentioned, also working hours.

For a complete review of the method, reference is made to Andersen and Rasmussen (2011).

mate of the current cyclical position when calculating the cyclical gaps, while the estimate of the output gap in earlier periods is less interesting for the planning of economic policy.

This section examines how the estimates of the cyclical position at various times have changed over time. This may give an indication of the accuracy of the first output gap estimates and hence their reliability.

### RELIABILITY IN REAL TIME

The estimates of the output gap are typically revised over time – often related to new information that has become available after the first estimation of the output gap. New information may include revision of data as well as new data covering an extra period and may contribute two things. On the one hand, it may present a new picture of cyclical pressures. On the other hand, it may constitute information about another structural level or potential growth than previously assumed.

One example of new information that may change the perception of the current pressure is price and wage developments that differ from pre-

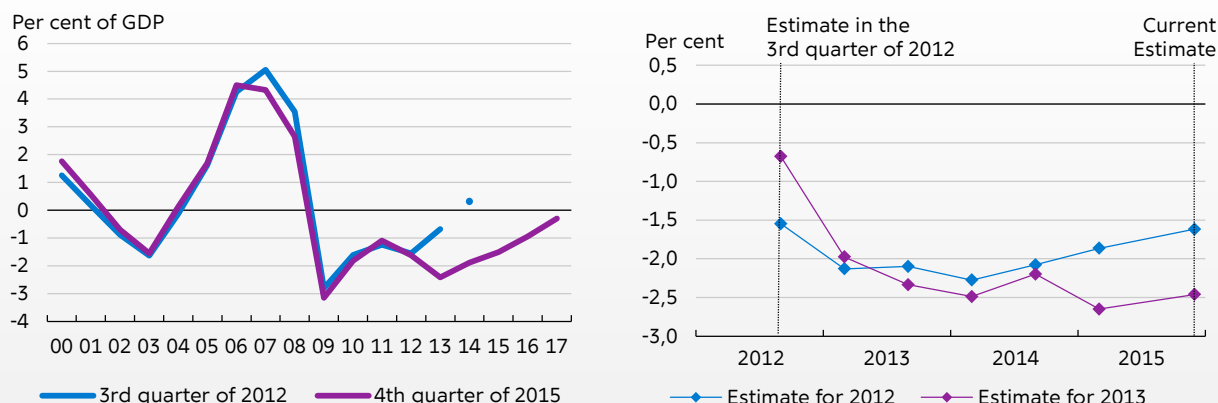
vious calculations. Since both price and wage developments are indicators of capacity utilisation in the economy, data revisions will point to a change in cyclical pressures. Weaker growth in GDP than expected and/or previously stated may also point to a change in cyclical pressures in the near term.

On the other hand, revisions of data that will not necessarily change the perception of cyclical pressures may present a different picture of the structures. For example, the major revision of the national accounts in 2014 did not generally contain new information on cyclical pressures, even though GDP growth was revised. This instead reflected e.g. that a number of definitions were changed, including that GDP now also contains output created through research and development. Basically, the revision does not reflect a different cyclical position, but a different definition of GDP and therefore also a different definition and calculation of structural GDP.

It can often be difficult to pinpoint whether new information reflects structural or cyclical changes. Hence, both the cyclical gaps and structural levels will typically be affected by new information in the estimation.

**Output gap estimates in selected Monetary Reviews**

Chart 3



Note: Left-hand chart: The output gap for 2014 from the 3rd quarter of 2012 has not been fully calculated. The dot indicates a technical projection. Right-hand chart: Time on the X axis denotes the time of forecast publication in the Monetary Review. For the sake of clarity, the output gaps are only shown in the 1st and 3rd quarters (and the 4th quarter for this Monetary Review).  
Source: Own calculations.

The revisions of Danmarks Nationalbank's output gaps have been limited in recent years. This is reflected in the fact that the output gap in the period 2000-12 is virtually the same in this Monetary Review as it was in e.g. the Monetary Review for the 3rd quarter of 2012, cf. Chart 3 (left). At that time, the output gap for 2012 was forecast at -1.5 per cent, and it has only been adjusted marginally to -1.6 per cent in this Monetary Review. This indicates that the original estimate in the 3rd quarter of 2012 for 2012 was fairly accurate. The assessments of the output gap for 2012 in the subsequent Monetary Reviews were not markedly different either, cf. Chart 3 (right).

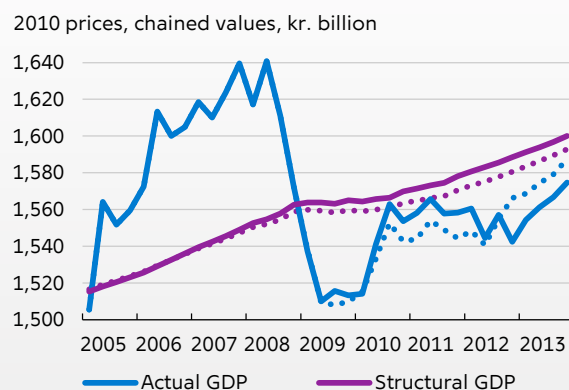
On the other hand, the assessment of 2013, which was part of the projection period in the 3rd quarter of 2012, changed considerably. The output gap was changed from -0.7 per cent to -2.0 per cent in the Monetary Review for the 1st quarter of 2013. The revision reflects exactly the two things that new information may contribute. Firstly, GDP was adjusted upwards in an intermediate publication from mid-2010 to early 2012, cf. Chart 4. The revision of the historical period does not present any immediate new picture of cyclical pressures during the period – for example, it does not affect the indicator of capacity utilisation in the industrial sector. Consequently, structural GDP has also been adjusted upwards. That revision enters the projection period and, viewed in

isolation, increases the output gap in 2013. At the same time, GDP growth is weaker than expected at the end of 2012. This shows that the economy is weaker than expected, so the forecast for GDP is adjusted downwards. Both of these factors contribute to the upward adjustment of the output gap.

**Actual and structural GDP**

Chart 4

The dotted lines indicate the Monetary Review for the 3rd quarter of 2012, while the solid lines indicate the 1st quarter of 2013



Source: Own calculations.

## END-POINT DEPENDENCY

Econometric methods tend to place great emphasis on observations at the end of the estimation period, so the result may be affected by changes in the outlook, since the projection period is part of the estimation. This is the “end-point problem”, which is a well-known issue when attempting to determine unobserved variables.

The end-point problem can be illustrated by a negative change in the growth outlook abroad. Typically, this will also be reflected in lower expected growth in Denmark during the projection period due to lower foreign demand. Lower growth abroad as such does not reflect weaker structures in the Danish economy, so such downward adjustments will typically be an indication of a temporary, cyclically determined deterioration expressed by a widening of the output gap. Nevertheless, structural output may also be affected in the estimation, because the end point has changed.

The end-point problem cannot be completely avoided. Even though the method to estimate potential output is rooted in economic theory, it is unable to distinguish clearly between supply and demand shocks.<sup>3</sup> However, statistical models based on economic theory contexts contribute to reducing end-point dependency. One reason is that the estimation is based on indicators containing information on cyclical pressures during the projection period.

In practice, a change in the growth pattern will therefore typically affect both potential output and the output gap – even if the change is attributable to a change in demand. This characteristic can be quite useful: In the light of the uncertainty associated with the estimation, it may also reflect that the original assumption about the structures was too optimistic or pessimistic.

But the method may be affected too greatly by the actual time series, e.g. if a change in the growth pattern is fully reflected in the output potential. While the method to estimate output gaps is end-point dependent, it is not dependent to such an extent that it will change the overall picture of the current cyclical position, cf. Box 2.

## ABOUT THE EVALUATION OF OUTPUT GAPS

In principle, it is not possible to calculate the reliability of the output gaps, as the true value can never be known. Revisions of the output gaps may, for example, reflect both new information (indicating a different gap) and uncertainty, reflecting the (in)accuracy of the method. It is therefore not in itself a success criterion that the first assessment of the output gap is not subsequently revised. In fact this may indicate that the method is too rigid and that new information presenting a new picture of the cyclical position is not included in the assessment. The output gaps should therefore be seen against the backdrop of other cyclical indicators and preferably correspond to these.

On the other hand, major, frequent revisions may also indicate that the method is unable to capture the cyclical position sufficiently in real time, e.g. because the end point has too much of an impact on the method. At the same time, major, frequent revisions make it difficult to apply the output gaps when planning economic policy.

## SPARE CAPACITY OUTSIDE THE LABOUR MARKET

The overall output potential is linked to e.g. employment. As a consequence, output and prosperity in Denmark depend crucially on how many people will return to the labour force in the coming years as the cyclical position normalises.

In the mid-2000s, the labour market showed clear signs of overheating with excessive wage increases relative to productivity development and a very high level of capacity utilisation. The cyclical reversal of employment in those years was characterised by strong fluctuation in the labour force and not just unemployment, which had primarily been the case previously.

The structural labour force is estimated on the basis of the participation rate, i.e. the number of persons aged 16-66 in the labour force. The difference between the actual and structural participation rates is currently assessed at -0.8 per cent,

<sup>3</sup> Firstly, this would require that the impact on the signal from the wage share used in the estimation of the unemployment gap and the other indicators included in the estimation strictly corresponds to the model parameters. Moreover, the built-in smoothing of the statistical filter would prevent such a distinction.

## End-point dependency of the method

Box 2

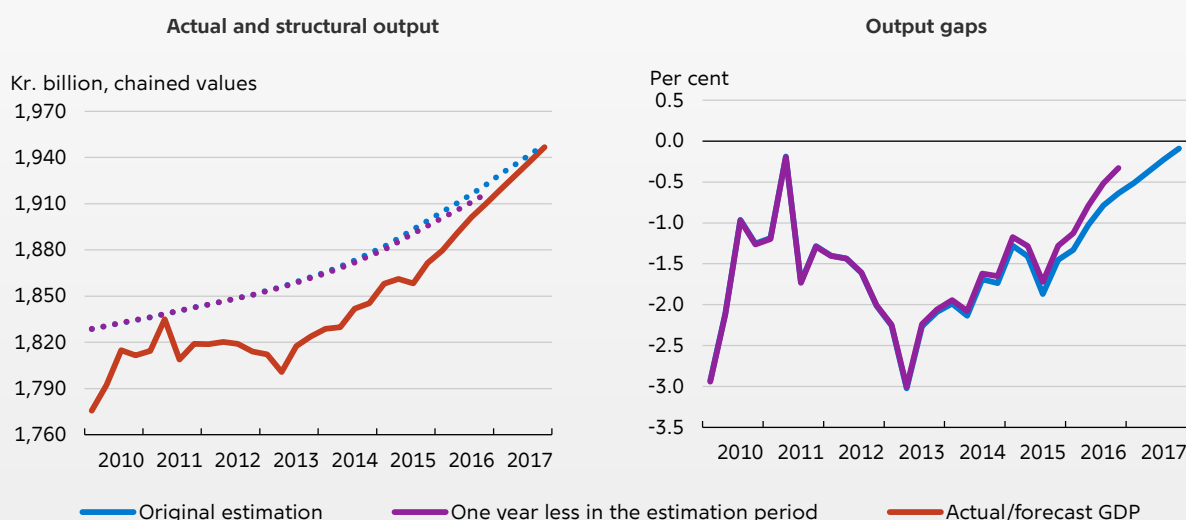
The end-point dependency can be assessed by mapping the properties of the method when adding an extra year to the projection period. This corresponds to estimating the output gap until and including 2016 and 2017, respectively, for the business cycle of this projection.

The Danish economy is projected to be close to normal in 2017. In principle, the year 2017 in the projection does not contribute new information about the preceding years, so, to all intents and purposes, potential output and the output gap should not be affected by the extra year in the projection.

The calculations show that potential output and the output gap are affected fairly evenly by the extra year, but to a relatively limited extent, cf. the charts below. Therefore, the overall perception of the economy is unchanged.

However, the attempt illustrates that the calculation of potential output and potential growth is subject to uncertainty, and that potential growth in the last projection year does not necessarily reflect potential growth in the medium and long term.

## Actual and structural output and output gaps



Note: Left-hand chart: Dotted lines indicate potential output.  
Source: Statistics Denmark and own calculations.

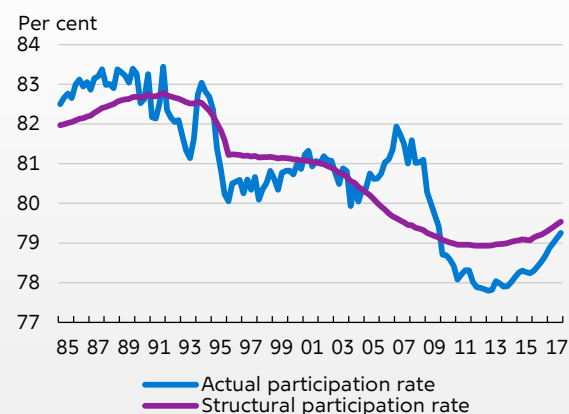
cf. Chart 5. This corresponds to a scope for employment of around 30,000 persons in the group of people outside the labour force.

Danmarks Nationalbank, the Ministry of Finance and the Danish Economic Councils have different assessments of the development in the structural labour force. While the Ministry of Finance and the Danish Economic Councils find that it increased from 2003 to 2013, it is virtually unchanged for the period as a whole according to Danmarks Nationalbank's forecast, cf. Chart 6.

The current cyclical gap in the labour force is primarily attributable to students, people receiving cash benefits, foreign employees and self-supporting individuals. These are among the groups outside the labour force, who can be assumed to be most closely attached to the labour market.

## Actual and structural participation rate

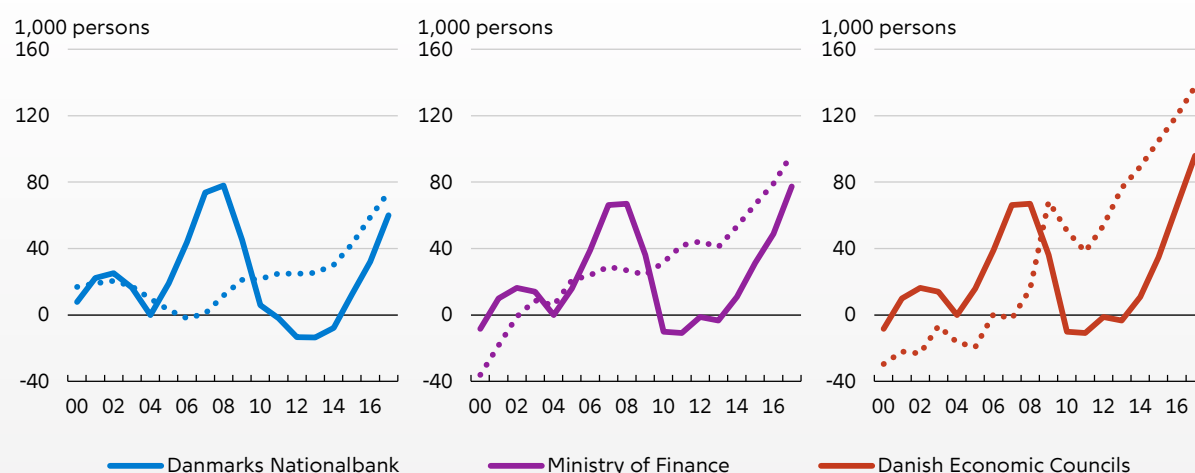
Chart 5



Source: Own calculations.

**Actual and structural labour force (actual labour force equals 0 in 2004)**

Chart 6



Note: The solid lines indicate actual labour force, while the dotted lines indicate structural labour force. The institutions use different definitions of the labour force, and for the sake of comparability they have been set at 0 in 2004. Danmarks Nationalbank calculates the labour force as the sum of employment and gross unemployment less people in subsidised employment who are included in both. The Ministry of Finance and the Danish Economic Councils calculate the labour force as the sum of employment and net unemployment. Hence, unemployed people in activation, who are not in subsidised employment, are included in Danmarks Nationalbank's labour force definition, while they are outside the labour force in the calculations by the Ministry of Finance and the Danish Economic Councils. The different definitions are of no significance to the assessment of the total number of spare resources in the labour market. Danmarks Nationalbank's calculations are based on the most recent national accounts, in which employment was adjusted downwards to between 5,000 and 9,000 people from 2012 to 2015. For the Ministry of Finance, a technical projection is applied in 2017.

Source: Ministry of Finance (September 2015), Danish Economic Councils (October 2015) and own calculations.

The next sections describe the development in the structural labour force on the basis of demographic factors and groups outside the labour force.

### CHANGING AGE COMPOSITION AFFECTS THE OVERALL PARTICIPATION RATE

The decline in the participation rate in 2008-09 is not only cyclically, but also structurally determined. The changing age composition since the mid-2000s has played a role in this respect.<sup>4</sup> One reason is the varied attachment to the labour market of the individual age groups, meaning that the age distribution in the labour market all things equal also affects the overall participation rate.

The decline in the participation rate applied to all age groups, except the 60-66-year-olds, whose participation rate has more or less continued to rise since the late 1990s. But the decline is particularly pronounced for the 16-29-year-olds, cf. Chart 7. This mainly reflects an increased intake

of students and that fewer students have student jobs due to the weak economy, cf. below.

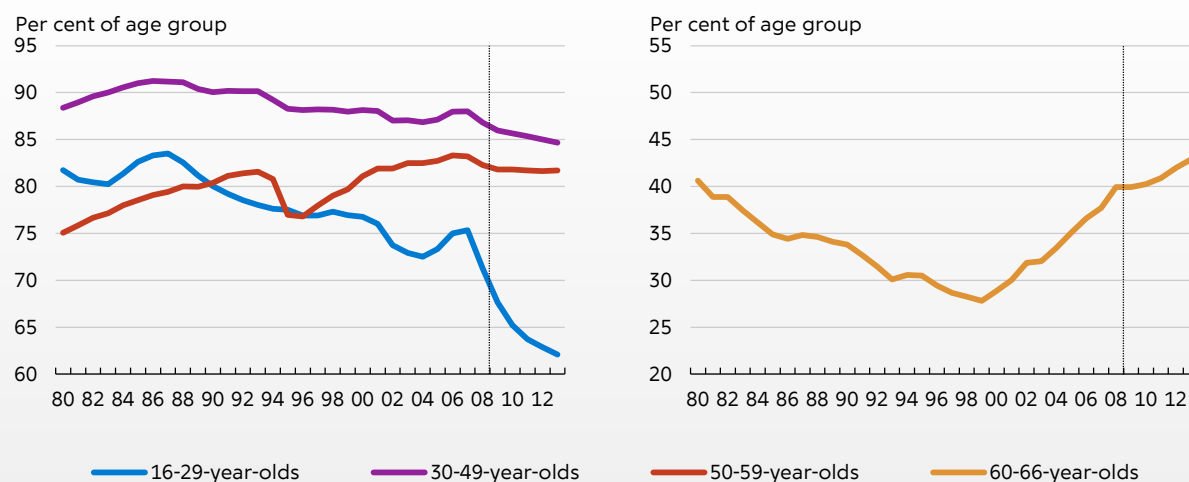
The age composition of the labour force has changed a good deal from the mid-2000s until today. The share of 60-66-year-olds among people aged 16-66 rose during the period 2003-08, cf. Chart 8 (left). The 60-66-year-olds have less attachment to the labour market than the other groups. But since the participation rate of that age group rose during this period, the 60-66-year-olds have actually contributed to increasing the participation rate overall, cf. Chart 8 (right). On the other hand, the number of people aged 30-49, who have the highest participation rate, has declined since 2003, meaning that the overall demographic development has reduced the structural labour force over the crisis years. Viewed in isolation, the participation rate may be reduced by around 1.5 percentage points due to changes in the age composition of the population.

<sup>4</sup> In addition, 2008 and 2009 in the statistics are subject to data breaks, with a downside effect on the employment level according to Statistics Denmark.



Participation rate for selected age groups

Chart 7



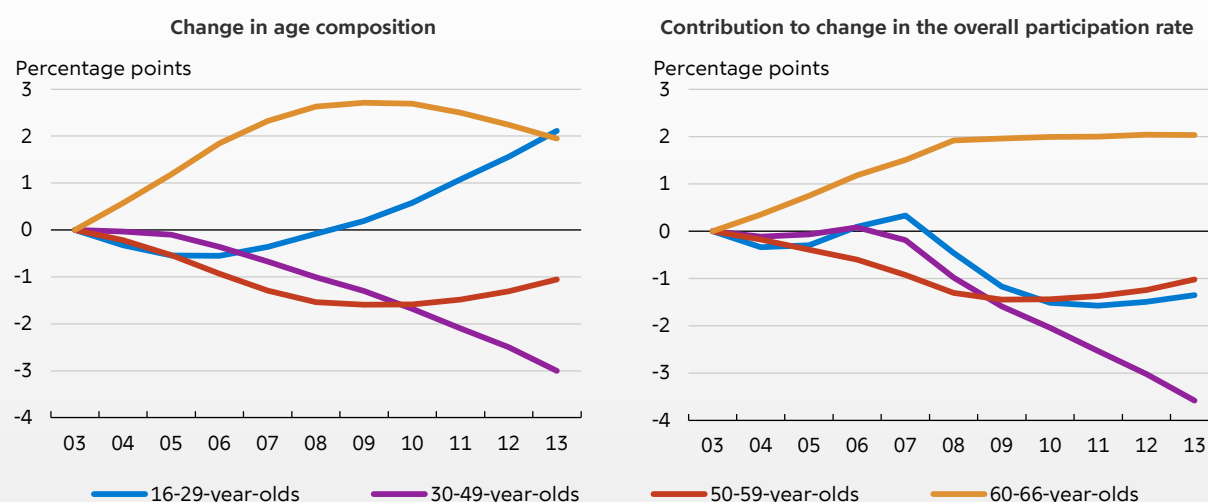
Note: Data from the register-based labour force statistics. Data break between 2008 and 2009.  
Source: Statistics Denmark and own calculations.

Demographics thus play a role in the development of the labour market structures. Danmarks Nationalbank estimates the structural participation rate for persons aged 16-66 where the share of 60-66-year-olds is used as an explanatory variable. The purpose of the variable is to capture the effects of the lesser attachment of 60-66-year-olds to the labour market and, viewed in isolation,

it reduces the structural participation rate when the share of 60-66-year-olds increases, cf. Andersen and Rasmussen (2011). In light of the fact that older age groups increasingly remain on the labour market, e.g. as a result of the reforms on later retirement, it may be appropriate to explicitly allow for demographic shifts in the estimation of the structural labour force.

Change in age composition and contribution to change in the overall participation rate since 2003

Chart 8



Note: Left-hand chart: Changes in the age group's share of the 16-66-year-olds. The sum of the lines is therefore 0 every year. Right-hand chart: The lines add up every year to the change in the aggregated participation rate since 2003.  
Source: Statistics Denmark and own calculations.



## STUDENTS

Students played a large role in the most recent reversal of employment. Students only appear in the labour force when they are in employment, the reason being that students are rarely insured against unemployment and therefore withdraw from the labour force when their employment comes to an end. Students who are not in employment consequently constitute a potential labour reserve outside the labour force and are included in the labour force gap.

The share of people of working age who are students has increased considerably since the 1980s, cf. Chart 9 (left). This development reflects that young people are increasingly taking an education and that they are studying for longer periods of time, cf. Chart 9 (right). In addition, a growing share of 16-29-year-olds among people of working age has contributed to the development since 2007. Viewed in isolation, the larger share of students reduces the spare capacity in the labour force, while the potential outside the labour force increases.

Students have also to a large extent found jobs alongside their studies and constituted a growing share of total employment in Denmark. The share of students who find jobs is subject to substantial cyclical fluctuations, and the downturn in 2008 significantly affected young people with student jobs. As the number of students has risen and the share of students in employment has fallen in recent

years, students could make up a considerable labour reserve. Their employment potential may be limited, however, due to a number of factors, including the so-called “progress reform”, the purpose of which is to reduce students’ period of study and ensure that they study full time. The limited potential is supported by the labour-force survey (AKU), according to which the number of students actively looking for a job is only approximately 15,000 above the average in 2007-08, at the peak of the upswing. Moreover, students mainly have jobs with reduced working hours.

## CASH BENEFIT RECIPIENTS

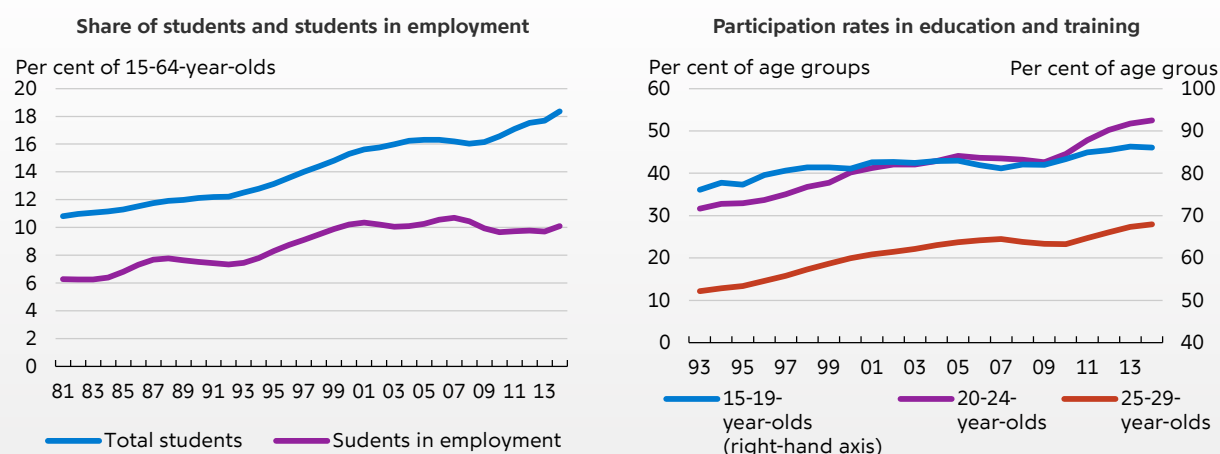
The number of cash benefit recipients varies with the cyclical position, because cash benefits for some people serve as income replacement for people without unemployment insurance. These people are required to be available for work and are therefore included in unemployment (and thus in the labour force).

But not all cash benefit recipients are available for work. In principle, these people should not be affected by cyclical changes, but the group shows a fairly clear cyclical trend in the period from 2004 to today, cf. Chart 10.

Therefore it is remarkable that the number of cash benefit recipients who are not ready to take a job continues to grow despite the fact that the labour market is picking up, employment is rising and unemployment is falling. This may indicate

Students and participation rate for selected age groups

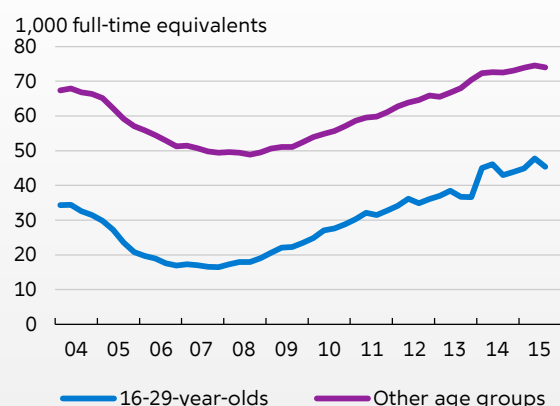
Chart 9



Source: Statistics Denmark.

**Cash benefit recipients  
(excluding those in activation),  
not ready to work**

Chart 10



Note: The figures includes people ready for education ("uddannelseshjælp") and also covers an unspecified visitation category.

Source: Jobindsats.dk.

that the development is more structural in nature and that, for this reason, they cannot be expected to return to employment in the near term. The development indicates that the cyclical contribution from cash benefit recipients to the labour force gap may be limited. For young people, however, the recent reform of the cash benefit system will contribute to more young people

under 30 starting an education or getting a job than before.

## FOREIGN LABOUR AND CROSS-BORDER WORKERS

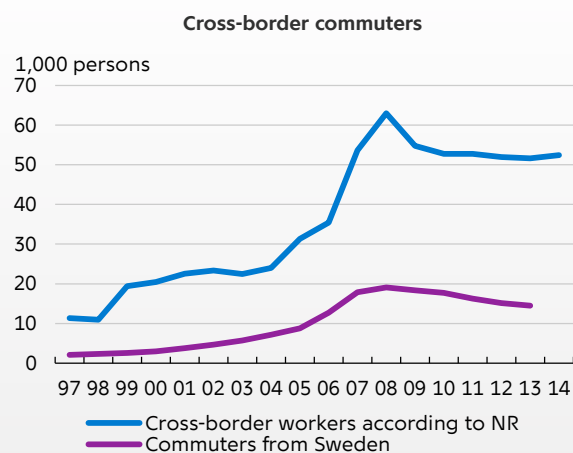
The freedom of movement for workers in the EU gives Danish firms access to a considerable reserve of foreign labour. This reserve increased markedly with the EU enlargements to include Eastern European member states in 2004 and 2007.

The mobility of labour among foreign employees turned out to be relatively high during the most recent boom. The influx of foreign employees contributed to easing the labour market pressure and they helped support the upswing. Recent developments in the labour market indicate that the mobility of foreign labour continues to be high, cf. Danielsen and Jørgensen (2015). In recent years, foreign employees have thus contributed to boosting employment in a period when the number of Danish citizens of working age declined.

The employment potential is not only made up of people who move to Denmark. People living outside Denmark may also contribute to Danish employment. The number of cross-border commuters has increased substantially since 2004, cf. Chart 11 (left). Part of the increase may reflect Danes who have moved to Sweden, but kept their jobs in Denmark. They should not be regarded as a structural contribution to employment in Denmark.

**Cross-border commuters and unemployment gaps in neighbouring countries**

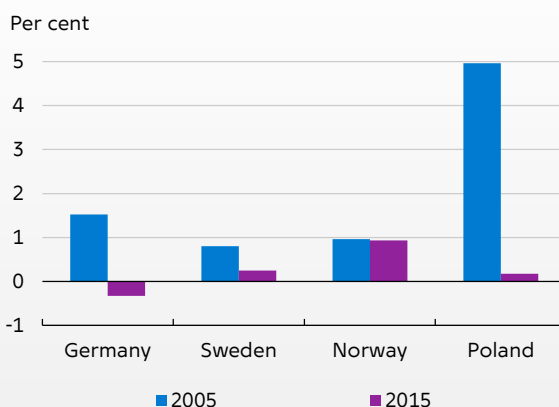
Chart 11



Note: The method and the definition of unemployment in the OECD's calculation of the unemployment gap both deviate from those used by Danmarks Nationalbank.

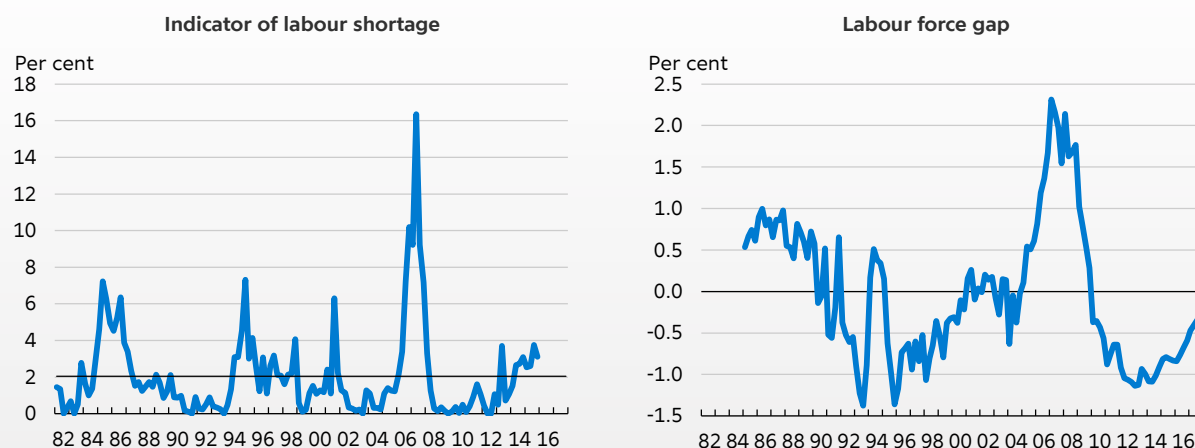
Source: Statistics Denmark, Ørestat and OECD.

**Unemployment gaps in neighbouring countries (OECD)**



Indicator of labour shortage in the industrial sector and the labour force gap

Chart 12



Note: The labour force gap is stated as the gap in the participation rate. Left-hand chart: The black line indicates averages over the period.  
Source: Statistics Denmark and own calculations.

While the potential influx of foreign labour affects spare capacity outside the labour force, it may also contribute to improving labour force structures. By easing wage pressures at a given unemployment rate, the foreign labour reserve may have contributed to the decline in structural unemployment over the last 10 years.

Assessing the extent to which the foreign labour reserve will contribute to boosting employment in the coming years is difficult. It depends on a large number of factors, such as wage and working conditions in competing labour markets, including the cyclical position in other countries, and the institutions, cultural and language barriers, etc. of the various labour markets. These factors can be hard to model, so it is difficult to determine the exact contribution from foreign labour.

There are indications that the influx of foreign labour will not be able to support a new economic recovery to the same extent as before. The situation in the competing labour markets, measured by the unemployment gap, shows that the current demand for labour has increased compared with the mid-2000s, cf. Chart 11 (right), especially in Germany and Poland, but also in Sweden.

#### INDICATOR OF LABOUR SHORTAGE

One of the key indicators used in the method to estimate the structural labour force and the labour force gap is the survey-based labour

shortage in the industrial sector. The indicator measures the extent to which recruitment problems are an impediment to production and shows an extraordinarily large shortage of labour during the boom in the mid-2000s, cf. Chart 12 (left).

The indicator is one-sided in the sense that it measures only the strength of the labour shortage and not the opposite situation with no shortage of labour. This may involve a risk of the estimation overestimating the strength of upswings and similarly underestimating the strength of downturns – even though the labour force gap averages zero over the period.

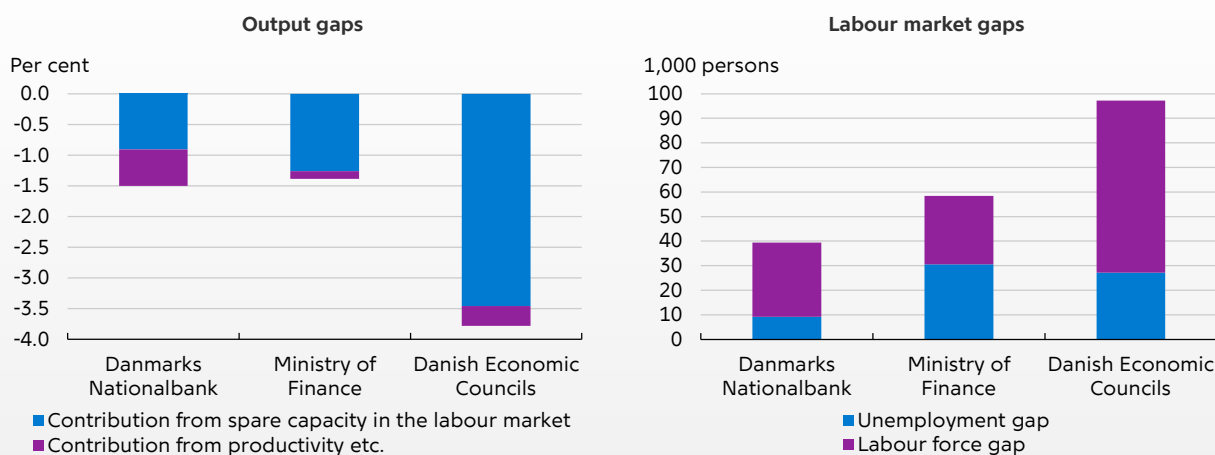
This indicator is not the only signal of the labour force gap, however. Wage pressures are also included in the estimation of the gap and help identify negative gaps in periods of economic slowdown, e.g. from around 2009 and ahead, cf. chart 12 (right). The strong overheating before that time also reflects that the structural participation rate was reduced somewhat at the same time due to changes in the age composition of the labour force, cf. above.

#### OTHER INSTITUTIONS' ASSESSMENTS OF POTENTIAL OUTPUT IN DENMARK

Danmarks Nationalbank, the Ministry of Finance and the Danish Economic Councils currently

Output and labour market gaps in 2015

Chart 13



Note: Left-hand chart: A positive figure indicates that actual output is above its structural level. Productivity refers to total factor productivity (TFP) in the calculations of the Ministry of Finance and Danmarks Nationalbank, and output per employee in the Danish Economic Councils' calculations. Right-hand chart: Danmarks Nationalbank and the Ministry of Finance apply gross unemployment in their unemployment gaps, whereas the Danish Economic Councils apply net unemployment.

Source: Ministry of Finance (September 2015), Danish Economic Councils (October 2015) and own calculations.

have different assessments of the size of output gap. Danmarks Nationalbank and the Ministry of Finance both forecast the output gap in 2015 to be around -1.5 per cent, but with different breakdowns on productivity and labour market gaps. In the Danish Economic Councils' assessment, the output gap is larger, i.e. just over -3.5 per cent, cf. Chart 13 (left).

Overall, the different assessments reflect different methods, data and forecasts. The Ministry of Finance estimates on e.g. gross value added, GVA, excluding raw materials extraction, while Danmarks Nationalbank estimates on GDP. The Ministry of Finance's model is particularly linked to the gaps by explicitly modelling the productivity gap, while parts of the models of Danmarks Nationalbank and the Danish Economic Councils aim to determine the structural levels.

The differences between the three institutions' assessments of spare resources in the labour market are particularly pronounced, cf. Chart 13 (right). Danmarks Nationalbank forecasts the labour market gap to be just under 40,000 per-

sons in 2015. Of this, 10,000 persons may come from gross unemployment, while approximately 30,000 persons may enter the labour force. In the assessments of both the Ministry of Finance and the Danish Economic Councils, more people can find employment from unemployment and from outside the labour force.

The Ministry of Finance estimates that approximately 60,000 persons may find employment without this leading to general pressures on the labour market. Around half of these persons can come from gross unemployment, which is a somewhat higher number than in Danmarks Nationalbank's forecast. The difference reflects that the structural unemployment estimate of the Ministry of Finance is lower than that of Danmarks Nationalbank.

In the assessment of the Danish Economic Councils, the volume of spare capacity in the labour market is considerably higher, especially outside the labour force. The labour market gap is forecast at 97,000, of which most can be attributed to the labour force gap<sup>5</sup> of 70,000 persons. The

5 While the Danish Economic Councils' labour force gap comprises people in activation, they are instead included in the unemployment gap for Danmarks Nationalbank, cf. the note to Chart 6. This explains a small part of the difference in relation to Danmarks Nationalbank's labour force gap, but it cannot explain the difference in the labour market gap.

labour force gap is made up mainly by students and a residual group, including self-supporting individuals and cross-border workers as well as statistical discrepancy. Together the residual group and students make up approximately 55,000 persons of the Danish Economic Councils' gaps in 2015, cf. Andersen and Linaa (2015).

Unlike Danmarks Nationalbank and the Ministry of Finance, the Danish Economic Councils' estimate is based on the population and the groups outside the labour force rather than the labour force itself. The Danish Economic Councils thus estimate a structural level and a cyclical contribution from a number of the groups outside the labour market, including statistical discrepancy, and the structural labour force is achieved by deducting the structural levels of the groups outside the labour market from the population, which can be regarded as structural.

Estimations of output gaps are always subject to uncertainty, so in the assessment of the cyclical position, the gaps should be interpreted with caution and not stand alone. According to a number of indicators, there is currently some spare capacity in the Danish economy, cf. Danielsen and Jørgensen (2015). But they also indicate that the situation in the labour market is gradually being normalised. Nominal wage growth is increasing, albeit still from a low level, while real wages are rising substantially due to the low rate of inflation. The indicator of labour shortage is increasing and currently on a par with the second half of the 1990s and the mid-2000s, and capacity utilisation in the industrial sector is close to its historical average. This is consistent with Danmarks Nationalbank's assessment that the output gap is around -1.5 per cent of GDP this year and will narrow in the coming years.

## LITERATURE

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