Staff memo

Labour supply has increased surprisingly rapidly

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A staff memo provides members of the Riksbank's staff with the opportunity to publish slightly longer, advanced analyses of relevant issues. It is a publication for civil servants that is free of policy conclusions and individual standpoints on current policy issues. Staff memos are approved by the appropriate Head of Department.

This memo has been produced by staff at the Forecasting Division in the Monetary Policy Department. The division is tasked with producing forecasts for economic developments. These assessments are then used as a basis for the monetary policy decision. The aim of this staff memo is to describe how the labour force has developed since 2006 and present a few feasible explanations for why the development has been underestimated.

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Summary

The development of the labour force is an important part of the assessment of the economy's long-term potential output and is therefore also significant for the development of inflation and for monetary policy. Labour supply, i.e. the number of persons available to the labour market, has risen rapidly in recent years. In 2016, just over half a million more people in the 15-74 age group participated in the labour force compared to ten years earlier, and labour force participation has now risen to a very high level. An increased labour supply is positive as it means that more people can find work and that output can increase without the risk of the economy overheating. At the same time, this is a development that has surprised both the Riksbank and other analysts.

Like many others, the Riksbank uses Statistics Sweden's population projections to generate longer-term forecasts. These forecasts have been continually revised upwards during much of the period, especially since the number of migrants coming into the country has been greater than expected. The Riksbank's forecasting error can therefore be partly explained by a more rapid increase in the working-age population than has been forecast during the period.

However, the main explanation for why labour supply has been underestimated is because the Riksbank has failed to identify the strength of the upturn in labour force participation, i.e. the proportion of the working-age population that participates in the labour force. The upturn has occurred among both Swedish-born and foreign-born persons. The increase among Swedish-born has mainly occurred among older persons. There are also factors pointing to a further rise in labour force participation among older persons in the period ahead.

There are several possible explanations for why labour force participation has been underestimated. One is that the effects of implemented reforms of economic policy have been greater than previously assumed by the Riksbank. Another possible explanation is that the labor supply has been affected by other structural changes that the Riksbank has not take sufficiently into account. However, the impact of the cyclical situation during this period is deemed to be limited.

Labour supply has increased surprisingly rapidly

Caroline Flodberg and Mårten Löf[1]
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Resource utilisation in the economy is an important factor when the Riksbank is to assess the development of inflation in the years ahead. Long-term potential output is therefore of considerable significance for monetary policy.

How quickly the working-age population grows and what proportion of it can and wants to work are the main determinants of labour force growth. Hence, population growth is an important factor in the assessment of potential output in the economy. Like several other analysts, the Riksbank uses Statistics Sweden's population projections as an important basis in order to assess the long-term development of labour supply. In addition, assessment are also made of behavioural changes, for example as a result of changed economic policy.

Like other analysts, the Riksbank has for many years been surprised by the strong development in labour supply, i.e. the number of persons available to the labour market. One reason for underestimating supply in the forecasts is a faster-than forecast increase in the working-age population, primarily as a result of a long period of unexpectedly high migration into the country. Labour supply has increased surprisingly rapidly, however, even considering the growth in the population. This is because labour force participation has also risen more than expected. A possible explanation for the surprisingly high labour force participation is that the effects of changed regulations and reforms on the labour market, including the new pension system, the earned income tax credit and changes in unemployment and sickness insurance, may have been underestimated.

This staff memo describes the Riksbank's labour force forecasts. In addition, a few possible explanations for why the development has been underestimated are presented. An unexpectedly strong upturn in the labour force also affects other variables in the economy, such as employment, unemployment and wages. However, this staff memo is limited to a more descriptive analysis of the increased labour supply. An evaluation of labour force forecasts during the period 2006-2016 can be found in the Appendix.

Labour supply has surprised on the upside

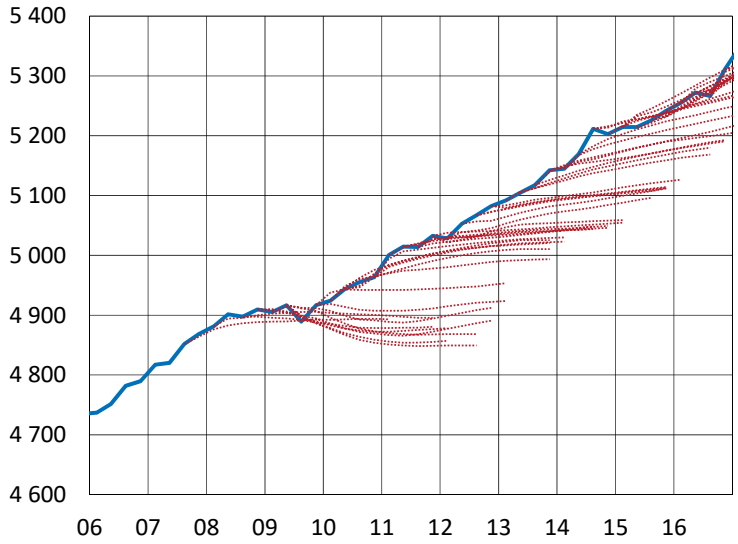
The labour force has increased at a rapid rate in recent years and in an international perspective, labour force participation in Sweden is on a very high level, especially among women. During the period 2006–2016, the number of persons in the labour force in the 15-74 age group has increased by just over half a million, which is a rise of more than 1 per cent per year on average. At the same time,

[1] We would like to thank Mattias Erlandsson, Jesper Johansson, Jesper Hansson, Åsa Olli Segendorf, Maria Sjödin and Anders Vredin for their valuable comments on earlier drafts. The opinions expressed in this staff memo are those of the authors and are not to be seen as the Riksbank's standpoint.

labour force participation, i.e. the proportion of the working-age population that participates in the labour force, has increased by almost 1.3 percentage points. This is a development that has surprised many analysts. The upturn in the number of persons in the labour force is mainly due to the addition of 400,000 foreign-born persons during the period. The fact that it is mainly the labour force among foreign-born persons that has increased is mainly a natural consequence of this group growing as a proportion of the working-age population. Greater labour supply is positive as it means that more people can find work and that output can increase without the risk of the economy overheating.

Figure 1 below shows the Riksbank's forecasts for the number of persons in the labour force in the 15-74 age group during the period 2007–2016 (broken red lines).[2] It is clear that the forecasts have underestimated the actual development (blue line) for a long time. The largest forecasting errors were made in connection with the financial crisis, when the labour market was not affected to the extent many analysts expected. GDP in Sweden fell sharply, but the labour market did not react in accordance with historical correlations. Even compared with other countries, labour supply developed relatively strongly in conjunction with the financial crisis. In our neighbouring Nordic countries, for example, labour supply declined significantly more.

Figure 1. Outcomes and the Riksbank's forecasts for the number of persons in the labour force, 15-74 years
Thousands



Sources: Statistics Sweden and the Riksbank.

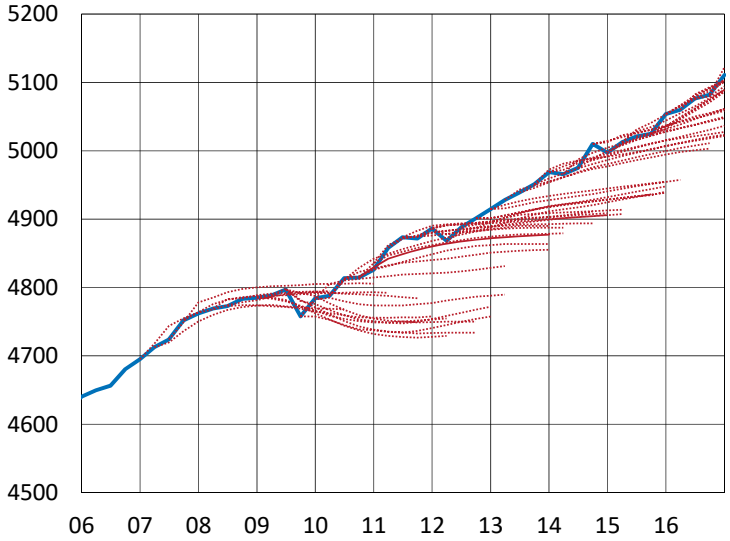
The underestimations are particularly large for the forecasts two to three years ahead. For example, the forecasts made at the end of 2011 and the beginning of 2012 underestimated the level of the labour force two to three years later by about 70,000 and 130,000 persons respectively. In relation to the total labour force, which amounted to just over five million persons, this is equivalent to approximately 1.4 and 2.5 per cent respectively. The forecasts made at the end of 2014 were more accurate. On average, the Riksbank underestimated the level in 2016 by just over 20,000 persons.[3,4] The Riksbank's forecasts for the development of the labour force slightly further ahead are based largely on three different factors: the demographic development in terms of population growth and composition; structural changes, for example as a result of changes to the pension system and tax

[2] During the period in Figure 1, outcomes for the labour force in the 15-74 age group have been marginally revised. In order for all the forecasts to be based on the current outcome series, the percentage change in the original forecasts has been used to project the level for the forecast series.
[3] The Riksbank is not alone in having been surprised by the strong development of the labour force. The National Institute of Economic Research (NIER) has also underestimated the development. The NIER's forecasts made at the end of 2011 and beginning of 2012 underestimated the level in 2013 by almost 60,000 persons. The NIER's forecasts made at the end of 2014 for 2016 were, like the Riksbank's forecasts, more accurate.
[4] The Riksbank and other analysts, like the NIER, use similar methods for making forecasts of the long-term development of the labour force. Both the Riksbank and the NIER use Statistics Sweden's population projections, for example. However, model support and assessments of the effects of economic policy and other behavioural changes differ among analysts.

regulations that affect labour force participation and the economic situation (when labour demand rises, more people come into the labour market and vice versa).

During the latter stages of the period shown in Figure 1, the Riksbank has only made forecasts for the labour force in the 15-74 age group. Earlier, the Riksbank also made labour force forecasts for the 16-64 age group. For obvious reasons, the forecasting errors for that age group are very similar to those for the 15-74 age group (see Figure 2).[5] The size of the errors is slightly smaller, however. The forecasts made at the end of 2011 and the beginning of 2012 underestimated the level of the labour force in the 16-64 age group two to three years ahead by around 50,000 and 80,000 persons respectively, which corresponds to 0.9 and 1.6 per cent of the total labour force in the age group.

Figure 2. Outcomes and the Riksbank's forecasts for the number of persons in the labour force, 16-64 years
Thousands



Sources: Statistics Sweden and the Riksbank.

Higher population growth can explain some of the underestimation

Every year, Statistics Sweden makes a population projection for Sweden broken down by age, sex and country of birth group.[6] Every third year, a more comprehensive analysis is performed, in which a main scenario and alternative projections are developed. For the intermediate years, follow-ups and revisions are made based partly on the Swedish Migration Agency's updated assessments of the number of asylum seekers. In recent years and at the request of various authorities, Statistics Sweden has performed more frequent updates of the population projections in order to take the major fluctuations in migration into account.

Forecasts for the labour force are often contingent on population projections, both in models and in the final assessment. The forecasts are also based on a perception of how labour force participation will develop, but one reason for the recurrent underestimation of labour supply is that the working-age population has increased more rapidly than expected.

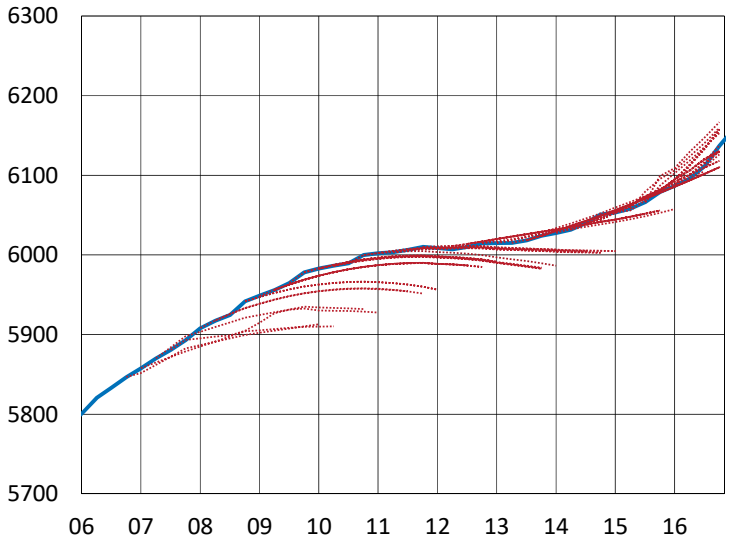
Figure 3 below shows the Riksbank's forecasts for the number of persons in the 16-64 age group based on Statistics Sweden's population projections. During the latter stages of the time period, the

[5] During the period in Figure 2, the outcome data for the labour force in the 16-64 age group has been marginally revised. In order for all the forecasts to be based on the current outcome series, the percentage change in the original forecasts has been used to project the level for the forecast series. During the latter stages of the period when the Riksbank actually focused on the 15-74 age group, the forecasts for the labour force in the 16-64 age group have been projected with the same percentage development as for the 15-74 age group. To a certain extent, this can affect the picture of how accurate the forecasts for the 16-64 age group have been. Neither have all the forecasts in Figure 2 been published or used in connection with monetary policy decisions.

[6] Country of birth groups are: Sweden; The Nordic countries excluding Sweden; the EU excluding the Nordic countries; and non-Nordic and non-EU countries. Non-Nordic and non-EU countries are divided into three groups based on their level of development as measured by the Human Development Index (high, medium and low). For more information, see www.scb.se.

Riksbank has actually only focused on the 15-74 age group in its forecasting work, but as the Riksbank did not make forecasts for the population in this group prior to 2013, the forecasts for the population, and, in the next step, labour force participation, in the 16-64 age group, is analysed here. Even here it is clear that the forecasts have often underestimated the actual development (blue line). The forecasts made at the end of 2011 and beginning of 2012 underestimated the level in 2013 and 2014 by around 10,000 and 30,000 persons respectively.

Figure 3. Outcomes and the Riksbank's forecasts for the number of persons in working age, 16-64 years
Thousands



Sources: Statistics Sweden and the Riksbank.

The forecasts for the working-age population have basically been lower than the outcome in all forecasts made prior to 2013. For obvious reasons, forecasts for the development of the population are difficult to make in periods when there are major migration flows, and during this period it is mainly the population of persons born outside Europe that has increased rapidly in Sweden. However, population forecasts made during 2014 and 2015, when the number of asylum seekers rose rapidly, overestimated the future development. As the Riksbank simultaneously underestimated the development of labour force participation, the high population forecast also helped improve the accuracy of the forecast for the number of persons in the labour force.

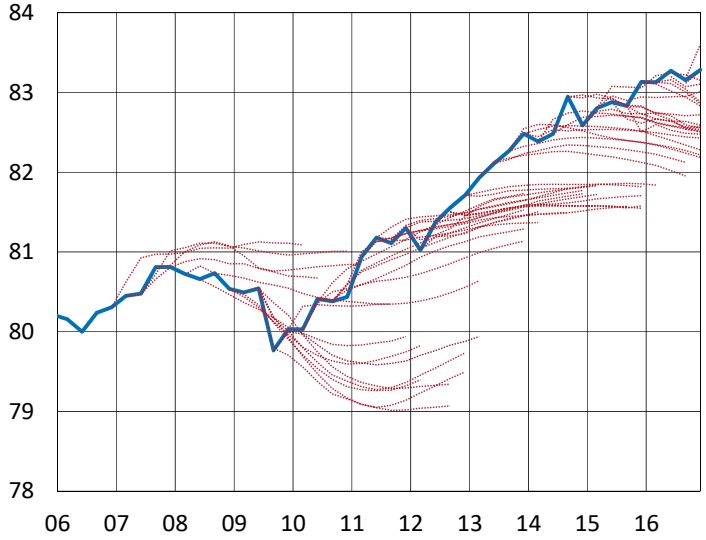
Above all, the upturn in labour force participation has been underestimated

The analysis above shows that the population projections have contributed to the underestimation of the labour force during much of the period. However, this is not the main reason, which is illustrated in the forecasts for labour force participation, i.e. the proportion of the working-age population that participates in the labour force (see Figure 4). Labour force participation in the 16-64 age group, which is now on its highest level since the beginning of the 1990s, has generally been underestimated during the period. The largest forecasting errors were made in connection with the financial crisis, when labour force participation did not fall to the same extent as it did in conjunction with previous major falls in demand.

Labour force participation is to a large extent dependent on how the population's composition is expected to develop. For example, young and older persons have on average lower labour force participation than persons in mid-life. Foreign-born persons have on average lower labour force participation than Swedish-born persons, and women have on average lower labour force participation than men. If groups with lower average labour force participation increase as a

proportion of the population, it will, all else equal, subdue the development of labour force participation in total. During the period shown in Figure 4, the composition of the population has changed mostly as a result of the proportion of foreign-born persons and older Swedish-born persons having increased as a share of the population, something which the population forecasts also showed. The Riksbank has therefore expected a more subdued development of labour force participation. However, labour force participation in these particular groups has increased, which has surprised the Riksbank.

Figure 4. Outcomes and the Riksbank's forecast for labour force participation, 16-64 years
Per cent



Sources: Statistics Sweden and the Riksbank.

The forecasts made at the end of 2011 and beginning of 2012 underestimated labour force participation in 2013 and 2014 by around 0.6 and 0.9 percentage points respectively. This corresponds to just under 40,000 and just over 50,000 persons respectively. All in all, this means that the majority of the forecasting errors for 2013 and 2014 made at the end of 2011 and beginning of 2012 can be explained by the underestimation of labour force participation (see Table 1).[7] The significance of the underestimation of population growth grows for forecasts further ahead, but the majority of the forecasting error for 2014 as well is explained by the underestimation of labour force participation. The forecasting errors for the labour force in the 15-74 age group can be explained to an even larger extent by the underestimation of labour force participation, as labour force participation has increased quite considerably among those older than 65.[8]

Table 1. Outcome minus forecast, labour force, population and labour force participation for the 16-64 age group for the forecasts performed at the end of 2011 and beginning of 2012
Thousands

	2013	2014
Labour force	**48**	**81**
Population	11	33
Labour force participation	38	54

Note. The reason that rows 2 and 3 are not added together in row 1 is because labour force participation in the population does not amount to 100 per cent.

Source: The Riksbank

[7] It is also possible that the composition of the population has turned out differently to what was assumed in Statistics Sweden's population projection. As labour force participation varies depending on underlying factors, such as age, sex and origin, this could also have affected the forecasting errors. However, this analysis is not performed here, but the effects are probably nevertheless minor in the context.
[8] Refers to the period after 2013 when there was access to data for both the population and the labour force for the 15-74 age group.

Economic policy affects the incentives to work

Labour force participation in the working-age population is affected by the economic incentives to work. Economic policy can affect both the individual's decision to participate in the labour force, known as the 'extensive margin', and how much the individual chooses to work given that they do choose to work, known as the 'intensive margin'.

The previous government implemented a number of reforms aimed at, for example, increasing labour force participation via the extensive margin.[9] This was mainly a question of changes that made it relatively more profitable to work as a result of a reduction in the replacement rate, i.e. that part of the previous wage that is replaced by unemployment insurance. The introduced earned income tax credit can be equated with a reduction in the replacement rate from unemployment insurance and other social insurance schemes as it implies that, after tax, it will be more profitable to work than not to work. A higher earned income tax credit was also introduced for those older than 65. The unemployment insurance compensation level has also been reduced during the period analysed here and the sickness insurance regulations have been tightened.[10]

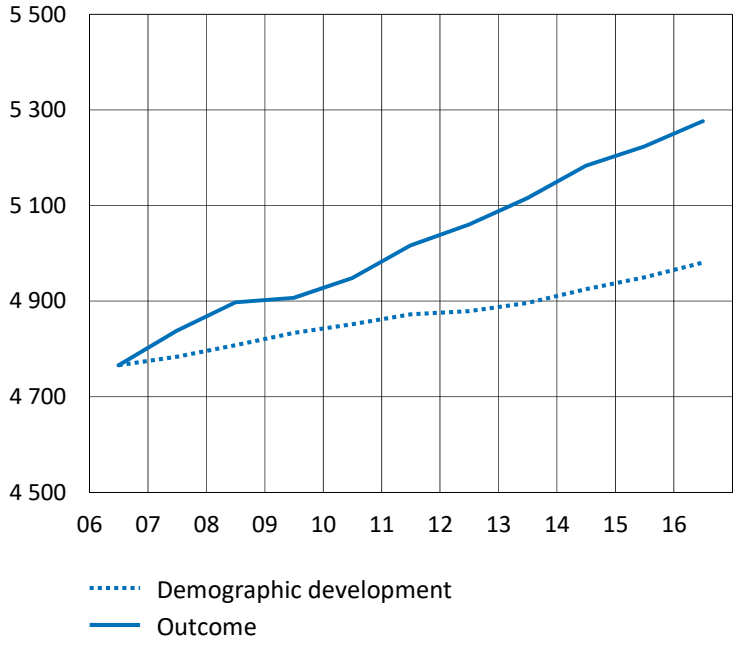
All in all, the Riksbank has previously deemed that these measures would increase labour supply in the 15-74 age group by 2.6 per cent or about 120,000 persons in the long run, most of the effect of which was deemed to stem from the earned income tax credit.[11] The Riksbank's assessment of the effects on the labour force were in line with the assessment made by the National Institute of Economic Research (NIER), but slightly lower than the government's assessment.[12] The Riksbank has also made an assumption about higher labour force participation among older persons as a result of improved health and the new pension system.[13] Assessments of how structural changes and economic policy affect the labour market are very difficult to make and very uncertain. It is also difficult after the event to assess which reforms have led to which effects as many of the changes occurred simultaneously and can interact.

During the period 2006–2016, the labour force in the 15-74 age group increased by just over 510,000 persons (see Figure 5). Some of the upturn in the figure may be due to the working-age population increasing at a rapid pace. However, projections of *demographic development* with the help of the NIER's KAMEL demographic model show that the labour force would only have increased by about 215,000 persons given the growth and composition of the population (see Figure 5).[14] Accordingly, after population growth and composition have been taken into account, there remains an increase of almost 300,000 persons as a result of changed behaviour, i.e. labour force participation has increased in various groups. The Riksbank's assessment that the previous government's policy would increase the labour force by about 120,000 persons can explain some of this increase, but there are still almost 180,000 persons left. Part of the increase can be attributed to increased labour force

[9] The current government has also implemented a number of measures that affect the incentives to work, but as they have been introduced very late in the period analysed here, they are assumed not to have affected the development to any greater extent.
[10] For a description of how the net replacement rate has developed during the period, see "Arbetslöshetsförsäkringens ersättningsgrad i Sverige [The net replacement rate in the Swedish unemployment insurance scheme]" in Lönebildningsrapporten [Wage Formation Report] 2016, National Institute of Economic Research.
[11] The assessment comprised a midpoint in an interval. The assessment also includes sickness insurance reforms, changes to unemployment insurance, the introduction of tax credits for domestic services and tax deductions for building repairs, maintenance and improvement as well as changes in active labour market policy, see the article " Long-run developments in the Swedish labour market", Monetary Policy Report, July 2012, Sveriges Riksbank.
[12] See "Långsiktiga effekter på arbetsmarknaden av ekonomisk-politiska reformer [Long-term effects on the labour market of economic policy reforms]", Swedish Economy Report, December 2011, National Institute of Economic Research and "How should the functioning of the labour market be assessed?", Report from the Economic Affairs Department 2011:1. Swedish Ministry of Finance.
[13] See "The driving forces behind trends in the economy can be analysed using a production function" in the Monetary Policy Report of October 2010, Sveriges Riksbank.
[14] In 'demographic development', labour force participation is assumed in different groups to be constant at its 2006 level with regard to sex, age and origin. Demographic development therefore reflects the expected development given the population's growth and composition. It can be seen as the expected development in the absence of regulatory and behavioural changes, structural reforms and variations in economic activity. For a description of KAMEL, see Appendix 2 in "the Swedish economy – a long-term scenario up to the year 2035", Special study no. 30, National Institute of Economic Research, 2012.

participation among older persons as a result of better health and the new pension system, but overall the assessments have nevertheless been on the low side.

Figure 5. Labour force, 15-74 years
Thousands



Sources: Statistics Sweden and the Riksbank

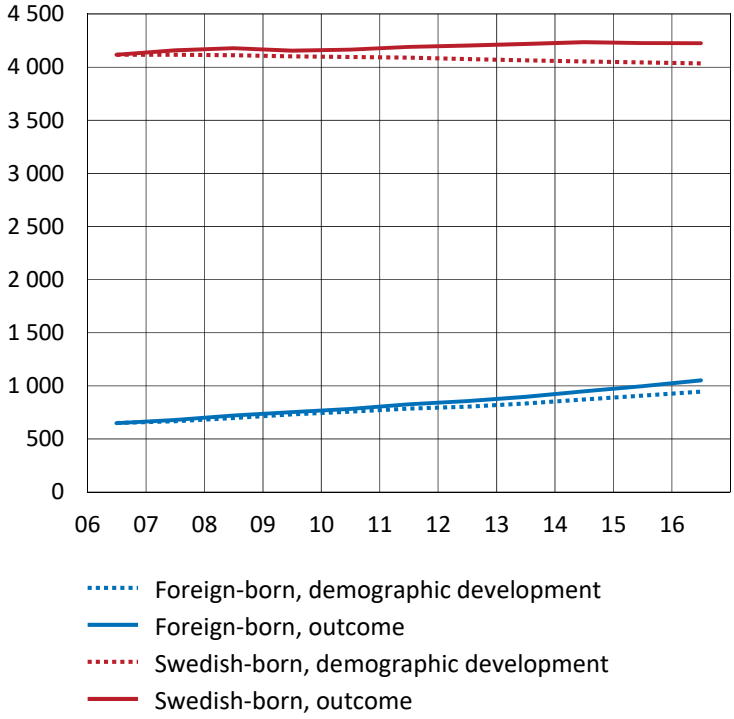
Labour force participation has increased among both Swedish-born and foreign-born persons

The assessment of the effects from the previous government's economic policy is not divided up into different groups, but the corresponding analysis in Figure 5 broken down into Swedish-born and foreign-born persons shows that the labour force has increased more than has been demographically justified in both groups (see Figure 6). In absolute figures, the labour force among Swedish-born persons has increased by about 190,000 more than what would be demographically justified given the group's growth and composition and by just under 110,000 among foreign-born persons. In both groups, the increase has been slightly greater among women than among men.

Labour force participation among foreign-born persons has increased by almost 7 percentage points between 2006 and 2016. Per age group, labour force participation is still on a lower level than among swedish-born persons in almost all age groups, but the upturn has been substantial in most age groups. This is illustrated in Figure 7 where labour force participation in individual age groups among foreign-born persons in 2016 (blue bars) is compared with 2006 (red bars).[15] The upturn has occurred among both men and women and both persons born in Europe excluding Sweden and persons born outside Europe. Among women born outside Europe, however, labour force participation is still relatively low.

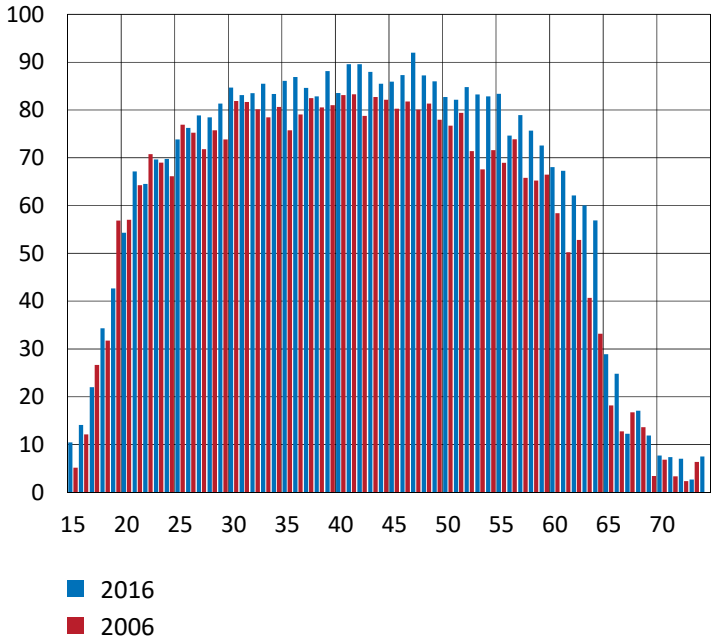
[15] Note that for some individual age groups, especially among the younger and older, the population (and sample) among foreign-born is relatively small, which leads to greater uncertainty.

Figure 6. Labour force, Swedish-born and foreign-born persons, 15-74 years
Thousands



Sources: Statistics Sweden and the Riksbank

Figure 7. Labour force participation among foreign-born persons per age group, 15-74 years, 2006 and 2016.
Per cent

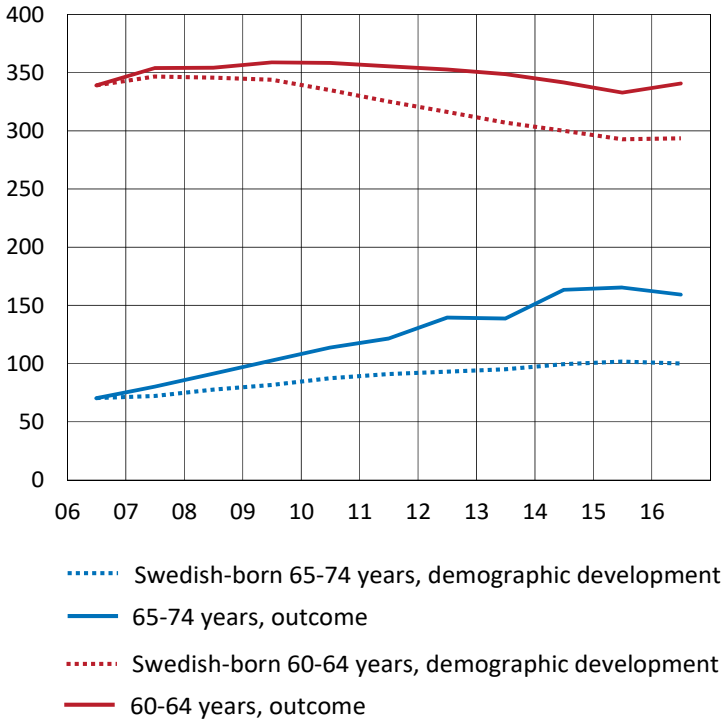


Source: Statistics Sweden.

Labour force participation among Swedish-born persons has increased among older persons in particular

In Figure 6, it is possible to discern that the expected demographic development for the labour force among Swedish-born persons has been slightly downwards. This is explained by the fact that the Swedish-born population has aged over the period. Given previous behaviour at higher ages, this would have led to a decline in the labour force as older persons left the labour force. However, a relatively large proportion of the increase among Swedish-born persons in Figure 6 is explained by the increase in the labour force and labour force participation among older persons (see Figure 8).

Figure 8. Labour force, Swedish-born persons, 60-64 and 65-74 years
Thousands

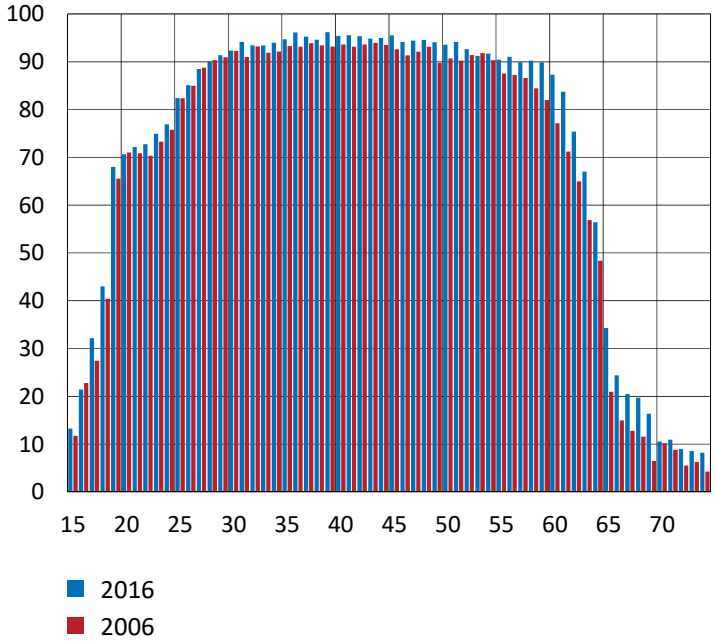


Sources: Statistics Sweden and the Riksbank.

Persons older than 65 constitute a small group on the labour market, but the upturn in this age group is nevertheless responsible for almost a third of the increase in the labour force over and above the demographic development among Swedish-born persons in total, as shown in Figure 6.[16] Since unemployment is very low among older persons who elect to stay in the labour force, higher labour force participation in this group normally implies a higher employment level in the economy.[17] The development of the labour force among Swedish-born persons aged 60-64 has also been relatively strong and together, these groups are responsible for more than half of the increase in the labour force over and above the demographic development among Swedish-born persons during the period shown in Figure 6. The fact that it is primarily among older persons that labour force participation among Swedish-born persons has risen is clear in Figure 9, which compares labour force participation among Swedish-born persons in individual age groups in 2016 (blue bars) and 2006 (red bars).

[16] The development among older foreign-born persons has also been slightly stronger than has been demographically justified. As a large proportion of those who migrate to Sweden are relatively young, the group of older persons among foreign-born persons is small, however, and the upturn only corresponds to just over 7 per cent of the unexpected increase in the labour force among foreign-born persons.
[17] A contributory cause of low unemployment among the over-65s is that those who don't have work normally leave the labour force as they are not entitled to unemployment benefits.

Figure 9. Labour force participation among Swedish-born persons per age group, 15-74 years, 2006 and 2016.
Per cent



Source: Statistics Sweden.

Why has the development of labour force participation been underestimated?

There are several possible explanations for labour force participation having risen more than the Riksbank assumed it would do. One example is the establishment reform in which Arbetsförmedlingen (Swedish Public Employment Service) in 2011 was given the coordination responsibility for new arrivals, a task previously performed by municipalities. The aim is to make it easier for persons who have recently arrived in Sweden to learn Swedish, find work and earn a living as quickly as possible.[18] The reform has led to new arrivals registering with the Employment Service at an earlier stage, which has probably contributed to the increase in labour force participation among foreign-born persons.[19] The Riksbank's assessment of the development of labour force participation among older persons has led to an underestimation, but it is difficult after the event to identify which incentive has been the greatest as many changes have occurred simultaneously. The current pensions system entered into force in 1999. One reason for reforming the pensions system was the increase in average life expectancy (see Figure 10). The old system was, as a result, deemed to no longer be economically sustainable. In 1999, upon the introduction of the new system, the expected remaining average life expectancy at the age of 65 was just over 18 years for men and women, which was two years longer than was the case twenty years previously. Today, in 2017, it is just over two years longer than in 1999 and is expected to increase by a further year over the next ten years. In the new pension system, the size of the pension is more dependent on how much the individual has paid in during their entire working life, which creates an incentive to carry on working for longer. The pension per year will also be higher, the later the individual chooses to leave the labour force, as the pension rights earned are

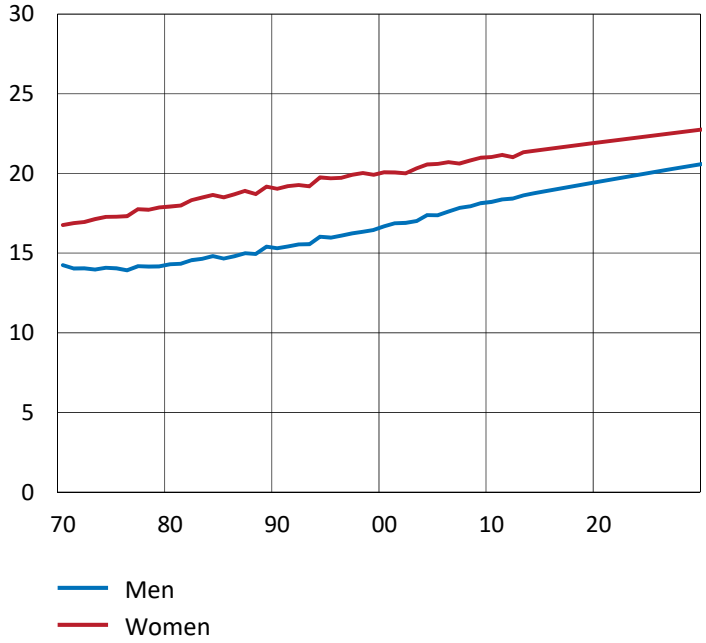
[18] See www.arbetsformedlingen.se for a description of how Arbetsförmedlingen performs its establishment task. As from 1 January 2018, the previous regulatory framework for the establishment task will be replaced by a new labour market policy programme called the Establishment Programme, a central component of which is clearer demands on the individual, see www.regeringen.se.
[19] A comparative study of those who participated in establishment initiatives for about one year after December 2010 and those who participated in the municipal introduction programmes for about one year before December 2010 shows that the establishment reform has increased the number of registrations at Arbetsförmedlingen, see Joona, P.A, et al. "Etableringsreformens effekter på de nyanländas integration [Effects of the establishment reform on the integration of new arrivals]. Final report", Swedish Institute for Social Research, Stockholm University, 2016.

then divided up over fewer expected remaining years of life.[20] Different age cohorts have been gradually phased into the new system. The first cohort included in the new system was born in 1938. People born in that year received 80 per cent of their pension from the old system and 20 per cent from the new system. The first cohort to be 100 per cent covered by the new system comprises individuals born in 1954, which means that they are now, in 2017, 63 years old. The gradually phasing-in of the new pension system coincides relatively well with the increased labour force participation among older persons.[21] A model simulation of the Swedish pension reform indicates that it has led to an increase in the average pension age by just over 2 years.[22]

The earned income tax credit is also higher for those older than 65. The aim of the reform was to keep older persons in the labour market and in conjunction with its introduction, employers' social security contributions for older workers were also reduced to stimulate demand. Empirical analysis shows that these reforms increased labour supply and employment among those older than 65.[23] In addition, there are also signs that the effects from the stricter regulations in sickness insurance increased labour force participation more than has been previously assumed.[24] Social norms may also play a part, for example, for the decision to leave the labour market.

Figure 10. Remaining life expectancy at 65 years old, 1970 to 2027

Number of years



Source: Statistics Sweden.

Labour supply also affected by the economic situation

Apart from the demographic development, in terms of population growth and composition, and changes to economic policy, labour supply is also affected by the economic situation as the chance of

[20] For a more detailed description of the new pension system, see Palmer, E. "The New Swedish Pension System", 2003.
[21] See Laun, L. and Palme, M. "The recent rise of labor force participation of older workers in Sweden,", Institute of Evaluation of Labour, Report 2017:18.
[22] See Laun, T. and Wallenius, J. "Effekter av den svenska pensionsreformen för äldre arbetstagare [Effects of the Swedish pension reform on older workers]", Ekonomisk debatt, no. 1, 2013.
[23] See, for example, Laun, L, "Om förhöjt jobbskatteavdrag och sänkta arbetsgivaravgifter för äldre [The increased earned income tax credit and reduced employers' social security contributions for older workers]", IFAU (Institute of Evaluation of Labour) Report: 2012:16.
[24] See Bergström, Å-P, et al. "Vilja, få och förmå – Synpunkter på en sysselsättningspolitik byggd på ekonomiska incitament [Will, allow and induce - Comments on an employment policy founded on economic incentives]", LO (Swedish Trade Union Confederation), 2014 and Laun, L. and Palme, M. "The recent rise of labor force participation of older workers in Sweden," IFAU (Institute of Evaluation of Labour), Report 2017:18.

finding a job varies according to the economic circumstances. In good times, when it is easier to find work, more people enter the labour force and in poorer times, more are outside it. It is clear that, for example, the group *latent job-seekers*, which is persons who can and want to work but who have nevertheless not looked for a job, varies depending on the economic situation. The fact that the labour force is affected by the economic situation can also be seen in Figure 4, where labour force participation rose in conjunction with the economic upturn in 2007 and then fell slightly in conjunction with the financial crisis. The assessment of what proportion of the increase in labour force participation is structural or cyclical is uncertain, but our assessment is that it is mainly structural. An important reason for this is that demand has been on a low level for much of the period analysed here. Some of the forecasting error for development of the labour force can, however, be due to an underestimation of the cyclical contribution at the time the various forecasts were made.

Greater labour supply affects the entire economy

In the long run, greater labour supply leads to a higher employment level. Empirical analysis shows that employment in the long run adapts almost proportionally to the labour force.[25] In the short run, however, unemployment rises when labour supply increases rapidly, as it takes time for the labour market to adapt to a greater supply.[26] This applies regardless of which qualifications the additions to the labour force possess. Furthermore, if the increased labour supply has worse conditions on the labour market on average, it can also affect the matching of unemployed persons with job vacancies. The increased supply can also affect productivity, as different groups with, for example, differing levels of education, have different average productivity levels.[27]

Greater labour supply also leads to greater competition for vacant jobs and it becomes easier for companies to employ workers. Less strained resource utilisation on the labour market with reduced competition for labour normally subdues wage growth in the economy. An effect of slower wage increases is that companies can then produce more at the same cost, which can also affect inflation.[28]

However, the issue of how the large increase in the labour force has affected other economic variables is not within the framework of this staff memo.

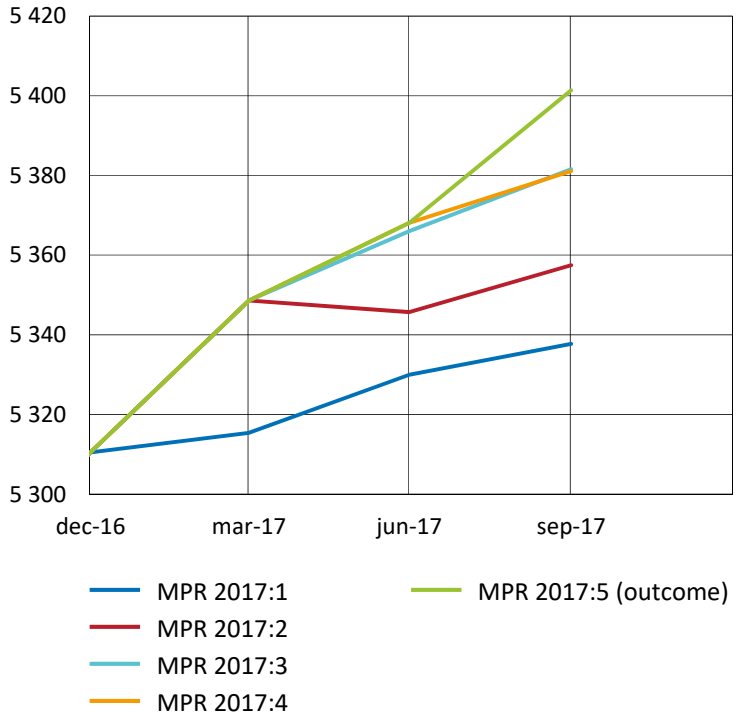
The labour force has continued to surprise on the upside in 2017

In 2017, the labour force and labour force participation have continued to rise by a surprising amount and the Riksbank has adjusted upwards its forecasts for labour force participation (see Figure 11). The increase in the labour force and labour force participation in 2017 applies to both foreign-born and Swedish-born persons.[29] Among those older than 65, labour force participation has again started to rise, after a discernible slowdown in 2016 (see Figure 8).[30]

[25] See, for example, "Långtidsutredningen 2011 Huvudbetänkande [Long-Term Survey of the Swedish Economy, 2011, Main Report], Swedish Government Official Reports, SOU 2011:11.
[26] For a calculation, see Chapter 4 in "Lönebildningsrapporten [Wage Formation Report] 2012", National Institute of Economic Research.
[27] In the government's bill on the second phase of the earned income tax credit, an assumption was made that those coming into the labour force as a result of the earned income tax credit had 25 per cent lower productivity than those already employed, see "Ett förstärkt jobbskatteavdrag [A strengthened earned income tax credit]", Government Bill 2007/08:22.
[28] For an analysis of how inflation and monetary policy are affected by lower wages in the Riksbank's RAMSES macro model, see Chapter 2 in the Monetary Policy Report July 2014, Sveriges Riksbank.
[29] To a certain extent, the very large increase in the labour force among foreign-born persons, which occurred in late 2016 and early 2017, is deemed to be the result of the sampling method used in the Labour Force Surveys, see the article "Rapid population growth making LFS difficult to interpret" in Monetary Policy Report, April 2017, Sveriges Riksbank.
[30] See also "Arbetsmarknadssituationen för hela befolkningen [Labour market situation for the entire population], 15-74 years, LFS Third Quarter, 2017", AM 11 SM 1704, Statistics Sweden.

The fact that labour supply continues to increase is positive as it means that more people can find work and that output can increase without the risk of the economy overheating. Resource utilisation in the economy is currently deemed to be higher than normal.[31] Some of the recent increase in the labour force is deemed to be due to the economic situation, something which above all clear in the latent job-seekers group, which is currently at very low levels. The increased labour force participation among older persons has coincided not only with the strong economic situation but also with the continued increase in the expected remaining average life expectancy at 65 (see Figure 10). This indicates that labour force participation among older persons may continue to rise further as we live increasingly longer. The right to work to a more advance age and a raising of the age at which people can start drawing their state pension have also been discussed in the parliamentary pension group.[32] Both these factors indicate that labour force participation among older persons will probably increase further. The development of labour force participation among foreign-born persons is dependent on how successful the integration process is. Among women born outside Europe, for example, labour force participation is still relatively low, which means that there is considerable potential to further increase labour supply.

Figure 11. Outcomes and forecasts for the number of persons in the labour force in 2017, 15-74 years
Thousands



Sources: Statistics Sweden and the Riksbank.

[31] See Monetary Policy Report, December 2017, Sveriges Riksbank.
[32] See the debate article "Premiepensionen görs om i nya överenskommelsen [Premium pension revamped in new agreement], Dagens nyheter, 14 December 2017. According to the cross-party agreement presented, the lowest age for withdrawing the state pension will be raised from 61 to 62 in 2020 and then to 63 and 64 in 2023 and 2026 respectively. Furthermore, the right to remain in the labour market will change for those who wish to from 67 to 68 in 2020 and then to 69 in 2023. The age at which it is possible to withdraw guarantee pension will be raised from 65 to 66 in 2023. In 2026, the guarantee pension will be tied to the continued increase in average life expectancy with some exceptions.

Appendix - An evaluation of labour force forecasts

There are different ways of evaluating forecasts. One of the simplest ways is to calculate the average forecasting error, which is sometimes called "bias". Bias shows whether the forecast on average has been over or under the outcome and hence captures the degree of systematics in the forecasting errors. The analysis above shows, for example, a clearly negative bias in the Riksbank's forecasts for the number of persons in the labour force (See Figure 1 and 2). The root-mean-square error (RMSE) summarises both the dispersion, standard deviation and bias for the forecasting errors. The lower the RMSE, the better the forecasting performance. A forecast that is always correct has an RMSE that is equal to zero.

In this evaluation, the Riksbank's labour force forecasts for the 16-64 age group are compared with forecasts from simple autoregressive time series models (AR) with and without population projections. Forecasts for up to twelve quarters ahead are analysed and the period studied is 2007–2016. During the latter stages of the period, the Riksbank has actually focused on the 15-74 age group, but since one of the aims of the evaluation is to study the significance of the population projection that is missing prior to 2013 for the 15-74 age group, the 16-64 age group is analysed instead.

In an AR model, the dependent variable is explained by its own previous values and by a stochastic term. The dependent variable is always the number of persons in the labour force, but it is transformed in slightly different ways. In the models studied here, the labour force is modelled in first differences (quarterly rates), fourth differences (annual rates) and in levels according to the specifications:[33]

$$\Delta^1 ak_t = \beta_0 + \beta_1 \Delta^1 ak_{t-1} + \varepsilon_t \quad (1)$$
$$\Delta^4 ak_t = \beta_0 + \beta_1 \Delta^4 ak_{t-1} + \varepsilon_t \quad (2)$$
$$ak_t = \beta_0 + \beta_1 ak_{t-1} + \varepsilon_t \quad (3)$$

In the first specification, the dependent variable is expressed in first differences $\Delta^1 ak_t = ak_t - ak_{t-1}$ and in the second it is expressed in annual rates $\Delta^4 ak_t = ak_t - ak_{t-4}$. In the third specification, the labour force is modelled in levels. The specifications (1) – (3) capture the recent trend for the number of persons in the labour force in different ways.[34] Even if the dependent variable is formed in slightly different ways in the models, it is always the level forecast that is evaluated. To illustrate that the population projections have contributed to the underestimation of the labour force, the population, bef, has, in the next step, been added as an explanatory variable in the models above according to the specifications:

$$\Delta^1 ak_t = \beta_0 + \beta_1 \Delta^1 ak_{t-1} + \beta_3 \Delta^1 bef_t + \varepsilon_t \quad (4)$$
$$\Delta^4 ak_t = \beta_0 + \beta_1 \Delta^4 ak_{t-1} + \beta_3 \Delta^4 bef_t + \varepsilon_t \quad (5)$$
$$ak_t = \beta_0 + \beta_1 ak_{t-1} + \beta_3 bef_t + \varepsilon_t \quad (6)$$

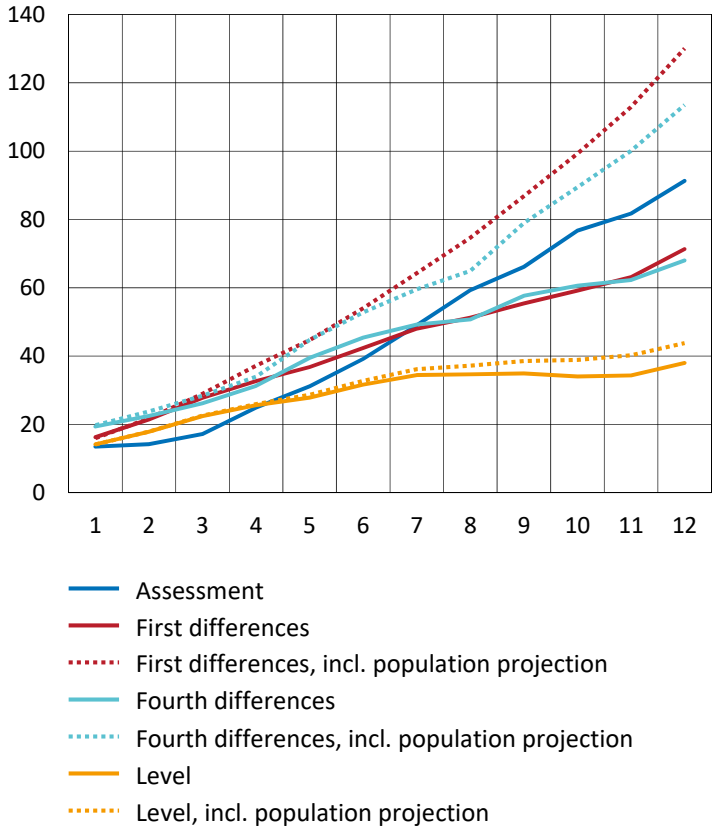
The exercise starts with the models being estimated using data from 1987 up until the end of the fourth quarter of 2006 (i.e. data for the period from the first quarter of 2007 and onwards is not included in the estimate). For each model approach (1) – (6) forecasts up to 12 quarters ahead are generated, Q=1,..., 12. Thereafter, the estimate period is then extended by one quarter (i.e. data for the second quarter of 2007 and onwards is not included in the estimate) and the exercise is repeated, which gives a new forecast for each model approach. In the next step another observation for the estimation period is added and the process is repeated, and so on. The forecasts from the models (4) – (6) always depend on the population forecasts made on each occasion respectively. In a first step,

[33] In all cases, the time series is logarithmised and seasonally adjusted. These are not the models normally used by the Riksbank in its forecasting work.
[34] In all specifications, one lag of the dependent variable is used.

the models are estimated up to and including the fourth quarter 2006, but the population forecast for the period 2007:Q1 to 2009:Q4 is also included when the forecasts for the labour force are generated.

Figure 12 shows RMSE for the number of persons in the labour force. The broken blue line shows RMSE for the Riksbank's assessment while the other lines show RMSE for various model forecasts with and without population projection (1) – (6). The evaluation for this period shows that the Riksbank's assessments have been accurate in the short run (up to four quarters ahead), but that all the simple model forecasts generate better forecasts after seven quarters. The evaluation also shows that the model forecasts from (4) – (6) where, like the Riksbank's assessment, the population projection is included, have a higher RMSE than the pure autoregressive models (1) – (3). This applies to all specifications, which indicates that the models' forecasting performance deteriorates when population projections are included. For example, model (1) has on average a forecast error of just over 50,000 persons three years ahead (solid red line in Figure 12). In model (4), when the projection of the population is included, the forecasting error is on average almost 100,000 persons three years ahead (broken red line in Figure 12).

Figure 12. Forecast evaluation for the number of persons in the labour force 16-64 years, 1-12 quarters ahead
RMSE, thousands of persons



Source: The Riksbank.

The evaluation shows that the Riksbank's forecasts for the labour force are better than simple AR model forecasts on horizons up to four quarters ahead, but on longer horizons, a simple AR model that excludes the population projection had generated better labour force forecasts during this particular study period. The period has been characterised by surprisingly large migration flows and institutional changes, however, which have resulted in a constant increase in labour supply. A premise of the Riksbank's forecasting work is that the forecasts are to be consistent and comprehensible for others. A long-term forecast in line with an AR model during this period had been difficult to underpin as, given the population projections, it would have led to an increase in labour force participation in certain groups to historically very high levels. Neither does this mean that an AR model is the best

long-term forecasting method for the years ahead as both migration flows and institutions have changed. The use of population projections in longer-term forecasting work is also international practice and constitutes an important and transparent basis for the forecasts for the development of the labour market.

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