DANMARKS NATIONALBANK

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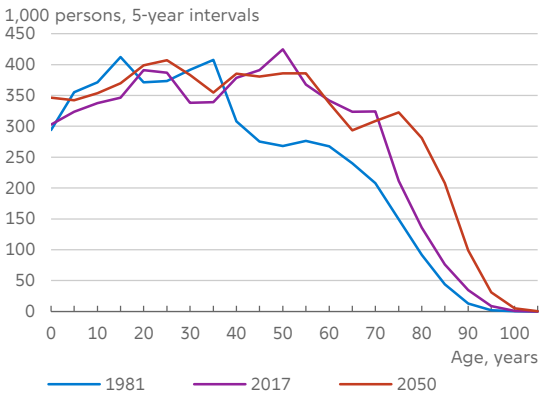
Prosperity growth facing demographic headwinds

- Viewed in isolation, population ageing will reduce annual GDP growth per capita by 0.3 percentage points towards 2050. This should be seen in the context that annual GDP growth per capita has increased by approximately 1 percentage point for the last couple of decades.
- Pushing age-related employment rates five years ahead in terms of age, meaning that the employment rate for, say, a 65-year-old in 2050 will be the same as for a 60-year-old today, will offset the effect of ageing on GDP per capita. Hence, reforms to expand the labour supply are important.
- Denmark as a nation is better prepared for the demographic challenge than many other countries. Considerable net foreign assets providing an annual return have been built up, and the public finances are sustainable.

The ageing of the Danish population continues, resulting in rising average life expectancy, cf. Chart 1. This will curb GDP growth per capita towards 2050. The analysis thus contributes to the discussion of the outlook for the annual prosperity increase in Denmark in the coming decades. No attempts are made to predict the underlying economic growth, which is also dependent on a number of other factors, including productivity growth.

Population developments in Denmark Chart 1



Source: Statistics Denmark and DREAM.

Link between economic growth per capita and population developments

Box 1

Labour input is the basis of all output and thus material prosperity in society. The volume of such output is determined partly by the number of hours worked by the population, partly by productivity. Output growth per capita, i.e. real GDP per capita, is the product of hourly productivity and the number of hours worked. The number of hours worked can be subdivided into annual working hours, the employment rate, i.e. the number of employees relative to the population of working age, and the share of 20-69-year-olds of the entire population. The chart below shows the following relationship:

GDP per capita (Y/N) = Hourly productivity (Y/t) X Annual working hours (t/L) X Employment rate (L/WA)

X 20-69-year-olds' share of the entire population (WA/N)

A broader prosperity measure should consider the total purchasing power, so further elements must be included:

Prosperity per capita (1.4) = [GDP (1.5) + Terms of trade effect (0.2) + Return on foreign assets (0.3)]

/ Population (-0.5)

The data in brackets indicate growth/growth contributions in per cent per year for the period 1995-2016. They can be added up. The negative contribution from "Population" reflects that the population is growing, so value added must be distributed on more persons. This reduces prosperity growth per capita.

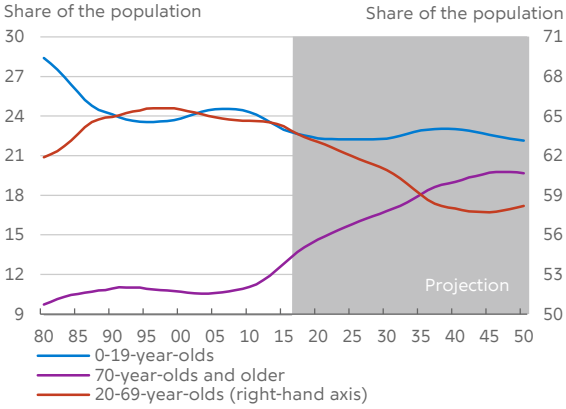
Y = real GDP, N = population, t = hours worked, L = people in employment, WA = population between the ages of 20 and 69.

The reason for the fact that ageing populations will curb growth in prosperity per capita is, firstly, that the share of 20-69-year-olds, from which the labour force is predominantly recruited, will decline[1], cf. Chart 2. Secondly, people of working age will tend to work less on average, as the employment rate falls with age. Thirdly, this is also applies to the weekly working hours. Together with the trend in hourly productivity, the three components mentioned determine growth in real GDP per capita, cf. Box 1.

Reforms which e.g. postpone the retirement age or succeed in increasing the immigrant employment rate will offset the tendency for lower total labour

Different age groups' share of the entire population

Chart 2



Source: Statistics Denmark and DREAM.

1 The analysis defines the population group of working age as the 20-69-year-olds rather than the 15-64-year-olds who are sometimes being focused on, because the retirement age will increase towards 2050, and only few 15-19-year-olds are on the labour market.

input in the economy. Another factor pointing in the same direction is the continued improvement of the state of health in the older age groups, if it causes them to postpone their retirement. On the other hand, part of the increase in GDP per capita over the last 50 years has been converted into more leisure time. This improves welfare on a par with greater opportunities of consumption resulting from higher production and income. Those factors are not considered in the analysis, the sole focus is the isolated effect of the age composition on GDP growth per capita.

Based on Statistics Denmark's most recent population projections[2], a projection shows that, viewed in isolation, changes in the age composition will reduce annual GDP growth per capita by 0.3 percentage points towards 2050. This should be seen in the context that annual GDP growth per capita has increased by approximately 1 percentage point for the last couple of decades.

Increased productivity has been the main driver of economic growth

Growth has been driven by increasing productivity over the last 50 years, cf. Chart 3. Since the mid-1990s, productivity growth has generally declined both in Denmark and many other advanced economies without any clear reason.

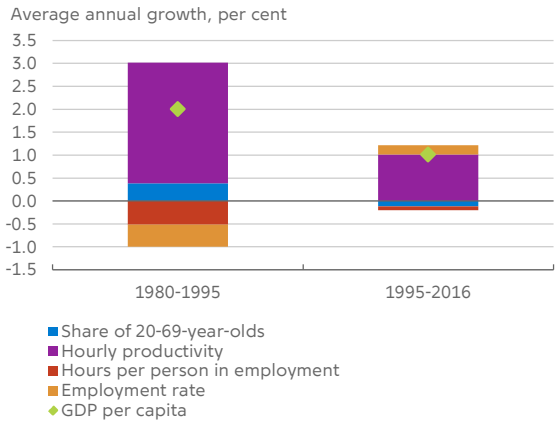
The analysis considers only the impact of demographic developments on labour input and not the future growth in total hourly productivity, which depends on many other factors in addition to population developments. Productivity growth will also be the main source of increased GDP per capita in the coming decades.

Growth subdued by relatively fewer people of working age in future

Demographic developments are dependent on fertility and mortality, which can be predicted relatively accurately towards 2050. To this should be added emigration and immigration rates, which are associated with somewhat greater uncertainty. As for labour input in the economy, frontier workers also play a role. These are people who live abroad and work in Denmark or vice versa. In Denmark, they do not change the conclusions here to any significant extent.

Drivers of the historical growth in GDP per capita

Chart 3



Note: Contributions to GDP growth per capita, cf. Box 1.
Source: Statistics Denmark and DREAM.

For many years, population trends contributed favourably to economic growth, as the share of the population of working age increased. That changed in the mid-1990s and, during the 20 years towards 2016, the demographics contribution to GDP growth per capita was marginally negative. The population share of 20-69-year-olds is expected to fall substantially over the coming decades, thereby dampening GDP growth per capita, especially in the period towards 2035, cf. Chart 4 (blue column).

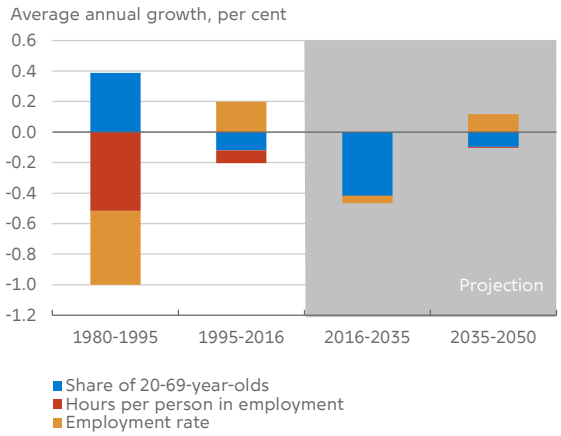
Population ageing means a lower average employment rate

Labour market participation is typically lowest for the younger and especially the older cohorts of working age, cf. Chart 5. When large cohorts approach retirement age, this will, viewed in isolation, exert downward pressure on the average structural employment rate[3]. In Denmark, the average structural employment rate for the 20-69-year-olds is around 76 at a neutral cyclical position.

2 The population projection is prepared by Statistics Denmark in collaboration with the DREAM Group. DREAM stands for Danish Rational Economic Agents Model.

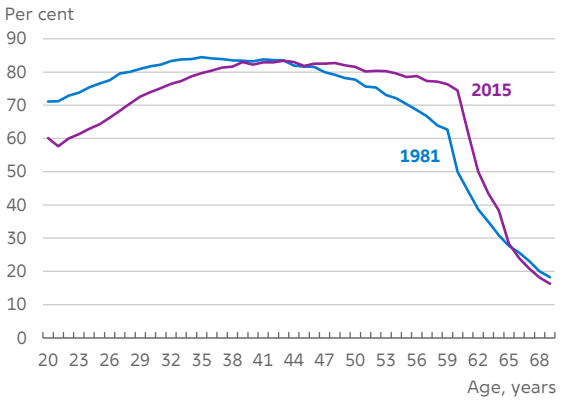
3 Cyclical developments are clearly reflected in the age-related employment rates, which rise during boom periods and fall during recessions. In a longer-term perspective, developments in the structural – cyclically adjusted – employment rate is what is of interest.

Demographics contributions to GDP growth per capita Chart 4



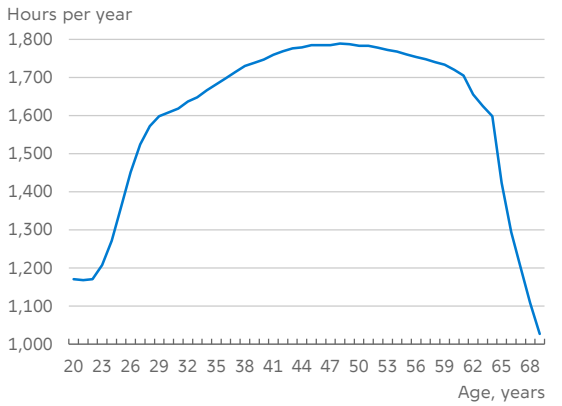
Source: Statistics Denmark and DREAM as well as Box 1.

Age-related employment rate Chart 5



Source: Statistics Denmark (register-based labour force – RAS). The data include people on leave.

Age-related working hours per year Chart 6



Source: Statistics Denmark (labour market account – LMA).

If the age-related employment rates at the current, i.e. cyclically neutral, level are maintained, a projection with the expected population trends shows a slight decline in the average employment rate to around 75 in 2035. This leads to a further negative drain on GDP growth per capita, cf. Chart 4 (orange column). The effect is not substantial and its sign changes after 2035 as changes in the age composition boost the employment rate in that period.

The number of hours worked in the economy depends on demographic developments

As is the case with the employment rate, the number of hours worked per week per person is age-related, cf. Chart 6. The lowest number of working hours is seen for young people, peaking for the middle-aged and declining again in the older age groups prior to retirement. This is partly due to opportunities to reduce working hours in the pre-retirement years, including collectively negotiated senior days.

Hence, the average number of hours worked per employee of working age is affected by the composition of the population in terms of age groups. The effect, which is calculated by maintaining the age-related working hours at the current level and making a projection by demographic developments, is very small. Moreover, projections of working hours are associated with substantial uncertainty.

Population ageing is an international phenomenon

Reduced fertility and increased life expectancy and the resultant ageing of the population are international phenomena. Among the large advanced economies, this development has been particularly pronounced in Japan where the share of 20-69-year-olds has been falling over the last 20-30 years, cf. Chart 7 (bottom). The fall is set to increase in Japan in the coming decades.

In the euro area and especially in the USA, the fall in the share of 20-69-year-olds has only recently begun, but may be expected to continue in the next 40 years – at a slightly lower rate in the USA than in the EU, cf. Chart 7 (top and middle).

Europe differs from Japan and the USA in that the average number of working hours has been substantially reduced over the last decades. Viewed in isolation, this has reduced GDP growth per capita. In addition, the employment rate in the euro area is at a somewhat lower level than in the USA and particularly Japan. On the other hand, this means that in Europe there is greater potential to counter the effect of population ageing on GDP growth per capita by working more.

Ageing of the labour force in the coming decades is less pronounced in Denmark than in a number of other countries, cf. Chart 8 (left). The southern European countries and Japan, among others, are facing considerable demographic challenges. Because fertility rates have been very low for a long time in those countries, they are facing substantial ageing of their populations and labour forces over the coming decades.

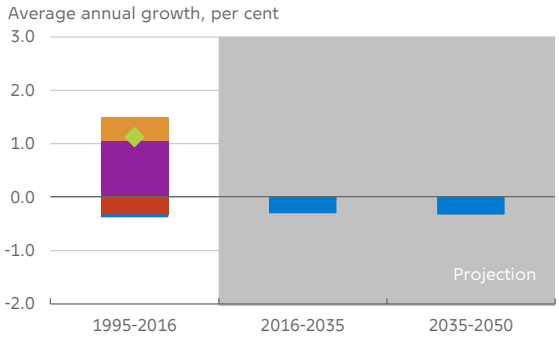
Pressure on welfare can be offset by higher labour input

Viewed in isolation, the ageing of the Danish population exerts downward pressure on GDP growth per capita. The pressure can be offset if Denmark succeeds in increasing the average employment rate, the weekly working hours or productivity growth.

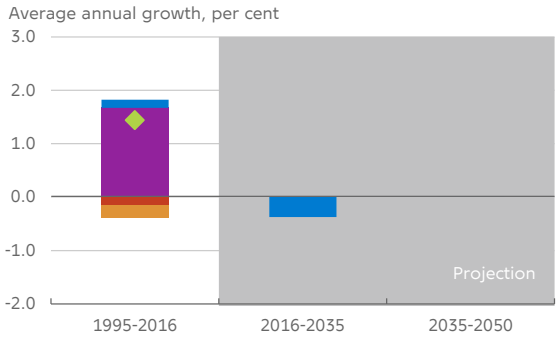
A sensitivity calculation is performed to determine how much the employment rate or weekly working

International comparison of sources of growth Chart 7

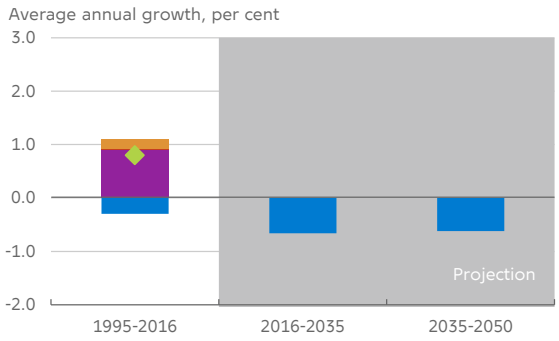
Euro area

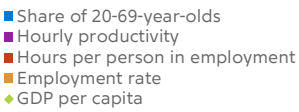


USA



Japan

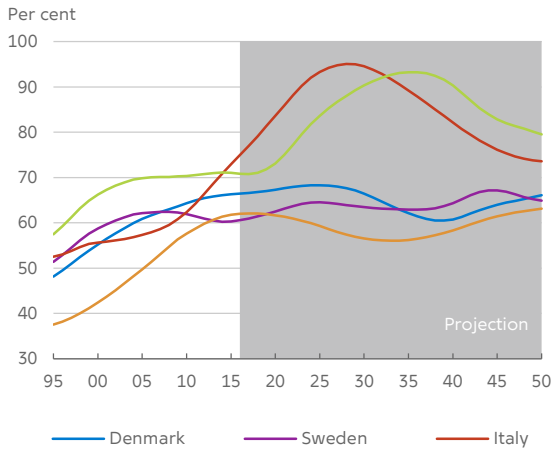




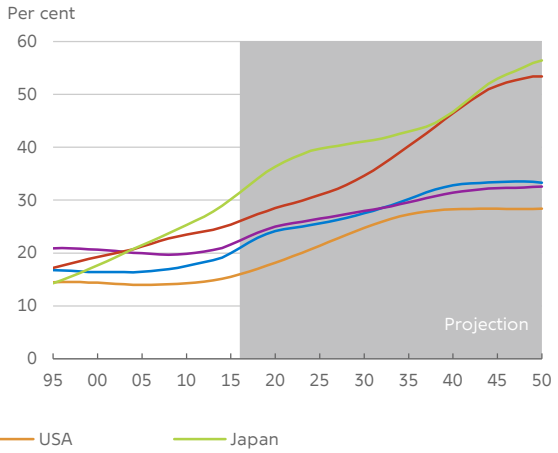
Note: The projection columns show the consequence for GDP per capita of falls in the share of 20-69-year-olds in the relevant countries. No calculations are made for other GDP growth components, cf. Box 1.
Source: Eurostat, OECD, The Conference Board Total Economy Database, U.S. Census, Japanese Statistics Bureau and United Nations Population Division (2017).

Population ageing is an international phenomenon Chart 8

Percentages of 50-69-year-olds relative to 20-49



Percentage of people aged 70+ relative to 20-69



Note: The labour force is primarily recruited from the 20-69-year age group.
Source: United Nations Population Division (2017).

hours are to be increased to neutralise the effect on GDP per capita of a falling population share of 20-69-year-olds in the coming decades, cf. Table 1.

Basing the calculation on Statistics Denmark's demographic projection, a neutralisation of the demographic effect on GDP growth per capita would require increasing the average employment rate in Denmark to 83 by 2050. International experience shows that no major country has sustained such a high employment rate over longer periods.

A higher fertility rate than in the baseline scenario increases the Danish employment rate requirement to 86 by 2050. The reason is that, despite the growth in population, the given time horizon is too short for the larger cohorts to join the labour force. In the long run, a higher fertility rate would reduce the employment rate needed to neutralise the consequences of population developments for GDP growth per capita.

If the fertility rate falls, the required employment rate would be 79 based on the same line of argument. These sensitivity calculations are based on the UN population projections, cf. Box 2.

As an alternative to a higher employment rate, the weekly working hours could be increased. This would be subject to negotiations between the social partners, or by some employees switching from

Requirements to offset the effect of demographic developments on GDP per capita Table 1

Offsetting scenarios	Lower fertility	Statistics Denmark's projection	Higher fertility
Employment rate	79	83	86
Longer working week (hours)	1.4	3.1	4.2

Note: The table shows the increase in the average employment rate or weekly working hours required to offset the effect of demographic developments on GDP per capita until 2050 (blue column in Chart 4). Higher and lower fertility scenarios are based on the UN population projection, cf. Box 2.
Source: Statistics Denmark, United Nations Population Division (2017) and Danmarks Nationalbank.

Population projections from Statistics Denmark and the UN Box 2

Statistics Denmark, in collaboration with DREAM, prepares annual population projections covering the period until 2050. Population developments are determined by fertility and mortality rates and cross-border migration. As the first two variables change very slowly, they can be estimated with a relatively high degree of accuracy, while the predictions on migration are more uncertain. Overall, an increase in the Danish population is expected over the coming 40 years, primarily as a result of net immigration. A slight increase is expected in the Danish fertility rate, which is currently approximately 1.8 children per woman, but it will still be lower than the 2.1 children per woman required for a population to remain constant without emigration or immigration. At the same time, the elderly population is growing considerably, so the share of people aged 70+ will increase. This means that there will be relatively fewer people to produce prosperity and that it must be distributed on more people.

In the 2017 projection from Statistics Denmark and DREAM, net immigration has been adjusted upwards and converges to higher levels than before. Migration projections are subject to considerable uncertainty and so may be substantially revised from one projection to the next. Higher immigration of qualified labour could offset the downward trend in GDP growth, but since many countries are in the same situation, international competition for qualified labour may increase. The consequences of migration for GDP growth per capita are more uncertain and depend on immigrant participation rates and productivity. If immigrant productivity and, by extension, the salary received is below the average for the population, this will have a negative impact on GDP growth per capita and vice versa in case of high productivity. Immigrants in employment increase output, but then the value added must be distributed on more people. Thus, the effect on prosperity per capita is not as clear for immigration as it is for higher productivity. The latter clearly increases prosperity growth per capita.

The sensitivity analysis in Table 1 uses the UN population projections. For Denmark, the baseline scenario of the UN projection is in line with the population projection from Statistics Denmark and DREAM. In the scenarios with higher (lower) fertility rates, respectively, the average global fertility rate increases (is reduced) by approximately 0.5 child per woman. This is quite significant. Historically, the UN population projection (the baseline scenario) has been fairly accurate in terms of the actual global trend.

part time to full time work. Full neutralisation of the demographic effect on GDP growth per capita would require increasing average weekly working hours by just over three hours in the baseline scenario.

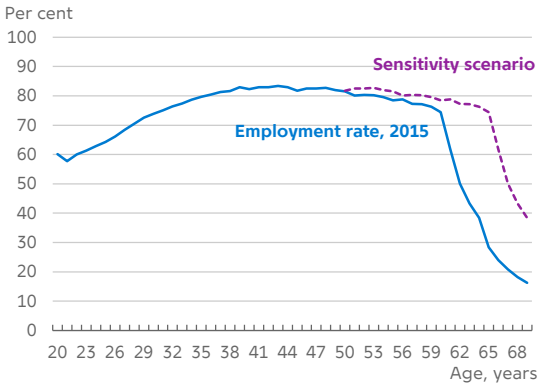
The labour force is affected by a number of factors besides demographics[4]. Reforms already adopted, including the 2006 Welfare Agreement and the 2011 Agreement on Later Retirement, will gradually increase labour market participation relative to the current level, especially among older cohorts, concurrently with the retirement age being raised. Another factor pointing in the same direction is the continuous improvement of the state of health in the older age groups and the potential to increase the immigrant employment rate. An opposing factor is that the prevalence of pension schemes may increase the opportunities for retiring before the official retirement age. Enhanced prosperity generally results in wishes for more leisure time.

A further sensitivity calculation has been performed in which the age-related employment rates for 50-year-olds and older increase as the retirement age is raised. This means that the employment rate for, say, a 65-year-old will be the same as the current employment rate for a 60-year-old, etc., cf. the dashed line in Chart 9. This brings the average employment rate to 81, more or less offsetting the negative effect on annual GDP growth per capita due to the fall in the share of 20-69-year-olds. It emphasises the importance of reforms being able to increase employment rates for the older age groups in the labour force. According to the Ministry of Finance, from today and towards 2050, reforms already implemented will increase employment for the older cohorts in the labour force by just below 300,000 persons and bring the average employment rate to 85 by 2050.

4 Cf. also the discussion in Danish Economic Councils, *Danish Economy*, Autumn 2017, page 34 ff.

Sensitivity scenarios for age-related employment rates

Chart 9



Note: The dashed line indicates a sensitivity scenario for the age-related employment rates.
Source: Statistics Denmark, RAS, and Danmarks Nationalbank.

Denmark is well prepared for the consequences of population ageing

GDP per capita is often used as a measure of a country's prosperity. However, for an overall measure of prosperity, i.e. the population's total consumption opportunities, the annual return on net foreign assets must be included, and adjustments must be made for changes in the terms of trade, cf. Box 1.

Domestic output per capita, or GDP per capita, creates only some of the total consumption opportunities in society. Danes are also entitled to part of the foreign output. This is attributable to savings of previous periods in the form of current account surpluses resulting in considerable net foreign assets. They currently account for close to 50 per cent of GDP. Net foreign assets typically provide an annual return that increases the Danes' consumption opportunities in line with domestically generated assets. The return on net foreign assets has risen over a number of years, accounting for 3-4 per cent of GDP. To this should be added any further gains in the form of improvement of Denmark's terms of trade.

These factors will offset the consequences for prosperity per capita due to population ageing in the coming decades. Public finance sustainability also contributes to the impression that Denmark as a nation is better prepared for the demographic challenge than many other countries.

ABOUT ANALYSIS

As a consequence of Danmarks Nationalbank's role in society we conduct analyses of economic and financial conditions.

Analyses are published continuously and include e.g. assessments of the current cyclical position and the financial stability.

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ECONOMICS AND MONETARY POLICY

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