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**MONETARY REVIEW**  
**1<sup>ST</sup> QUARTER**

2016



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# CONTENTS

## 7 CURRENT ECONOMIC AND MONETARY TRENDS

### ARTICLES

- 45 EXCHANGE RATE PASS-THROUGH TO DANISH  
IMPORT AND CONSUMER PRICES  
Mark Strøm Kristoffersen and Morten Spange, Economics

This article analyses pass-through of fluctuations in the nominal effective krone rate to import and consumer prices. As regards import prices, pass-through happens already within 1-2 months, although it is not complete. This indicates that some exporters adjust their prices to the Danish market. Pass-through to consumer prices is considerably weaker, reflecting that imports account for only part of private consumption. Furthermore, domestic distributors absorb part of the exchange rate fluctuations in their profit margins. The analysis indicates that pass-through is lower than previously. There are no indications that changes in the effective krone rate lead to a persistent rise in the rate of price increase.

- 57 FOREIGN DIRECT INVESTMENT  
Jacob Isaksen and Paul Lassenius Kramp, Economics  
Sanne Veje Klausen, Statistics

Over the last 30-40 years, the extent of FDI has expanded rapidly, both globally and in Denmark. This has enabled firms to expand more than if they operated solely within the borders of a single country. Very large Danish firms, especially in the industrial sector, are the main Danish investors abroad, especially in Denmark's trading partner countries. FDI generates substantial investment income. FDI abroad is found to neither crowd out nor stimulate domestic investment to any substantial extent.

- 69 GLOBAL VALUE CHAINS  
Peter Beck Nellemann and Karoline Garm Nissen, Economics

A final product is created through a chain of activities such as design, production, marketing and distribution, each of which adds value to the product. When activities are distributed among multiple firms, value chains are created. Using value chain analysis,

Danish value added can be tracked from the production of intermediate inputs to their final use. This provides a more accurate picture of how the level of Danish production and employment depends on foreign demand than that provided by traditional trade analyses. Germany is Denmark's largest trading partner, but measured by final use of Danish value added, Germany is less important than in terms of direct exports. The USA and China, on the other hand, are more important trading partners. Nearly 800,000 Danish jobs are linked to exports. These jobs are split about equally between jobs with exporters and jobs with the subcontractors of exporters.

## 77 TRENDS IN CLEARING OF EQUITY TRANSACTIONS BY A CENTRAL COUNTERPARTY

Johan Gustav Kaas Jacobsen, Financial Stability

Competition is currently strengthening in the European securities infrastructure, including as regards clearing of equity transactions. One reason is a tendency for several central counterparties to be active in the same marketplace. The article describes the role of central counterparties in the equity markets as well as benefits and challenges of recent developments.

# CURRENT ECONOMIC AND MONETARY TRENDS

## SUMMARY

Developments in oil prices and the economic situation in China have had a strong impact on the international economy in recent months. A number of emerging market economies have been negatively affected by the very low oil prices and the declining rate of growth in China, and their growth rates have slowed down. The advanced economies are picking up. Most of them are oil importers and therefore benefit from the low oil prices. At the same time, they are not much affected by the lower growth rate in China. Moreover, monetary policy remains very accommodative, also in the USA, although the Federal Reserve raised the target range for the federal funds rate a little in December 2015. Overall, global economic growth is expected to be slightly higher in the coming years, but the risk that it will be more subdued has increased.

The financial markets have seen strong fluctuations in the first months of the year, and equity prices, among others, have fallen. This reflects market assessments that the risks linked to China's economy and the global economic recovery in general have increased.

The European Central Bank, ECB, lowered its monetary policy interest rates on 10 March. At the same time, the ECB announced new targeted longer-term refinancing operations, TLTROs, and an expansion of the existing asset purchase programme. Danmarks Nationalbank kept its monetary policy interest rates unchanged.

Following eight quarters of steady growth, output and demand in Denmark stagnated in the

2nd half of 2015, while employment continued to rise. In the projection, labour market developments are seen as an indication that, overall, the Danish economy is still improving. Slightly weaker growth in the export markets in the coming years will curb growth – also in domestic demand. Consequently, growth in the gross domestic product, GDP, is forecast at 1.3 per cent in 2016, rising to 1.8 per cent in both 2017 and 2018. Employment is expected to increase by almost 75,000 from the 4th quarter of 2015 to the end of 2018.

The economy is expected to reach a normal level of capacity utilisation within the next few years. This is a little later than assessed in the projection from December 2015. The labour market gap, which indicates how much employment can rise without causing inflationary pressures, is expected to narrow in the coming years. Hence, the capacity situation is tightening, and by the end of the projection period in 2018 it will be close to its neutral level. Against that background – and in view of strong stimuli from interest rates and oil prices – there is still a need to tighten fiscal policy, but this may be done over a slightly longer period than assessed in the most recent projection.

Prices of single-family houses had shown signs of dampening throughout the 2nd quarter of 2015, but picked up again in the 2nd half of the year, adjusted for seasonal fluctuations. Prices of owner-occupied flats also continue to rise in the cities, but the rate of increase is lower than in the first part of 2015. In general, trading activity, measured by the number of sales registered in the

land register, has fallen since last spring, which could indicate that price pressures will subside.

## THE INTERNATIONAL ECONOMY AND THE FINANCIAL MARKETS

### ECONOMIC DEVELOPMENT AND GROWTH OUTLOOK

In the euro area, GDP growth was 0.3 per cent in the 4th quarter of 2015, cf. Chart 1 (left). The Purchasing Managers' Index, PMI, which provides a good indication of where the economy is heading, points to euro area growth remaining at more or less the same level in the 1st quarter of 2016. For 2015 overall, GDP grew by 1.6 per cent.

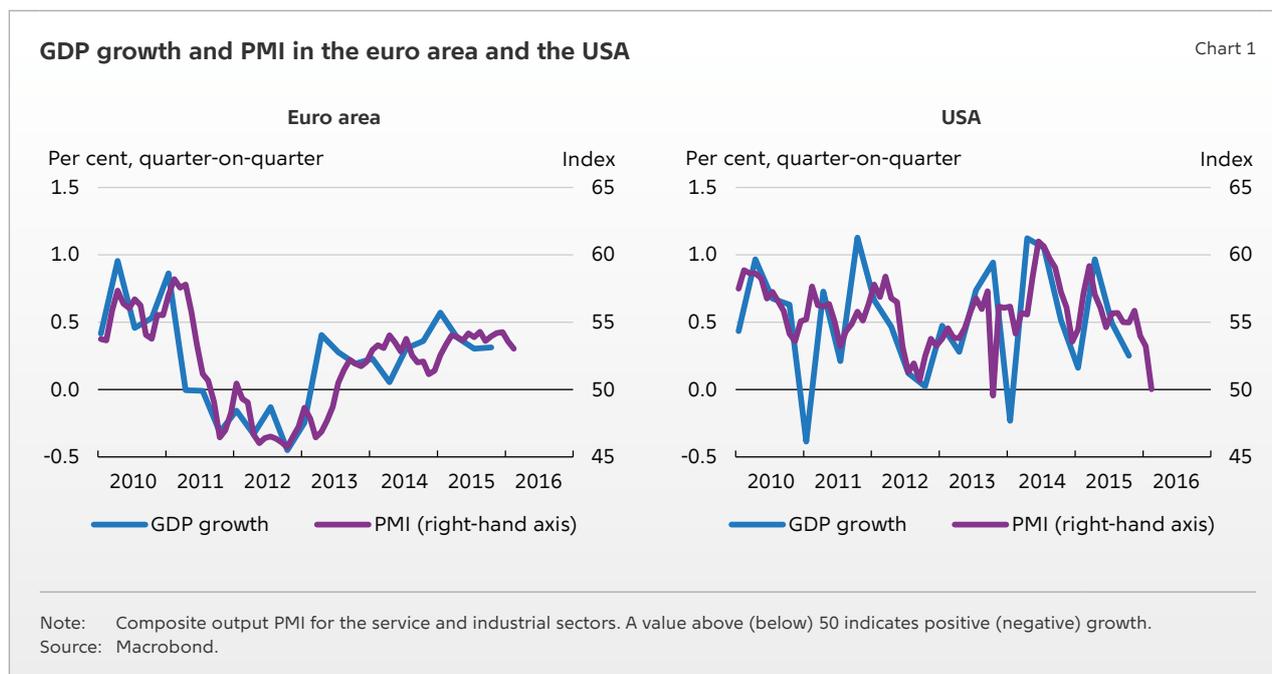
The recovery in the euro area is broad-based. Growth is particularly high in Ireland, but Spain and several Eastern European member states are also seeing strong growth rates. The German economy is growing at roughly the same pace as the euro area overall, while growth in France and Italy is a little lower. The Greek economy is contracting.

Growth is higher in the USA than in the euro area, standing at 2.4 per cent in 2015, and capacity pressures are gradually mounting in the labour market. Consequently, in December 2015 the Federal Reserve raised the target range for the federal

funds rate for the first time in more than nine years. However, at 0.3 per cent, economic growth was moderate in the 4th quarter of 2015, cf. Chart 1 (right). One of the reasons is that the manufacturing industry has been negatively affected by a 20 per cent appreciation of the nominal effective dollar rate from July 2014 to December 2015. At the same time, investments in the oil sector have fallen substantially as prices have dived. The PMI indicator points to a potential further decline in GDP growth in the 1st quarter of 2016.

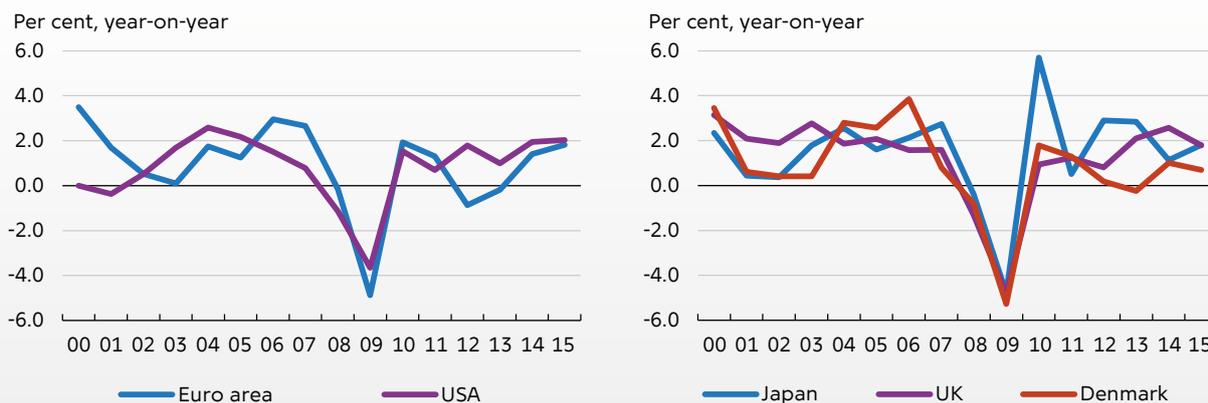
The UK is also showing robust economic growth with GDP growth of 2.2 per cent in 2015. In Japan, the economic progress is slower. The economy grew by a mere 0.5 per cent in 2015, primarily reflecting a shrinking population. Measured per capita (20-64-year-olds), growth is thus somewhat higher and more or less on a par with that of the USA, the euro area and the UK, cf. Chart 2 (left and right).

Growth in the advanced economies is driven mainly by private consumption. Positive effects of e.g. the low interest rates and oil prices have boosted disposable income. In the USA, consumption is also underpinned by the strengthening of the dollar, cf. Chart 3 (left). Investments are showing weaker developments, especially in the euro area, but US investment growth also declined in 2015, reflecting factors such as a sharp decline in investments in the oil industry, cf. above. In



**GDP per capita (20-64-year-olds) in selected economies**

Chart 2



Source: Macrobond and own calculations.

both the USA and the euro area, fiscal policy is more or less neutral (measured by the change in the primary structural balance) so that it is no longer dampening economic activity, cf. Chart 3 (right). In addition, euro area exports are positively affected by the weakening of the exchange rate, while the opposite applies in the USA. The strengthening of the dollar by approximately 20 per cent against the euro from May 2014 to early March 2016 reflects the different cyclical positions and levels of interest rates in the two economies. Looking ahead, private consumption will pick up

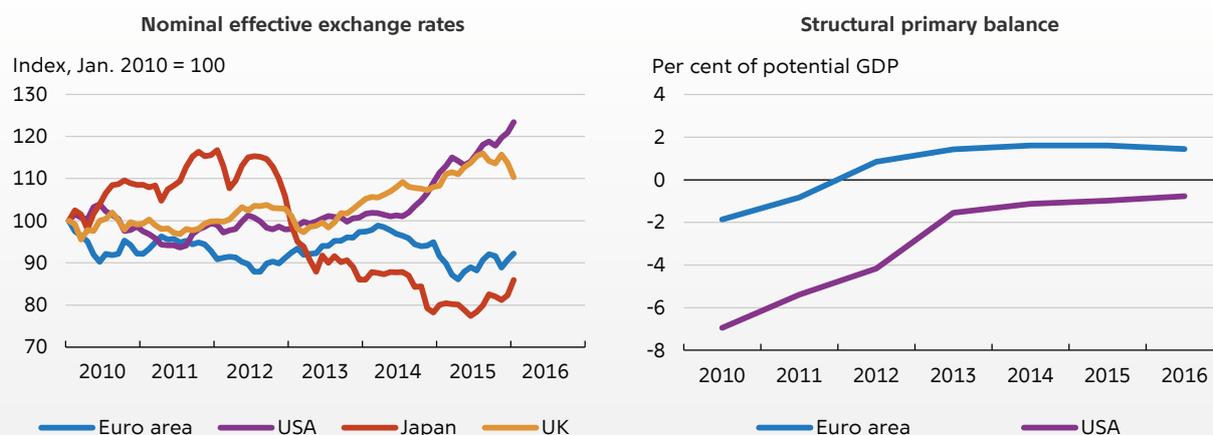
as employment and disposable incomes rise, and this is still expected to be the primary driver of economic growth in the advanced economies.

Growth in Sweden is strong and broad-based. GDP grew by 4.1 per cent in 2015. In Norway, the oil industry has been negatively affected by the low oil prices, which has dampened growth in the Norwegian economy overall. But it is being buoyed up by rising public consumption, low interest rates and depreciation of the Norwegian krone.

In the emerging market economies, economic growth has slowed down. Russia and Brazil are

**Nominal effective exchange rates and structural primary balances in selected economies**

Chart 3



Note: Left-hand chart: The broad nominal index from the Bank for International Settlements, BIS, has been applied. Right-hand chart: Based on the OECD's forecast from November 2015. Estimates for 2016.  
Source: Macrobond.

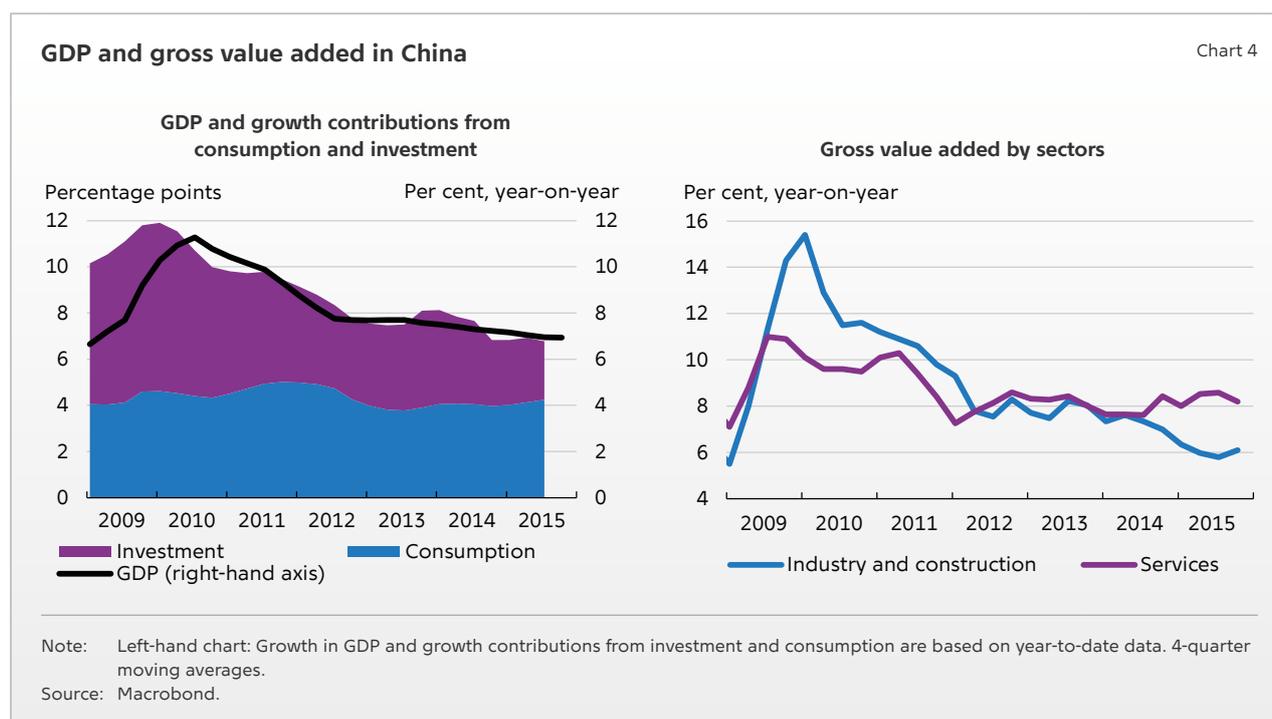
among the countries severely affected by the lower commodity prices and weaker growth in global demand for commodities. In China, GDP is growing at a slower rate because growth in investments has declined notably, and this is not fully offset by higher consumption, cf. Chart 4 (left). Especially growth in residential investments has slowed down. Moreover, the population of working age has begun to shrink. The weaker growth in activity has reduced growth in China's imports of commodities, which in turn has pushed down global commodity prices. At the same time, it has led to excess capacity in several industries in China.

While growth has declined in China's industrial and construction sectors, it has increased in the service sector, cf. Chart 4 (right). This reflects the trend in private consumption. In 2014 and 2015, growth in the service sector was driven mainly by consumption of financial services, which has been affected by developments in the Chinese equity market.

The Chinese economy is in a transition, which means that the rise in economic activity will increasingly be driven by consumption rather than investment. This will make the economic recovery more sustainable, but is expected to lead to a more subdued increase in GDP as the lower rate of investment growth is not fully offset by higher

consumption growth. In 2015, a number of monetary and fiscal policy measures were introduced to support the economy and reduce the risk of a too sharp decline in economic growth. This policy may increase existing imbalances such as high credit growth in the private non-financial sector (private non-financial sector debt rose by almost 50 per cent of GDP from end-2008 to mid-2015). The International Monetary Fund, IMF, and the OECD expect the authorities to be able to manage the process so that growth will decline only gradually over the coming years. Developments in China in the last year or so have not changed this assessment notably, but the organisations emphasise that downside risks have increased. This has also been reflected in the financial markets, where developments in China have contributed to large fluctuations.

Global economic growth is expected gradually to accelerate, cf. Table 1. This is mainly due to expectations that the economic situation in Russia and Brazil will improve. Nevertheless, the level of growth in the global economy has been adjusted slightly downwards because the emerging market economies are growing more slowly and because US growth is now expected to remain more or less unchanged rather than rising. Furthermore, the risk of a more subdued development has increased.



## Forecasts of real GDP growth in selected economies

Table 1

Per cent, year-on-year	Change relative to October 2015 <sup>1</sup>					
	2014	2015	2016	2017	2016	2017
Global <sup>2</sup>	2.7	2.5	2.7	3.0	-0.3	-0.2
USA	2.4	2.4	2.6	2.6	-0.2	-0.2
Euro area	0.9	1.6	1.7	1.7	0.1	0.0
Germany	1.6	1.7	1.7	1.7	0.1	0.2
France	0.2	1.2	1.3	1.5	-0.2	-0.1
Italy	-0.3	0.8	1.3	1.2	0.0	0.0
Spain	1.4	3.2	2.7	2.3	0.2	0.1
UK	2.9	2.2	2.2	2.2	0.0	0.0
Japan	0.0	0.5	1.0	0.3	0.0	-0.1
China	7.3	6.9	6.3	6.0	0.0	0.0
India	7.3	7.3	7.5	7.5	0.0	0.0
Brazil	0.1	-3.8	-3.5	0.0	-2.5	-2.3
Russia	0.6	-4.4	-1.0	1.0	-0.4	0.0

Note: Data for 2015 are forecasts for the global economy and India. Data for 2016 and 2017 are forecasts for all economies.

Source: Macrobond, OECD and IMF, *World Economic Outlook Update*, January 2016.

1. Percentage points.

2. GDP at market prices.

## OIL PRICE

In early March the price of oil (Brent) was approximately 40 dollars per barrel, cf. Chart 5 (left). This is some 65 per cent lower than in June 2014. The fall mainly reflects an increased supply, but growth in demand has also been weaker. Overall, there is an excess supply of oil and as a result, oil stocks have grown considerably. Global oil stocks increased by around 9 per cent from early 2014 until September 2015, while they had been relatively stable in the period 2010-13, cf. Chart 5 (right).

Global oil production has increased considerably in recent years, partly because the high oil prices seen previously had a positive impact on investment in the energy sector, particularly in the USA. At the same time, the members of the Organization of the Petroleum Exporting Countries, OPEC, have kept their output unchanged or increased it in order to protect their market shares. In addition, sanctions against Iran have been eased, allowing Iran to export oil again.

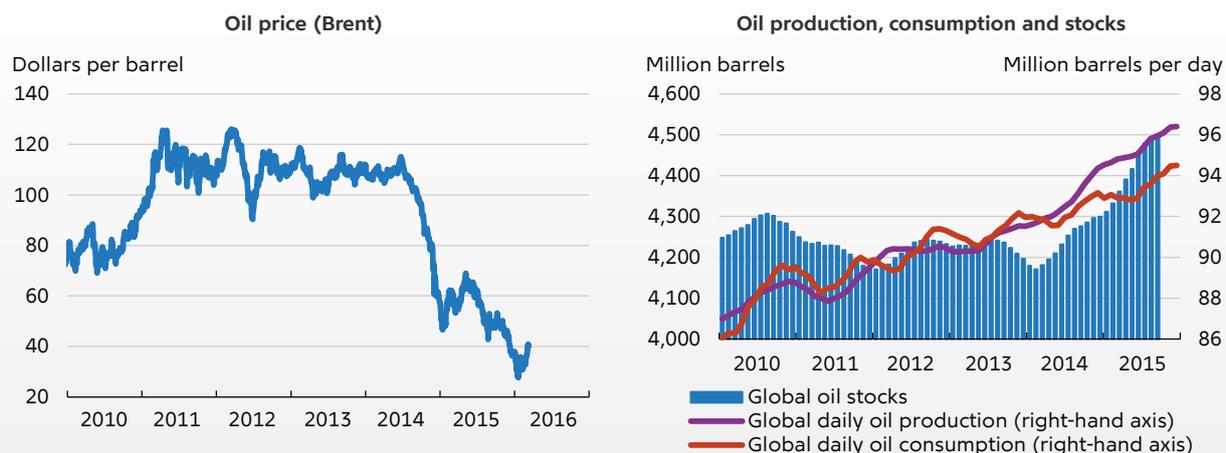
The weak growth in demand for oil in 2014-15 reflects a dampening of global economic activity and lower growth in China's oil imports.

The plummeting oil prices entail extensive redistribution of income from producers to consumers, both within and between countries. For the euro area, the saving amounts to almost 2 per cent of GDP, while losses for the OPEC countries correspond to just under 20 per cent of their GDP, cf. Chart 6 (left). The fall in oil prices has led to less favourable terms of trade for oil exporting countries because their export prices have dropped more sharply than their import prices. This means that their level of prosperity has declined. In some countries, including Norway and Russia, the terms of trade have deteriorated further due to depreciation of their currencies. This means that the loss on net exports is reduced because the oil price fall is smaller when measured in the local currency, cf. Chart 6 (right).

As a main rule, the global economy benefits from lower oil prices as a result of increased sup-

## Oil price and supply of and demand for oil

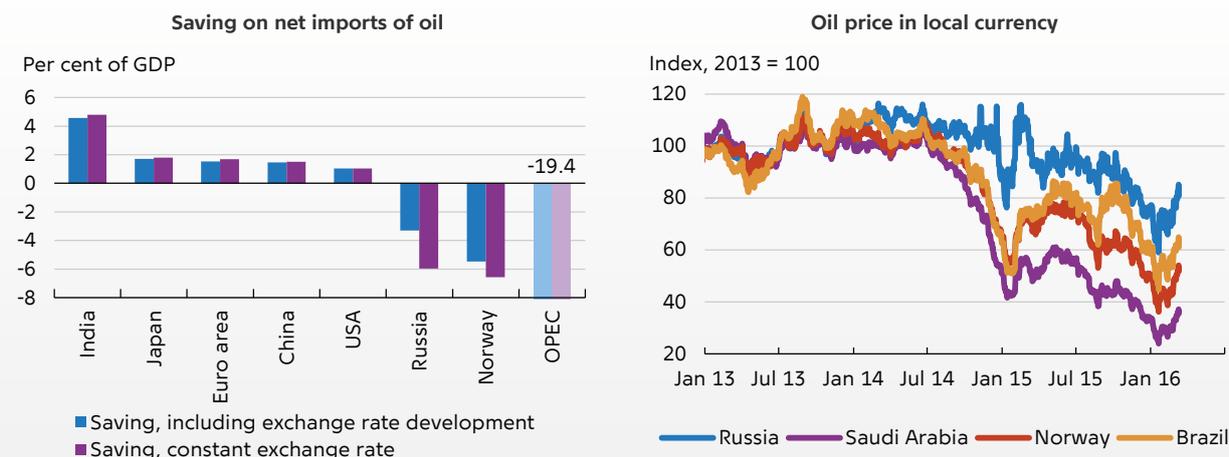
Chart 5



Note: Right-hand chart: 6-month moving averages. The series are based on data from the US Energy Information Administration.  
Source: Macrobond and own calculations.

## Saving on net imports of oil and oil price in local currency

Chart 6



Note: Left-hand chart: An oil price drop from 110 to 35 dollars per barrel has been applied in the calculation. Exchange rates on 21 July 2014 and 9 March 2016. The exchange rates of OPEC countries have been set at 1 as several of these countries pursue fixed exchange rate policies against the dollar. Data for net imports/exports of oil and GDP in the national currency is from 2015.

Source: Thomson Reuters Datastream, US Energy Information Administration, Macrobond and own calculations.

ply. One of the reasons is that the rise in aggregate consumption in the oil importing countries exceeds the fall in the oil exporting countries as many of the latter can normally cushion the negative impact, e.g. via fiscal policy. And in the short term, the propensity to consume is generally higher for oil consumers than for oil producers. But in the assessment of the IMF, consumption in the oil importing countries has shown a more subdued

response to the recent fall in energy prices than seen in previous periods when oil prices have fallen. At the same time, there is a risk that the negative effects will exceed the positive effects when oil prices dive sharply. Several oil exporting countries do not have the scope to counter the negative effects via fiscal or monetary policy, and public finances have come under further pressure because tax revenue from oil production has

declined. In its October 2015 forecast, the IMF expected a number of oil exporting countries to post large government deficits, both in 2015 and in subsequent years.

The low level of oil prices means that the profit from oil extraction has shrunk considerably. If energy sector companies experience debt servicing problems, this may affect financial stability in the countries in question and increase volatility in the financial markets. Some banks in the emerging market economies and some regional banks in the USA have high exposures to the energy sector, but for most of the globally systemically important banks the exposure is low.

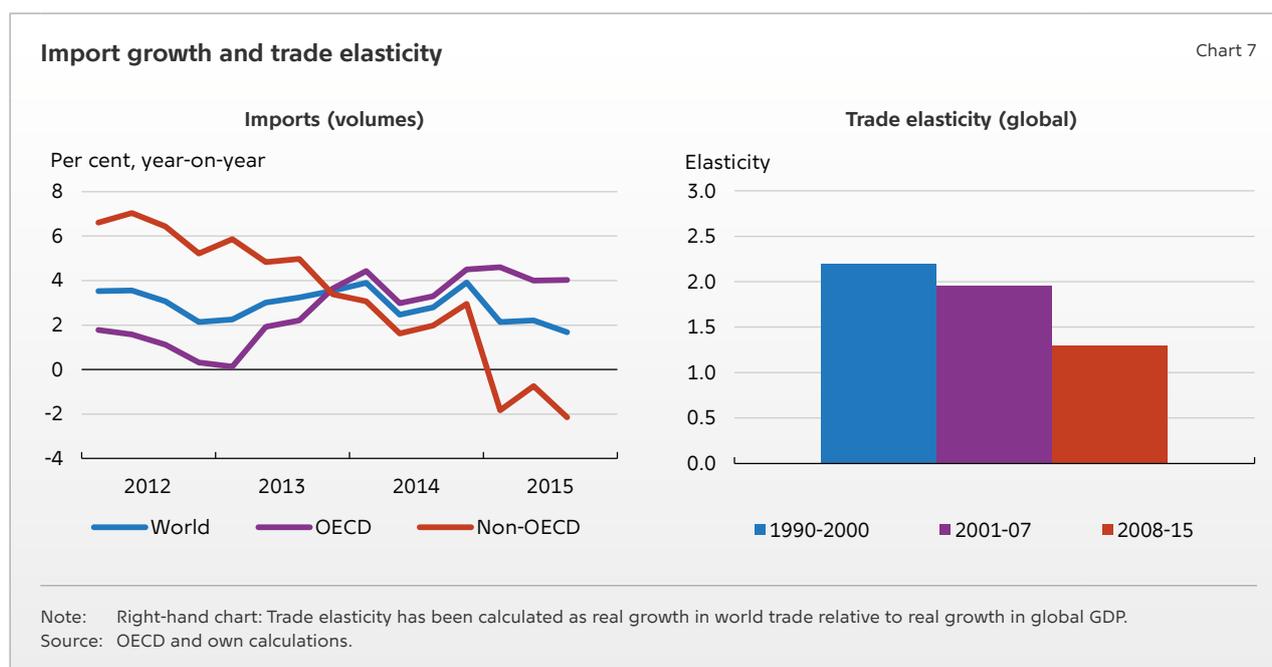
The low price of oil has led to an abrupt slowdown in investments in the oil industry and this is expected to continue in 2016. In the longer term this may cause the supply of oil to fall below demand, which is expected to rise as the global economy picks up. Both factors point to a rise in oil prices at some point. However, other factors may have the opposite effect, including the large stocks, the completion of oil extraction facilities under construction, a stronger-than-expected slowdown in growth in China and advances within energy-saving technology and renewable energy. According to the International Energy Agency, IEA, energy-saving measures will reduce growth in energy demand in OECD countries to 60 per cent of what it would otherwise have been by 2040. At end-February, a wide range of international

banks believed that the price of oil would rise to an average of approximately 65 dollars per barrel in 2018. In its World Energy Outlook from November 2015, the IEA expected the oil price to be 80 dollars per barrel in 2020 – and rising.

## DEVELOPMENT IN WORLD TRADE

Growth in world trade has declined, cf. Chart 7 (left). The main reason is that trade growth has fallen in non-OECD countries, especially Russia, Brazil and China. This reflects declining GDP growth in China, while Brazil and Russia have both been hit by severe economic downturns due to the low commodity prices, cf. above. Russia's imports are also negatively affected by import restrictions. Furthermore, world trade is impeded by the subdued global growth. The European Commission, the IMF and the OECD all expect growth in world trade to increase as global economic activity picks up.

Growth in world trade has generally been weaker since the economic and financial crisis. In the two decades up to the crisis, the ratio of average annual growth in world trade to average annual GDP growth, i.e. trade elasticity, was approximately 2, but after the crisis it fell to 1.3, cf. Chart 7 (right). This applied to both OECD and non-OECD countries. The elasticity is being further reduced by the fact that the non-OECD countries' share of global GDP and imports has risen, in that their trade elasticity is lower than that of



the OECD countries due to less trade with other countries.

The development in trade elasticity reflects both cyclical and structural factors. One cyclical explanation for the fall is that demand for investment goods is currently weak. This has a negative impact on growth in world trade since investments typically have a large import content. A structural explanation could be that the development in global value chains has slowed down, cf. the article "Global value chains" in this Monetary Review. Other explanations are that the reduction of trade tariffs has stagnated, while other barriers to trade have increased a little.

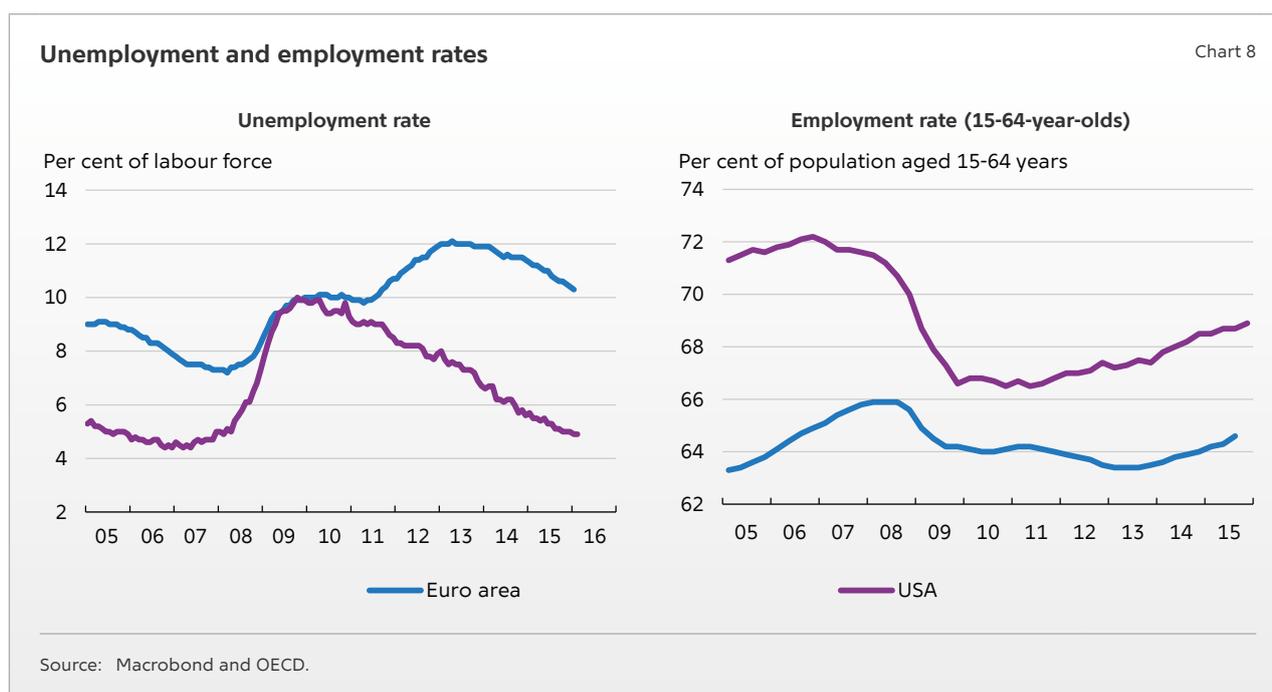
### LABOUR MARKETS, WAGES AND INFLATION

Labour markets in the advanced economies are improving. In the euro area, unemployment fell to 10.3 per cent in January, which is almost 2 percentage points below the peak in the spring of 2013, cf. Chart 8 (left). In the USA, unemployment is down to 4.9 per cent, which the Federal Reserve deems to be the level of structural unemployment in the USA.

Despite the recovery in the labour markets, wage growth remains moderate, cf. Chart 9 (left). One reason is that there are still spare resources. In the USA, the employment rate (15-64-year-olds) is approximately 3 percentage points below the pre-crisis level, cf. Chart 8 (right), and many

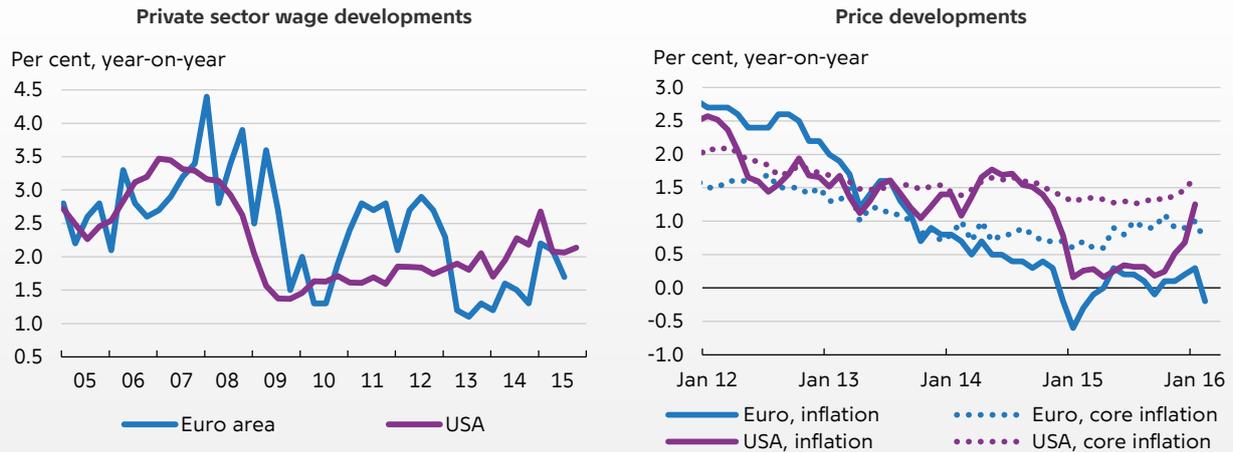
part-timers would like full-time employment. In the euro area, the employment rate is only approximately 1 percentage point lower than before the crisis, but unemployment is still high. Viewed over the last few years, wage growth has, however, been increasing in both the USA and the euro area, and in the USA both employers and employees expect wage growth to accelerate over the coming year.

In the euro area, the annual rate of increase in consumer prices fell to -0.2 per cent in February, having been marginally positive at the end of 2015 and in January 2016, cf. Chart 9 (right). This is to a large extent attributable to oil price developments. But underlying price pressures are also subdued. Core inflation, measured by the annual increase in the index of consumer prices excluding energy, food, alcohol and tobacco, fell to 0.7 per cent after having been stable at around 1 per cent since the summer of 2015. In the USA, price inflation, measured by the Personal Consumption Expenditures index, PCE, which is the Federal Reserve's preferred measure of inflation, has risen considerably in recent months, standing at 1.3 per cent in January compared with 0.2-0.3 per cent throughout most of 2015. This reflects factors such as a reduced downward pressure from the fall in oil prices (base effect). However, underlying price pressures have also risen a little, to 1.7 per cent in January.



## Wage and price developments in the euro area and the USA

Chart 9



Note: Right-hand chart: The EU Harmonised Index of Consumer Prices, HICP, has been applied for the euro area and the Personal Consumption Expenditures index, PCE, for the USA.  
Source: Macrobond.

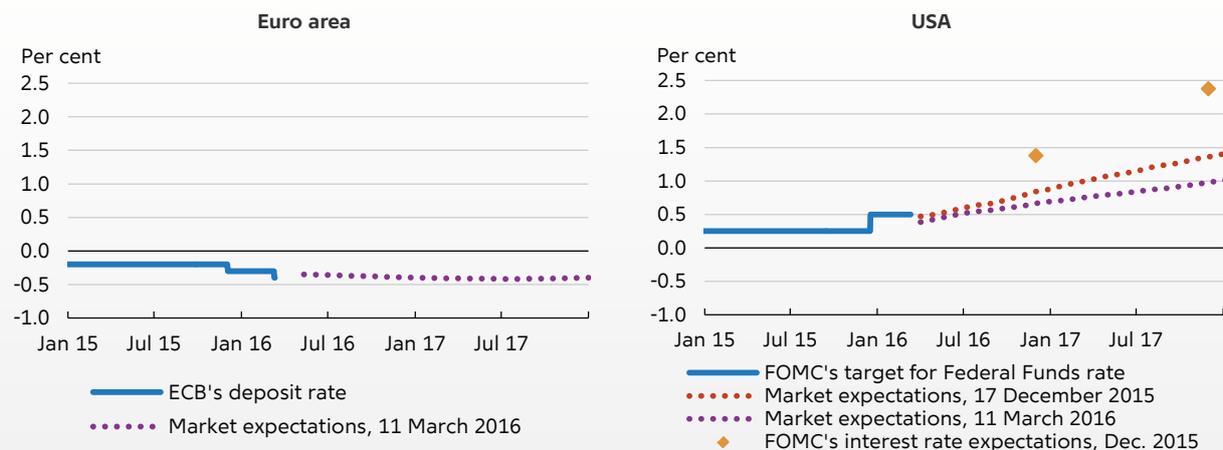
## MONETARY POLICY

At its interest rate meeting on 10 March, the ECB decided to lower its monetary policy interest rates. The deposit rate was reduced by 10 basis points to -0.4 per cent, cf. Chart 10 (left). The main refinancing rate and the marginal lending rate were reduced by 5 basis points, to 0 per cent and 0.25 per cent, respectively. Monthly purchases of,

inter alia, government bonds will be increased from 60 to 80 billion euro and the programme will be expanded to include corporate bonds. Purchases will continue until and including March 2017, as planned. In addition, four new series of targeted longer-term refinancing operations, TLTROs, each with a maturity of four years, will be launched. The rate of interest on the new TLTROs

## Expectations of monetary policy interest rates in the euro area and the USA

Chart 10



Note: Left-hand chart: Changes in deposit rates are shown on the date of announcement. The broken line indicates the expected interbank rate and has been calculated on the basis of the rates of interest on Overnight Interest Swaps on 11 March 2016. Right-hand chart: Market-derived expectations of the Federal Funds rate have been calculated on the basis of Federal Funds Futures. The increase adopted by the Federal Open Market Committee, FOMC, in December 2015 took effect on 17 December 2015.  
Source: Macrobond and Scanrate Rio.

will, as a minimum, correspond to the deposit rate.

In Japan monetary policy is also being eased further. In late January, the Bank of Japan introduced negative rates of interest on some of the banks' deposits. At the same time, it continues to purchase government bonds and other securities. The Bank of Japan currently holds around one third of the outstanding volume of Japanese government bonds, up from around 15 per cent in early 2013.

The Bank of Japan is the latest in a series of central banks that have introduced negative rates of interest on bank deposits within the last couple of years, cf. Chart 11 (left). These changes in monetary policy interest rates have been passed through to money market interest rates, which have in several cases become negative, cf. Chart 11 (right).

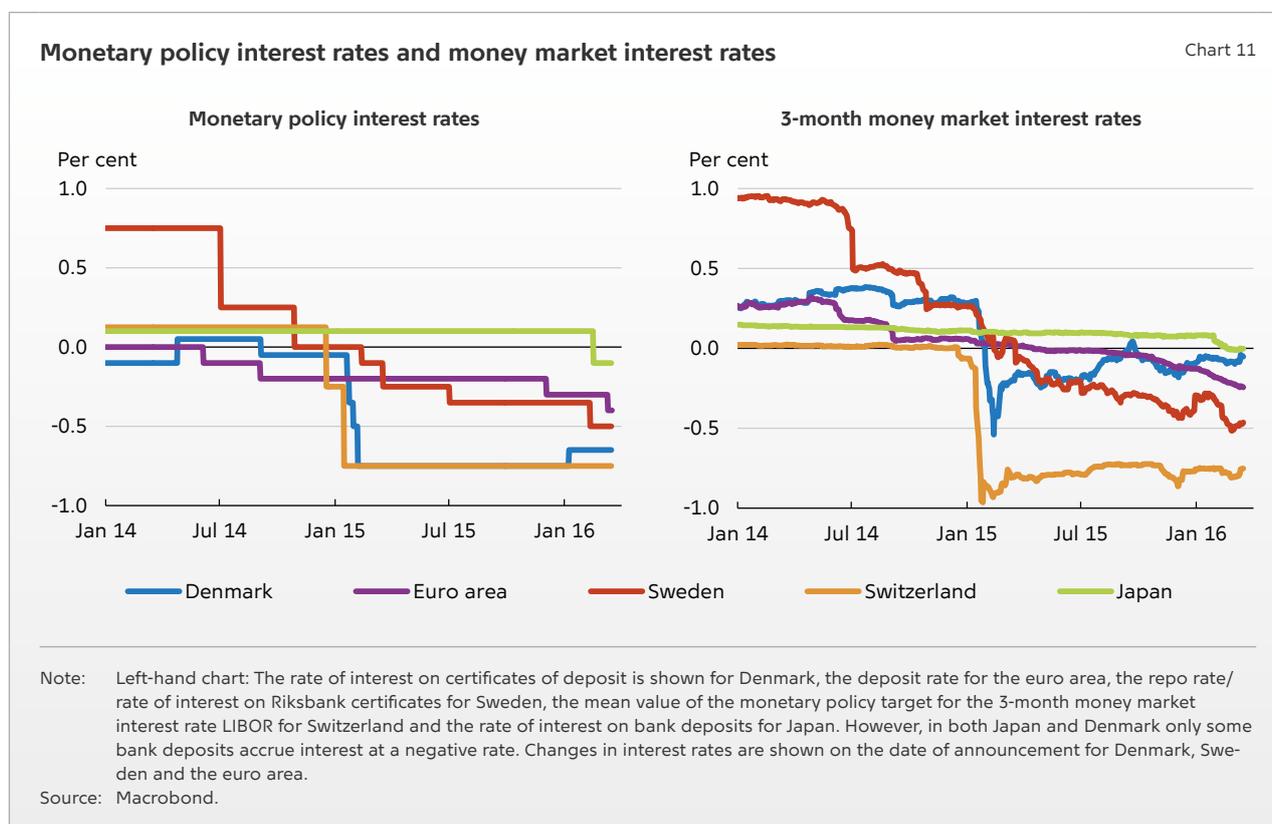
As previously stated, the Federal Reserve increased the target range for the federal funds rate from 0.0-0.25 per cent to 0.25-0.50 per cent in December. On the same occasion, the members of the Federal Open Market Committee, FOMC, announced that they expect to raise the fed funds rate by a total of 1 percentage point in

both 2016 and 2017. That is considerably more than market prices have currently factored in, cf. Chart 10 (right). Furthermore, the recent heightened volatility in the financial markets and weaker development in the US economy have led market participants to expect that the Federal Reserve will wait until around the turn of the year 2016/17 before it raises the fed funds rate again.

Norges Bank kept its key policy rate unchanged at 0.75 per cent at the monetary policy meeting on 17 December 2015, but indicated that it may be lowered in the 1st half of 2016. On 11 February, Sveriges Riksbank lowered the repo rate to -0.5 per cent to help keep consumer price inflation at the target of 2 per cent p.a. Furthermore, in January the Riksbank decided to intervene in the foreign exchange market to weaken the Swedish krona if it finds this necessary in order to ensure observance of the inflation target.

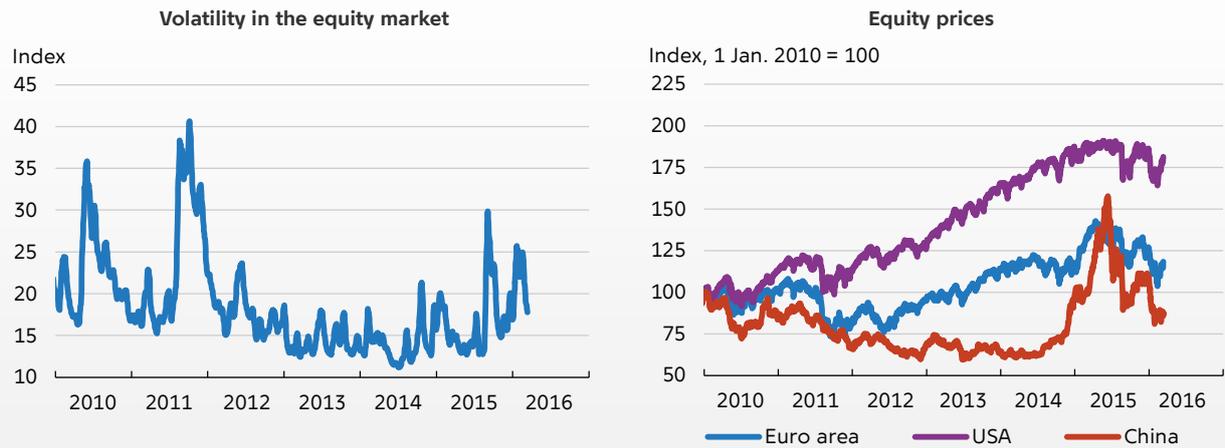
## FINANCIAL MARKETS

The financial markets have been characterised by strong fluctuations in the first months of the year, and e.g. equity prices have fallen, cf. Chart 12 (left and right). This reflects, inter alia, market assessments that the risks linked to the Chinese



## Volatility in the equity market and selected stock indices

Chart 12



Note: Left-hand chart: 10-day moving average of VIX (S&P 500). Right-hand chart: STOXX for the euro area, S&P 500 for the USA and Shanghai Composite for China.  
Source: Macrobond.

economy and the global economic recovery have generally increased. But in recent weeks, volatility has declined and equity prices have risen a little, especially in the USA.

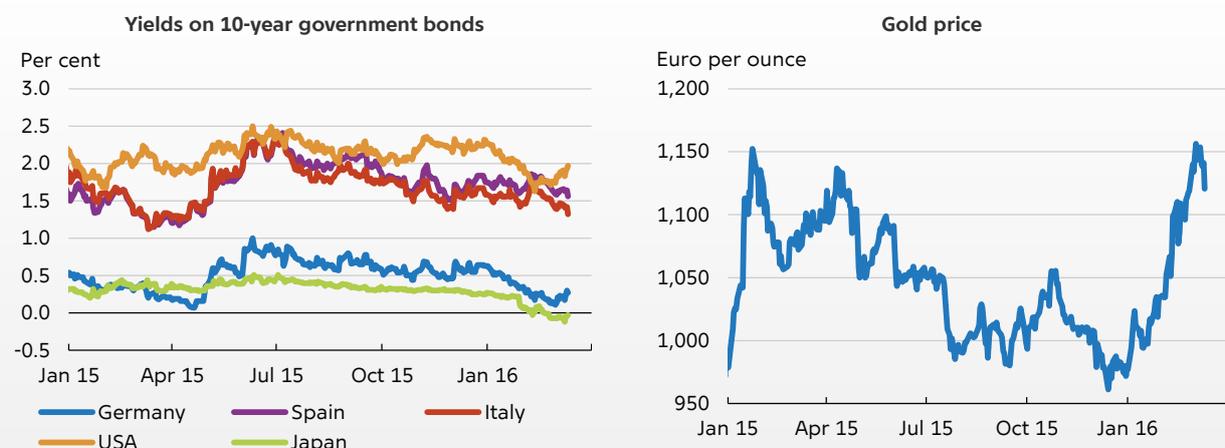
The increased volatility in the financial markets and the fall in equity prices triggered an investor flight to safer assets such as government bonds and gold. As a result, the yield on 10-year government bonds fell in countries such as Germany

and the USA, cf. Chart 13 (left), while the price of gold rose, cf. Chart 13 (right). The yield on 10-year Japanese government bonds fell immediately after the introduction of the negative rate of interest on some of the banks' deposits, and subsequently it fell further, to a little below zero.

From August 2015 to March 2016, the Chinese currency weakened by 5 per cent against the dollar, and capital has flowed out of the country, cf.

## Yields on 10-year government bonds and gold price

Chart 13



Note: Left-hand chart: 10-year benchmark bonds.  
Source: Macrobond.

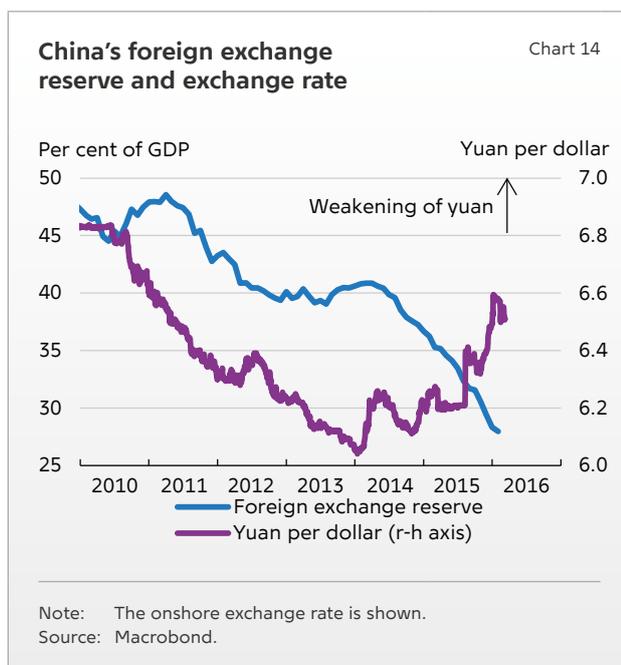


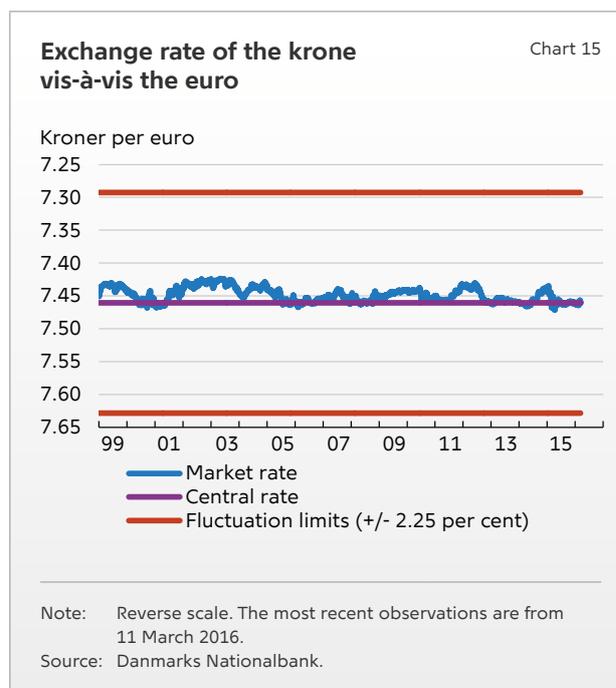
Chart 14. This should be viewed in the light of e.g. expectations that economic growth in China will subside and assessments that the risks linked to the development in the economy have increased. The People's Bank of China reduced its foreign exchange reserve by approximately 775 billion dollars from April 2014 to February this year.

## MONETARY AND EXCHANGE RATE CONDITIONS

### THE MONEY AND FOREIGN EXCHANGE MARKETS

The krone is stable against the euro at a level very close to its central rate in ERM2. Since mid-April 2015, fluctuations in the exchange rate have been extremely small, cf. Chart 15. Danmarks Nationalbank sold foreign exchange for kr. 49.6 billion in connection with intervention in December 2015 and for kr. 7.7 and 8.4 billion in January and February, respectively. This meant that the foreign exchange reserve was kr. 421.5 billion at end-February 2016, i.e. slightly smaller than before the pressure on the krone in early 2015. Overall, non-residents sold kroner net, while domestic market participants purchased kroner net in 2015.

In early December, when the ECB reduced its deposit rate, Danmarks Nationalbank kept the rate of interest on certificates of deposit un-



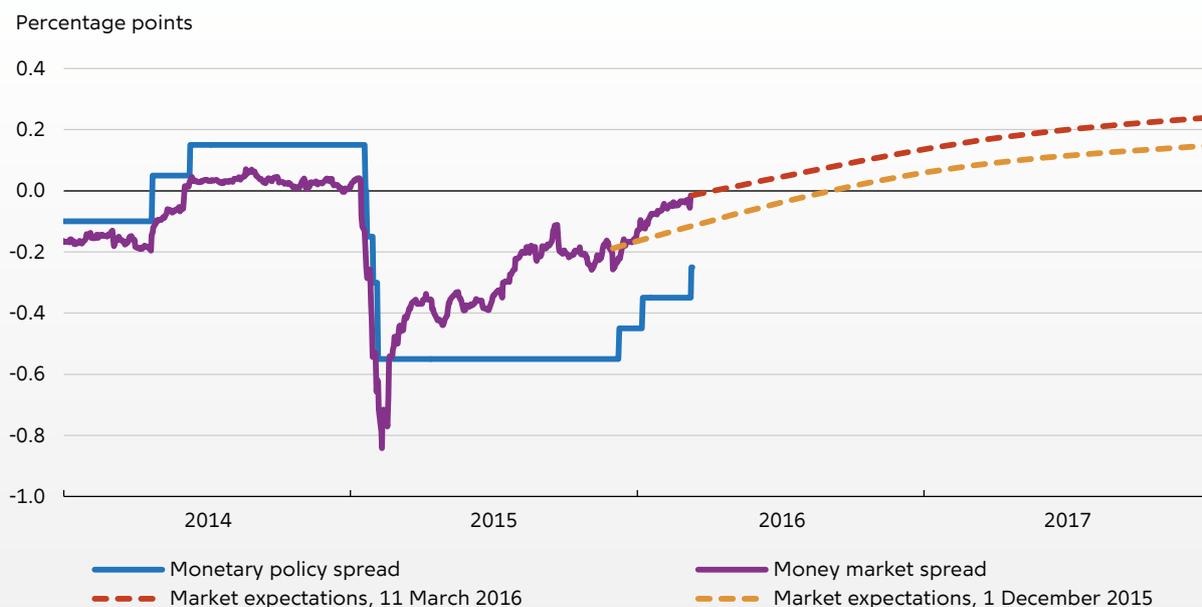
changed in view of its intervention sales of foreign exchange. Since intervention sales continued, Danmarks Nationalbank unilaterally raised the rate of interest on certificates of deposit by 0.10 percentage point effective 8 January. When the ECB, at its meeting on 10 March, announced a reduction of its monetary policy interest rates and a number of other measures, Danmarks Nationalbank kept its monetary policy interest rates unchanged. This decision was made against the background of Danmarks Nationalbank's intervention since the turn of the year.

This means that the monetary policy spread to the euro area has been reduced on three occasions within the last three months; from -0.55 percentage point in early December to -0.25 percentage point in mid-March. In the same period, the spread between short-term money market interest rates in Denmark and the euro area moved in the same direction, bringing the 3-month spread close to zero, cf. Chart 16.

Immediately after the ECB's interest rate meeting in early January and from then onwards, market expectations that the ECB would ease its monetary policy further this year increased. Hence, European money market interest rates had already declined prior to the interest rate cut in March. Based on the current interest rates at longer maturities, market participants still expect the ECB to reduce its deposit rate later this

Monetary policy interest rate spread and money market spread to the euro area

Chart 16



Note: The monetary policy spread is the spread between Danmarks Nationalbank's rate of interest on certificates of deposit and the ECB's deposit rate. Changes in interest rates are shown on the date of announcement. The money market spread is based on 3-month CITA and EONIA swap rates. Expectations relate to the money market spread and are based on forward rates derived from CITA and EONIA interest rate swaps, respectively. The most recent observations are from 11 March 2016.

Source: Nordea Analytics, Scanrate Rio, ECB and Danmarks Nationalbank.

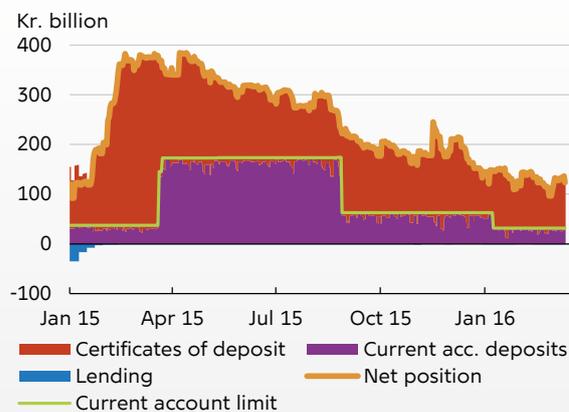
year, but to a slightly lesser extent than before the March meeting. Developments in the euro area also affected expectations of Danish money market interest rates. In mid-March, the markets expected the Danish overnight interest rate to rise, but at a slower pace than expected in early December 2015. Towards the end of 2017, the increase is expected to be approximately 0.2 percentage point. This means that the time when the overnight interest rate is expected to enter positive territory has been postponed by about half a year, to the spring of 2019.

In connection with Danmarks Nationalbank's increase of the rate of interest on certificates of deposit in January, the overall current account limit for the monetary policy counterparties was reduced from kr. 63 to 32 billion, cf. Chart 17. This reflected a decrease in the counterparties' placement requirement due to Danmarks Nationalbank's intervention sales of foreign exchange and purchases of kroner.

Since April 2015, the banks' deposit rates for financial corporations have generally risen in step with money market interest rates, cf. Chart 18 (left). The degree of pass-through from the

Use of Danmarks Nationalbank's monetary policy instruments

Chart 17



Note: The net position is the monetary policy counterparties' total net account in kroner with Danmarks Nationalbank for monetary policy purposes. It is defined as the counterparties' holdings of certificates of deposit and current account deposits less monetary policy loans. The most recent observations are from 11 March 2016.

Source: Danmarks Nationalbank.

negative rate of interest on certificates of deposit to the banks' interest rates on demand deposits varies considerably for the different types of financial corporation. For example, the rate of interest for insurance companies and pension funds was -0.4 per cent in January, while it was -0.1 per cent for credit institutions. For deposit rates overall the difference is somewhat smaller, however. This is to a large extent because the various sectors use different deposit types. The credit institutions' bank deposits are predominantly in the form of repo deposits, for which the rate of interest is substantially lower than for their demand deposits. Repo deposits are part of the collateralised money market. Viewed over a longer period, there has been a downward trend in repo market turnover, cf. Chart 18 (right). This has also contributed to increasing the overall rate of interest on the banks' deposits from credit institutions. The lower turnover may be attributable to the banks having reduced their bond portfolios and hence their possibilities of pledging collateral in connection with repo transactions. According to the market participants, this should be seen in the light of reduced risk appetite, one reason being that investors focus on whether the banks' earnings come from their core areas. Add to this new and future regulation in the form of capital and liquidity requirements, which can also make the

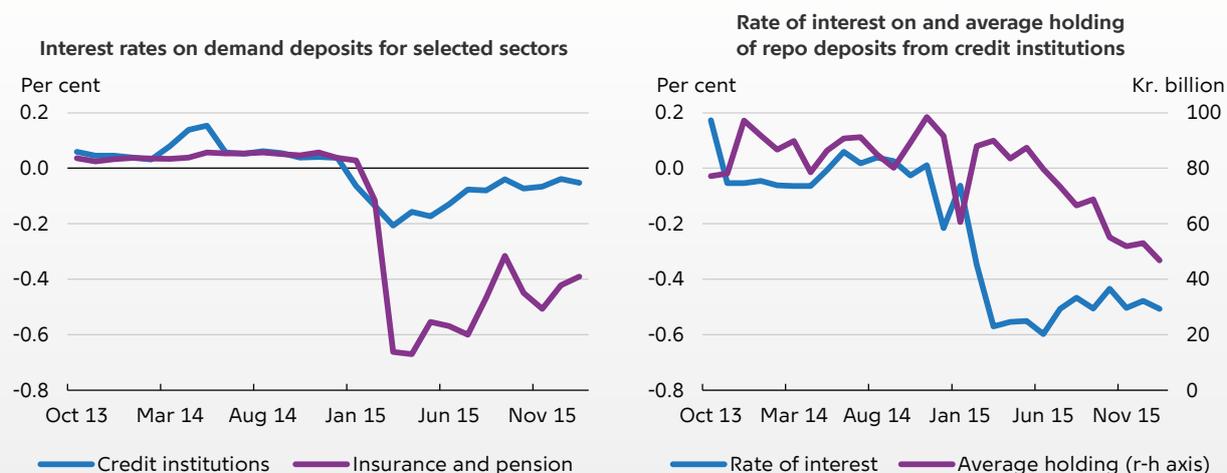
banks less willing to conclude repo transactions, cf. Danmarks Nationalbank, *Financial stability*, 1st Half 2015.

### CAPITAL MARKET

Danish government bond yields have broadly developed in line with their German counterparts. Government bond yields rose a little in December 2015. This reflects several factors, including that the ECB's easing of monetary policy at the interest rate meeting in early December was smaller than expected, and that the Federal Reserve increased its target rate in mid-December, the first increase in nine years. In addition, there were growing expectations in the market that Danmarks Nationalbank would raise its rate of interest on certificates of deposit. After the turn of the year, the tide turned, and government bond yields fell, cf. Chart 19 (left). In early January, this was attributable mainly to general concerns about a slowdown in the global economy and resulting stock market turmoil, which led investors to seek safer assets, cf. the section on the international economy. Towards the end of January and in early February, government bond yields were affected by the interest rate cut in Japan and increased expectations that the ECB would introduce further easing. The fall in government bond yields has been most pronounced for the long maturities, so that

**The banks' deposit rates vis-à-vis financial institutions and repo transactions with credit institutions**

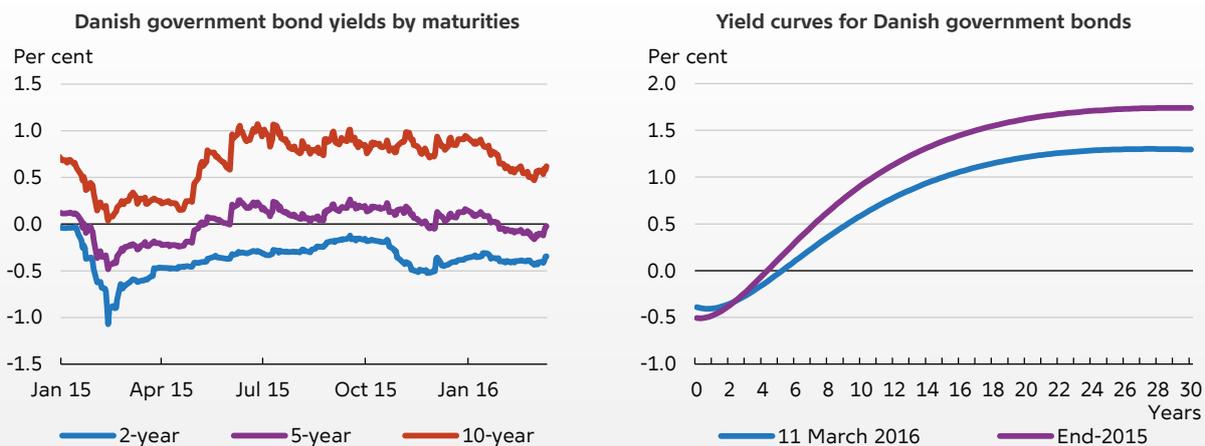
Chart 18



Note: Monthly average interest rates on the banks' outstanding deposits. Credit institutions are mainly banks and mortgage banks.  
Source: Danmarks Nationalbank.

**Danish government bond yields**

Chart 19



Note: Left-hand chart: Par yields, i.e. calculated yields for maturities of exactly 2, 5 and 10 years. The most recent observations are from 11 March 2016.  
Source: Nordea Analytics and Scanrate Rio.

the yield curve has flattened in recent months, cf. Chart 19 (right).

In the last few months, the yield spread between Denmark and Germany has continued to widen a little, cf. Chart 20. In the same period, the spreads of a number of other countries to Germany have also widened, e.g. those of Sweden, Finland and Belgium. Presumably a part of the widening of the Danish-German spread

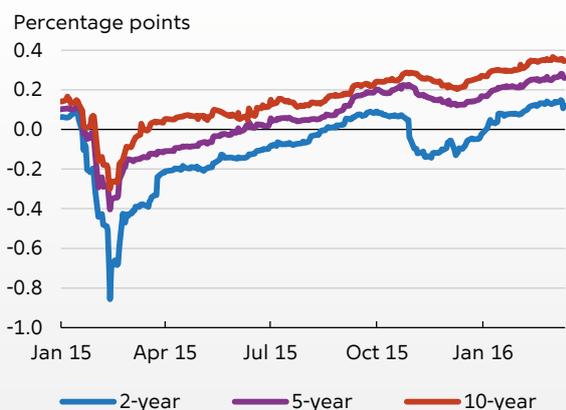
reflects that liquidity in the market for Danish government bonds has not yet normalised completely after the suspension of issuance from end-January until October 2015. But the widening should also be viewed in the light of the ECB's purchases of government bonds, which are still keeping euro area yields at an extraordinarily low level.

In the first two months of 2016, the Danish and international equity markets were characterised by great uncertainty. Concerns about a downturn in the global economy and a more cautious approach to risky assets led to high volatility, and from the beginning of the year until and including February, the Danish equity market experienced four trading days with falls exceeding 3 per cent. That is very unusual. In the period 2011-15 there were only nine trading days in all with correspondingly negative reactions. However, the fall in the first two months of 2016 should be viewed against the backdrop of surging equity prices in the preceding two years. The price rises in 2014-15 can generally be attributed to growth in earnings and market expectations of future earnings, cf. Box 1.

Short-term mortgage yields have more or less mirrored government bond yields, cf. Chart 21 (left). The 30-year mortgage yield has been less volatile, but fell by approximately 0.1 percentage point, to 3 per cent, from early December to

**Spread between Danish and German government bond yields**

Chart 20



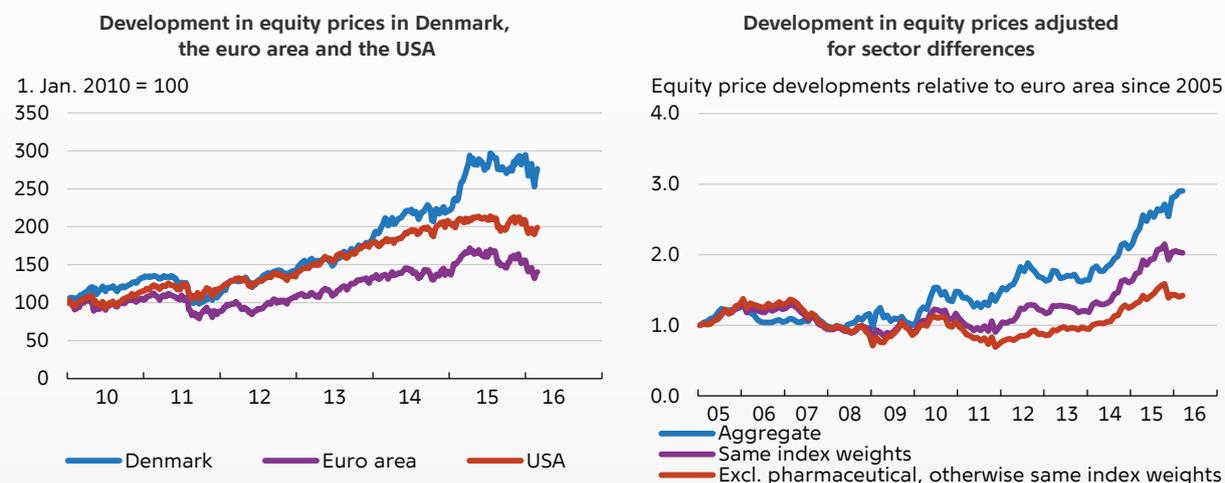
Note: Par yields, i.e. calculated yields for maturities of exactly 2, 5 and 10 years. The most recent observations are from 11 March 2016.  
Source: Nordea Analytics.

## Danish equity prices have risen strongly in recent years

Danish equity prices have risen in each of the last four years. In the period 2013-14, the rate of increase was in line with that of the USA and slightly higher than that of the euro area, cf. the left-hand chart below. But in 2015 Danish equi-

ties outperformed those of practically all other developed countries. The largest Danish equities rose by almost 40 per cent, including dividends distributed in 2015.

### Development in equity prices in Denmark relative to other areas



Note: Left-hand chart: Total yield (i.e. including dividends) in the local currency. Indices: OMXC (Denmark), EURO STOXX (euro area) and S&P 500 (USA). Right-hand chart: Relative development in equity prices compared with the euro area when 1. differences in the weighting of the various sectors are eliminated (purple) and 2. price developments for pharmaceutical equities are eliminated (red). Calculated on the basis of Datastream's sector index (not total yield), which includes other companies than the indices in the left-hand chart and does not include dividends. The index for the pharmaceutical sector also includes biotech equities.

Source: Thomson Reuters Datastream.

Part of the explanation for the high return on Danish equities compared with those of e.g. the euro area is that Denmark's largest company by far in terms of market value, Novo Nordisk, has risen strongly in value. But the higher return is not attributable to Novo Nordisk only. The pharmaceutical sector has a large weight in the index in Denmark relative to the euro area. In terms of price, equities in that sector have performed better than those of other sectors in both Denmark and the euro area. The difference in the return that stems from the difference in index weights can be isolated by constructing indices with identical weights for the two areas. That reduces the return in Denmark somewhat, cf. the right-hand chart above. In addition, Danish pharmaceutical companies have performed better than equivalent companies in the euro area. However, an investment in equities in companies in other sectors also gave a higher return than a corresponding investment in the euro area.

The valuation of Danish equities, measured relative to the book value of the equity capital or relative to current earnings, is high and has been rising since 2012, cf. the left-hand chart below. This does not in itself indicate that equity prices are unsustainably high. There can be many reasons for the rise in equity prices and valuation, e.g. expectations of high future earnings.

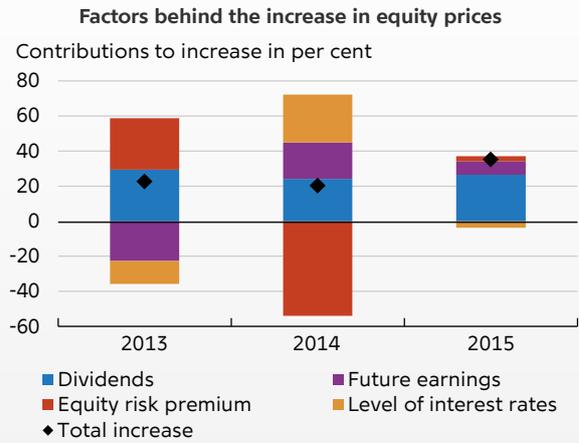
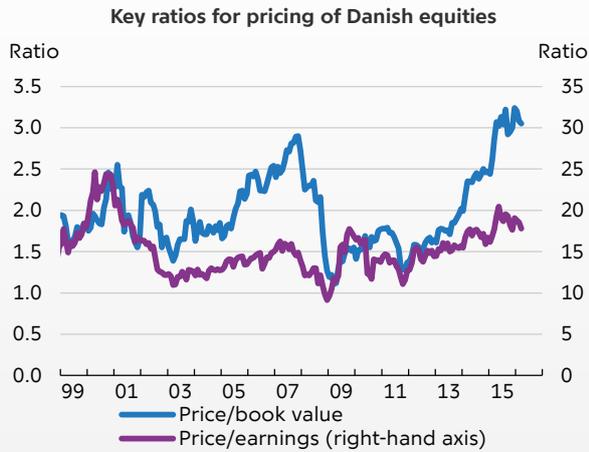
A "dividend discount model" can provide insight into whether an equity price increase is driven by developments in current dividends and future earnings, changes in interest rates or simply a change in the price of risk. In the model, the increase in equity prices in Denmark is attributable mainly to high growth in dividends, cf. the right-hand chart below. All else equal, the expected future earnings growth has also contributed to the rise in equity prices in 2014 and 2015. Changes in the equity risk premium have not contributed systematically to the increase.

mid-February. This meant that for a brief period in late January the price of 30-year 3 per cent bonds exceeded 100.

As the spread between long-term and short-term yields narrowed, households increasingly took out fixed rate mortgage loans in the course

of 2014. In early 2015, when yields were generally record low, many households also took the opportunity to switch from loans with short fixed interest periods to fixed rate loans. Since then the trend has reversed, cf. Chart 21 (right). Immediately after the ECB's interest rate meeting

Pricing of Danish equities and drivers of the increase

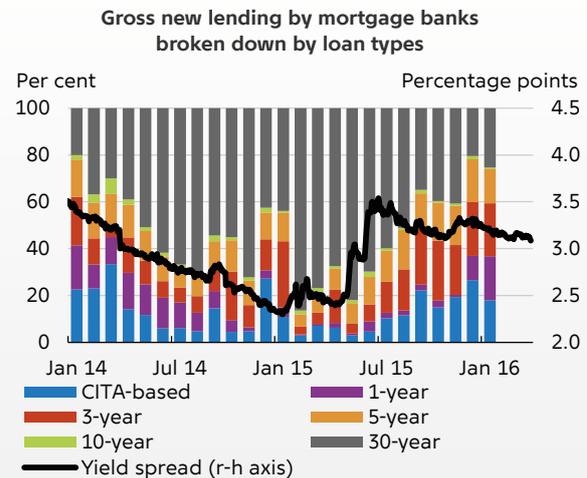
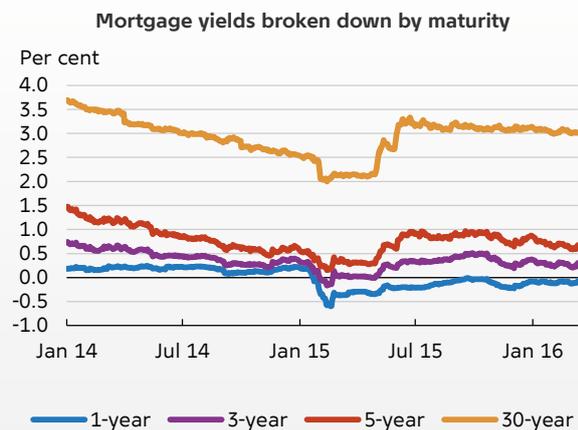


Note: Left-hand chart: "Price/book value" is the ratio of the market value of Danish companies to the book value of their equity capital. "Price/earnings" is the ratio of market value to market analysts' expectations of earnings in the current financial year. Expectations have been applied rather than the preceding years' realised result so as to avoid noise from extraordinary income and expenses. Right-hand chart: Based on OMXC20. Decomposition based on approximation to a "three-stage dividend discount model", see Russel J. Fuller and Chi-Cheng Hsia, A simplified common stock valuation model, Analysts Journal, September/October 1984, Vol. 40, No. 5. The calculation includes the dividend percentage, analysts' expectations of medium-term growth in earnings, a long-term, risk-free interest rate (10-year Danish government bond yield) and a long-term expected nominal GDP growth rate (potential real growth, applying the method described in Asger Lau Andersen and Morten Hedegaard Rasmussen, Potential output in Denmark, Danmarks Nationalbank, Monetary Review, 3rd Quarter 2011, Part 2, with the addition of 2 per cent).

Source: Thomson Reuters Datastream and own calculations.

Mortgage yields and distribution of gross new lending on loan types

Chart 21

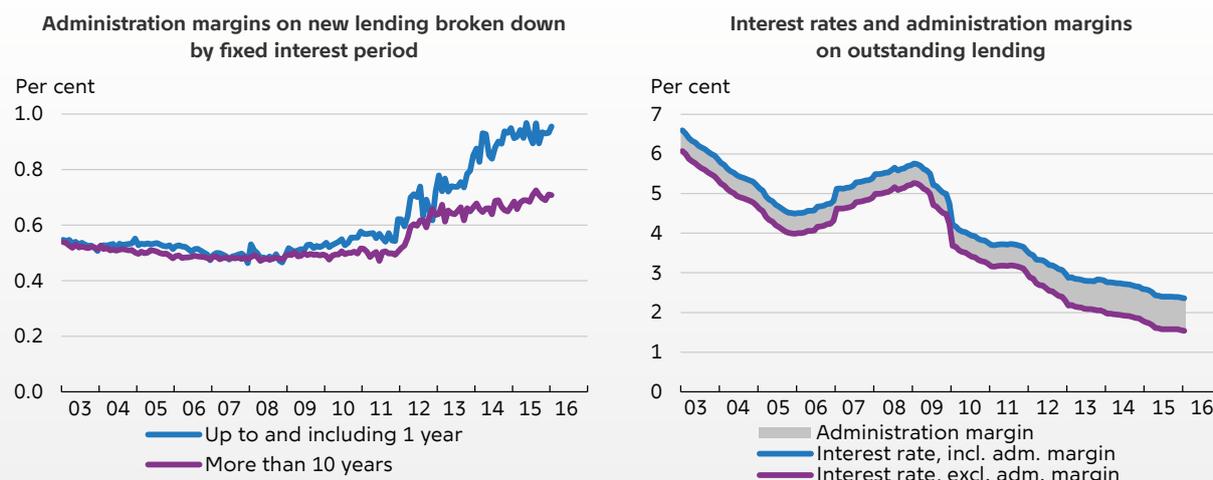


Note: Left-hand chart: The 1-, 3- and 5-year mortgage yields are based on fixed bullets. The 30-year yield is an average yield to maturity based on callable mortgage bonds. The most recent observations are from 11 March 2016. Right-hand chart: The various loan types have been estimated on the basis of their fixed interest periods. The yield spread is the spread between the 30- and 1-year yields. The most recent observations are from January 2016 for new lending and from 11 March 2016 for the yield spread.

Source: Nordea Analytics, Nasdaq OMX and Danmarks Nationalbank.

## Interest rates and administration margins on lending to households

Chart 22



Note: Average administration margins and lending rates. Adjustment has been made for the data break resulting from the transition to new MFI statistics in September 2013. The most recent observations are from January 2016.  
Source: Danmarks Nationalbank.

in March, both Danish and German government bond yields rose a little.

For a number of years, the mortgage banks have, via their administration margins, increased the incentive for borrowers to choose loans with longer fixed interest periods. From the end of 2011 until and including 2014, the spread between administration margins for loans with short fixed interest periods and fixed rate loans widened considerably, cf. Chart 22 (left). Brokerage fees in connection with remortgaging also increased in this period. In 2015, the relative administration margins for the various loan types remained virtually unchanged. But in early February, Nykredit announced that it planned to become stock exchange listed and that the administration margins for loans provided by Totalkredit would be raised by 0.1-0.4 percentage point with effect from July 2016. The increase will be most pronounced for adjustable rate loans with short fixed interest periods, so that the incentive to choose loans with longer fixed interest periods increases. Despite the fact that administration margins have risen in recent years, total borrowing costs for households have fallen sharply due to the low level of interest rates, cf. Chart 22 (right).

Nykredit's plans to strengthen its capital base via listing are positive in terms of financial stability for two reasons. Firstly, listing will give Nykredit

a capital injection, thereby increasing the robustness of the company. Secondly, listing will give Nykredit a new channel for sourcing capital in future, should it be necessary.

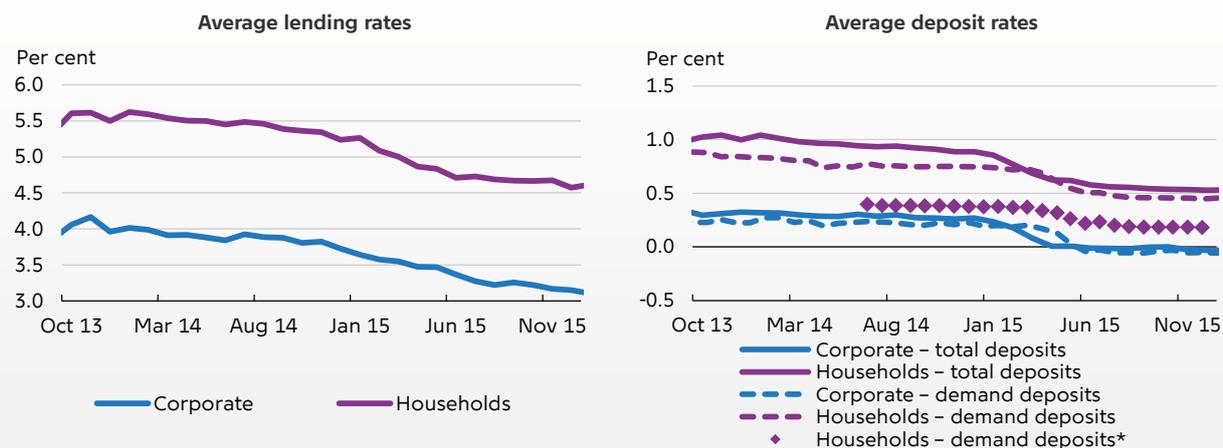
In February, the mortgage banks held auctions of fixed bullets for refinancing loans with interest rate fixing in April. For the loans with the shortest fixed interest periods, this led to an increase of 0.2 percentage point relative to the preceding refinancing, while the rates of interest on 3- and 5-year adjustable rate loans fell by around 0.5 and 2.5 percentage points, respectively. Borrowers with 5-year adjustable rate loans were therefore able to switch to fixed rate loans without any increase in their interest payments. If the volume of bonds maturing is compared with the volumes offered, the degree of refinancing was just under 80 per cent. So the downward trend in the share of loans with short fixed interest periods continues. Combined with the spreading of the refinancing auctions, this helps to reduce the refinancing risk.

### THE BANKS' AND MORTGAGE BANKS' INTEREST RATES, LENDING AND DEPOSITS

The banks' interest rates on loans to households and the corporate sector have decreased a little in recent months, while deposit rates have been more or less unchanged, cf. Chart 23. The most recent fall in interest rates on lending to households

The banks' lending and deposit rates for households and the corporate sector

Chart 23



Note: Monthly average effective interest rates on outstanding lending and deposits. Mortgage-like bank loans are all types of mortgage-like loans where the lending rate also applies to the corresponding deposits. The most recent observations are from January 2016.

\* Adjusted for mortgage-like bank loans.

Source: Danmarks Nationalbank.

masks a practically unchanged rate of interest on housing loans, while the rate of interest on consumer credit has declined a little. In addition, lending for other purposes, where the rate of interest is approximately 2 percentage points higher than for loans against the home as collateral, have fallen.

The banks' corporate deposit rates have been around 0 per cent since April 2015. In the same period, the rate of interest on household deposits has remained positive. In January 2016, the rate of interest on household demand deposits was just under 0.5 per cent. This is because around 15 per cent of household demand deposits were linked to mortgage-like loan agreements, for which the rate of interest was approximately 2 per cent. Only around half of household deposits accrued interest at 0 per cent. By comparison, approximately one third of deposits from the corporate sector and most deposits from other MFI's accrue interest at negative rates. Compared with corporates, households have a larger share of deposits that are tied up for a certain period, in the form of either time deposits or deposits redeemable at notice, for which the rate of interest is also higher.

The period for which such deposits are tied up depends very much on the difference in the remuneration of the various deposit types. If the interest rate spread between time deposits

and demand deposits narrows, the incentive to choose the former is reduced. Consequently, the share of demand deposits relative to total deposits increases. This has not least been the case in recent years, cf. Chart 24.

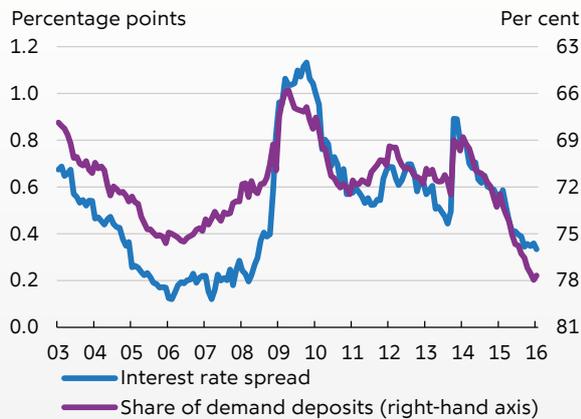
Cash in circulation increased by 4 per cent in 2015. Since the spring of 2015, the increase has been a little higher than the trend in the last five years would point to. However, there are no signs that the sectors experiencing negative rates of interest have increased their demand for cash, and nor has demand for the large banknote denominations been unusually high, cf. Chart 25 (left). This indicates that the increase in the circulation does not reflect a rise in the demand for cash as a store of value. Nor has the increase been at the expense of deposits in banks.

Measured as a share of GDP, deposits from non-MFIs have been stable during the period in which cash in circulation has increased, cf. Chart 25 (right). The rise in the most liquid assets, i.e. both cash and deposits, is not a purely Danish phenomenon. In the euro area, average year-on-year growth in the money stock, M1, has been 13 per cent – more or less in line with that seen in Denmark.

The banks' and mortgage banks' aggregate lending to households and the corporate sector has been virtually unchanged in recent months, cf.

**The banks interest premium on time deposits relative to demand deposits from households and demand deposits as a share of total deposits**

Chart 24



Note: Reverse scale on the right-hand side. The rate of interest on time deposits varies with the term of the deposit, but the vast majority of time deposits have terms of up to 2 years. The rate of interest applied is an average for all time deposits. The share of demand deposits has been calculated relative to total deposits, i.e. relative to not only time deposits, but also e.g. deposits redeemable at notice. However, other types of deposit constitute less than 5 per cent of total deposits. Adjustment has been made for the data break resulting from the transition to new MFI statistics in September 2013. The most recent observations are from January 2016.

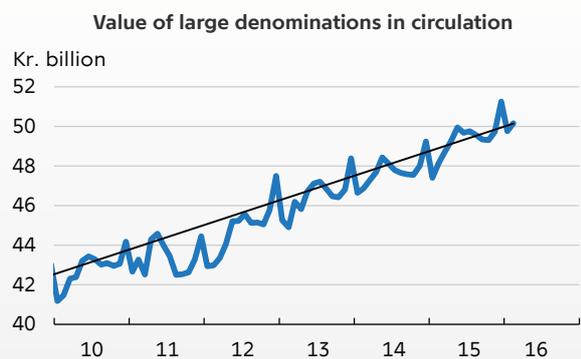
Source: Danmarks Nationalbank.

Chart 26. Lending to the corporate sector totalled kr. 1,031 billion at end-January 2016, while lending to households totalled kr. 2,334 billion. Over the last year, total lending has increased by just under 1 per cent, driven mainly by mortgage banks' lending to households.

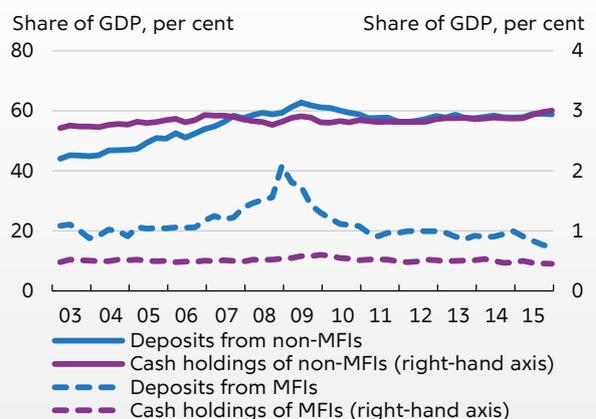
According to Danmarks Nationalbank's lending survey, both the banks and the mortgage banks expected to tighten credit standards vis-à-vis households in the 4th quarter of 2015, cf. Chart 27 (left). These expectations were based on the introduction of "good practice" rules for financial institutions, under which house buyers must pay a down payment of 5 per cent of the value of the home. The banks ultimately tightened credit standards slightly more than expected, while the mortgage banks tightened them slightly less. This tightening is not reflected in the actual development in lending in the 4th quarter of 2015. The reason could be that some of the banks already applied the 5 per cent rule and that the mortgage banks are not directly comprised by the rule, but only affected to the extent that the banks grant fewer loans. As regards lending to the corporate sector, credit standards have remained more or less unchanged, but the mortgage banks expect to tighten them in the 1st quarter of 2016, cf. Chart 27 (right). This reflects the proposed amendment to the Executive Order on Govern-

**Development in the circulation of cash and deposits**

Chart 25



**Cash in circulation and deposits as ratios of GDP broken down by MFIs and non-MFIs**

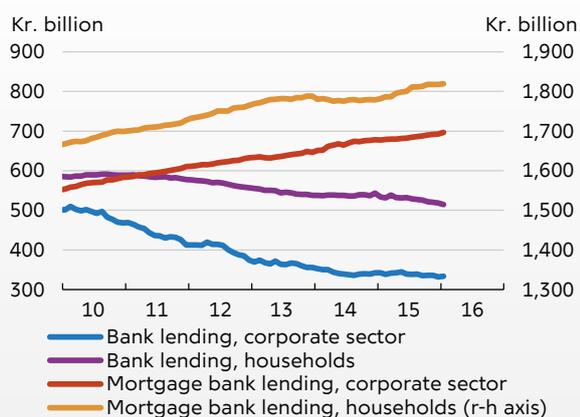


Note: Left-hand chart: Large denominations are 500- and 1,000-krone banknotes. The black line is the linear trend. The most recent observation is from end-February 2016. Right-hand chart: The most recent observations are from the 4th quarter of 2015.

Source: Danmarks Nationalbank.

**Lending by banks and mortgage banks to households and the corporate sector**

Chart 26



Note: Seasonally adjusted lending at nominal value. Adjustment has been made for the data break resulting from the transition to new MFI statistics in September 2013. The most recent observations are from January 2016.  
Source: Danmarks Nationalbank.

ance, stating that loans for mortgaging commercial properties may be provided only to the extent that the property generates positive liquidity. Since the 3rd quarter of 2014, especially the banks

have stated that competition within the sector has contributed to more accommodative credit standards for both households and the corporate sector. In the 4th quarter of 2015, tightening vis-à-vis households was driven by a sharper risk perception and risk appetite among both banks and mortgage banks. In relation to the corporate sector, it is mainly the mortgage banks' funding costs that have led to tightening over the last year or so.

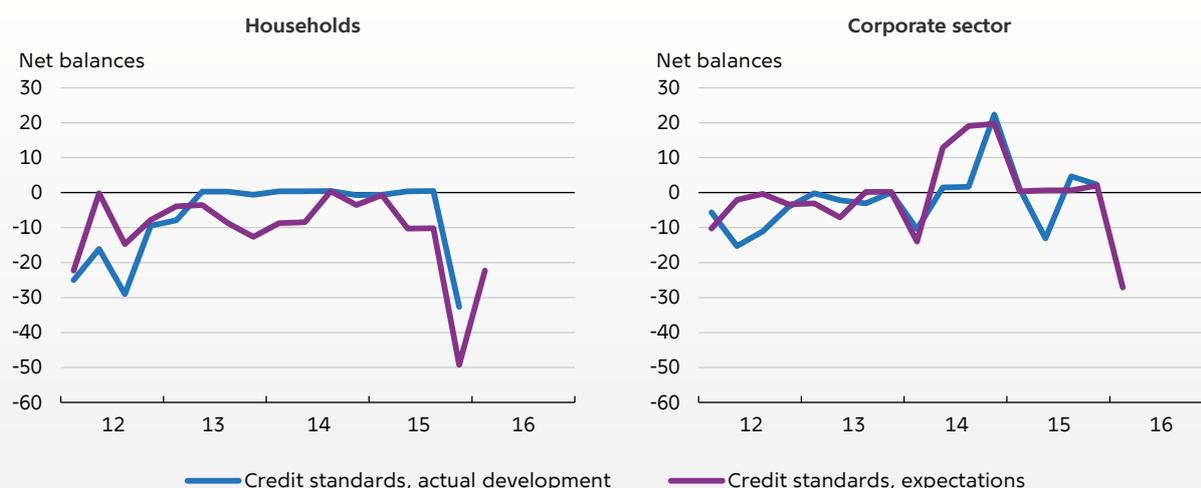
## THE DANISH ECONOMY

### DOMESTIC ACTIVITY

The development in output and demand over the last half year points to a slowdown, whereas the labour market is still picking up. Real GDP rose by 0.2 per cent in the 4th quarter of 2015, driven by domestic demand, while exports were flat. Given the 0.5 per cent fall in GDP in the 3rd quarter, this means that output and demand stagnated in the 2nd half of 2015, following eight quarters of steady growth. This would seem to be in contrast to the strong labour market, where employment is still rising, cf. Chart 28 (left).

**Changes in credit standards**

Chart 27



Note: The lending survey provides qualitative statistical data based on responses from the largest Danish banks and mortgage banks. The responses are assigned a value of -100, -50, 0, 50 or 100, and the value is weighted according to the institution's share of total lending. Hence, the net balance lies within the interval -100 to 100, a negative figure indicating tightening, a positive figure easing. For example, a net balance of -100 (100) means that all institutions have tightened (eased) their credit standards considerably, while a net balance of -50 (50) means that they have tightened (eased) them a little.  
Source: Danmarks Nationalbank.

The increase in employment since the beginning of 2013 is generally assessed to have a solid foundation. The development in the wage share, which reflects the relationship between real wages and productivity, does not as such point to any imbalance. The wage share in the private non-primary sector has risen substantially in the last three quarters, cf. Chart 28 (right), but a corresponding fall was seen during 2014, so viewed over a longer period it is not much above the average since 1985. Continued acceleration in real wage growth and consistently weak productivity growth are not compatible with a sustainable economic development.

In the projection, labour market developments are seen as an indication that, overall, the Danish economy is still improving. Low interest rates and oil prices continue to stimulate demand, and there has been a sizeable increase in disposable income. In addition, wage growth has for some time been lower in Denmark than abroad, and combined with a lower effective exchange rate of the krone this provides a good competitive platform for boosting exports. However, growth in the export markets is expected to be slightly weaker in the coming years, which will also curb domestic demand. All in all, the upswing is assessed to be a bit slower to accelerate so that the growth outlook for the Danish economy is a little more subdued than forecast in December 2015.

Growth in GDP in 2016 is expected to be 1.3 per cent, rising to 1.8 per cent in both 2017 and 2018 as foreign demand picks up. The growth forecast for 2016 has been adjusted downwards by 0.5 percentage point relative to the previous projection. This primarily reflects a weaker position at the end of 2015. Employment is expected to increase by almost 75,000 from the 4th quarter of 2015 to the end of 2018, cf. Table 2.

The output gap, which indicates the volume of spare capacity, is estimated to have been -1.4 per cent of GDP in 2015. The economy is assessed to reach its normal level of capacity utilisation over the next few years, albeit slightly later than forecast in the December 2015 projection. The labour market gap, which indicates how much unemployment can fall without causing inflationary pressures, will narrow in the coming years. Hence, the capacity situation will tighten, and by the end of the projection period in 2018 it will be close to its neutral level.

The projected GDP growth is based on the assumption that structural growth in hourly productivity will be restored to a level more or less matching that seen before the crisis. If that is not the case, growth in output will, viewed in isolation, be lower in the coming years. Given the projected expectations of demand, this will cause capacity to tighten faster than assumed. As a result, the need to tighten fiscal policy will become



## Key economic variables

Table 2

Real growth on preceding period, per cent	2015						
	2015	2016	2017	2018	Q2	Q3	Q4
GDP	1.2	1.3	1.8	1.8	0.2	-0.5	0.2
Private consumption	2.1	1.8	2.0	2.0	-0.1	0.7	0.3
Public consumption	0.9	0.7	0.0	1.2	-0.1	-0.3	-0.2
Residential investment	-0.3	1.1	4.2	3.9	0.3	-1.3	-2.4
Public investment	-1.7	-1.5	0.0	0.0	0.5	-1.1	2.0
Business investment	2.1	3.2	4.1	3.5	1.8	-1.3	1.7
Inventory investment, etc. <sup>1</sup>	-0.4	0.0	0.0	0.0	0.3	0.4	-0.2
Exports	-0.9	1.0	3.3	2.9	-2.9	-1.4	0.1
Industrial exports	0.9	1.6	4.3	3.8	-2.2	-3.8	0.9
Imports	-1.3	1.3	3.5	3.4	-2.8	0.4	-0.2
Employment, 1,000 persons	2,796	2,827	2,851	2,875	2,791	2,799	2,811
Gross unemployment, 1,000 persons	124	113	109	106	125	122	121
Balance of payments, per cent of GDP	6.8	6.7	6.7	6.7	5.9	7.2	5.9
Government balance, per cent of GDP	-2.2	-3.2	-2.4	-1.8	-2.3	-1.7	-1.4
House prices, per cent year-on-year	6.0	3.5	3.1	3.0	6.0	6.0	6.0
Consumer prices, per cent year-on-year	0.2	0.6	1.8	1.8	0.4	0.4	0.2
Hourly wages, per cent year-on-year	1.8	2.1	2.5	2.6	1.9	2.0	1.9

1. Contribution to GDP growth (this item comprises inventory investment, valuables and statistical discrepancy).

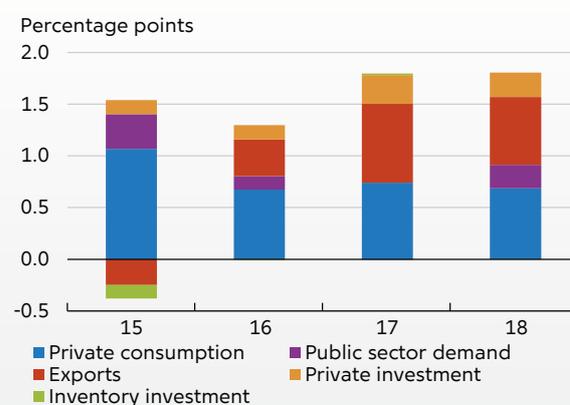
more acute. In the longer term, lower structural productivity growth will reduce growth in prosperity.

The economic recovery in 2015 was driven by both private and public consumption, while exports had a downward impact, cf. Chart 29. In volume terms, exports of goods and services fell by 0.9 per cent in 2015. This follows several years of positive growth. But exports in value terms rose in 2015, cf. below. Export volumes are expected to begin to make a positive contribution to GDP growth again, but to a lesser extent than previously forecast.

The fundamental drivers of private consumption are more or less unchanged compared with the previous projection. The housing and labour markets are picking up and real wages are increasing. The consumption ratio is low, but rising. Against that background, the most significant

**Growth contributions adjusted for imports**

Chart 29



Note: Growth contributions have been adjusted for average import content.

Source: Statistics Denmark and Danmarks Nationalbank.

contribution to growth will still come from private consumption in 2016. In 2017 and 2018, exports will contribute more to growth.

Residential investment fell slightly in 2015.

Looking ahead, rising house prices are expected to boost residential investment. This is attributable to both new construction and maintenance of the existing housing stock. Business investment is also expected to rise, supported by low interest rates and rising capacity utilisation, as well as the large savings surpluses accumulated by firms in recent years. In the coming years, investments in plant and equipment are expected to grow at a faster rate than value added in the non-primary sector, which will increase the investment ratio for plant and equipment. Business investment in building and construction is expected to increase less than investment in plant and equipment, one reason being that there are many vacant premises.

There are both downside and upside risks linked to the forecast, but the downside risks carry more weight than previously. This should be viewed in the context of international economic developments over the turn of the year, especially the slowdown in growth in China. Although Danish firms do not have substantial direct exports to China, growth among Denmark's trading partners depends on their exports to China. Furthermore, there is uncertainty as to how solid the foundation for employment growth in Denmark is. In normal circumstances, a fall in exports of the magnitude seen in 2015 would lead to a considerable decline in employment, but typically this occurs with a lag. Hence, there is a risk that employment will be reduced over the next couple of quarters, but this is not the central scenario.

Conversely, the international equity market turmoil in early 2016 has pushed down interest rates further, and combined with the lower oil prices this will, viewed in isolation, boost the Danish economy. The same applies if the low consumption and investment ratios normalise sooner than expected, and it should also be taken into account that non-financial corporations still have large savings surpluses, which can be converted into increased demand.

## HOUSING MARKET

Prices of single-family houses had shown signs of dampening throughout the 2nd quarter of 2015, but picked up again in the 2nd half of the year, adjusted for seasonal fluctuations. Prices of single-family houses rose by 0.7 and 1.4 per cent on the preceding quarter in the 3rd and 4th quarters, respectively<sup>1</sup>. Prices of owner-occupied flats also continued to rise, but a little more slowly than earlier in the year, cf. Chart 30 (left). In the 4th quarter, prices of owner-occupied flats rose by 2.0 per cent despite a dive from October to November. At the regional level, the highest increases have been seen in and around Copenhagen, where the rate of increase has been higher than in the rest of Denmark.

While the supply of homes for sale has been flat for Denmark overall, trading activity, measured by the number of sales registered in the land register, has fallen since the spring, and especially the 4th quarter saw a sharp dive in sales of single-family houses, cf. Chart 30 (right). There is still a large backlog of houses for sale in many parts of Denmark. That exerts downward pressure on prices.

Around the turn of the year, a number of tightening measures in relation to credit for home buyers entered into force. For instance, the good practice rules that came into force on 1 November 2015 require buyers to provide a down payment of at least 5 per cent of the purchase sum. In February 2016, this was followed by enhanced requirements for the robustness of home buyers' finances in growth areas, including Copenhagen and Aarhus. These new guidelines may have an impact on house prices. Indicators of expectations<sup>2</sup> in the housing market remain high compared with the level in the last few years.

Prices of single-family houses are forecast to rise by around 3.5 per cent this year, and by approximately 3 per cent annually in 2017 and 2018. The continued price increases for owner-occupied homes should be viewed in the light of the low level of interest rates, the general improvement in the economy and expectations of further positive developments in the housing market.

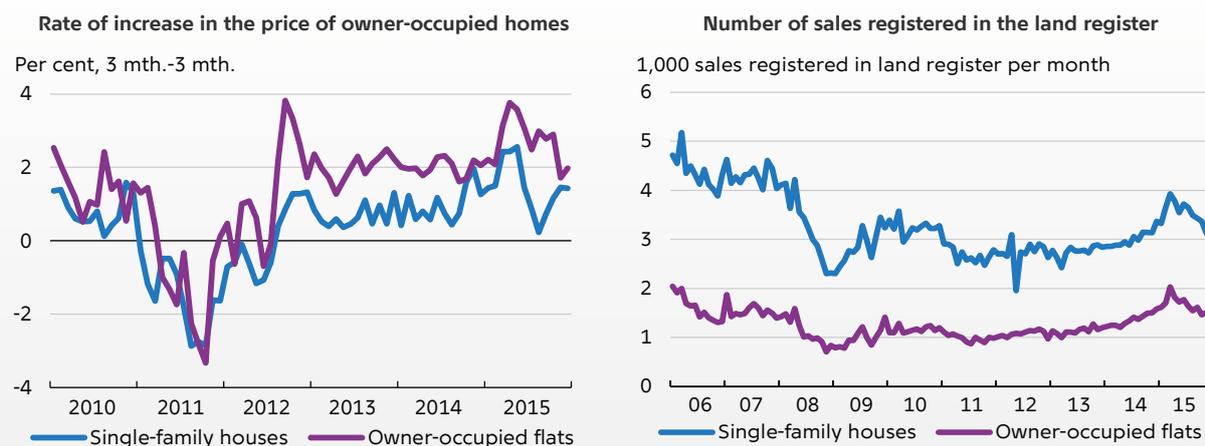
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1 Based on data from Statistics Denmark with own seasonal adjustment.

2 Measured by Nykredits Huspristillid (the Nykredit house price confidence indicator) and the Green house confidence indicator.

Prices of owner-occupied homes and number of sales registered in the land register

Chart 30



Note: Left-hand chart: Price increases over 3-month periods relative to the preceding 3-month period. Prices according to Statistics Denmark with own seasonal adjustment. The most recent observations are from December 2015. Right-hand chart: Own seasonal adjustment.  
Source: Statistics Denmark and Danmarks Nationalbank.

## FOREIGN TRADE

In 2015, exports showed a weak trend in value terms and especially in volume terms. The total value of exports of goods rose by 2.3 per cent in 2015, while imports rose by 2.6 per cent. This resulted in a monthly trade surplus of around kr. 6 billion in the last half of 2015 and the first month of 2016. The increase in exports of goods in 2015 was solely attributable to an exceptionally strong first part of the year, after which exports fell back. In the 2nd half of 2015, exports of goods were slightly higher than in the corresponding period of 2014. Fuel exports were almost 30 per cent lower than in the 1st half of 2014, mainly due to the fall in oil prices and a continued downward trend in North Sea oil and gas output, while exports of industrial goods increased. In the services sectors, exports of sea freight shrank considerably, cf. Chart 31 (left). This decline was primarily attributable to lower freight rates.

Export market growth was relatively limited in 2015, reflecting weaker growth in activity, especially in the emerging market economies, but also among some of Denmark's large trading partners such as Germany. The weaker-than-expected development in exports should be seen in that light and does not indicate problems in relation to wage competitiveness.

The stage is set for stronger exports of goods if there is sufficient foreign demand. For some

years, wage growth has been more subdued in Denmark than abroad, and the effective krone rate has weakened since 2014. This puts Danish firms in a favourable competitive position in the coming years. Conversely, a weaker international growth outlook has led to downward adjustment of Danish export market growth, cf. Appendix 1. Against that background, growth in exports of both goods and services is expected to be a little weaker in the coming years.

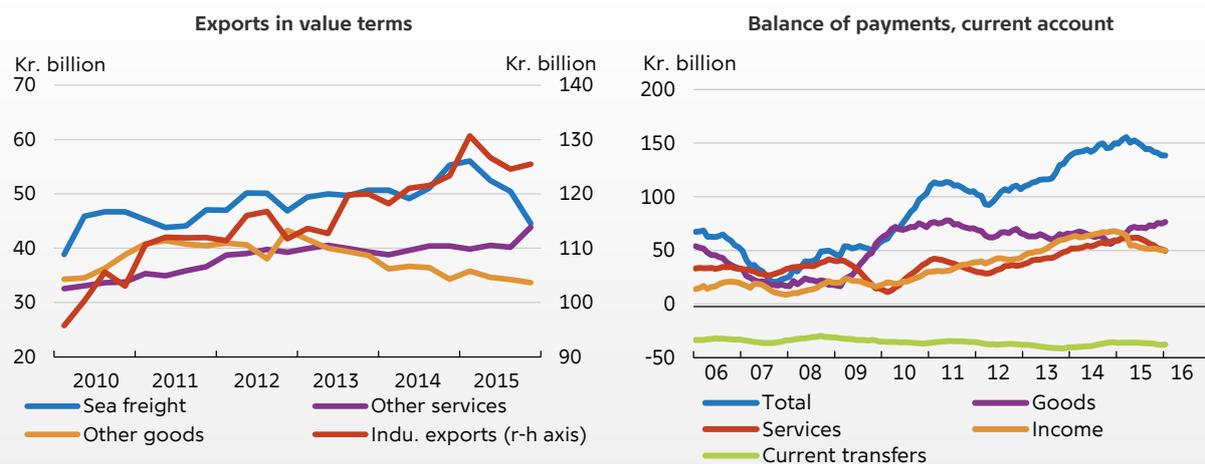
In 2015, the current account surplus totalled kr. 139 billion, which is kr. 11 billion lower than in 2014, cf. Chart 31 (right). The primary reason for the fall is that the surplus from trade in services decreased, mainly as a result of a decline in exports of sea freight. In addition, net income from abroad was lower due to extraordinarily large dividend payments by Danish firms in 2015. There was a larger surplus from trade in goods, chiefly reflecting higher exports of pharmaceuticals. In recent years, the current account surplus has been 7-8 per cent of GDP. The level in the coming years is expected to be only slightly lower.

## LABOUR MARKET AND CAPACITY

Employment continued to rise in the 2nd half of 2015 and has now risen for 12 consecutive quarters. Total employment rose by 76,000 from the 4th quarter of 2012 to the 4th quarter of 2015. Slightly less than half of this increase can be

## Exports and balance of payments

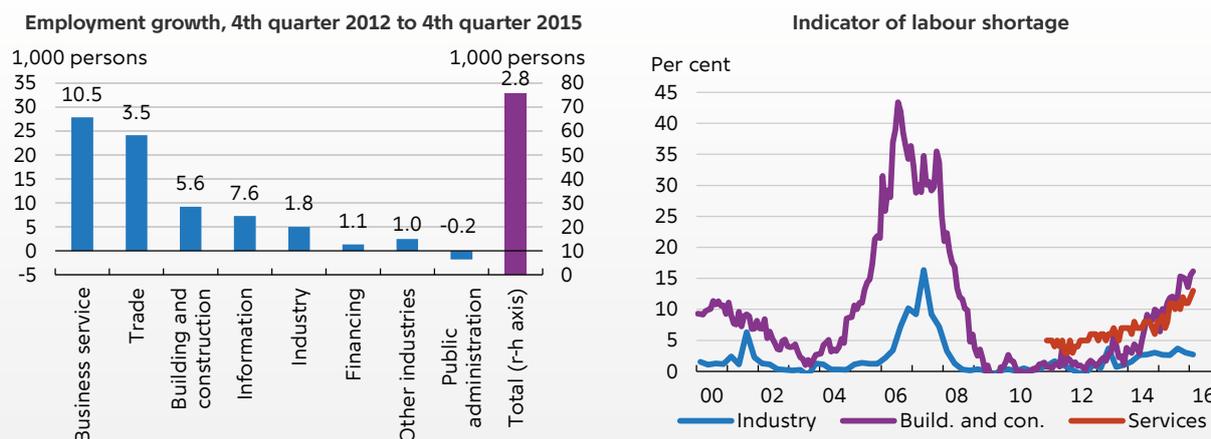
Chart 31



Note: Left-hand chart: Quarterly exports in value terms. Right-hand chart: 12-month sums. The most recent observations are from January 2016.  
Source: Statistics Denmark.

## Employment growth and indicator of labour shortage

Chart 32



Note: Left-hand chart: Employment according to the national accounts. The figures above the bars indicate growth since the 4th quarter of 2012 in per cent. Right-hand chart: Share of firms (adjusted for employment) stating that shortage of labour is an impediment to production. Own seasonal adjustment.

Source: Statistics Denmark.

attributed to the improved economic situation, while the rest is a result of rising structural employment, e.g. due to the 2011 retirement reform, which raises the structural participation rate.

Growth has come from the private sector and is broad-based across industries, albeit strongest within business service, information etc., building and construction and trade. Only public administration etc. has seen a fall, cf. Chart 32 (left).

Throughout 2015, unemployment continued the downward trend seen since mid-2012. Gross unemployment stood at 115,800 in January, corresponding to 4.4 per cent of the labour force. This means that unemployment is not far from its structural level, which has been estimated at around 110,000.

The labour market gap, which indicates how much employment can rise without causing infla-

tionary pressures, is assessed to be slightly less than 40,000 persons in 2015 overall, of which gross unemployment accounts for 10,000. The gap is expected to narrow in the coming years. Hence, a large share of the expected increase in employment of almost 75,000 from the 4th quarter of 2015 until the end of 2018 is to come from people who are now outside the labour force. It has been assumed that the structural labour force will rise, reflecting measures such as the retirement reform from 2011, which will boost the structural participation rate in the coming years.

In general, the labour shortage indicators point to increasing capacity utilisation in the labour market, cf. Chart 32 (right). Especially for the building and construction and service industries, these indicators have risen since the beginning of 2015. Although there is no extensive shortage of labour yet, experience from previous upswings shows that such shortages can rapidly arise.

## WAGES

Private sector wage growth remains moderate. In the 4th quarter of 2015, the annual rate of increase was 1.5 per cent according to Statistics Denmark. For the export-heavy manufacturing sectors, annual wage growth was 1.9 per cent in

the 4th quarter. This was unchanged compared with the preceding quarter. It is slightly higher than abroad, following a period in which Danish wage increases were lower than those of foreign trading partners, cf. Chart 33 (left). Wage growth is slightly higher within several domestically oriented service industries, while it was 1.8 per cent in building and construction in the 4th quarter.

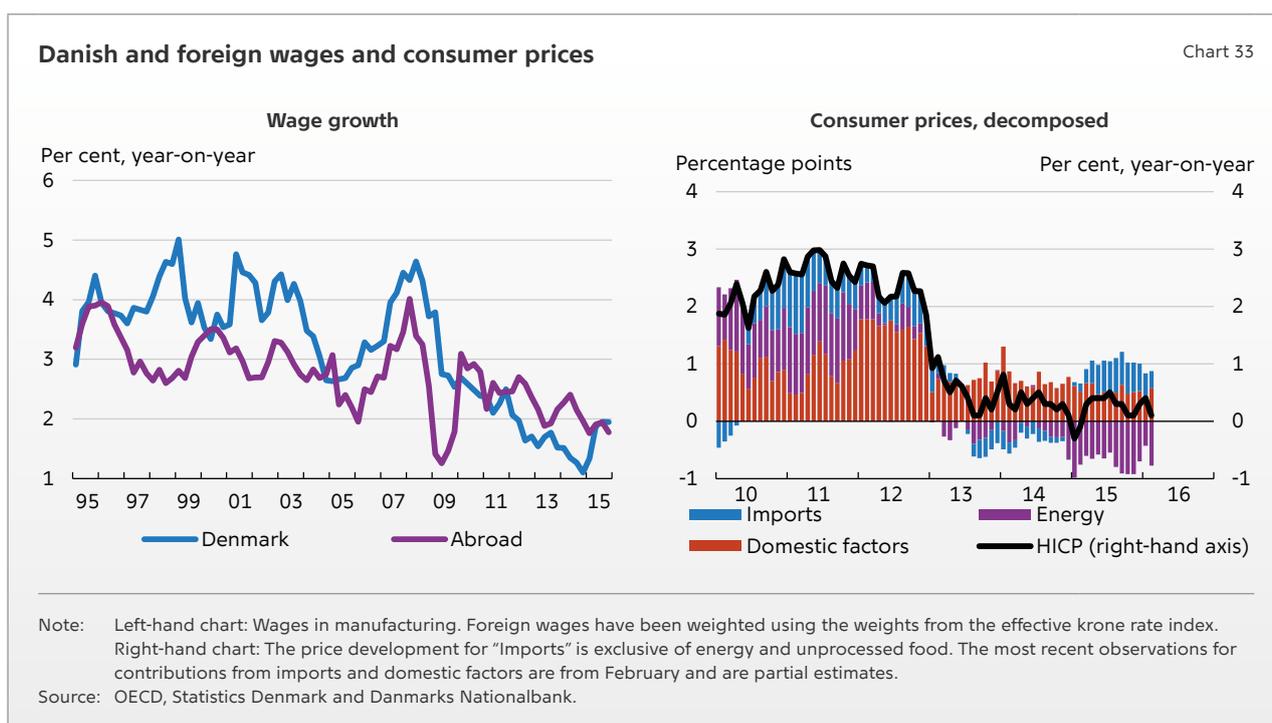
Annual wage growth in the private sector manufacturing industries is expected to be around 2.5 per cent this year and the coming years, i.e. marginally higher than in recent years.

Public sector wage growth is still affected by developments since 2008, when wages for a period rose at a faster pace than in the private sector. In the 4th quarter of 2015, public sector wages rose in step with private sector wages. In the long term, public sector wages are regulated relative to those of the private sector, so that they move in parallel.

The expected rise in wages means that real wages in both the private and public sectors will be boosted considerably as consumer prices are rising only slightly.

## PRICES

Price inflation remains very low, pushed down by further falls in the price of oil, which was around 40 dollars per barrel in mid-March. The annual rate of increase in the EU Harmonised Index of



## Consumer prices

Table 3

Per cent, year-on-year	Weights <sup>1</sup>	2015/2016									
		2015	2016	2017	2018	Q4	Q1	Q2	Feb.	Mar.	Apr.
HICP		0.2	0.6	1.8	1.9	0.2	0.3	0.2	0.1	0.2	0.1
Index of net retail prices	100.0	0.7	0.9	2.0	2.0	0.6	0.8	0.6	0.6	0.6	0.6
Exogenous:											
Energy	6.9	-9.8	-6.9	3.0	3.1	-10.9	-8.3	-10.0	-10.1	-9.8	-9.8
Food	4.8	2.6	1.7	1.8	1.6	2.6	2.4	1.5	3.6	2.3	1.8
Adm. prices	4.1	0.9	2.7	3.0	2.8	2.1	2.4	2.6	2.3	2.3	2.3
Rent	26.0	2.1	2.0	2.0	2.6	2.1	2.2	2.1	2.2	2.2	2.1
Excl. exogenous:	58.2	1.4	1.6	1.8	1.5	1.4	1.3	1.7	1.1	1.0	1.1
Imports	18.7	2.4	1.0	1.8	1.5	2.9	1.7	0.5	1.5	1.1	0.7
IMI	39.5	0.9	1.3	1.8	1.7	0.7	0.7	1.5	0.8	1.0	1.3

Note: The most recent actual figures are from February 2016.

1. Weight in the index of net retail prices, per cent. The weights are from January 2016.

Consumer Prices, HICP, was 0.1 per cent in February 2016, down from 0.4 per cent in January, cf. Chart 33 (right).

Core inflation, calculated as HICP excluding energy and unprocessed food, was 0.7 per cent in February compared with 0.8 per cent in January 2016. The rise in core inflation is attributable to factors such as higher prices for imported goods due to the weakening of the effective exchange rate of the krone. Conversely, the lower price of oil exerts downward pressure on core inflation as the lower energy prices ripple through to consumer goods and services in general.

In the longer term, consumer prices develop in line with those of the euro area, but in recent months both HICP inflation and core inflation have been higher than in the euro area, where HICP fell by 0.2 per cent in February.

Domestic market-determined inflation, IMI, was 0.7 per cent in February. In the longer term, IMI is determined by developments in the level of costs in the economy, including wages. The low level of IMI indicates that firms have found it hard to fully pass on the higher import prices to consumers, and hence gross profits are squeezed. So overall, domestic price pressures remain limited.

The price index for the domestic supply of goods fell from December to January, but was

still 0.3 per cent higher than in January 2015. This means that price pressures from the wholesale link remain weak. Energy prices have a downward impact on the index; if they are excluded, the index rose by 1.6 per cent. Import prices excluding energy rose by 1.5 per cent.

The low oil prices will dampen price inflation throughout 2016. HICP is expected to rise by 0.6 per cent year-on-year, while it rose by 0.2 per cent in 2015, cf. Table 3. In 2017 and 2018, when the pass-through from the low oil prices fades away and the economy approaches its capacity limit, price inflation will rise to 1.8.

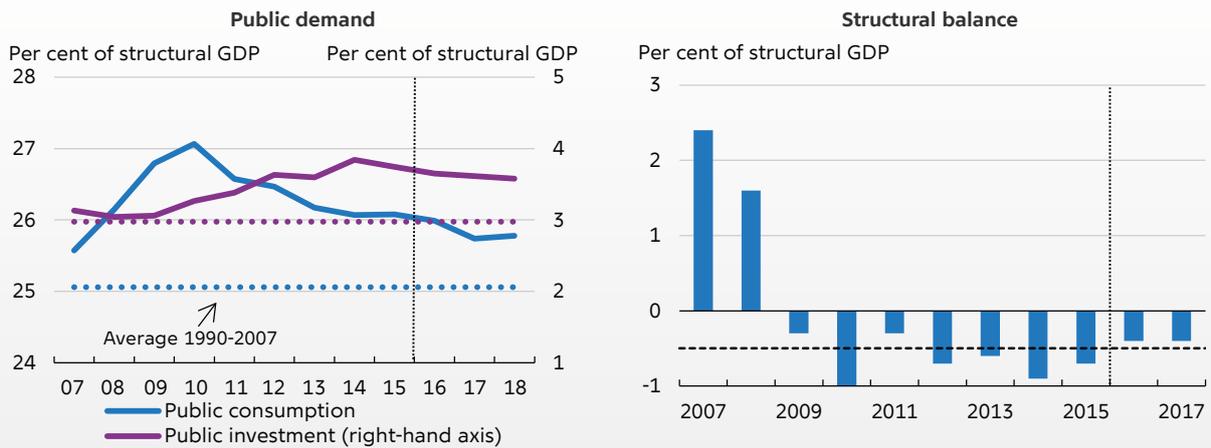
## PUBLIC FINANCES

Public consumption rose by 0.9 per cent in 2015 and public sector demand is expected to show a relatively moderate trend. Public spending is forecast to rise by 0.7 per cent this year, reflecting factors such as the agreed "reprioritisation contribution"<sup>3</sup> in the Finance Act, which will, viewed in isolation, dampen growth in public sector spending. On the basis of, inter alia, the government's

<sup>3</sup> The reprioritisation contribution means that the ceiling on local government spending is lowered by 1 per cent this year and each of the following years, albeit with partial compensation. Viewed in isolation, the reprioritisation contribution will reduce growth in expenditure over the projection period.

## Public demand and structural balance

Chart 34



Note: Right-hand chart: Ministry of Finance's calculation of structural government balance.  
Source: Ministry of Finance and Danmarks Nationalbank.

most recent medium-term projection from September 2015, real public consumption is expected to be unchanged in 2017 and to rise by 1.2 per cent in 2018.

In recent years, public investment has been at a very high level by historical standards, cf. Chart 34 (left). The announced reduction of public investment has previously been postponed several times, and the projection assumes that investment will be reduced only slightly in 2016 and will remain broadly unchanged in 2017 and 2018.

The government deficit is expected to have been 2.2 per cent of GDP last year. Without the extraordinary revenue from the restructuring of capital pensions etc., the deficit would have exceeded the permitted limit of 3 per cent of GDP under EU legislation. For this year, Danmarks Nationalbank forecasts a deficit of 3.2 per cent of GDP. Several temporary factors can explain why the deficit exceeds 3 per cent, including rising asylum costs. Hence, it is assessed that the 3 per cent limit will be exceeded only briefly and only to a relatively limited extent. Over the projection period, the government deficit decreases to 2.4 per cent of GDP in 2017 and 1.8 per cent of GDP in 2018, reflecting a cyclical improvement and subdued growth in public spending, among other factors.

According to the government's forecast from December, the structural deficit is expected to be 0.4 per cent of GDP this year. This represents tightening of 0.3 percentage point relative to

2015. However, the planned tightening still leaves the structural deficit close to the maximum of 0.5 per cent of GDP stipulated in the Budget Act. Next year's structural deficit is expected to be at the same level as this year's, cf. Chart 34 (right).

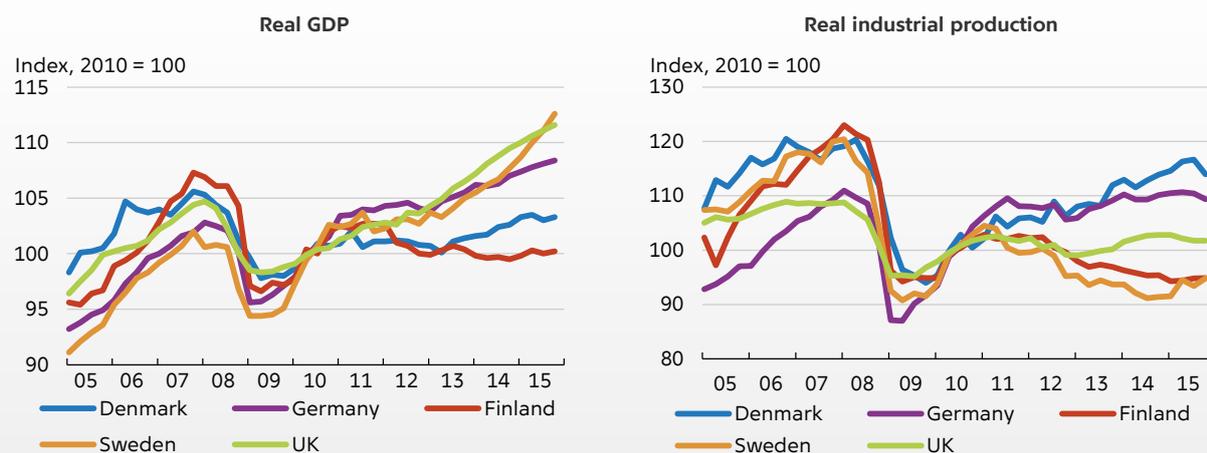
### DEVELOPMENTS IN MATERIAL PROSPERITY IN DENMARK AND NEIGHBOURING COUNTRIES

Assessed on the basis of growth in real GDP, the Danish economy has fared worse than several neighbouring economies, including Germany and Sweden, since the global downturn in the wake of the financial crisis in 2008, cf. Chart 35 (left). The low rate of growth in Denmark is to a large extent attributable to weak domestic demand. A major reason has been the preceding overheating of e.g. the housing market in the period 2005-07, which was particularly pronounced in Denmark. The strong slowdown in the years after the financial crisis has had a protracted effect in the form of subdued domestic demand, including a strong decline in construction activity. Private consumption has only begun to pick up in recent years, but the consumption and investment ratios both remain well below the long-term average.

However, industrial production, which is predominantly intended for the export market, has risen more sharply in Denmark than in several neighbouring countries since 2010 and is now close to the pre-crisis level, cf. Chart 35 (right). This is in contrast to developments in e.g. the UK,

## GDP and industrial production

Chart 35



Source: Statistics Denmark and Eurostat.

Sweden and Finland. The pharmaceutical and engineering industries, including wind turbines and furniture and other industries – which also comprise toys – account for a large share of total Danish industrial production, and since 2009 these industries have seen substantially higher growth than other parts of industry.

If terms of trade, returns on foreign assets and population developments are taken into account, a somewhat different picture emerges of the Danish economy in an international perspective, cf. Box 2. The fact that Denmark has performed well in the more export-oriented sectors has, combined with the subdued domestic demand, contributed to a sizeable current account surplus, which has been further boosted by a considerable annual net return on the foreign assets accumulated. The latter gives Danish households and firms extra purchasing power beyond that created by growth in real GDP. Add to this the effect on purchasing power of a continuous improvement of Denmark's terms of trade. Finally, unlike in several neighbouring countries, the population of working age has been virtually unchanged in Denmark, so there have not been more people to create the output.

### ECONOMIC POLICY

The prospect of normalisation of the Danish economy with full employment and neutral capacity utilisation has moved a bit further into the future after the slowdown in the 2nd half of 2015. At

the same time, uncertainty about the strength of the international economy has increased in early 2016, which has been characterised by falling oil and equity prices and weak Chinese economic indicators. All the same, the underlying drivers of both the Danish and the international economy are assessed to be intact so the central scenario is that the upswing will gain momentum and that the remaining spare resources in the economy will be utilised over the next 2-3 years. Against that background – and in view of strong stimuli from interest rates and oil prices – there is still a need to tighten fiscal policy, but this may be done over a slightly longer period. That is consistent with Denmark's Nationalbank's recommendations and risk assessments in 2015, cf. Box 3.

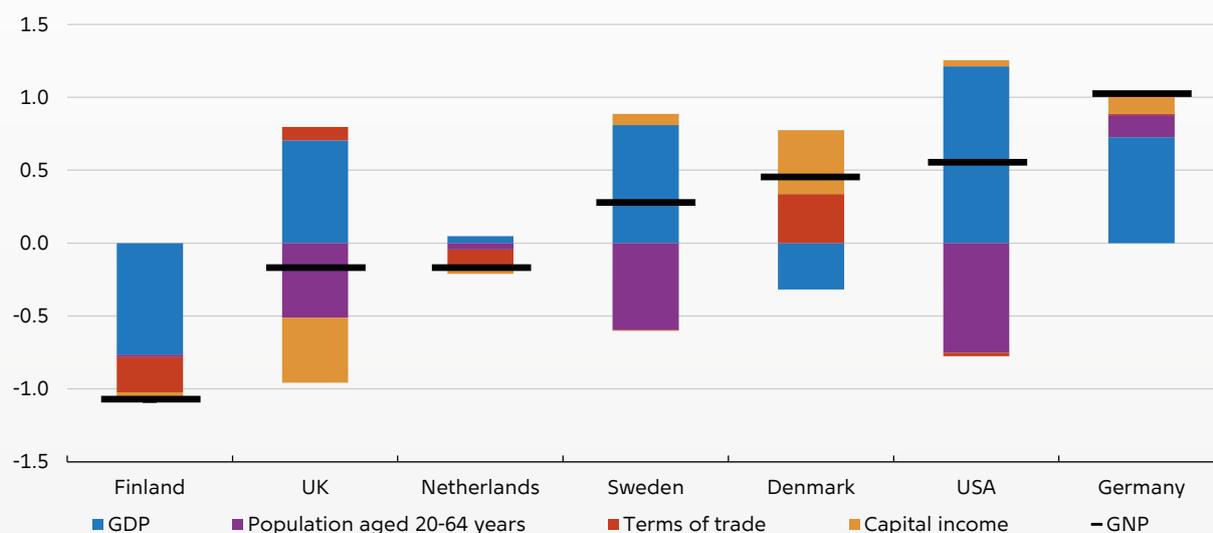
It looks as if the government deficit will increase in the coming years without the large one-off revenue from restructuring of capital pensions and presumably also the pension yield tax. Together with the Budget Act's limit on the structural deficit, the rules of the Stability and Growth Pact contribute to ensuring sound public finances. The 2016 deficit is expected to exceed 3 per cent of GDP, which is the limit under the Stability and Growth Pact, but the divergence is expected to be limited and temporary. In this respect, the influx of asylum seekers is a major uncertainty factor and a challenge to public finances in both the short and longer term if these groups do not manage to gain a foothold in the labour market.

The Danish economy has been struggling to get out of the slump that followed after the financial crisis in 2008. Growth has only slowly begun to pick up within the last year and a half. A number of neighbouring countries have performed better in terms of real GDP. But from a broader prosperity perspective, this measure is too narrow. Firstly, growth should be viewed relative to the potential of the economy, which varies from country to country, and secondly, it is relevant also to consider terms of trade, net income from

abroad and the size of the population. It is natural that growth in real GDP is higher in economies with growing populations than in those where they are declining. If higher growth, and hence higher value creation, is to be distributed on more people, this does not increase material prosperity correspondingly. In an international comparison, the cyclical positions of the economy at the start and end of the period of comparison also play a role. Adjustment for this does not change the conclusions in this box.

**Development in prosperity per capita in various countries in the period 2007-14**

Average annual growth 2007-14 in GNP per capita for population aged 20-64 years, adjusted for terms of trade, per cent p.a.



Note: "GNP" is average annual growth in the period 2007-14 in the real gross national product per capita for the population aged 20-64 years, adjusted for terms of trade. "Capital income" is the return on net foreign assets deflated by the index of import prices.  
 Source: Statistics Denmark, Eurostat, U.S. Census Bureau, Bureau of Economic Analysis, U.S. Department of Commerce.

Prosperity should be taken to mean the households' current consumption opportunities. They depend not only on the value created in a country measured by traditional real GDP, but also on how the terms of trade develop. In Denmark, export prices have shown a more favourable trend than import prices since 2007, i.e. Denmark's terms of trade have improved, and this gives Danish households and firms increased purchasing power. This is in contrast to the situation in several neighbouring countries, where the terms of trade have been either constant or deteriorating. One of the reasons is that these countries, to a larger extent than Denmark, produce goods within industries with high productivity growth, so that competition drives down the prices of the finished goods. As a result, the productivity gains are passed on to consumers. This applies to industries such as electronics, where prices are typically going down, while e.g. Denmark's large pharmaceutical industry has not been subject to the same downward price pressures. And Danish firms also produce other goods that fetch high prices. Among the countries selected, Denmark has had the highest terms-of-trade gain in this period, cf. the chart.

Furthermore, Danish households' consumption opportunities have been boosted thanks to Denmark's large foreign assets, which have yielded a high return by international

standards. The reason for the relatively high return is that a large proportion of Denmark's foreign assets are in the form of direct investment in foreign production facilities, while liabilities are to a large extent composed of non-residents' holdings of Danish government and mortgage bonds, which have yielded low returns in this period. Given that Denmark has net foreign assets, i.e. its assets exceed its liabilities, this has contributed some 3-4 per cent of GDP to domestic incomes in recent years.

Finally, some of the countries that have seen the highest rates of growth in real GDP have also had growing populations. This applies to e.g. the USA and Sweden. This reduces consumption opportunities per capita for a given domestic value created, thereby moderating actual prosperity growth. The calculation focuses on the population of working age, as this is the group that has produced the wealth. Alternatively, the entire population could have been applied. However, the size of the population of working age is relevant when it comes to assessing which countries have navigated the crisis best from an economic perspective. The conclusion is that in terms of ensuring material prosperity for the population Denmark has performed on a par with comparable countries since 2007. This result differs substantially from the picture that emerges if you look at growth in real GDP only.

At the beginning of the year, Danmarks Nationalbank forecast continuation and strengthening of the upswing that had already been underway for some time. In the 2nd half of the year, the GDP growth forecasts were adjusted a little downwards, mainly as a result of weaker-than-predicted exports, cf. the chart, but the output gap was still expected to close within a couple of years. The recovery of the economy was most pronounced in the labour market, where employment

rose and unemployment fell, and in the housing market, where price increases remained high, especially in the cities, despite a slowdown in the 2nd half of the year. Consumer price inflation remained very low throughout the year, mainly due to falling energy prices, but in the assessment of Danmarks Nationalbank there was no risk of deflation. Danmarks Nationalbank's policy recommendations should be viewed against this background.

**Danmarks Nationalbank's recommendations during 2015 and background factors**

Policy area:	Fiscal policy	Labour market policy	Tax policy and housing market
Recommendations	Restore fiscal policy to a neutral level within the next couple of years.	Introduce measures to increase the labour supply and structural employment.	Restore the link between the value of the home and housing taxes. Limit the use of deferred amortisation loans. Increase the required down payment when purchasing a home.
Background	The fiscal policy stance should reflect the cyclical position of the economy. Danmarks Nationalbank expects the output gap to close within the next couple of years.	There are limited spare resources in the economy and pressures may rapidly arise.	Housing taxes are procyclical. Combined with a high loan-to-value, LTV, ratio, this entails a risk of macroeconomic instability.

In Danmarks Nationalbank's policy recommendations, as expressed in connection with the quarterly projections, focus was on fiscal policy and the labour and housing markets. Given the economic recovery and the outlook for the Danish economy, it was recommended that fiscal policy be restored to a neutral level after having been expansionary for some years. Specifically, it was recommended that the structural balance should be brought to equilibrium over the next couple of years. In connection with the Finance Act for 2016, tightening measures were introduced so that fiscal policy is moving towards a neutral level. In the opinion of Danmarks Nationalbank, such tightening was well-timed in a cyclical perspective. At the same time, warnings were issued about budget overruns, as seen in previous years.

In Danmarks Nationalbank's assessment, spare resources in the labour market are limited, and a more widespread shortage of labour may soon arise. It was emphasised that reforms, including of the unemployment benefit and tax systems, should focus on increasing the supply of labour. The unemployment benefit reform adopted in the autumn was virtually neutral in this respect.

The policy recommendations focused on developments in the housing market. Danmarks Nationalbank warned against the risk of an unsound development with self-reinforcing price rises, especially in the Copenhagen area. It was pointed out repeatedly that the current system of housing taxes is procyclical, and previous years' recommendation to restore the link between property values and property taxes was reiterated and strengthened. It was underscored that such restoration is urgent and cannot wait until 2020. With

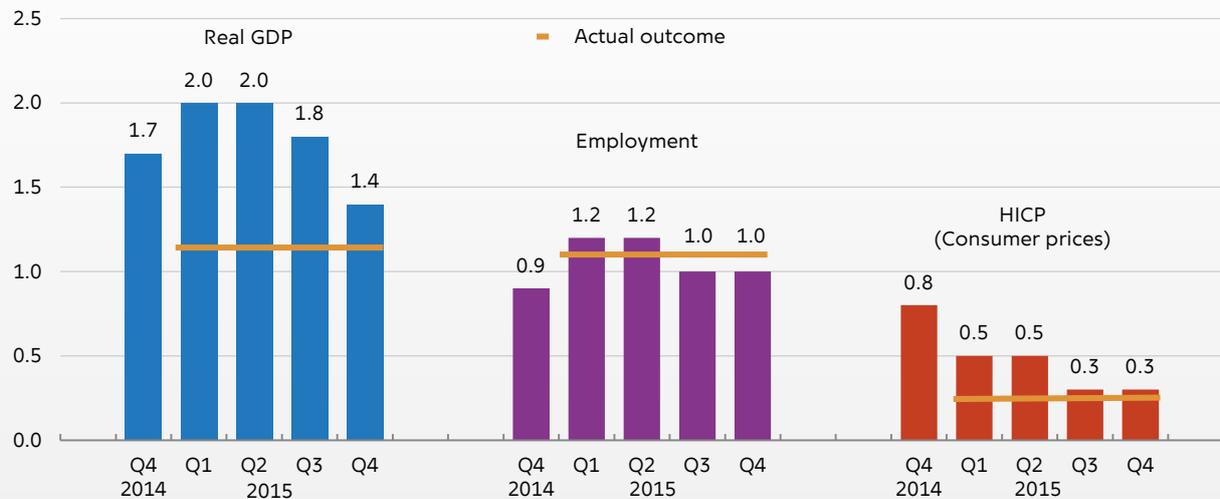
the Finance Act, a freeze on land tax in 2016 was adopted. Danmarks Nationalbank noted that this will have a destabilising effect on the housing market, especially in the areas where price increases are strongest.

With a view to ensuring financial stability, Danmarks Nationalbank recommended that the Supervisory Diamond for mortgage banks be supplemented with a lower ceiling on deferred amortisation for the individual borrower; the existing rules cap the mortgage banks' total portfolios only. It was also pointed out that in many cases it would be prudent for the banks to require a considerably larger down payment than the 5 per cent of the purchase price that was included in the rules on good practice for financial corporations from 1 November. Following a slowdown in the spring of 2015, prices for single-family houses accelerated again in the 2nd half of the year.

The projections for 2015 included not only forecasts for a great many variables but also descriptions of the risk scenario. The major upside risk was assessed to be more rapid normalisation of the low consumption and investment ratios and hence stronger growth in domestic demand than assumed. Combined with a procyclical housing market, this could cause inappropriate pressures on the labour market. The most significant downside risk was assessed to be weaker-than-expected growth abroad. As regards developments during 2015, the downward adjustment in the 2nd half of the year reflected disappointing exports, while private consumption was still growing more or less in line with expectations at the beginning of the year.

### Danmarks Nationalbank's 2015 forecasts of GDP growth, employment and consumer prices in 2015

Per cent, year-on-year



Note: Forecasts from Danmarks Nationalbank's projections as published in the Monetary Reviews, 4th Quarter 2014 and 2015. The horizontal line shows the actual annual average calculated in mid-March 2016.

Source: Danmarks Nationalbank and Statistics Denmark.

Prices of single-family houses had shown signs of dampening throughout the 2nd quarter of 2015, but picked up again in the 2nd half of the year, adjusted for seasonal fluctuations. Prices of owner-occupied flats also continue to rise in the cities, but the rate of increase is lower than in the first part of 2015. Trading activity, measured by the number of sales registered in the land register, has fallen since last spring, which could indicate that price pressures will subside. The Danish Financial Supervisory Authority's tightening of its guidelines for mortgaging of homes, particularly in Copenhagen and Aarhus, will presumably put a damper on the markets in these areas. In general, it is important to ensure a steady and balanced improvement in the housing market, and in view of the low interest rates there is still reason to monitor developments in Copenhagen.

## APPENDIX 1: ASSUMPTIONS IN THE PROJECTION FOR THE DANISH ECONOMY

The projection has been prepared using the macroeconomic model MONA<sup>4</sup> and is based on the available economic statistics, including Statistics Denmark's preliminary quarterly national accounts for the 4th quarter of 2015. The projection involves a number of assumptions concerning the international economy, financial conditions and fiscal policy.

### THE INTERNATIONAL ECONOMY

The international economy and those of most of Denmark's trading partners are gradually recovering. The international growth outlook is supported by low oil prices and interest rates as well as a low exchange rate of the euro against e.g. the dollar. Compared with the previous projection, growth forecasts have been adjusted a little downwards, especially for 2016. This is mainly attributable to weaker import growth in the emerging market economies and the fact that US growth is now expected to be more or less unchanged relative to 2015 instead of rising. Overall, growth in the markets for Danish industrial exports is assumed to be 3.7 per cent this year and by 4.5 and 4.3 per cent, respectively, in 2017 and 2018, cf. Table 4. It should be noted that the calculation of export market growth has been changed relative to the most recent projection and therefore the growth assumptions are not directly comparable.

Foreign wage growth is expected to be modest as labour markets are still weak – but improving. The fall in oil prices will keep inflation at bay among most of Denmark's key trading partners. All in all, prices in Denmark's export and import markets are expected to be slightly lower this year than last year. Moderate foreign price increases are expected next year and in 2018.

### INTEREST RATES, EXCHANGE RATES AND OIL PRICES

Developments in short- and long-term interest rates in the projection are based on the expectations of future developments that can be derived from the interest rate curves in the

financial markets. In February, the 3-month money market interest rate, measured by the CITA swap rate, fluctuated between -1.0 and 0.1 per cent and in early March 2016 it was -0.5 per cent. It is expected gradually to rise in 2016, 2017 and 2018, but is not expected to turn positive until the end of 2018.

The average bond yield is an average of the yields to maturity on outstanding government and mortgage bonds. It was approximately 1.0 per cent at the beginning of March and is assumed to rise to approximately 1.7 per cent by the end of 2018.

The effective exchange rate of the krone fell at the beginning of 2015 and despite an increase since last spring, it is somewhat lower than in 2014. It is expected to remain at this level throughout the projection period. In the projection, the dollar rate is assumed to remain constant at the current level.

The price of oil fell sharply from the summer of 2014 until January 2015. It rose from January to May, but has subsequently fallen back again, especially around the turn of the year. In early March 2016, the price of oil was around 40 dollars per barrel. The oil price is assumed to develop in line with futures prices, rising to just under 50 dollars towards the end of 2018. This is a downward adjustment of approximately 5 dollars throughout the period compared with the most recent projection.

### FISCAL ASSUMPTIONS

The projection is based on the planned fiscal policy, i.e. the Finance Act for 2016 and the updated 2020 scenario from September in relation to capping expenditure.

Real public consumption is assumed to rise by 0.7 per cent this year, cf. Table 4, and by 0.0 and 1.2 per cent in 2017 and 2018, respectively. Public investment is assumed to fall by 1.5 per cent this year and then to remain more or less unchanged in 2017 and 2018.

<sup>4</sup> The model is described in Danmarks Nationalbank, *MONA – a quarterly model of the Danish economy*, 2003.

## Overview of projection assumptions

Table 4

	2015	2016	2017	2018
<b>International economy:</b>				
Export market growth, per cent year-on-year	2.8	3.7	4.5	4.3
Export market price <sup>1</sup> , per cent year-on-year	-1.6	0.7	1.4	1.6
Foreign price <sup>2</sup> , per cent year-on-year	-1.6	0.7	1.4	1.6
Foreign hourly wages, per cent year-on-year	1.8	2.0	2.3	2.5
<b>Financial conditions, etc.:</b>				
3-month money market interest rate, per cent p.a.	-0.4	-0.4	-0.3	-0.2
Average bond yield, per cent p.a.	1.0	1.1	1.3	1.6
Effective krone rate, 1980 = 100	99.2	100.1	100.0	100.0
Dollar exchange rate, DKK per USD	6.7	6.8	6.8	6.8
Oil price, Brent, USD per barrel	52.4	40.6	46.6	48.9
<b>Fiscal policy:</b>				
Public consumption, per cent year-on-year	0.9	0.7	0.0	1.2
Public investment, per cent year-on-year	-1.7	-1.5	0.0	0.0
Public sector employment, 1,000 persons	815	815	817	820

1. Weighted import price for all countries to which Denmark exports.

2. Weighted export price for all countries from which Denmark imports.

## APPENDIX 2: REVISIONS IN RELATION TO THE PREVIOUS PROJECTION

Compared with the December projection, the forecast for GDP growth in Denmark this year has been revised downwards by 0.6 percentage point. This is mainly attributable to declining exports of goods in the 2nd half of 2015, resulting in a low point of departure for exports and GDP at the start of this year. Slightly lower growth in private consumption and investment, primarily residential investments, also has a downward impact this year.

Growth in Denmark's export markets from 2016 onwards has been reduced relative to the December projection, cf. Appendix 1. Furthermore, the effective krone rate is higher than forecast. Both these factors push down GDP growth in 2016.

Bond yields have been adjusted downwards and are set to rise more slowly. In 2017, yields are 0.25 percentage point lower, which results in lower user costs, thereby supporting GDP growth.

The forecast for HICP inflation has been adjusted downwards relative to the December projection due to the falling oil prices. This effect is amplified by the increase in the effective exchange rate of the krone, which reduces effective import prices. Factors such as falling food prices contribute to the relatively large downward adjustment of HICP for 2016.

Revisions in relation to the previous projection

Table 5

Per cent, year-on-year	GDP			Consumer prices, HICP		
	2015	2016	2017	2015	2016	2017
Projection, December 2015	1.4	1.8	2.0	0.3	1.3	1.9
Contribution to revised forecast from:						
Export market growth	0.0	-0.1	0.0	0.0	0.0	0.0
Interest rates	0.0	0.0	0.1	0.0	0.0	0.0
Exchange rates	0.0	-0.1	0.0	0.0	-0.1	-0.1
Oil prices	0.0	0.0	0.0	0.0	-0.3	-0.1
Other factors	-0.2	-0.4	-0.3	-0.1	-0.3	0.1
This projection	1.2	1.3	1.8	0.2	0.6	1.8

Note: The transition from the previous to this projection may not add up due to rounding. "Other factors" includes data revisions.

# ARTICLES



# EXCHANGE RATE PASS-THROUGH TO DANISH IMPORT AND CONSUMER PRICES

By Mark Strøm Kristoffersen and Morten Spange,  
Economics

## INTRODUCTION AND SUMMARY

Price developments play a key role in Denmark's Nationalbank's ongoing assessment of the Danish economy. Increased pressure on production resources will often lead to higher wage and price increases, while a downturn will have a dampening effect. Moreover, in a small, open economy like Denmark, prices are also very much influenced by external factors. This applies not least to developments in the effective krone rate.<sup>1</sup> Due to Denmark's fixed exchange rate policy, the krone is stable against the euro. However, currencies other than the euro have a weight of 54.3 per cent in the calculation of the effective exchange rate of the krone.<sup>2</sup> This means that the effective krone rate mirrors fluctuations in the euro.

This article analyses pass-through of fluctuations in the nominal effective krone rate to import and consumer prices. As regards import prices, pass-through happens already within 1-2 months, although it is not complete. This indicates that some exporters adjust their prices to the Danish market. Pass-through to consumer prices is considerably weaker, reflecting that imports account for only part of private consumption. Furthermore, domestic distributors absorb part of the exchange rate fluctuations in their profit margins. Consequently, since 1998 the estimated pass-through to consumer prices has

been weaker than immediately warranted by the import content of private consumption. There are no indications that changes in the effective krone rate lead to a persistent rise in the rate of price increases.

The analysis indicates that pass-through is lower than previously. The explanation could be that the fixed exchange rate policy is now perceived as more credible than when it was introduced in 1982. A credible monetary policy regime has less scope for a shock to the exchange rate to impact the rate of price increase beyond the very short term. Moreover, the fact that Denmark's current anchor currency, the euro, is, to a higher degree than the D-mark, a major global currency may also play a role. Cross-border trading is often invoiced in major currencies. Pass-through may be reduced if a large share of Denmark's trade with non-euro area countries is invoiced in euro. The declining pass-through may also reflect the increasing prevalence of global value chains or the intensified competition in the product markets.

For a firm exporting to Denmark, fluctuations in the exchange rate between the krone and the currency of the exporter's home country will be passed through to either the firm's price competitiveness in the Danish market or its profit margins. To a certain extent, exchange rate fluctuations can

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1 The effective krone rate is a weighted average of the krone's rate against the currencies of Denmark's largest trading partners.

2 See Denmark's Nationalbank (2014) regarding the current set of weights.

be addressed by hedging via the financial markets. But this implies extra costs for firms.

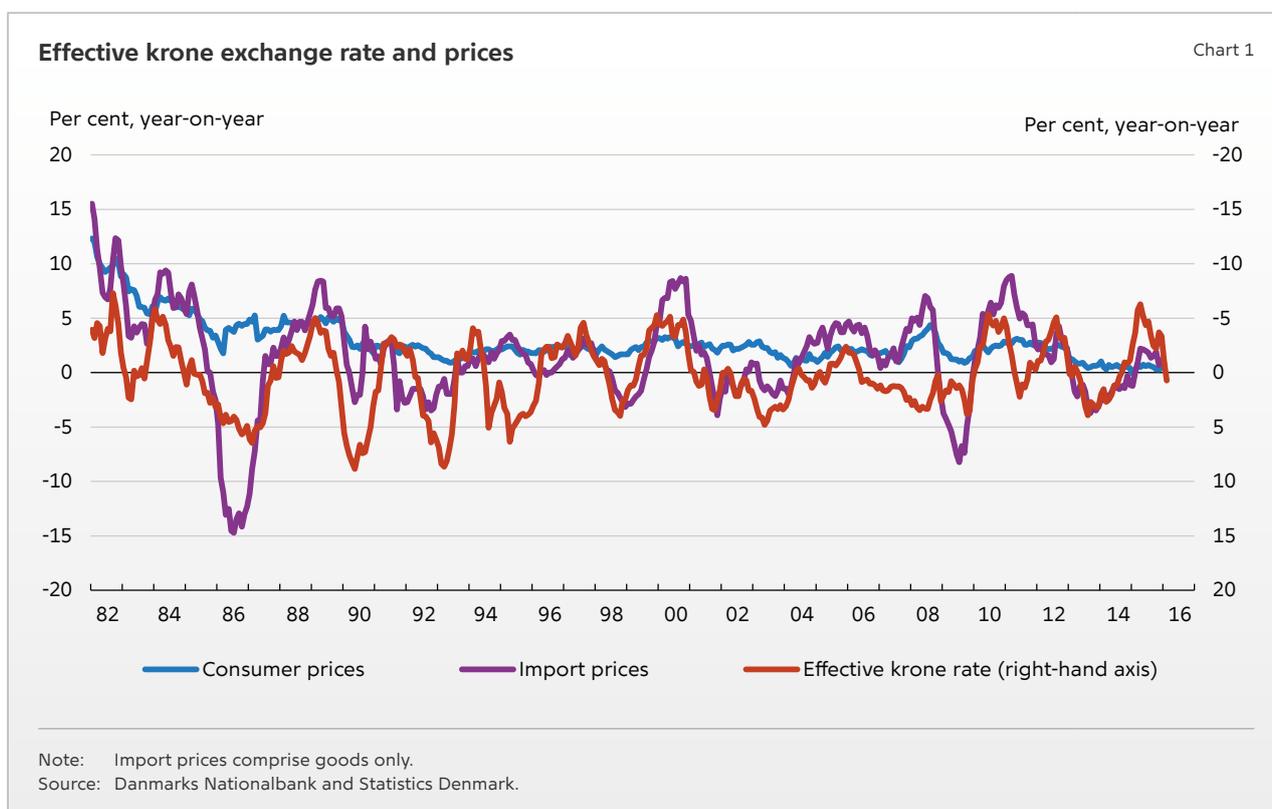
Against this backdrop, the fixed exchange rate of the krone vis-à-vis the euro may contribute to promoting trade between Denmark and abroad. Danish Economic Councils (2009) find that Denmark, like the euro area member states, has reaped considerable trade gains from the introduction of the euro. This is not the case for e.g. Sweden and the UK, given their floating exchange rates.

## EXCHANGE RATES AND PRICES

Exchange rate pass-through is a measure of the effect of a change in the nominal effective krone exchange rate on prices in Denmark. Danish firms trading with abroad invoice in either Danish kroner or foreign currency. If the price of a product or service traded across national borders is fixed in a currency other than kroner, exchange rate fluctuations will have a direct impact on import prices. However, a firm exporting to Denmark may also opt for invoicing in kroner. If so, fluctuations in the krone exchange rate will have

no immediate impact on import prices. Instead, the fluctuations in the exchange rate will initially be passed through to the price which the exporter receives for the product, converted into the exporter's currency. The fixed exchange rate policy means that this also applies if imports are invoiced in euro.

In that situation, exchange rate fluctuations will influence exporter's profit margins. If an imported product is invoiced in foreign currency and the exchange rate of the Danish krone appreciates, the price of the product falls when measured in Danish kroner. The exporter thus gains a competitive advantage over exporters from countries whose exchange rates vis-à-vis the krone have not changed, and over Danish manufacturers. The exporter may exploit this advantage to boost exports. Alternatively, the exporter may raise the price in the exporter's own currency, thus increasing the profit margin. This means that exchange rate fluctuations will not be fully passed through to import prices. The exporter's incentive to change its price in its own currency depends, inter alia, on the competitive environment in the export market, cf. Krugman (1987).



Conversely, an exporter invoicing in kroner or euro will not immediately enjoy higher demand if the krone strengthens. But profit margins are increased. Subsequently, the optimum step could be to reduce the price in kroner in order to utilise part of the competitive advantage to boost sales. The invoicing currency may thus be of less importance in the long term. There is not necessarily a clear relationship between the price adjustment resulting from a change in the krone exchange rate and the observed change in imports. This reflects that firms whose profit margins rise as a result of exchange rate fluctuations may seek to increase their exports e.g. by intensifying their marketing efforts.<sup>3</sup>

A share of imports is made up of production equipment, intermediate goods and internationally traded services bought by firms. The price of those imports influences the production costs of Danish firms and hence the prices which consumers pay for goods manufactured in Denmark. Imports also contain goods directly included in private consumption. Fluctuations in the prices of those imports have a more direct impact on consumer prices.

The impact of krone exchange rate fluctuations is far less pronounced in consumer prices than in import prices, cf. Chart 1, reflecting that the import content of private consumption is only around one quarter. But considerable domestic value added is generated even in the consumption of imported goods. For example, the total price of an imported product will contain distribution and marketing expenses, and the final price will also contain indirect taxes. Changes in import prices are to a certain extent absorbed in the profit margins of domestic distributors.

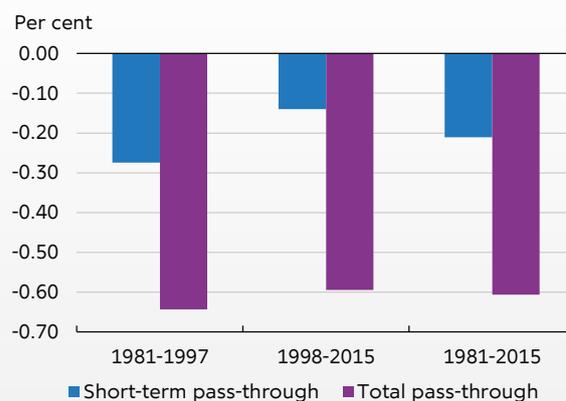
## PASS-THROUGH TO IMPORT PRICES

This section specifies an economic relation estimated on Danish data with a view to providing a more accurate picture of the relationship between the exchange rate and import prices. On the basis

<sup>3</sup> Against this background, the coefficient of an equation stating the response of import and export volumes to exchange rate fluctuations should be interpreted with caution, as there are other transmission channels besides the direct effect of shifts in relative prices.

**Effect of a 1 per cent strengthening of the effective krone rate on import prices**

Chart 2



Note: Estimated pass-through to import prices of a 1 per cent strengthening of the nominal effective krone exchange rate, where the estimates are the result of a regression model, cf. Box 1. Import prices cover only goods.

Source: Statistics Denmark and own calculations.

of the analysis, a short-term pass-through and a total pass-through are determined. The methodology is described in Box 1.

According to the analysis, an increase in the nominal effective exchange rate causes import prices to fall. For the period 1981-2015 taken as one, an appreciation of the effective exchange rate by 1 per cent will in the short term (within the same month) entail a drop in import prices of 0.21 per cent, cf. Chart 2. The total effect is a fall of 0.61 per cent.

Exchange rate fluctuations are thus passed through to import prices gradually. This indicates that prices are, to a certain extent, invoiced in kroner or euro and that exporters subsequently adjust their prices against the background of exchange rate developments. However, the estimated relationships also reflect that the exchange rate is a monthly average, while import prices are calculated on the 15th of each month. Hence, exchange rate fluctuations after the 15th will be included in the results for the next month.

The following equation is estimated in order to determine pass-through from the effective exchange rate of the krone to import and consumer prices<sup>1</sup>

$$\Delta p_t = c + \sum_{i=0}^I \delta_i \Delta e_{t-i} + \sum_{j=1}^J \gamma_j \Delta p_{t-j} + \epsilon_t$$

where  $p$  denotes the price,  $e$  is the effective krone exchange rate,  $c$  is a constant, and  $\epsilon$  is an error term. Moreover, a full set of seasonal dummies is included. Prices are from Statistics Denmark, while data for the effective krone rate is from Danmarks Nationalbank. Both prices and the effective krone rate are included in log differences. Import prices denote prices on the 15th of each month, while the effective krone rate is a monthly average. Consumer prices are typically collected between the 7th and the 15th of each month, but less frequently for certain goods and services, cf. Statistics Denmark (2004).

To achieve the best possible specification of the equation, it includes both the current and last month's value for the exchange rate (i.e.  $I=1$ ). In addition, the values for the last two months for import prices are included as explanatory variables (i.e.  $J=2$ ), while up to and including the 12th lag are included in the specification of consumer prices (i.e.  $J=12$ ). This reflects a higher degree of persistence in consumer prices than in import prices. The equation is estimated using

ordinary least squares. The model is estimated on monthly observations for the period 1981-2015. In order to examine whether pass-through has changed over time, the estimation is divided into the sub-periods 1981-97 and 1998-2015.

$\delta_0$  denotes the immediate price response to a change in the effective krone rate, i.e. the short-term pass-through. However, as a result of pass-through being gradual, the total pass-through will deviate from pass-through occurring within the month. Assuming stationarity, total pass-through to the price level can be calculated as

$$\kappa \equiv \frac{\sum_{i=0}^I \delta_i}{1 - \sum_{j=1}^J \gamma_j}$$

The estimation results are shown in the tables below. A 1 per cent appreciation of the nominal effective krone rate entails a decrease of 0.21 per cent in import prices in the short term for the period 1981-2015 as a whole, while the total decline is 0.61 per cent. Both short-term and total pass-through are statistically significant. The corresponding fall for consumer prices is 0.02 per cent in the short term and 0.32 per cent in total. However, the pass-through figures for consumer prices are not statistically significant, which should be viewed in the light of the general uncertainty in the estimation.

### Estimated pass-through to import prices

	1981-1997	1998-2015	1981-2015
Short-term pass-through	-0.2741***	-0.1398*	-0.2109***
	(0.0710)	(0.0828)	(0.0526)
Total pass-through	-0.6434***	-0.5945***	-0.6065***

Note: \*, \*\* and \*\*\* denote levels of significance of 10, 5 and 1 per cent, respectively. Robust standard errors in parentheses.  
Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

### Estimated pass-through to consumer prices

	1981-1997	1998-2015	1981-2015
Short-term pass-through	-0.0410	-0.0070	-0.0192
	(0.0208)	(0.0280)	(0.0155)
Total pass-through	-0.4589	-0.1151	-0.3239

Note: \*, \*\* and \*\*\* denote levels of significance of 10, 5 and 1 per cent, respectively. Robust standard errors in parentheses.  
Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

1. The equation is a standard specification in the literature on exchange rate pass-through, cf. Goldberg and Knetter (1997).

## INDICATIONS OF DECLINING PASS-THROUGH

A number of international studies have found indications of declining pass-through over time.<sup>4</sup> The increasing prevalence of global value chains is often cited as a major cause.<sup>5</sup> A global value chain is characterised by the processes adding value to goods or services being distributed over several countries.<sup>6</sup> For example, depreciation of the pound sterling vis-à-vis other currencies, including the Danish krone, will make Denmark's imports from the UK cheaper. If a product imported from the UK has been produced via a global value chain, the depreciation will only affect the price in Danish kroner for a part of the total value creation, however. This reduces pass-through.

Intensified competition in the product market may also reduce pass-through. In a highly competitive market, even small fluctuations in relative prices will entail considerable shifts in demand. Consequently, firms have only limited scope for passing through exchange rate fluctuations to prices. Another factor which may reduce pass-through is better access for firms to hedge exchange rate risks via financial markets, cf. the European Commission (2015).

### The role of monetary policy

Enhanced credibility of monetary policy may reduce pass-through, cf. e.g. BIS (2015). If a country's currency depreciates and exporters to that country maintain prices in their own currencies, prices in the importing country will rise. A central bank with strong focus on maintaining price stability will seek to address this by raising monetary policy interest rates. This reduces demand and hence price increases. In step with many countries' increasing policy focus on price stability, the scope for exchange rate fluctuations having a permanent impact on inflation has declined.

Denmark's monetary policy stance is not directly aimed at inflation. However, the fixed exchange rate policy is merely an indirect way of obtaining price stability, and a credible fixed

exchange rate policy reduces the potential of pass-through to consumer prices of changes in the exchange rate vis-à-vis currencies outside the anchor country.

Firms' perception of the credibility of the fixed exchange rate policy has strengthened substantially since the introduction of the policy in 1982, so the exchange rate pass-through is calculated for two separate sub-periods. The first sub-period covers 1981-97. During this period, the central rate of the krone against the D-mark was adjusted downwards on several occasions, cf. Chart 3. Although the adjustments of the central rate after the transition to the consistent fixed exchange rate policy in 1982 were not instigated by Denmark, they may have generated a degree of uncertainty in that period.

During this period, Denmark's Nationalbank allowed the krone to fluctuate within a band of +/- 2.25 per cent around the central rate. In connection with the EMS crisis, the fluctuation band was expanded, in August 1993, to +/- 15 per cent, and the krone depreciated markedly. In the subsequent period, the fluctuations of the krone rate were more pronounced than in the preceding years. Since the late 1990s, however, it has been very stable close to the central rate. Against that background, a lower pass-through of fluctuations in the effective exchange rate can be expected.

International trade tends to be invoiced in "major" currencies, not least US dollars. This means that US prices are notably less exposed to exchange rate fluctuations than prices in other countries, cf. Gopinath (2015). The introduction of the euro in 1999 may have entailed that an ever-increasing share of Denmark's non-euro area imports is invoiced in euro rather than in the export country's currency or in dollars. If this is the case, it has contributed to reducing the exchange rate pass-through in Denmark.<sup>7</sup>

The empirical analysis confirms that the short-term pass-through has declined from -0.27 in the period 1981-97 to -0.14 in the subsequent period. The total pass-through has fallen from -0.64 to

4 See e.g. BIS (2015) and Di Mauro et al. (2008).

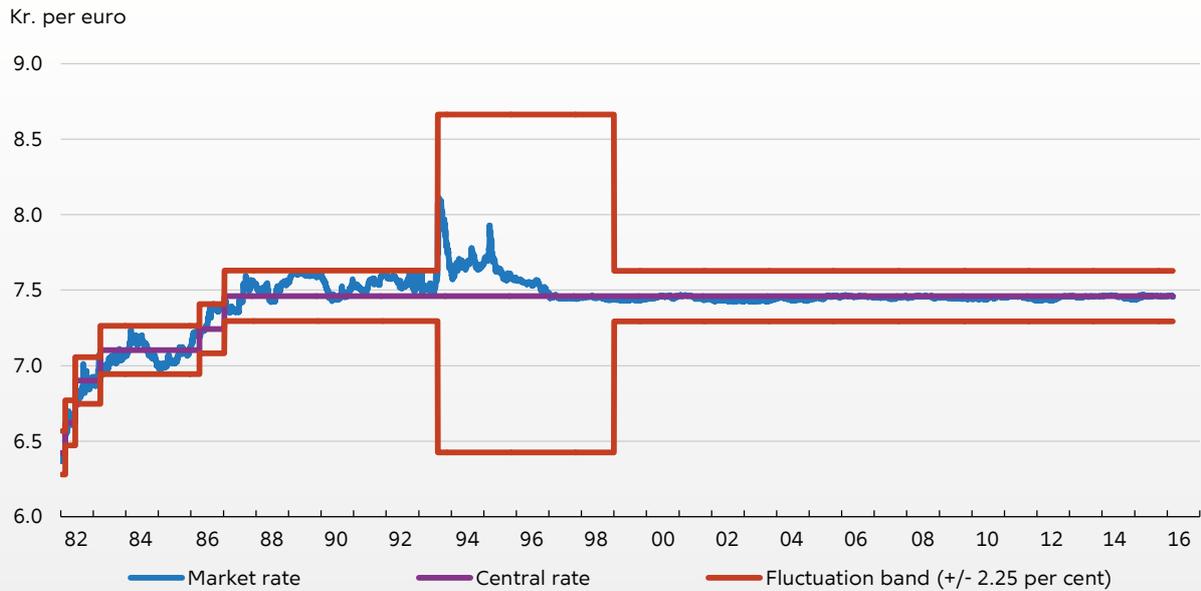
5 See e.g. European Commission (2015).

6 See the article "Global value chains" in this Monetary Review for an analysis of Denmark's role in the global value chains.

7 Kamps (2006) finds indications that the role of the euro as an international invoicing currency is increasing. However, at the time of the analysis, its role was still limited compared with the dollar. Lighthart and Werner (2012) find that the introduction of the euro has entailed that a larger share of Norway's euro area imports is now invoiced in the exporter's currency.

Exchange rate of the krone vis-à-vis the euro

Chart 3

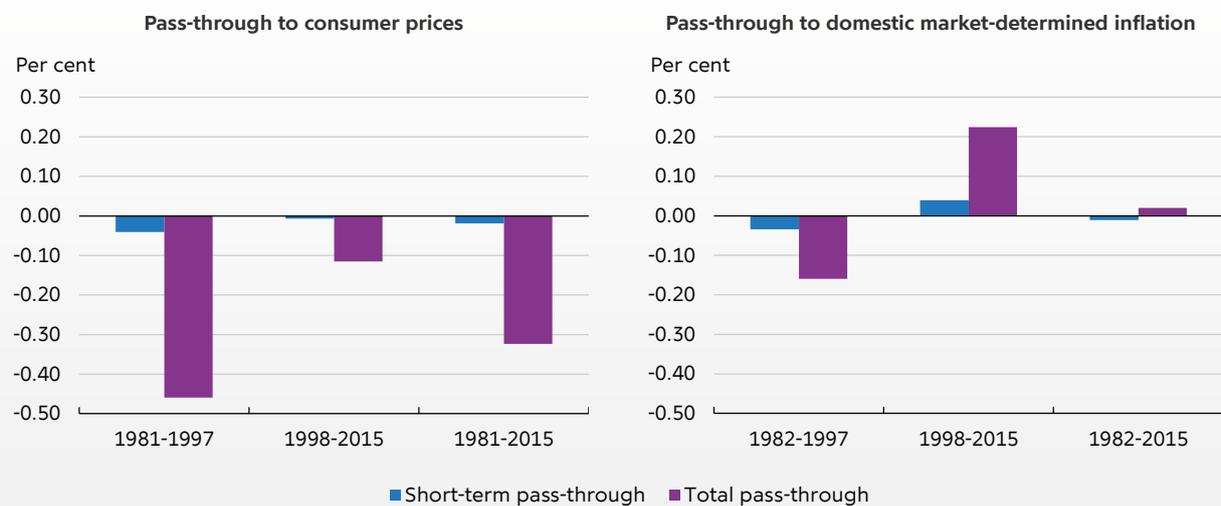


Note: Before 1999 a synthetic exchange rate has been applied for the krone vis-à-vis the euro, calculated on the basis of the krone's exchange rate vis-à-vis the D-mark and the conversion rate between the euro and the D-mark locked on 1 January 1999.

Source: Danmarks Nationalbank.

Effect of a 1 per cent strengthening of the effective krone rate (lower import prices) on consumer prices and domestic market-determined inflation

Chart 4



Note: Estimated pass-through to consumer prices and domestic market-determined inflation, IMI, of a 1 per cent strengthening of the nominal effective krone rate, where the estimates are the result of a regression model, cf. Box 1. Consumer prices are the consumer price index, CPI.

Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

-0.59, although this difference is not statistically significant.<sup>8</sup>

## PASS-THROUGH TO CONSUMER PRICES

The exchange rate of the krone has a direct impact on consumer prices via prices of imported consumer goods and an indirect impact via prices for imported inputs for domestic production. In the short term, a 1 per cent increase in the effective krone rate causes consumer prices to fall by 0.02 per cent for the period 1981-2015 taken as one, cf. Chart 4.<sup>9</sup> The total pass-through is -0.32 per cent.

Pass-through was weaker in the period 1998-2015 than in 1981-97. The lower pass-through to both import and consumer prices in the most recent period may reflect, inter alia, the enhanced credibility of monetary policy, the increasing use of the euro as an invoicing currency and the higher prevalence of global value chains, cf. above. Pass-through to consumer prices has fallen despite a modest increase in the import content, although the estimated pass-through to consumer prices is not statistically significant.

Total pass-through to consumer prices estimated for the period 1981-97 seems disproportionately large, given that the import content of the consumer price index is only around one quarter. This may reflect changes in the inflation rate of a more permanent nature, especially at the begin-

ning of the period, which – given the estimation method applied – may result in overestimation of exchange-rate pass-through.

On the other hand, in the period since 1998, during which the rate of price increases has been more stable, especially short-term pass-through, but also total pass-through, has been lower than immediately warranted by the import content of consumption.<sup>10</sup> Changes in import prices are instead to a certain extent absorbed in the profit margins of domestic manufacturers and wholesalers, which is evidenced by the marginally positive total pass-through to the domestic market-determined inflation, IMI, for the period 1982-2015 taken as one, and by the positive short-term as well as total pass-through in the period 1998-2015.<sup>11</sup> This should be viewed in the light of the considerably enhanced perception among firms of the credibility of the fixed exchange rate policy since the 1980s.

A mechanical calculation of pass-through to consumer prices on the basis of pass-through to import prices and the import content of consumption is, however, subject to considerable uncertainty, since the estimated pass-through to import prices covers only goods, just as pass-through to consumer prices will depend on the impact of higher prices on indirect taxes.

The applied method is relatively simple. A more advanced method shows a relatively modest pass-through to consumer prices, cf. Box 2. According to this method, pass-through in the period 1998-2015 is not markedly different

8 There may be concerns that the strong fluctuations in the prices of selected goods, e.g. energy, lead to strong fluctuations in import prices which are not related to the exchange rate. To examine this, a specification is also considered as from 2005, whereby only prices of imported manufactures are considered, to the exclusion of e.g. commodities. However, this does not entail any substantial shifts in the estimated relationships.

9 Pass-through has been calculated using the same method as for import prices, cf. Box 1.

10 The mechanical pass-through to consumer prices is calculated as the product of the estimated pass-through to import prices and the import content of the consumer price index. The import content, which constitutes the sum of the direct and indirect import contents, has been calculated on the basis of input-output tables showing the share of final consumption (excluding indirect taxes, etc.) made up of imported products (excluding indirect taxes, etc.), by 74 components of consumption, cf. Statistics Denmark (2011). The import content of the consumption components is then weighted using the weights of the consumer price index (distributed on the 74 consumption components of the input-output tables). An input-output table from 1990 has been used for the period 1981-97 and an input-output table from 2006 for the period 1998-2015. Price weights for the respective years are applied. The calculated import content was 24 per cent in 1990 and 27 per cent in 2006.

11 With a view to examining domestic price pressures, Danmarks Nationalbank calculates a price index for domestic market-determined inflation, IMI. On the basis of the headline consumer price index, HICP, the price effect of exogenous factors is gradually excluded, cf. e.g. Hansen and Knudsen (2005) and Mortensen and Staghøj (2015). The exogenous factors which are excluded are energy, unprocessed food, administered prices (e.g. rent, day care institutions and public transport), duties and indirect taxes and the (direct and indirect) import content.

This box presents an alternative estimation of the exchange rate pass-through to consumer prices on the basis of a Bayesian vector autoregressive, BVAR, model, cf. e.g. Litterman (1986). The point of departure is a vector autoregression

$$Y_t = B_1 Y_{t-1} + B_2 Y_{t-2} + \dots + B_p Y_{t-p} + D Z_t + \varepsilon_t$$

where  $Y_t$  is an  $n \times 1$  vector of endogenous variables,  $Z_t$  is a  $d \times 1$  vector of exogenous variables,  $\varepsilon_t$  is an  $n \times 1$  vector of error terms with an expected value of zero and the variance-covariance matrix  $\Sigma$ . The  $B$ s are  $n \times n$  matrices with the parameters for the endogenous variables, while  $D$  is an  $n \times d$  matrix with the parameters for the exogenous variables.

The endogenous variables of the model are the oil price, a short-term interest rate, real GDP, the nominal effective krone exchange rate, import prices, producer prices and consumer prices. All variables except the short-term interest rate are included in logarithms. Two exogenous indicator variables, for the 4th quarter of 2008 and the 1st quarter of 2009, are included in order to take special conditions during the financial crisis into account. The model is estimated on quarterly data, whereas monthly data is applied in the analysis in the main text, and four lags are included ( $p=4$ ). This analysis considers a temporary shock to the krone rate, while the analysis in the main text concerns a permanent shock.

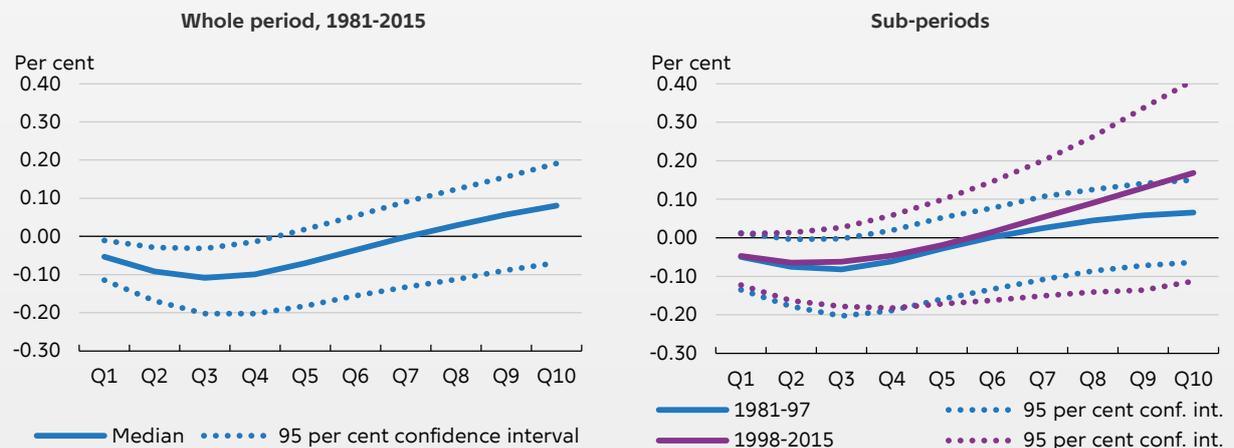
The model is estimated using a Bayesian approach. In Bayesian econometrics, the parameters are regarded as sto-

chastic variables to be characterised by a distribution. This contrasts with classical econometrics, where the parameters are regarded as having a "true" value to be estimated in the best possible way. Combining data for the endogenous and exogenous variables with an a priori distribution of the underlying parameters and the variance-covariance matrix allows estimation of an ex post distribution of the model parameters.

The chosen a priori distribution is a normal Wishart distribution, which is a combination of a multivariate normal distribution for the parameters and an inverse Wishart distribution for  $\Sigma$ . The choice of a priori distribution follows Comunale and Kunovac (2016), who estimate a similar model. The parameters of the model are identified by means of a Choleski factorisation, including the endogenous variables in the order stated above.

Once the model has been estimated, impulse response functions can be derived, showing the effect on the endogenous variables of a shock to one of the other endogenous variables. In this case, the relevant impulse response function is the effect on consumer prices of a shock of 1 per cent to the nominal effective krone rate. For the total period 1981-2015, it is found that pass-through from the effective krone rate to consumer prices is significant for up to four quarters and then the effect becomes insignificant, cf. the chart. In the period 1981-97, the effect is significant in the 2nd and 3rd quarters, while the estimated pass-through is not significant in any of the quarters for the data period 1998-2015. However, the difference in the estimated median pass-through between the two periods is very modest.

Pass-through to consumer prices of a temporary 1 per cent strengthening of the nominal effective krone rate



Note: The impulse response of consumer prices resulting from a shock to the nominal effective krone rate on estimation of the Bayesian vector autoregressive model described above. The shock has been normalised to 1 per cent in the 1st quarter. The BEAR toolbox has been used in the estimation, cf. Dieppe et al. (2015).

Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

from pass-through in the preceding period. This illustrates that the results are subject to some uncertainty.

The gradual pass-through to consumer prices is illustrated in Chart 5 on the basis of the estimation for the period 1998-2015. The effect on the price level in a given month is the result of accumulating the effects on the rate of price increases up to and including that month. Although the effect on the rate of price increases is temporary, changes in the effective krone rate will have a permanent effect on the price level.

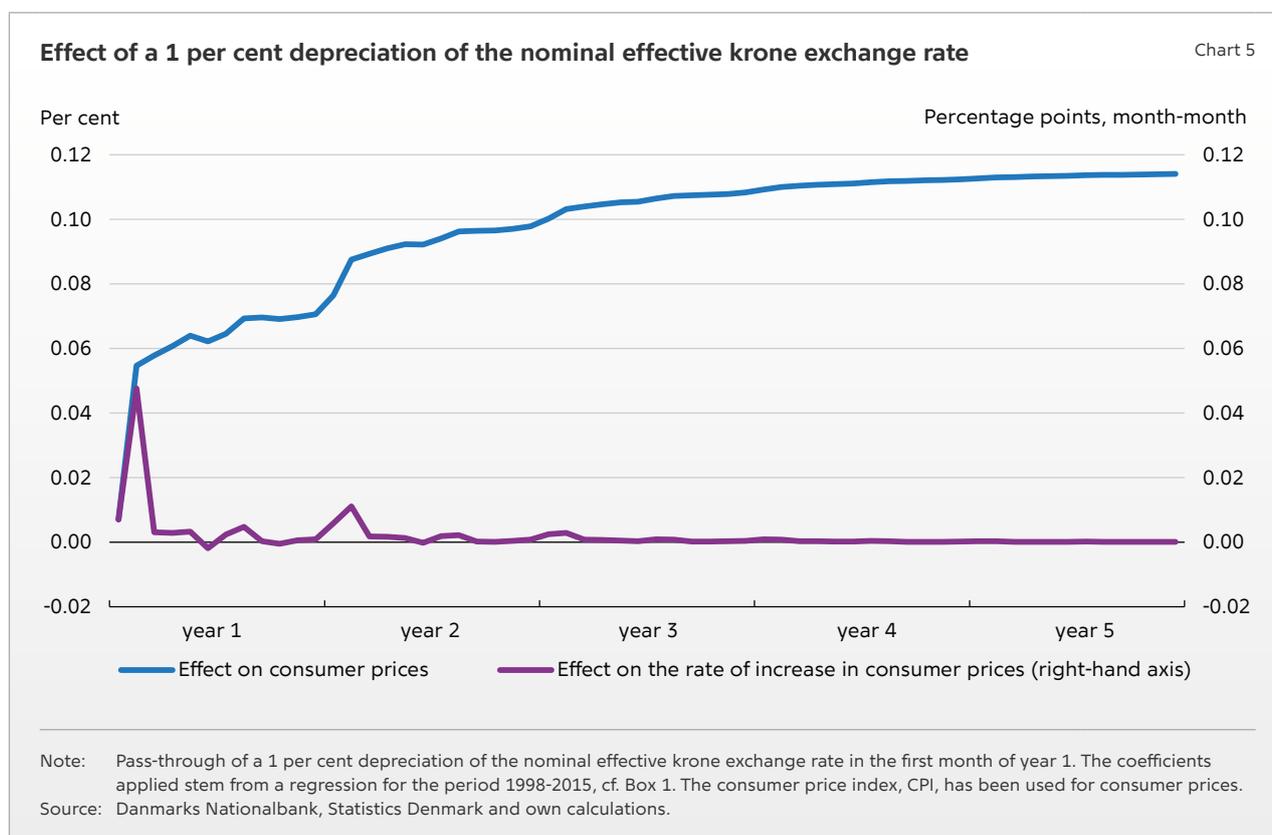
Unless employees have a clear picture of whether inflation will be kept stable in the longer term, they will attach a certain probability to the higher rate of price increases being a permanent phenomenon. This may prompt them to demand higher wages in the collective bargaining process. Higher wage increases which are not justified by higher productivity growth will lead to higher consumer prices.

This means that higher wage demands in the wake of consumer price increases may trigger a price-wage spiral. A situation where an increase in prices leads to higher wages which result in a prolonged rise in inflation is called second round

effects. However, there are no indications of fluctuations in the effective krone rate entailing marked second round effects, since the rate of price increase quickly falls back, cf. Chart 5.

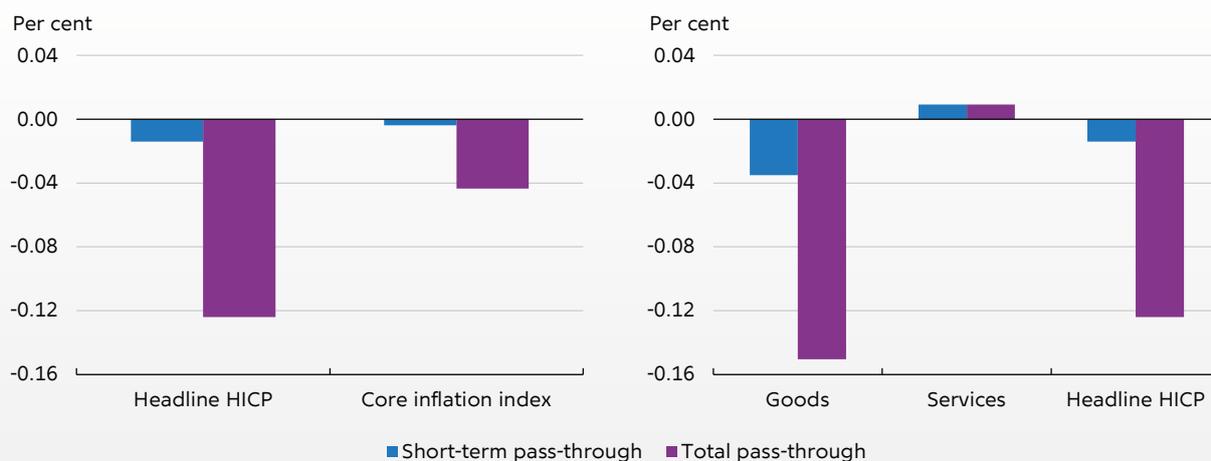
Pass-through from fluctuations in the nominal effective exchange rate of the krone to the total consumer price index is stronger than pass-through to the core inflation index calculated excluding energy and unprocessed food, cf. Chart 6. BIS (2015) also finds that the relationship between exchange rates and core inflation is weaker than that between exchange rates and the headline consumer price index.

The exchange rate pass-through to goods prices is more pronounced than that to service prices, cf. Chart 6. This should be viewed in the light of the much larger import content in goods than in services. For the period 1998-2015, an increase in the effective krone rate of 1 per cent led to a decline in goods prices of 0.04 per cent in the short term and a total fall of 0.15 per cent, of which only the total pass-through is statistically significant, however. In contrast, a corresponding fall in the effective krone rate led to a marginal increase in service prices of 0.01 per cent, which is not significantly different from zero.



### Effect of a 1 per cent strengthening of the effective krone rate on consumer prices, HICP and the core inflation index, 1998-2015

Chart 6



Note: Estimated pass-through to consumer prices of a 1 per cent strengthening of the nominal effective krone rate, where the estimates are the result of a regression model, cf. Box 1. For the sake of comparison, the EU Harmonised Index of Consumer Prices, HICP, has been applied to consumer prices. The core inflation index has been calculated as HICP excluding energy and unprocessed food, cf. Hansen et al. (2013).

Source: Statistics Denmark, Eurostat and own calculations.

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# FOREIGN DIRECT INVESTMENT

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## INTRODUCTION AND SUMMARY

The value of firms located abroad but owned by Danish firms is known as foreign direct investment (FDI).<sup>1</sup> Over the last 30-40 years, the extent of FDI has expanded rapidly, both globally and in Denmark, driven, inter alia, by easier and cheaper access for firms to set up in markets other than their home market. This has enabled them to expand more than if they operated solely within the borders of a single country.

Developments in Denmark are similar to developments in other advanced economies. However, since the mid-2000s, growth in Danish FDI abroad has exceeded growth in FDI in Denmark, entailing that the Danes have accumulated large net FDI stocks. This reflects, inter alia, that Denmark has been running large current account surpluses for some time, thereby accumulating foreign assets. Moreover, countries with positive net stocks tend to be wealthy advanced economies.

Very large Danish firms, especially in the industrial sector, are the main Danish investors abroad. Thus, in 2014, the 10 largest groups accounted for about half of Denmark's FDI stocks. Danish FDI abroad is concentrated in a few countries, primarily Danish trading partner countries. The country composition is very stable, illustrating that FDI represents long-term economic relations.

FDI generates substantial investment income. For each year in the past decade, Danish FDI abroad have been generating a higher rate of return than the return on FDI in Denmark. The difference is attributable, in particular, to Danish pharmaceuticals with patents registered in foreign subsidiaries, which generate high earnings relative to the investment. Excluding the pharmaceutical industry, there is no systematic difference in the rate of return.

When Danish firms engage in FDI, this could, in principle, be at the expense of domestic real capital investment. However, this does not seem to be the case. Danish real capital investment in industries and firms with FDI stocks does not differ from that in other industries and firms. This applies in the short term. But in the longer term, FDI abroad is not assessed to crowd out domestic investment to any substantial extent either.

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1 Foreign Direct Investment (FDI). The abbreviation is used in charts in the article. Changes in stocks as a result of transactions are referred to as outward or inward, depending on whether FDI flows out the country or into the country.

## FOREIGN DIRECT INVESTMENT (FDI)

FDI is the value of firms located abroad in which the investor has controlling influence, cf. Box 1. The activity of foreign subsidiaries can be related to production facilities, port terminals, sales offices, etc. Tax optimisation could be another motive for setting up firms abroad. In other words, FDI is a broad concept. In some cases, FDI is comparable to real capital investment, in others FDI is more similar to a financial investment. Statistically, FDI is not decomposed into subgroups depending on the activity of foreign subsidiaries. Thus, it is not possible to determine whether FDI covers e.g. the construction of a new plant, i.e. greenfield investment, mergers & acquisitions or something else altogether.

### INTERNATIONAL FDI DEVELOPMENT

The global scope of FDI has been expanding rapidly since 1980, cf. Chart 1 (left) – especially during the periods 1994-99 and 2003-06, i.e. periods of strong global growth. The explanation is easier and cheaper access for firms to set up in markets other than their home market. This enables them to expand more than if they operated solely within the borders of a single country. Moreover,

setting up production facilities and sales offices abroad can be necessary to achieve market access. In addition, this facilitates access to new knowledge and technology.

The rise in FDI stocks is driven by the advanced economies in particular, although the FDI share of emerging market economies has increased since the millennium change. From the early 1980s until the mid-2000s, the advanced economies accounted for about 90 per cent of global FDI stocks, slightly more than their share of the global gross domestic product, GDP. Since then, the share of FDI stocks has decreased to just under 80 per cent, while their share of global GDP has been reduced to 60 per cent.

The advanced economies have primarily invested in other advanced economies, reflecting, inter alia, that global corporate structures have become more complex, cf. Box 2. This entails that the net investment of the advanced economies is far lower than their gross investment, cf. Chart 1 (right).

### DANISH FDI

Developments in Danish FDI are similar to developments in other advanced economies. Both

#### FDI in the national accounts and seen from the perspective of firms

Box 1

##### FDI in the national accounts

In the national accounts, stocks of FDI abroad are defined as a financial item covering the value of firms located abroad in which the Danish investor has controlling influence. The specific limit is set at 10 per cent of the equity or voting rights. Thus, the foreign subsidiaries of Danish groups are included in the national accounts as part of Danish FDI abroad. Technically, this figure is included as a foreign asset, i.e. a receivable. Changes in FDI abroad can be due to changes in value or volume.

Ownership is achieved through acquisition by Danish firms of equity securities issued by foreign firms. This entails that, in the national accounts, FDI is regarded as a cross-border financial investment and recorded in the financial account of the balance of payments. FDI also includes loans and trade credits between affiliated enterprises, for instance from the parent company to a foreign subsidiary.

FDI can be calculated using two approaches: the directional approach and the balance of payments approach. In the calculation of FDI stocks, the difference between the two approaches is that intercompany loans are calculated net per country using the directional approach, while gross figures are used in the balance of payments approach. This means that the gross figures calculated using the direction-

al approach could be smaller. In the article, we use both approaches, depending on the data available.

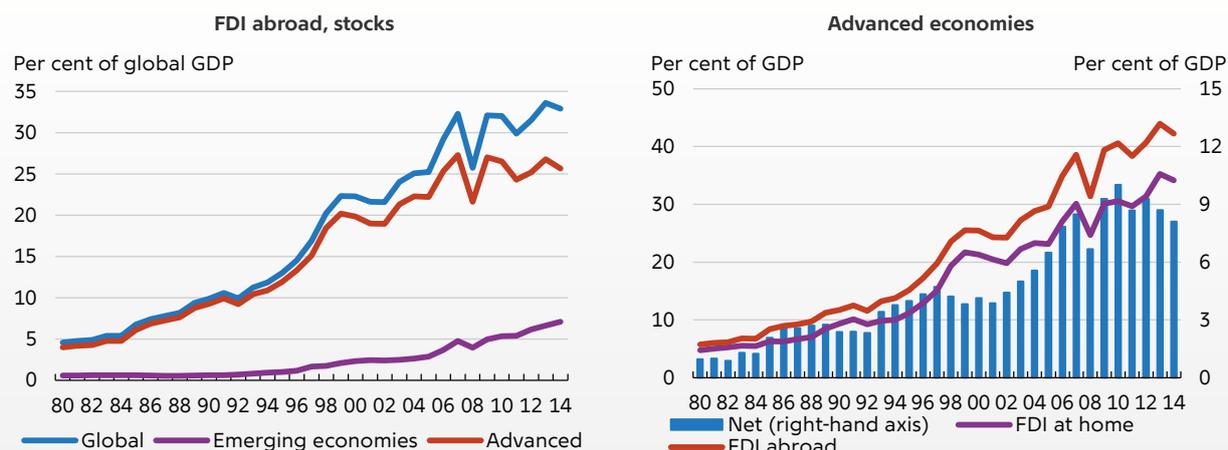
The value of FDI is subject to some uncertainty, for instance because it is difficult to determine the market value of firms that are not listed and thus not traded in a market.

##### FDI seen from the perspective of firms

Firms plan production and sales to achieve profit maximisation. Consequently, they will operate from abroad if they find this advantageous. In some cases, geographical borders will be insignificant to them. As a case in point, an IT server or a patent registered abroad may be used by employees in Denmark. In principle, certain activities conducted by foreign subsidiaries could be performed in Denmark such as the production of goods or intermediate inputs. However, in many cases, it is physically impossible to locate the subsidiary in Denmark, for example when it comes to US port installations. Similarly, sales offices abroad are typically set up to be closer to the customers. Another constraint could be the availability of spare resources in the Danish labour market. With unemployment close to its structural level, the amount of spare resources is limited, cf. Danielsen and Jørgensen (2015). Finally, foreign subsidiaries may be set up for liquidity management or tax optimisation reasons.

## FDI stocks

Chart 1



Note: Left-hand chart: Calculated using the directional approach. Percentage of global GDP in current prices and market exchange rate. Emerging economies are calculated as the world excluding advanced economies. Right-hand chart: Calculated using the directional approach as the percentage of GDP in advanced economies in current prices and market exchange rate. Gross figures are calculated as the cross-country sum of stocks. "Net" represents the difference between outward and inward FDI.

Source: United Nations Conference on Trade and Development, Unctadstat.

Danish FDI abroad and FDI in Denmark have risen sharply over the last decades, cf. Chart 2 (left). Since the mid-2000s, Danish FDI abroad have, however, exceeded FDI in Denmark. Thus, the Danes have accumulated large net FDI stocks.

Danish FDI abroad grew particularly strongly in the period 2008-11, while growth in FDI in Denmark was weaker. The primary reason was large individual transactions. As a case in point, Carlsberg acquired Scottish & Newcastle in partnership with Heineken in 2008, substantially increasing Danish FDI abroad. At the same time, non-resi-

dents have been selling firms in Denmark. Multiple sales of Chr. Hansen Holding, ISS and TDC are examples of large transactions that have reduced FDI in Denmark.

There does however, not seem to be any major structural explanations for Denmark's large accumulation of net stocks. For example, the OECD constructs an index of regulatory restrictions on FDI, the FDI Regulatory Restrictiveness Index. According to this index, Danish regulatory barriers are low and below the OECD average (slightly higher than e.g. Germany and the Netherlands,

## Global value chains and FDI<sup>1</sup>

Box 2

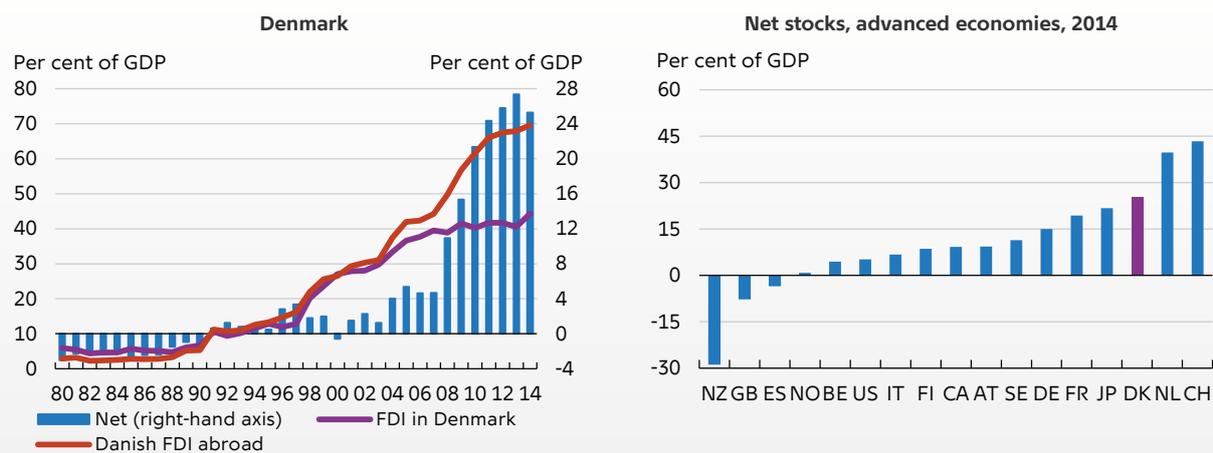
Firms are increasingly using subcomponents from other firms, sometimes their own subsidiaries, in the production of goods. When activities are distributed among firms, several firms are involved in the value chain of a product. Thus, the value of the final product may consist of value added from a variety of firms. If value added is generated in a number of countries, a global value chain is created. A long value chain tends to lead to higher global exports, since the entire value of the product/intermediate input is included in the calculation of exports each time a national border is crossed.

Globalisation has manifested itself, in particular, in longer global value chains and more FDI. However, FDI may, in itself, lengthen global value chains. If a Danish firm decides to relocate part of its production process abroad, this will lengthen the value chain of the final product (production will be made by two firms rather than one). According to the UN, multinational corporations account for around 80 per cent of global trade, and approximately 33 per cent of the trade is carried out within the same group.<sup>2</sup>

1. See the article "Global value chains" in this Monetary Review for a description of GVC.  
2. See United Nations Conference on Trade and Development, Unctad, press release 001, 2013, (<http://unctad.org/en/pages/PressRelease.aspx?OriginalVersionID=113>).

## FDI stocks

Chart 2



Note: Left-hand chart: Calculated based on the balance of payments approach, excluding pass-through investment. Data before 1999 is from UNCTAD, while subsequent data is from Danmarks Nationalbank, which migrated to a new data collection system in 2004. NZ: New Zealand, GB: UK, ES: Spain, NO: Norway, BE: Belgium, US: USA, IT: Italy, FI: Finland, CA: Canada, AT: Austria, SE: Sweden, DE: Germany, FR: France, JP: Japan, DK: Denmark, NL: Netherlands, CH: Switzerland.

Source: Danmarks Nationalbank, OECD and UNCTAD.

but slightly lower than e.g. Sweden, Austria and the USA).<sup>2</sup> Moreover, the return on FDI in Denmark has not been low relative to the return in other countries either, cf. Kramp et al. (2014).

Cross-border corporate expansion in the advanced economies has been the main driver of growth in both Danish FDI abroad and FDI in Denmark. However, this development does not help to explain why Denmark and many other advanced economies have more FDI abroad than foreigners have FDI at home, i.e. why they have accumulated positive net stocks relative to the rest of the world, cf. Chart 2 (right). Rather, this reflects, inter alia, that FDI seeks the highest return. The return tends to be highest where the capital stock is smallest. Free capital flows mean that net FDI flows tend to go from countries with a high per capita income to countries with a lower per capita income, cf. Chart 3 (left) to such an extent that the cross-country return is largely the same when risk is factored in.

The main accumulators of large net FDI stocks are countries that have been running current account surpluses for many years, cf. Chart 3 (right).

Denmark's current account surplus means that the Danes – i.e. the domestic sectors taken as one – have a net savings surplus. Thus, Danes invest assets abroad. Some of these assets are invested in outward FDI. The Danes' net FDI stocks are in line with the Danish level of wealth and current account surpluses in recent years.

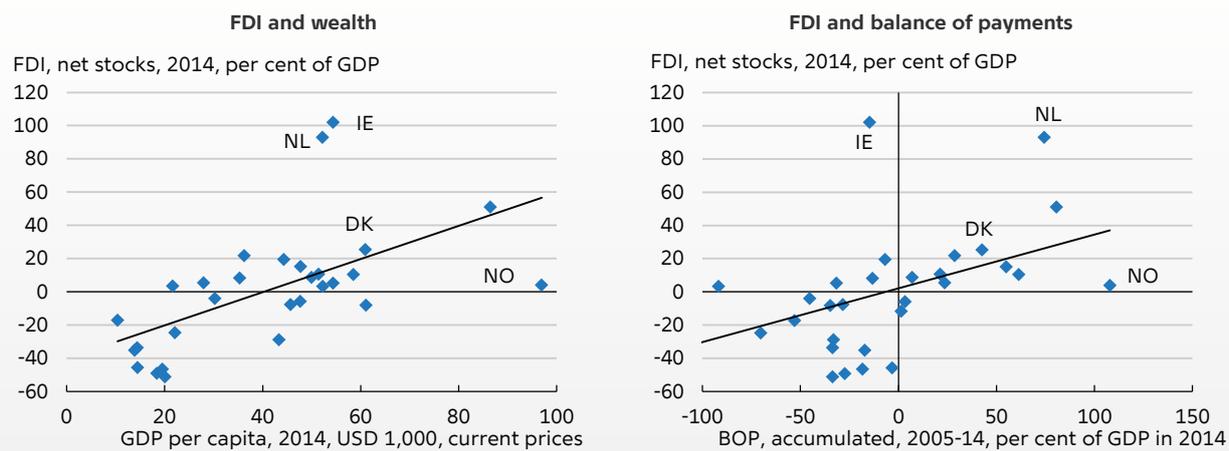
However, this does not apply to Ireland, the Netherlands and Norway. In the case of Ireland, the reason is that many international corporations are headquartered in Ireland. Their assets increase the Irish FDI abroad, while the liabilities are not included as FDI in Ireland since just a few investors hold more than 10 per cent of the share capital. Instead, the liabilities are classified as portfolio investment.<sup>3</sup> The Netherlands is also the domicile of many large global corporations, which points to large net stocks if any foreign owners have an ownership interest of less than 10 per cent. Norway, on the other hand, has small net FDI stocks. The Norwegian current account surplus is largely oil driven. The revenue is invested in the Government Pension Fund, which mainly has portfolio investments. Thus, Norwegian outward FDI is relatively small.

<sup>2</sup> The Danish Productivity Commission (2013) has one recommendation, i.e. that "The industry-specific regulation is reviewed for the purpose of simplification and adaptation to the regulation of our key trading partners. As part of this review, ownership restrictions should, as far as possible, be removed."

<sup>3</sup> See Central Statistics Office (2015).

Relationship between net FDI stocks, wealth and balance of payments

Chart 3



Note: Data is shown for 30 OECD countries. DK: Denmark, IE: Ireland, NL: Netherlands and NO: Norway. In a regression in which wealth and the accumulated balance of payments are both used as explanatory variables, the accumulated balance of payments is not significant. The explanation is that the level of wealth also helps to explain the size of a country's balance of payments (capital seeks the highest return).  
Source: OECD and own calculations.

### Danish FDI abroad broken down by country

At end-2014, Denmark's FDI abroad were kr. 1,351 billion excluding pass-through investment in Denmark, equivalent to 70 per cent of GDP. Danish FDI is concentrated in a few countries, and the country composition widely reflects Danish trading patterns, i.e. we invest in our trading partners, cf. Table 1. At end-2014, approximately 75 per cent of the FDI abroad was invested in just 10 countries. As far as FDI in Denmark is concerned, the 10 largest investor countries account for about 85 per cent. The countries targeted by Denmark for investment, and the countries targeting Denmark for investment are largely the same. Moreover, the country composition has been very stable over time, highlighting that FDI represents long-term economic relations.

Almost 60 per cent of Danish FDI goes to EU member states, especially Sweden, the UK, Germany and the Netherlands. The large Swedish share is attributable to the recording method where FDI abroad is recorded for the first counterparty country. Carlsberg's investments

in Russia are owned through Swedish subsidiaries, and in the statistics these investments are recorded as an investment in Sweden. The large stock of Danish FDI in Singapore is due, among other factors, to Maersk-owned port facilities in the country.

Other EU member states account for just under 70 per cent of FDI in Denmark, more than 20 per cent of which comes from the Netherlands and Luxembourg. These two countries are often used by firms to pass through investment from one country to other countries.<sup>4</sup> With the adoption of the new IMF standard for balance of payments statistics, it became possible, starting in 2014, to allocate inward FDI to the ultimate investor country rather than the first counterparty country. Using this method, less than one third of the investment from the Netherlands and Luxembourg is actually controlled by their residents. Instead, a large portion of the final owners are from the USA and the UK, for instance through ownership via investment banks, private equity funds, etc., domiciled in these countries.

4 Some countries, for example Luxembourg and the Netherlands, have a high level of pass-through investment, inter alia as a result of favourable tax regimes. Pass-through investment is usually excluded from analyses if possible, as pass-through investment has no real economic effect. However, fully identifying pass-through investment is difficult, which makes cross-country comparisons of gross figures difficult.

**Danish FDI stocks and trade broken down by country, average 2005-14**

Table 1

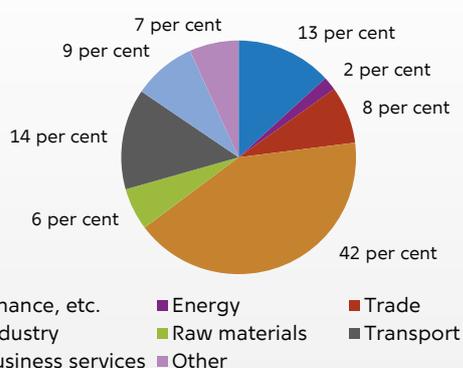
Per cent	FDI abroad	Export share	Per cent	FDI in Denmark	Import share
Sweden	17.3	12.9	Sweden	24.2	13.3
USA	9.9	5.2	Netherlands	12.1	7.0
UK	9.8	8.0	Luxembourg	10.0	0.3
Germany	8.5	15.4	UK	7.9	5.4
Norway	6.1	6.2	USA	6.9	3.0
Netherlands	6.0	4.3	Norway	6.7	5.0
Switzerland	5.3	0.8	Germany	6.5	20.9
Singapore	3.8	0.6	Switzerland	4.0	0.9
France	3.8	3.6	France	2.9	3.5
Finland	3.6	2.5	Japan	2.5	0.6
10 largest countries	74.1	59.4	10 largest countries	83.6	60.0

Note: Data is shown for 30 OECD countries. DK: Denmark, IE: Ireland, NL: Netherlands and NO: Norway. In a regression in which wealth and the accumulated balance of payments are both used as explanatory variables, the accumulated balance of payments is not significant. The explanation is that the level of wealth also helps to explain the size of a country's balance of payments (capital seeks the highest return).

Source: OECD and own calculations.

**Stocks of Danish outward FDI, industries, 2014**

Chart 4



Note: Investment through non-financial holding companies is broken down by the industries in which the group operates. Non-disclosed industry is distributed equally among the other industries.

Source: Danmarks Nationalbank.

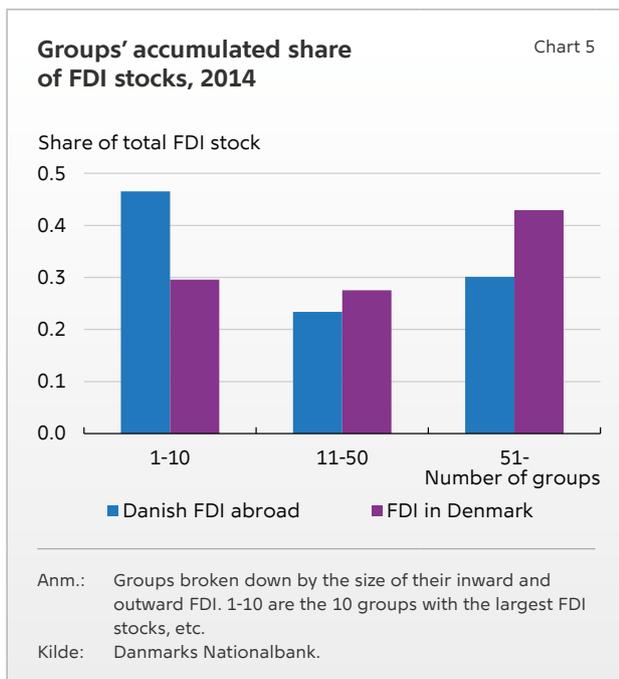
### Danish FDI abroad broken down by industry

A large share of Danish FDI abroad is made by industrial firms, accounting for 42 per cent of Danish FDI abroad in 2014, cf. Chart 4.<sup>5</sup> More than half of the industrial sector's investment is made in foreign industrial firms, primarily in the food, beverage and tobacco industry. The rest of the industrial sector's investment is made almost exclusively in non-financial holding companies. It is unclear where the capital is subsequently channelled to, but presumably it is widely channelled to industrial firms. Other Danish industries also mainly invest in their own industry, the industrial sector and non-financial holding companies when investing abroad.

### Firm size and FDI

It applies to both Danish FDI abroad and FDI in Denmark that subsidiaries are primarily fully owned, i.e. have only one owner. The value of FDI is distributed on a few Danish firms, cf. Chart 5. This is true for both Danish FDI abroad and FDI in Denmark.

<sup>5</sup> Around 20 per cent of Danish FDI abroad is made through non-financial holding companies. However, this percentage can be distributed on the industries in which the group operates, which approach has been used in this article.

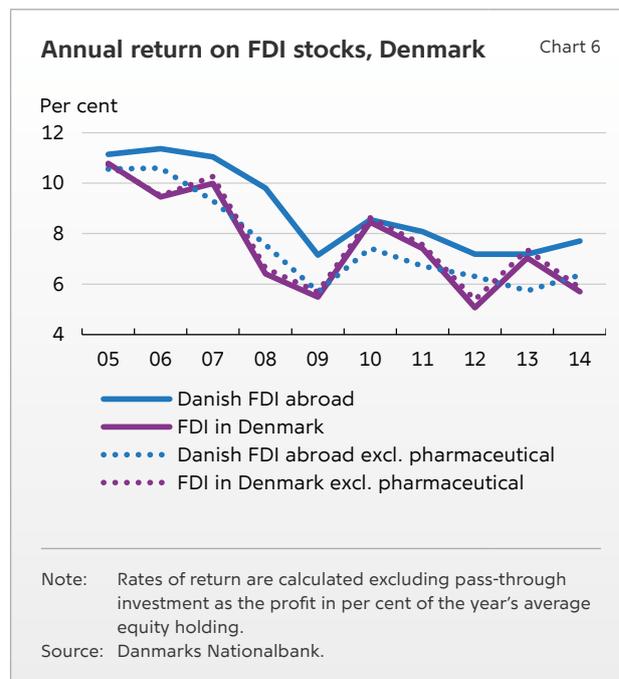


At end-2014, the 10 largest groups accounted for just under 50 per cent of Danish FDI abroad, and the 50 largest groups accounted for 70 per cent, cf. Chart 5. In 2014, FDI in Denmark was kr. 860 billion, and, contrary to Danish FDI abroad, was distributed on multiple firms. The 10 largest foreign investors hold 30 per cent of FDI in Denmark, while the 50 largest investors hold 57 per cent.

### RETURN ON FDI

FDI generates investment income from the foreign capital. For equity investments, the income is equal to the profit of subsidiaries, defined by distributed and undistributed dividends, while for intercompany loans the income consists of interest payments.

For the last decade, Danish FDI abroad have consistently generated a higher return than the return on FDI in Denmark, cf. Chart 6. One explanation for the difference is Danish pharmaceuticals, which, e.g. through patents registered abroad, generate a high level of earnings relative to the investment. If the pharmaceutical industry is disregarded, there is no systematic difference in the return on Danish FDI abroad and FDI in Denmark.<sup>6</sup>



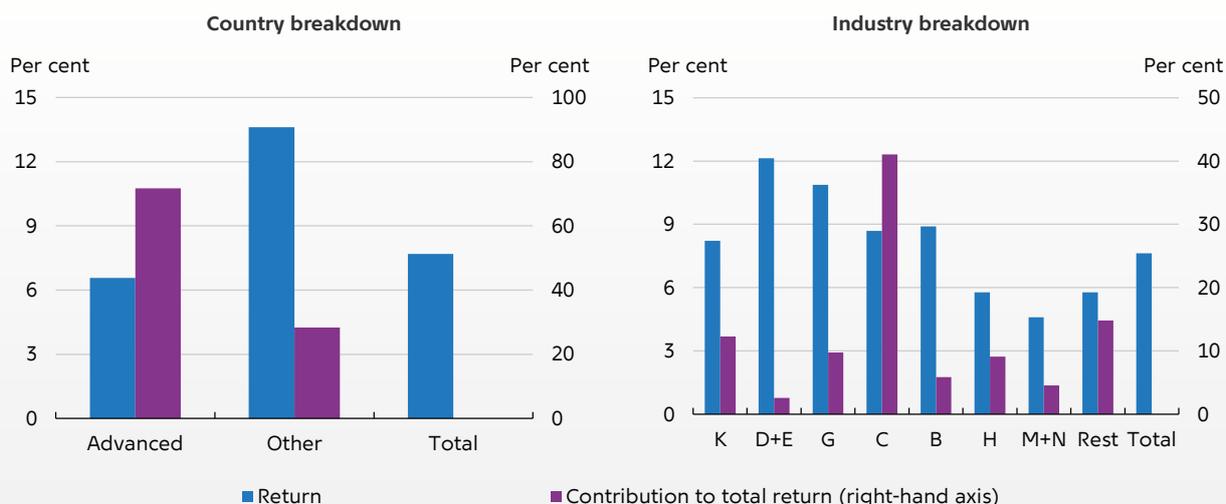
In the period 2009-14, the average annual return on Danish FDI abroad was 7.6 per cent. Broken down by country, the advanced economies contribute the most, at just over 70 per cent, while other countries contribute the remaining approximately 30 per cent, cf. Chart 7 (left). Among the advanced economies, Switzerland, the UK and Sweden are the main contributors to income. The return on investment in advanced economies is 6.6 per cent. Among other economies, the return is approximately double this figure. Investment in other economies is more risky and therefore generates a higher return, which could explain the difference.

Broken down by industry, the industrial sector is the main driver of the total return, accounting for 41 per cent. The return in the industrial sector is 8.7 per cent, cf. Chart 7 (right). The high return is attributable to the pharmaceutical industry, among others, accounting for about half of industry's contribution to the total return. This is remarkable as the pharmaceutical industry's FDI abroad accounts for just about 15 per cent of the investment in the industrial sector taken as one. The large contribution reflects that the return in the pharmaceutical industry was almost 37 per cent annually in the period 2009-14.

<sup>6</sup> See also Andersen et al. (2013).

Annual return from Danish FDI abroad, countries and industries, 2009-14

Chart 7



Note: Non-financial holding companies are broken down by their typical target industries for investment. The industry abbreviations are as follows. K is Finance and insurance. D+E are energy supply, water supply and refuse collection. G is trade. C is industry. B is raw material extraction. H is transport. M+N are knowledge services, travel agencies, cleaning and other operational services. Rest is other industries. Total is all industries taken as one.

Source: Danmarks Nationalbank.

## DOES OUTWARD FDI AFFECT DOMESTIC REAL CAPITAL INVESTMENT?

In the last 20-25 years, the investment ratio of the advanced economies has been showing a gradual decrease, cf. Chart 8, while the ratio has been

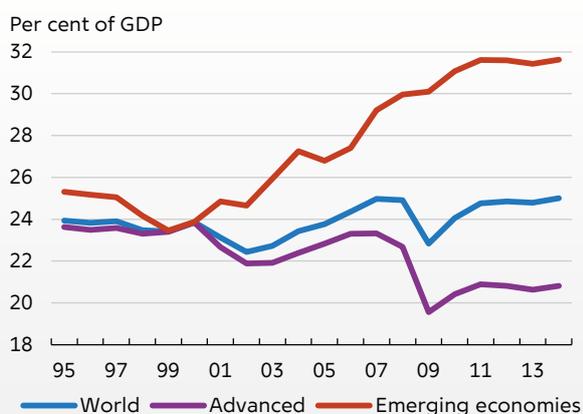
rising in the emerging market economies, driven, in particular, by strong growth in China. There may be several reasons for this development. A possible explanation is that, through FDI, firms in the advanced economies have relocated a share of their production to emerging market economies. Hence, outward FDI will tend to crowd out domestic real capital investment.

However, there are also other possible explanations for the decline in the investment ratio among the advanced economies, including technological advances that enable more effective utilisation of the existing capital stock, falling prices of certain types of investment, e.g. IT investment, and a larger services sector that reduces the capital intensity of the overall economy.<sup>7</sup> Moreover, a substantial portion of the decrease is due to less residential investment, which is not affected by FDI.

Outward FDI may also be due to the expansion of a firm, which could have derived effects in the form of increased activity – also in the home country. Thus, there is no clear theoretical link between outward FDI and domestic real capital investment. Rather, this is an empirical issue.

Investment ratios

Chart 8



Note: Total gross investment as per cent of GDP calculated in market currency.

Source: IMF, World Economic Outlook Database, October 2015.

7 See e.g. Kramp and Pedersen (2015) for a review of investment drivers.

In Denmark, we do not see the decreasing trend in the investment ratio. The private sector's investment ratio excluding housing was in the range of 20-22 per cent of gross value added, GVA, in the years preceding the onset of the financial crisis, cf. Chart 9. In the years after the financial crisis, the ratio plunged to about 17 per cent of GVA. The decline was not offset by larger outward FDI. On the contrary, the investment ratio and outward FDI have, to some extent, moved in sync.

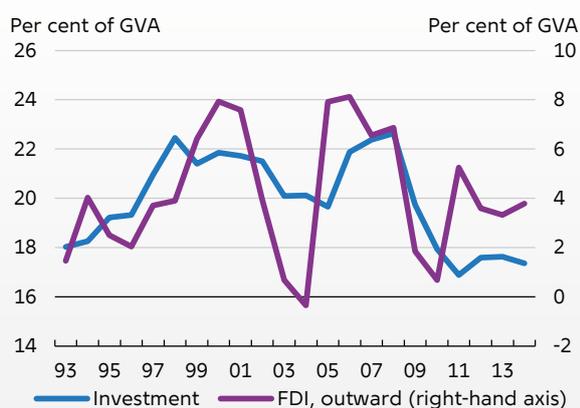
Thus, firms have increased their level of real capital investment, while at the same time expanding their outward FDI. This indicates that, over the last 20 years, Danish outward FDI has not been replacing or crowding out Danish firms' domestic real capital investment. This is supported by a large Danish trade surplus, indicating that production has not been relocated from Denmark. If anything, the international expansion of Danish firms will boost domestic real capital investment. We see no cross-country relationship between outward FDI and domestic real capital investment, cf. Box 3.

#### DANISH FDI AT INDUSTRY AND FIRM LEVEL

To assess whether a relationship exists between Danish outward FDI and domestic real capital investment, we examine the investment and outward FDI of Danish industries and firms.

**Danish outward FDI and investment ratio, excluding housing**

Chart 9



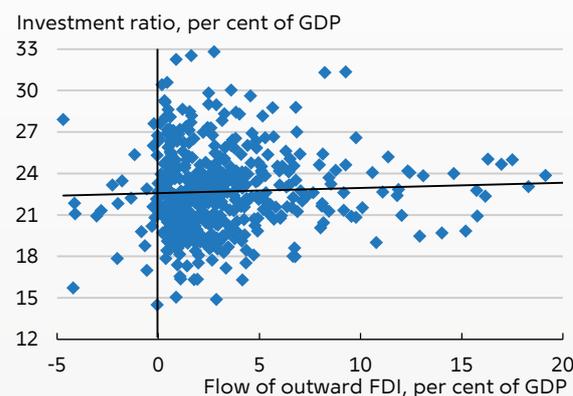
Note: Excluding the industries public administration, training and education, healthcare and raw material extraction. The investment ratio is excluding residential investment relative to gross value added, GVA.  
Source: Statistics Denmark and Danmarks Nationalbank.

#### Real capital investment and outward FDI

Box 3

This box examines the relationship between investment ratios and outward FDI across 22 OECD countries over the period 1990-2014. A simple cross plot of investment ratios and outward FDI indicates that no statistically significant relationship exists between the two, cf. the chart below.

#### Outward FDI and investment ratios, 22 advanced economies, 1990-2014



Note: Simple cross plot of investment ratios and outward FDI.  
Source: IMF, OECD, UNCTADSTAT and own calculations.

To examine the relationship statistically, a panel model is constructed in which the investment ratio is explained by outward FDI and a number of control variables:

$$Invk_t^i = \alpha FDI\_ou_t^i + \xi X_t^i + \varepsilon_t^i,$$

where  $Invk_t^i$  and  $FDI\_ou_t^i$  are the investment ratio and outward FDI, respectively, as per cent of GDP in country  $i$  at time  $t$ , and  $\xi X_t^i$  is a vector of the control variables inward FDI, output gap and nominal interest rate. If outward FDI crowds out domestic real capital investment,  $\alpha < 0$ . The model is estimated both as Ordinary Least Squares, OLS, with cross-section and time dummies, with lagged values of the investment ratio (Arellano-Bond) and as differences. The estimations show that  $\alpha$  is not significantly different from zero, regardless of the choice of model. Thus, outward FDI does not crowd out domestic real capital investment in the short term.

If relocation of capital takes place slowly over a number of years, it will not be captured by the estimated relationship. Thus, based on this analysis, it cannot be ruled out that outward FDI may help to explain a long-term trend of a decline in investment ratios in advanced economies.

Not all Danish industries engage in outward FDI. Thus, in 2014, 7 out of 19 industries accounted for 93 per cent of Danish FDI abroad. The same industries accounted for about half of the Danish gross investment (excluding housing) made in Denmark.

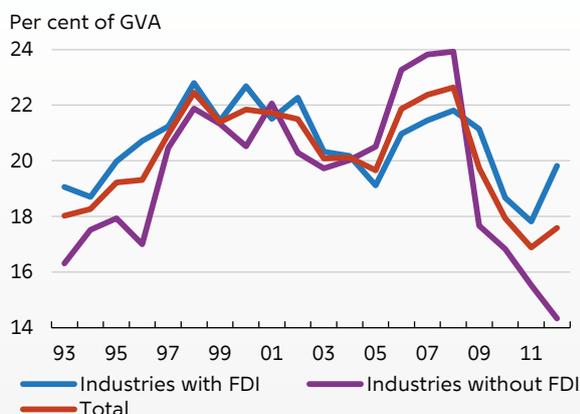
Industries with FDI largely have the same investment ratio as industries that do not engage in FDI, cf. Chart 10. Viewed over a business cycle, the pattern of the two industry groups is also approximately the same. This suggests that firms' decisions about investing in Danish real capital are not influenced by outward FDI decisions.

For quite some time, the development of the two groups has been largely the same. There has been no tendency for industries with outward FDI either to reduce or increase their real capital investment relative to other industries. This indicates that, in the longer term, Danish outward FDI neither crowds out nor stimulates domestic real capital investment.

Moreover, it appears that the current low level of investment is due mostly to low investment in industries without outward FDI, as they are very domestically oriented. This illustrates that investment in Denmark is hampered, in particular, by weak domestic demand.

At firm level, there are also no indications that firms with outward FDI differ from other firms in terms of real capital investment, cf. Box 4. Overall, FDI thus seems neither to crowd out nor stimulate real capital investment in Denmark.

**Real capital investment ratios for industries with and without FDI** Chart 10



Note: Investment ratios are calculated as the industries' real capital investment excluding residential investment relative to the industries' gross value added, GVA. Industries with FDI are industry, energy supply, trade, transport, finance and insurance as well as knowledge services. Industries without FDI are agriculture, forestry, fisheries, water supply and refuse collection, building and construction, hotels and restaurants, information and communication, property trading and rental, travel agencies, cleaning and other operational services, culture and recreation and other services and private households. Public administration, training and education and healthcare, along with raw material extraction, have been excluded from the calculations.

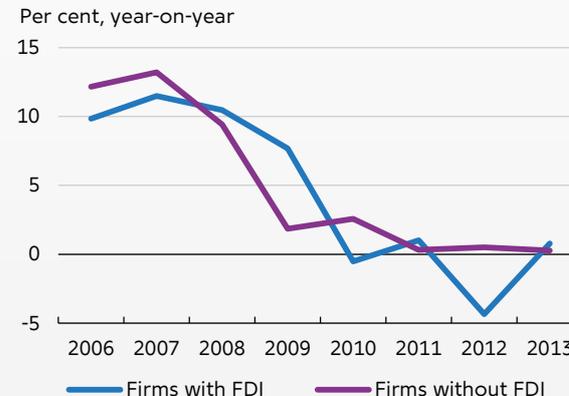
Source: Statistics Denmark, Danmarks Nationalbank and own calculations.

**Investment by Danish firms, analysis of firm data**

Box 4

The box compares the development in fixed assets (both intangible and tangible) for firms with and without outward FDI stocks. The development in fixed assets is a proxy for real capital investment. In the period 2006-13, the annual growth rate of the two groups' stocks of fixed assets is largely identical, cf. the chart below. Thus, there are no indications that the investment behaviour of firms with outward FDI is different from that of other firms.

**Annual growth in firms' stocks of intangible and tangible fixed assets**



Note: Annual growth as per cent.

Source: Experian, Danmarks Nationalbank and own calculations.

Data is constructed from own data on firms' inward and outward FDI, combined with data from Experian on firms' annual financial data. Firms with FDI are selected based on the criterion that, for at least one of the years 2005-13, the firm had a positive gross outward FDI stock, either in the form of equity or intercompany loans. The selection of both types of firms is held constant during the period in order to avoid annual shifts in investment resulting from changes in the number of firms. The two selections are 72,911 and 523 firms, respectively, without and with FDI. The original data set included 112,893 firms in 2005 and 165,720 firms in 2013.

## FDI: BENEFITS AND CHALLENGES

As already described, FDI is an element of globalisation and enables firms to expand more than if they operate solely within the borders of a single country. This means, inter alia, that they can benefit from economies of scale. By producing and selling abroad, they are also able to access new knowledge and technology. These factors indicate that multinational corporations can be more productive than local firms. Based on a number of studies, the Danish Productivity Commission, among others, assesses (2013) that Danish firms with foreign subsidiaries and foreign-owned firms in Denmark are more productive than other Danish firms.

The public debate tends to focus more on whether outward FDI leads to job losses in Denmark. As discussed above, there are no indications that Danish outward FDI has crowded out domestic real capital investment. Hence, Danish outward FDI should not lead to Danish job losses, see also Andersen et al. (2013). This is consistent with the findings of other studies. Based on a literature review, Copenhagen Economics, among others, concludes (2010) that outward FDI has not markedly affected employment in the EU.

Although FDI does not affect overall employment, it may influence employment and wages in some industries. However, cross-industry and cross-education effects are difficult to separate from general technological advances, as automation may be the alternative to relocating production abroad, cf. Danish Economic Councils (2004). However, labour market flexibility and adaptability, along with ongoing skills upgrading, are required in both cases. Given Denmark's flexible labour market, high level of education and focus on continuing education and supplementary training, relative to many other countries Denmark is well poised to enjoy the benefits of FDI, while at the same time averting possible negative effects of FDI.

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# GLOBAL VALUE CHAINS

Peter Beck Nellemann and Karoline Garm Nissen,  
Economics

## INTRODUCTION AND SUMMARY

A final product is created through a chain of activities such as design, production, marketing and distribution, each of which adds value to the product. These activities can be performed by a single firm or multiple firms. When activities are distributed among multiple firms, value chains are created. The distribution of production means that firms purchase intermediate inputs from other firms to be used in the production of new products. The difference between the value of the products produced by the firm and the costs of intermediate inputs used in the production is defined as the value added of the firm.

Using value chain analysis, Danish value added can be tracked from the production of intermediate inputs to their final use. This provides a more accurate picture of how the level of Danish production and employment depends on foreign demand than that provided by traditional trade analyses.

The rapid development of global value chains has been a key driver of world trade. World trade grew in the run-up to the financial and economic crisis, driven primarily by growth of trade in intermediate inputs, reflecting, among other factors, the development of global value chains. The subsequent weak growth in world trade was also driven by the development of intermediate input trade, indicating that the expansion of global value chains was slower.

Germany is Denmark's largest trade partner. However, in terms of final use of Danish value added, Germany and Sweden are less important

trade partners than indicated by traditional trade analyses, while the USA and China are more important.

Nearly 800,000 Danish jobs are linked to exports. These jobs are split about equally between jobs with exporters and jobs with the subcontractors of exporters. Changes in Danish exports must be expected to affect not just exporters, but also their subcontractors. Thus, changes in exports may affect employment in domestically-oriented industries as these may be subcontractors of exporters. Some of the analyses of global value chains are described in more detail in Andersen et al. (2015).

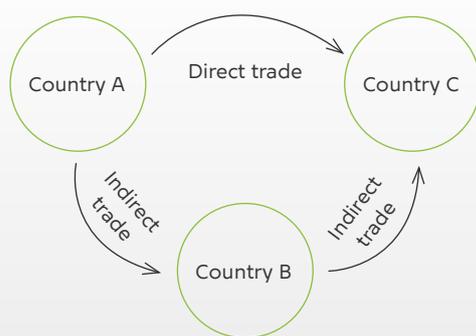
## DIRECT AND INDIRECT EXPORTS

Global value chains mean that value added may be exported from one country to another, both directly and indirectly. Indirect trade is when country A exports intermediate inputs to country B where the inputs are used in the production of products exported to country C, cf. Chart 1. Hence, country B re-exports value added from country A, entailing that country A indirectly exports to country C.

Pig feed that is exported from Ukraine to Denmark to be used for raising pigs is one example of a global value chain. Subsequently, the pigs are exported to Germany for slaughter and their meat is then exported to the UK. Here, the pigs are consumed in final use. This example illustrates that

## Direct and indirect bilateral trading

Chart 1



although Danish pig production is initially exported to Germany, it is ultimately linked to final use in the UK due to indirect trade.

If the value of the pig feed is 100 and the value of the pigs is 200, the Danish value added is  $200 - 100 = 100$ , cf. Table 1. In other words, the value of Danish gross exports is 200, while the value of exports of Danish value added is only 100, i.e. 50 per cent of gross exports. If the value of the German slaughterhouse production is 300, German value added accounts for only 33 per cent of exports.

The analysis of global value chains in this article is based on data from the World Input-Output Database, WIOD, described in more detail in Box 1.

## Data and assumptions

Box 1

The World Input-Output Database<sup>1</sup>, WIOD, contains annual trade data for 35 industries in 40 countries<sup>2</sup>. Moreover, the Rest of the World proxies for all other countries in the world have been aggregated into a single economy, also with 35 industries. The value of trade comprises trade in both goods and services, measured in current prices. The database is constructed from national supply-use tables (SUTs), national accounts figures and international trade statistics, described in Timmer (2012). Although the database is based on national sources, the data in the database is not identical to data from e.g. Statistics Denmark. If the world's total exports and imports are compiled from national sources, the value of exports exceeds the total value of imports due to statistical discrepancies. Adjustments are made in WIOD to produce a perfect match between imports and exports.

A significant difference between the international input-output table, WIOD, and national input-output tables is that all imported inputs are distributed according to the industry in the country from which they are imported, while all exports are distributed according to the destination country. Thus, it is possible to track the country to which the products are exported and whether they are exported for final or intermediate use. If the products are exported for intermediate use, it is also possible to track the industry to which they are exported. This makes it possible to track Danish value added through global value chains.

However, it is necessary to make the following assumptions. The value added created by an industry is defined as the value of production less the value of intermediate inputs. The products from the industries are sold either as intermediate inputs to other industries or to the industry itself or for final use. Final use includes private and government consumption and investment. As investment is treated for data purposes as final use, it is not included as input in value

chains. If a firm supplies an investment object, for instance a plant, to another firm, this transaction is not considered in WIOD as a supply of input for a firm, but as final use.

Each industry is assumed to produce a unique product. This implies that all products from a given industry are produced using the same variety of intermediate inputs and containing the same share of value added created by the industry. The products contain the same share of value added regardless of whether they are sold as intermediate inputs or for final use and whether they are exported or sold domestically. It is also assumed that the products from each industry are produced using the same intermediate inputs, regardless of how they are sold.

If, for instance, the value of Danish agricultural production follows the example of Table 1 and is made up of an average of 50 per cent of intermediate inputs from Ukraine and 50 per cent of Danish value added, the value of all Danish agricultural production is assumed to be composed in this manner. Thus, Danish value added is assumed to account for 50 per cent of the value of agricultural production, regardless of whether it is sold as intermediate inputs to e.g. the Danish food industry or to Danish hotels and restaurants. Agricultural products also account for 50 per cent of Danish value added, regardless of whether the products are sold to the German, Japanese or Chinese food industry, and the products account for the same share of value added regardless of whether they are sold for final use in Denmark, Germany, Japan or China.

In the analyses of how employment is linked to exports, it is assumed that the labour productivity in each sector is the same, regardless of how its products are sold. In a given sector, the same labour input is required to create a product, regardless of whether it is sold as an intermediate product or for final use and whether it is exported or sold domestically.

1. [www.wiod.org](http://www.wiod.org).

2. Australia, Belgium, Brazil, Bulgaria, Canada, Cyprus, Denmark, Estonia, Finland, France, Greece, Netherlands, India, Indonesia, Ireland, Italy, Japan, China, Latvia, Lithuania, Luxembourg, Malta, Mexico, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, UK, Sweden, South Korea, Taiwan, Czech Republic, Turkey, Germany, Hungary, USA and Austria.

## Example of a global value chain

Table 1

	Value of intermediate inputs	Value of production (Gross exports)	Value added (Exports of national value added)	Final use
Ukraine	0	100	100	0
Denmark	100	200	100	0
Germany	200	300	100	0
UK				300

Note: The example illustrates a value chain in which Ukrainian pig feed at a value of 100 is imported to Denmark and used for raising pigs at a value of 200. The pigs are exported to Germany for slaughter, and the slaughterhouse products at a value of 300 are exported to the UK for final consumption.

## DEVELOPMENT OF GLOBAL VALUE CHAINS AND WORLD TRADE

From 1995 to 2008, the value of world trade, i.e. the value of products traded across national borders, surged. The increase was greater than the growth in total global value added, causing the value of world trade relative to total global value added to increase, cf. Chart 2 (left).

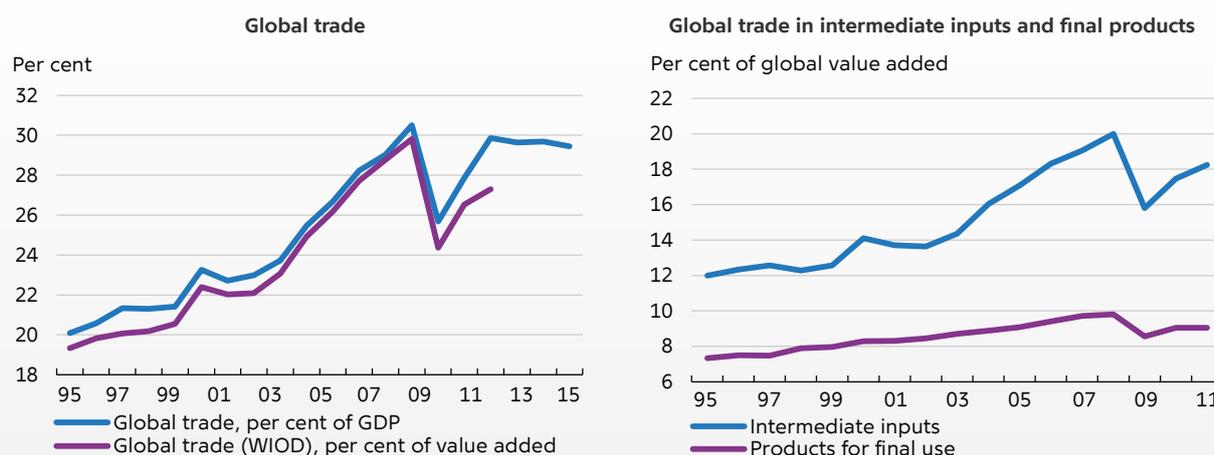
Growth in world trade was driven by trade in intermediate inputs, cf. Chart 2 (right). This indi-

cates that the development of global value chains has been a key driver of world trade. Increased trade in intermediate inputs reflects that firms specialise, for instance in producing a specific component of a value chain.

An example could be a farmer who initially produces pig feed and raises pigs, but then specialises in raising pigs while buying pig feed. As a result of this specialisation, the value chain is divided between two firms: one that produces pig feed and one that raises pigs, leading to

## Global trade

Chart 2



Note: Left-hand chart: In the blue series, the value of global trade as a percentage of GDP is defined as the value of global imports as a percentage of global GDP in current prices. Data for 2015 are forecasts. In the purple series, the value of global trade as a percentage of global value added is defined as the trade value among the 40 countries in WIOD and the economy defined as the Rest of the World, divided by total global value added. Trade within the 'Rest of the World' economy is not included in global trade. Trade comprises trade in intermediate inputs and final products. Due to global value chains, the same value added can be traded across borders several times and thus be included in the numerator several times. Right-hand chart: Intermediate inputs are products sold by one firm to another. Final products are products for final use, i.e. private and government consumption and investment.

Source: Macrobond, WIOD and own calculations.

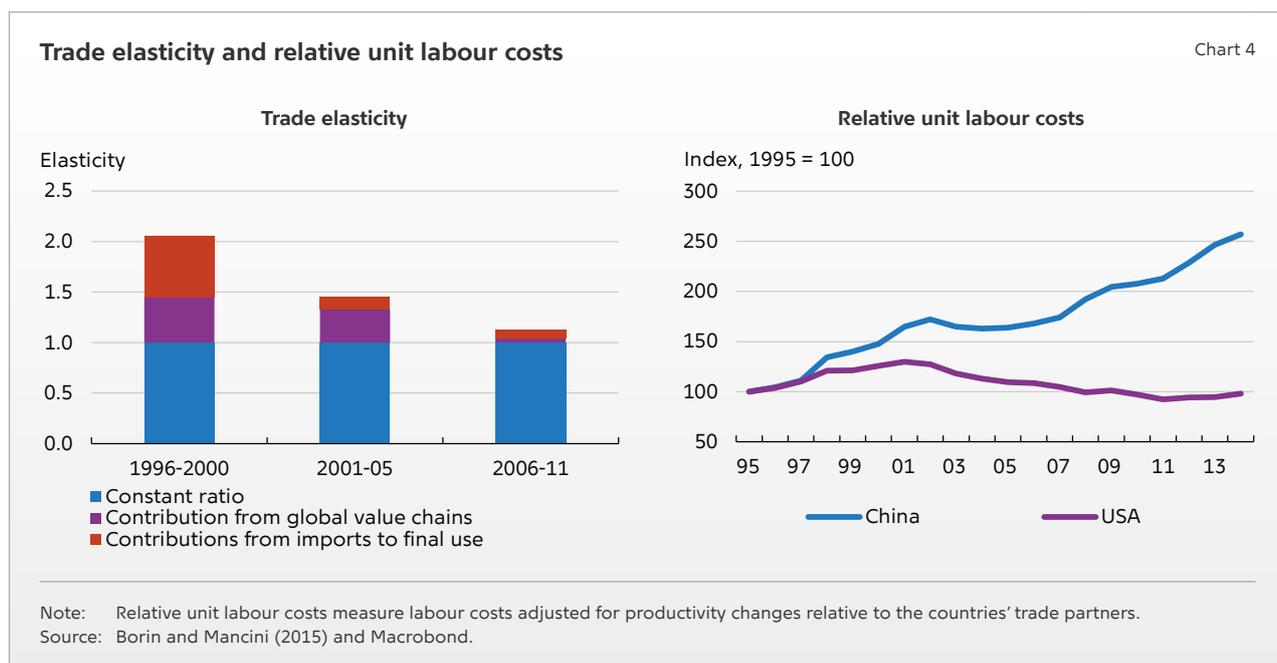
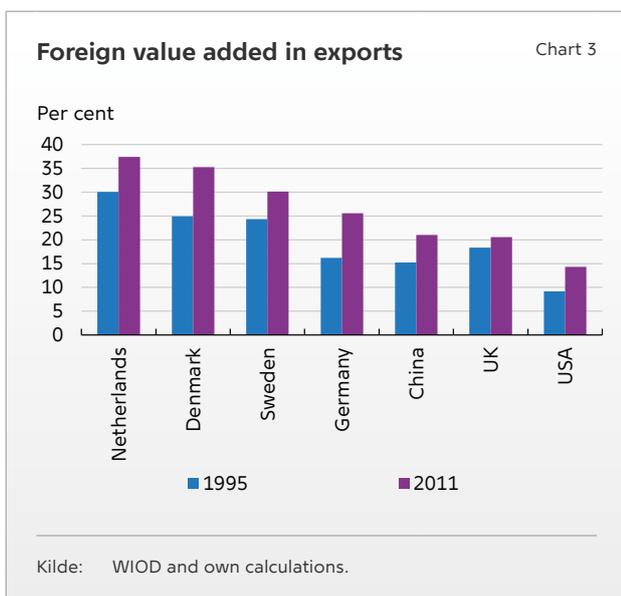
trade in intermediate input (feed) between the two firms.

The development of global value chains is reflected in the use of more foreign intermediate inputs in the production of most industries in most countries. In Denmark, the increased use of imported intermediate inputs means that the share of foreign value added in Danish exports rose by about 10 percentage points from 1995 to 2011, cf. Chart 3. The share of foreign value added in the exports of other countries has also increased. The share of foreign value added clearly tends to be higher in small open economies. One

explanation could be that the domestic market for intermediate inputs is smaller in small economies, providing a greater incentive to purchase foreign intermediate inputs.

In 2009, world trade was negatively affected by the global economic and financial crisis, and the value of world trade relative to total global value added declined. The fall was driven primarily by the reduction in trade in intermediate inputs, while the decrease in trade in final products was more moderate. The reasons could be a slow-down in the pace of expansion of global value chains, insourcing of processes and a reduction in the value of intermediate input inventories.

The weak growth in world trade relative to value added, cf. Chart 2 (left) could be attributable to a new relationship between global output growth and world trade. Borin and Mancini (2015) find that the ratio of global trade growth to global GDP growth – the elasticity between the two components – decreased from just over 2 during the period from 1996 to 2000 to just over 1 in the period from 2006 to 2011, cf. Chart 4 (left). They decompose elasticity into three subcomponents: a contribution of 1, reflecting a constant ratio of imports to GDP (constant unitary value), a contribution from the development of global value chains and a contribution from imports to final use. The decomposition shows that global value chains contributed just under 0.5 to total trade elasticity until 2005 after which time this contribu-



tion largely disappeared. The subsequent weak growth in world trade may thus be explained, among other factors, by weak growth in global value chains.

Constantinescu et al. (2015) also find that the weak growth in world trade in the 2000s is attributable, inter alia, to the slowdown in the pace of expansion of global value chains, especially between the USA and China. A possible explanation for this slowdown could be that Chinese wage costs have increased considerably, cf. Chart 4 (right), reducing the incentive to relocate production to China.

## SIGNIFICANCE OF DANISH TRADE PARTNERS

The amount of Danish value added that is finally used in a country depends on three factors: 1 the value of gross exports to the country; 2 the share of gross exports accounted for by Danish value added; and 3 indirect trade in Danish value added. Indirect trade in Danish value added is made up of re-exports of Danish value added and indirect imports of Danish value added.

The first column in Table 2 shows the significance of Danish trade partners for Danish gross

exports, i.e. the traditional calculation of Danish exports based on WIOD data. The second column shows where exported Danish value added is finally used. For instance, the column shows that the final use of Danish value added in Germany accounted for 9.3 per cent of the total final use of Danish value added abroad. Thus, the difference between the two columns is that allowance is made for both the share of Danish value added in exports to various trade partners and indirect trade in Danish value added.

It is shown that the USA and China are of greater significance to Danish exports if significance is measured in terms of final use of Danish value added. In case of a rise in final use in the USA and China, demand for Danish value added must be expected to increase more than warranted by direct gross exports to these countries. Although the opposite is true for Sweden and Germany, Germany remains Denmark's largest export market – also measured by final use of Danish value added.

Regardless of how Danish exports are calculated, the Danish export market must be described as diversified. In other words, Danish exports are not dependent on any one country, which is positive in terms of macroeconomic stability.

Traditionally, export shares, as shown in the first column of Table 2, are used in trade-weight-

**Significance of Danish trade partners, 2011**

Table 2

	Danish gross exports, per cent of total Danish gross exports	Final use of Danish value added, per cent of foreign final use of Danish value added
Germany	9.8	9.3
USA	5.7	8.9
UK	7.6	8.1
Sweden	9.7	6.6
China	3.8	5.3
France	2.6	3.6
Netherlands	2.7	2.5
Italy	1.9	2.5
Japan	1.4	2.2
Spain	1.8	2.2

Note: Final use includes private and government consumption and investment.  
Source: WIOD and own calculations.

ing of economic variables such as export market growth. The trade weights show the initial destination of Danish exports, but allow for neither differences in the share of Danish value added contained in exports to various countries nor for indirect trade. In order to weight trade partners relative to the final use of Danish value added in the country, the weights in the second column must be used. The trade weighting to be chosen will depend on the specific analysis. To analyse the significance to Danish exports of an increase in final use abroad, the weights in the second column are most relevant, while the weights in the first column are relevant e.g. for analysis of the significance to Danish exports of unit labour cost developments relative to developments abroad.

## SIGNIFICANCE OF EXPORTS TO DANISH EMPLOYMENT

National value chains arise when Danish firms use other Danish firms as subcontractors. With national value chains, Danish employment is linked to exports from both exporters and their subcontractors. Jobs with exporters are defined

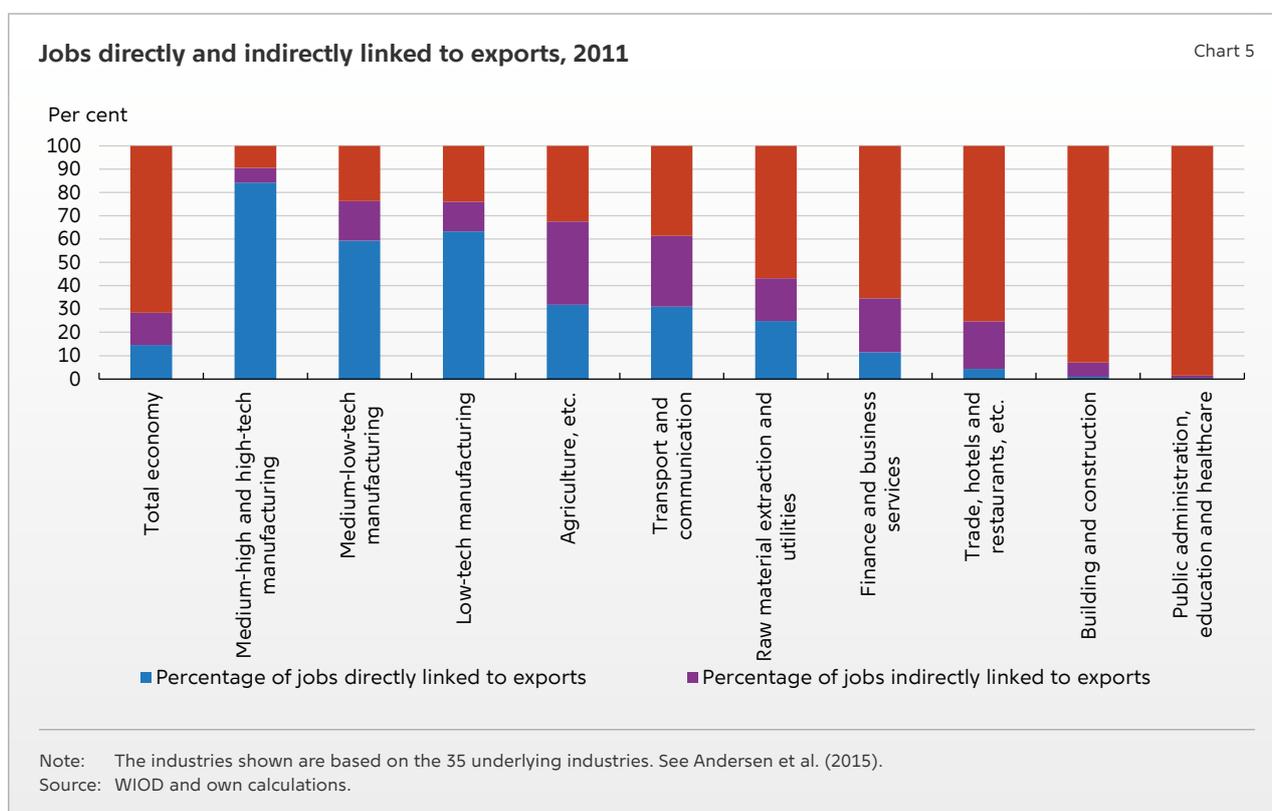
as directly linked to exports, while jobs with subcontractors of exporters are defined as indirectly linked to exports.

Jobs that are indirectly linked to exports may comprise many industries, for instance an accountant auditing the accounts of an exporter or a tractor mechanic repairing the tractor of an exporter.

Just over 28 per cent of total Danish employment – equivalent to nearly 800,000 jobs – was linked to exports in 2011. These jobs were almost equally distributed between jobs directly and indirectly linked to exports, cf. Chart 5.

In the manufacturing industries, especially in medium-high and high-tech manufacturing, a very large share of employment is directly linked to exports. According to the calculations, few jobs in construction are linked to exports. The explanation is that jobs in construction that are linked to investments in export firms, for instance the construction of a plant, are not included because firms' investments are classified as final use for data purposes.

In domestically-oriented industries such as finance and business services as well as trade, hotels and restaurants, etc., only a very small share of employment is directly linked to exports.



However, about 20 per cent of employment is indirectly linked to exports because firms in these sectors are subcontractors of exporters.

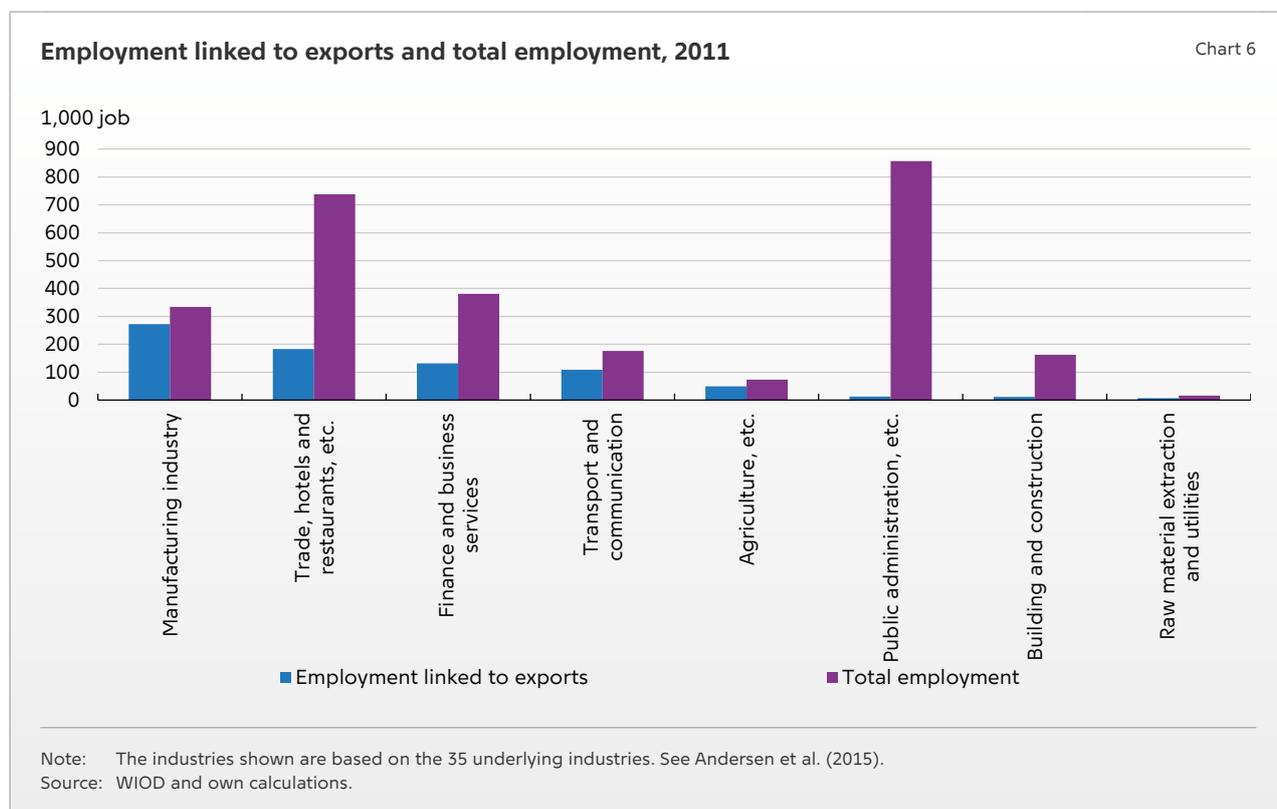
In 2011, the sectors finance and business services as well as trade, hotels and restaurants, etc., had a total of 1.1 million jobs, equivalent to around 40 per cent of all jobs in Denmark. More than 300,000 of these jobs were directly or indirectly linked to exports, cf. Chart 6. This is more than the entire manufacturing industry and equivalent to just over 40 per cent of all jobs linked to exports. This demonstrates that export fluctuations may be expected to affect production and employment in both exporting firms and their subcontractors. Thus, domestically-oriented industries will also be impacted by fluctuations in exports through demand from exporters. Domestically-oriented industries may also be affected by export fluctuations through other channels. As a case in point, changes in exports may influence private consumption and, by extension, production in domestically-oriented industries.

A distinction between the significance of exports to the country and the significance of final use in the country must be made when determining the significance of Danish trade partners to Danish employment. In the example in Table 1 in

which a Danish farmer exports pigs to Germany for final consumption in the UK, the farmer's job is linked to exports to Germany but final use in the UK.

In 2011, about 95,000 Danish jobs were linked to exports to Germany, but only approximately 80,000 jobs were linked to final use in Germany, cf. Table 3. The divergence is due to indirect trade in Danish value added, i.e. re-exports of Danish value added from Germany and indirect imports of Danish value added to Germany.

Around 70,000 Danish jobs were linked to final use in the USA, while the corresponding figure for Sweden, the UK and China was about 50,000. The significance for Danish employment of final use in China has been rapidly increasing. Over the period from 1995 to 2011, the number of Danish jobs linked to final use in China by and large quintupled, while the number of jobs linked to final use in Germany declined by almost one third.



**Danish employment linked to exports, 2011**

Table 3

1,000 jobs	Danish jobs linked to exports	Danish jobs linked to final use
Germany	95	82
USA	54	69
Sweden	73	53
UK	54	53
China	40	47
France	23	27
Italy	18	22
Netherlands	29	21
Japan	14	19
Others	380	384
Total	780	776

Note: Final use includes private and government consumption and investment. The difference between the total number of jobs depending on exports and final foreign use, respectively, is due to reimports of Danish exports, i.e. Danish value added exported for later reimports to Denmark. The economy modelled as the 'Rest of the World' is included in the category 'Other' and is of relatively large significance to Danish employment. The reason could be the way in which WIOD ensures a match between global imports and global exports, cf. Box 1.

Source: WIOD and own calculations.

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# TRENDS IN CLEARING OF EQUITY TRANSACTIONS BY A CENTRAL COUNTERPARTY

Gustav Kaas Jacobsen, Financial Stability

## INTRODUCTION AND SUMMARY

Central counterparties, CCPs, have attracted considerable attention in the aftermath of the financial crisis. One explanation is that CCPs contribute to reducing risk between market participants and to ensuring enhanced market transparency. Thus, a CCP positions itself between the parties to a securities transaction, assuming the risk for both the buyer and the seller from the transaction date until the transaction is finally executed. If either of the parties to the transaction defaults within this period, the CCP thus still has an obligation to the other party. However, this entails that risk is concentrated in the CCP, and therefore the CCP is subject to a number of regulatory requirements to ensure the completion of the transaction.

CCPs have been established in the equity markets of most European countries. In recent years, there has also been a tendency for several CCPs to be active in the same marketplace. While this promotes increased competition, it also creates interdependencies across European markets. This development has also extended to the Nordic equity markets in which free choice of CCPs is being introduced.

Danmarks Nationalbank regards increased competition among CCPs as positive. European legislation ensures that CCPs in the equity markets are subject to risk management requirements to reduce the risks resulting from increased market interconnectedness. It is important to regularly assess whether CCPs comply with the regulatory requirements so as to effectively reduce the risk of contagion.

## CLEARING OF EQUITY TRANSACTIONS BY A CENTRAL COUNTERPARTY

Equity transactions can be carried out via trading venues operated by stock exchanges etc. or directly between counterparties, known as over-the-counter (OTC) transactions. In either case, two days typically pass from the transaction date until the transaction is settled, i.e. until the securities involved have been delivered from the seller to the buyer and the payment has been transferred. In normal circumstances, this does not cause any problems. But if, for instance, the seller defaults, the buyer may have to repurchase a security at a higher price. This risk is reduced by CCP clearing. A CCP positions itself between the buyer and the seller in an equity transaction, and in the period from the transaction date until the transaction is settled, the parties will have counterparty risk to the CCP only – not to each other. The process of an equity transaction, i.e. from the transaction is concluded until it is cleared and settled, is described in detail in Box 1.

Due to their central position in the financial infrastructure, CCPs are often regarded as systemically important. If a CCP is unable to complete the normal clearing of transactions, the participants' market access could be cut off for a period of time. Moreover, a CCP's default could cause contagion to the participants and onwards to the rest of the market. Therefore, CCPs are subject to a number of requirements to ensure the settlement of transactions.

## Conclusion, clearing and settlement of equity transactions

Box 1

To **conclude** an equity transaction on a trading venue, a buyer for instance places an order on the venue, and a search for a seller is initiated. Once a match has been created, confirmation is sent to the buyer and the seller. If the transaction is subject to CCP clearing, the transaction is reported to the CCP the moment it is confirmed. In an OTC transaction concluded directly between the buyer and the seller, the parties report the transaction information through their systems, including whether the transaction will be CCP cleared.

**Clearing** is the calculation of claims and obligations pertaining to an agreed exchange of financial instruments, in the case of an equity transaction the exchange of equities for cash. A CCP clears equity transactions by acting as the counterparty to both sides of the transaction through a legal process known as novation. A characteristic of CCP clearing is that the participants' exposures are reduced through netting, cf. Chart 1. Netting takes place on an ongoing basis after the reporting of the transactions to the CCP and thus reduces the exposures between the CCP and its participants during the period until settlement.

**Settlement** is the time of exchange of securities for cash in a securities settlement system. Settlement is typically performed in net settlement cycles in which all claims and obligations are converted into a net claim or a net obligation for each participant, whereby the need for settlement liquidity is reduced. Viewed in isolation, this will not have any impact on CCP cleared transactions, since these transactions have already been netted by the CCP.

The period from a transaction has been concluded until it is finally settled is referred to as the **settlement period**. In 2014, the EU securities markets adopted a standardised two-day settlement period. This entails that a securities transaction must be settled on the second banking day after the transaction date. The background to this change is new European regulation that aims to harmonise the market, thereby strengthening cross-border trading in securities and enhancing competition between European central securities depositories (CSDs).<sup>1</sup>

1. Cf. Regulation (EU) No 909/2014 of the European Parliament and of the Council of 23 July 2014 on improving securities settlement in the European Union and on central securities depositories and amending Directives 98/26/EC and 2014/65/EU and Regulation (EU) No 236/2012.

In the EU, CCPs are regulated by the EMIR regulation<sup>1</sup>. Under EMIR, a CCP must be authorised to operate. To obtain such authorisation, which is granted by national competent authorities, the CCP must comply with a number of requirements for instance in relation to governance structures, collateral, financial resources, risk management, etc. Ongoing supervision to ensure that CCPs comply with the regulatory requirements is conducted by supervisory colleges, comprising representatives from both supervisory authorities and central banks. As CCPs tend to operate across borders, the supervisory colleges often have representatives from various countries.<sup>2</sup>

One benefit of CCPs is that the participants' mutual exposures are reduced through netting. As a CCP applies bilateral netting between the CCP and its clearing participants, each partici-

part's position will be reduced because only one amount or one volume of securities will be provided or received under a given ISIN code.<sup>3</sup> The result of bilateral netting between the CCP and its participants is that the various parties' transactions are in fact netted multilaterally, cf. Chart 1. To the market as a whole, multilateral netting also means that the overall exposure – and thus risk – is reduced.

Since the autumn of 2009, transactions in Danish Large Caps on Nasdaq have been subject to mandatory CCP clearing, and in February 2015 Mid Caps were also included in this clearing.<sup>4</sup> The Dutch CCP EuroCCP has been responsible for the clearing of equity transactions since 2009.<sup>5</sup> In practice, all Large and Mid Cap equity transactions concluded on Nasdaq are immediately reported to EuroCCP, which subsequently acts as

1 Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories.

2 For instance, Danmarks Nationalbank and the Danish Financial Supervisory Authority participate in a supervisory college for the Dutch CCP EuroCCP. This college is governed by the Dutch central bank. Danmarks Nationalbank participates as an observer, while the Danish Financial Supervisory Authority is a member.

3 International Securities Identification Number, ISIN, is an ISO standard for unique identification of securities.

4 Nasdaq is the primary securities exchange for Danish equities. Equities are divided into overall categories, such as Large Caps, currently comprising the 33 most frequently traded Danish equities, and Mid Caps, comprising the 29 next most frequently traded Danish equities.

5 The Dutch CCP European Multilateral Clearing Facility, EMCF, began clearing on Nasdaq in 2009. In January 2014, EMCF merged with UK EuroCCP Ltd. under the name of EuroCCP.

## The netting effect

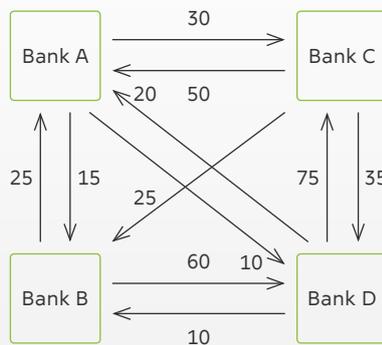
Chart 1

1) Gross positions between banks

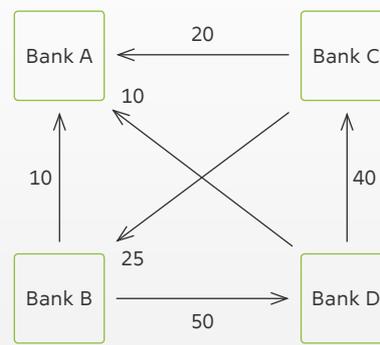
2) Bilateral netting between banks

3) Multilateral netting between banks and CCP

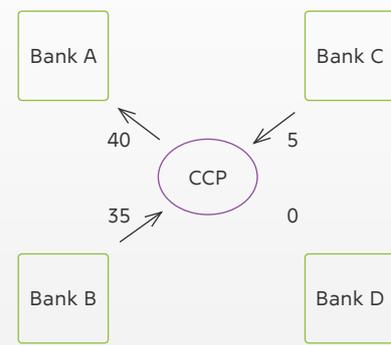
Total exposure: 355



Total exposure: 155



Total exposure: 80



Note: 1) shows the gross positions between the banks;  
 2) here all gross positions are netted bilaterally, leaving just one mutual position between each of the banks;  
 3) here CCP clearing has been introduced, entailing that the CCP positions itself between the buyer and the seller for all positions. With bilateral netting, positions are reduced to the effect that each bank has only one overall position against the CCP. Thus, positions are netted multilaterally.

Source: The chart is inspired by Figure 5 in De Nederlandsche Bank, *All the ins and outs of CCPs*, October 2013, but using own figures and calculations.

the counterparty to the transactions. This entails that EuroCCP acts as the counterparty to both the buyer and the seller immediately after a transaction has been concluded and until it is settled.<sup>6</sup> If one of the parties fails to deliver, EuroCCP still has an obligation to the other party.

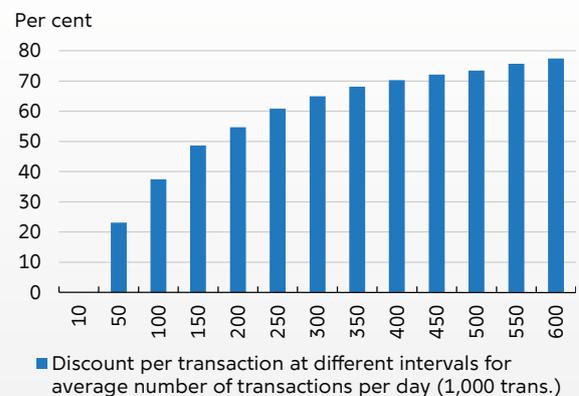
CCPs usually offer considerable quantity discounts to participants clearing a large number of daily transactions, cf. Chart 2. As a result, large banks and investment banks are often the only direct CCP participants. Other market participants enter into agreements with direct participants to carry out the clearing of transactions on their behalf. EuroCCP has eight Danish participants, two of which are General Clearing Participants and thus authorised to clear transactions on behalf of indirect participants. In 2015, Danish Large and Mid Caps worth an average of kr. 5.3 billion were cleared daily, cf. Chart 3.

## Risk management

A CCP is subject to a number of requirements under EMIR, the purpose of which is to reduce the risk between the CCP and its participants. A

## Quantity discount per CCP transaction

Chart 2

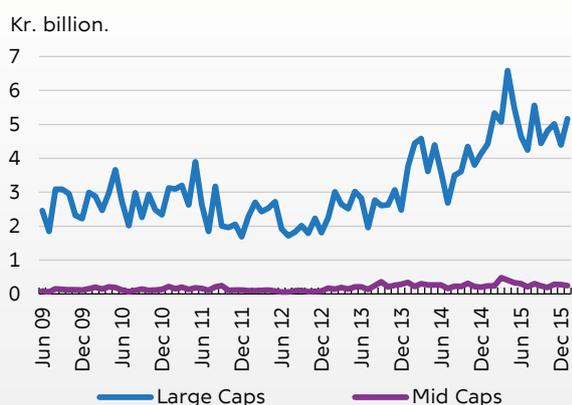


Note: The calculation of the percentage savings per transaction is based on the participant's average number of transactions per day. The discount is calculated as an average of the discount achievable in three of the largest CCPs in European equity markets.

Source: Websites of LCH Clearnet Ltd. ([link](#)), EuroCCP ([link](#)) and SIX x-clear ([link](#)), respectively, and own calculations.

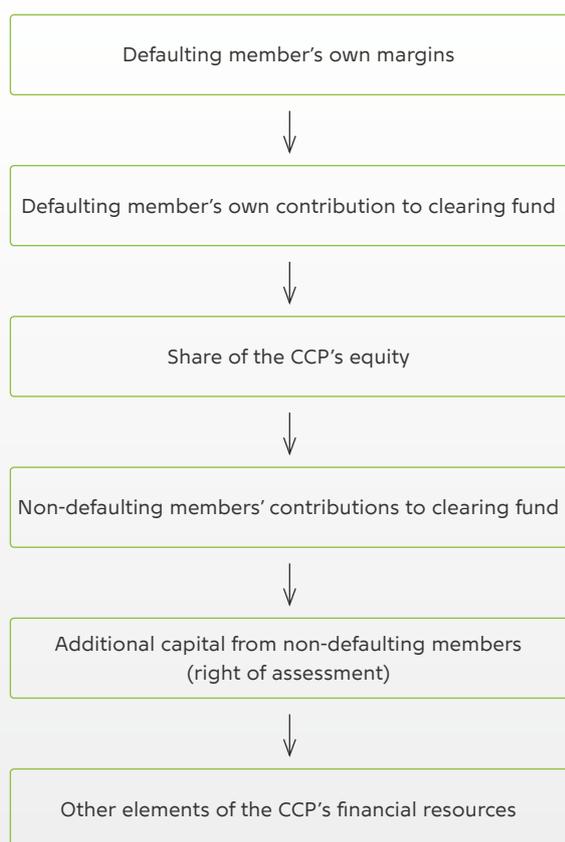
<sup>6</sup> In a legal process known as novation.

**Turnover in Danish Large and Mid Cap equities on Nasdaq, daily average** Chart 3



Source: Monthly Reports - Total equity trading, Nasdaqomx.com ([link](#))

**A CCP's default waterfall** Chart 4



Note: The order of a CCP's default waterfall is defined in Article 45 of EMIR.

CCP thus uses a number of risk management tools designed to protect it from loss. Overall, risk management can be divided into three categories, cf. below.

Firstly, the CCP typically applies a number of overall admission criteria to the clearing participants, including that they are subject to financial supervision and comply with minimum capital and liquidity requirements. It is a regulatory requirement for a CCP's admission criteria to be clear and objective to allow fair and open access for participation in the CCP.

Secondly, the CCP handles its counterparty risks by imposing margin requirements on the participants, who post collateral to the CCP. The margin, primarily cash deposits and highly liquid bonds, is to cover the counterparty risk under normal market conditions<sup>7</sup> and ensure that the CCP is able to maintain uninterrupted operations if a participant defaults. The counterparty risk is determined by the CCP compiling, on an intra-day basis, a total of all unsettled transactions at current market prices, cf. the EMIR requirements. The result shows the potential loss in case of participant default, and against this backdrop the CCP assesses whether the margin posted by the participants is sufficient or whether margin calls are required.

Thirdly, the CCP maintains financial resources to withstand potential losses. These resources comprise equity, deposits in a clearing fund and possibly also guarantees from the participants, loss allocation agreements, insurance schemes, etc. In case of participant default, the financial resources are used in a predetermined order, referred to in legislation as the CCP's default waterfall, cf. Chart 4. This order is as follows:

If a defaulting participant's own collateral/margin does not suffice, the loss will be covered by the defaulting participant's own contribution to the CCP's clearing fund. If this contribution is still not sufficient, a share of the CCP's equity will subsequently be used. Additional losses will be covered by the non-defaulting participants' contributions to the CCP's clearing fund. The CCP's total clearing fund must be sufficient to

<sup>7</sup> This means that margins must be sufficient to cover losses that result from at least 99 per cent of the exposure movements over an appropriate time horizon, cf. Article 41 of EMIR.

cover the default of the largest participant.<sup>8</sup> The CCP may also require the participants to contribute additional capital (right of assessment). If these measures together are not sufficient, the CCP must cover the loss with what remains of its financial resources, including its remaining equity.

## DEVELOPMENT IN THE MARKETS FOR CENTRAL COUNTERPARTIES

In the early 2000s, the practice in most European countries was for securities trading to be conducted on national securities exchanges, often with an affiliated CCP clearing equity transactions in the national markets. This was not the case in Denmark, presumably because the benefits of establishing a CCP did not outweigh the costs. The securities settlement in VP<sup>9</sup> already took place through multilateral payment netting, both on the securities and the payments side, and the counterparty risk was limited due to a relatively modest turnover.<sup>10</sup>

The implementation of the MiFID<sup>11</sup> changed the market for securities trading in Europe. The MiFID enabled securities trading on Multilateral Trading Facilities, MTFs, which was not possible earlier. As a result of the changes, new CCPs were established to carry out clearing on the new trading venues. As CCPs were the standard in most marketplaces, Nasdaq chose to introduce CCP clearing in the Nordic equity markets in 2009.

To strengthen competition, a Code of Conduct was signed by the European industry associations for stock exchanges, central securities depositories and central counterparties in 2006.<sup>12</sup>

In this Code of Conduct, the industry associations agreed to seek to promote *interoperability*, entailing for CCPs that two CCPs may mutually exchange information on transactions, thereby enabling netting across systems. Under MiFIR<sup>13</sup> from 2014, CCPs are required to allow non-discriminatory access to system information to other CCPs. MiFIR enters into force in 2017 and will strengthen the possibilities of CCP interoperability.

The current status is that three CCPs have entered into interoperability agreements in the European equity market.<sup>14</sup> These CCPs clear equity transactions in several of the same European marketplaces, while the clearing in other markets is still carried out by CCPs with a local monopoly, cf. Chart 5.

### Benefits of interoperability

In interoperable clearing, two CCPs enter into an agreement to participate in clearing of the other party's transactions. In practice, they establish a technical link for intersystem communication. That way, each market participant is able to use its preferred CCP, while still benefiting from netting. If, for instance, the purchase and sale of equities is conducted on separate trading venues and cleared by different CCPs, the transactions may be netted if the two CCPs involved have entered into an interoperability agreement, cf. Chart 6. Hence interoperability reduces exposures – and thus risk – between participants across marketplaces.

Another benefit of interoperability is that the participants only need to participate in one CCP. This means that the participant needs only to adapt its system for internal settlement with this

8 A CCP must be able at least to withstand, under extreme but plausible market conditions, the default of the clearing participant to which it has the largest exposures or of the second and third largest clearing participants, if the sum of their exposures is larger, cf. Article 42(3) of EMIR.

9 VP comprises the Danish systems for securities settlement and safe-keeping. The systems are operated by VP Securities A/S.

10 Cf. Torben Nielsen and Peter Restelli-Nielsen, Analysis of the pros and cons of introducing a central counterparty in the Danish securities market, *Danmarks Nationalbank Working Paper*, November 2007.

11 Directive 2004/39/EC of the European Parliament and of the Council of 21 April 2004 on markets in financial instruments.

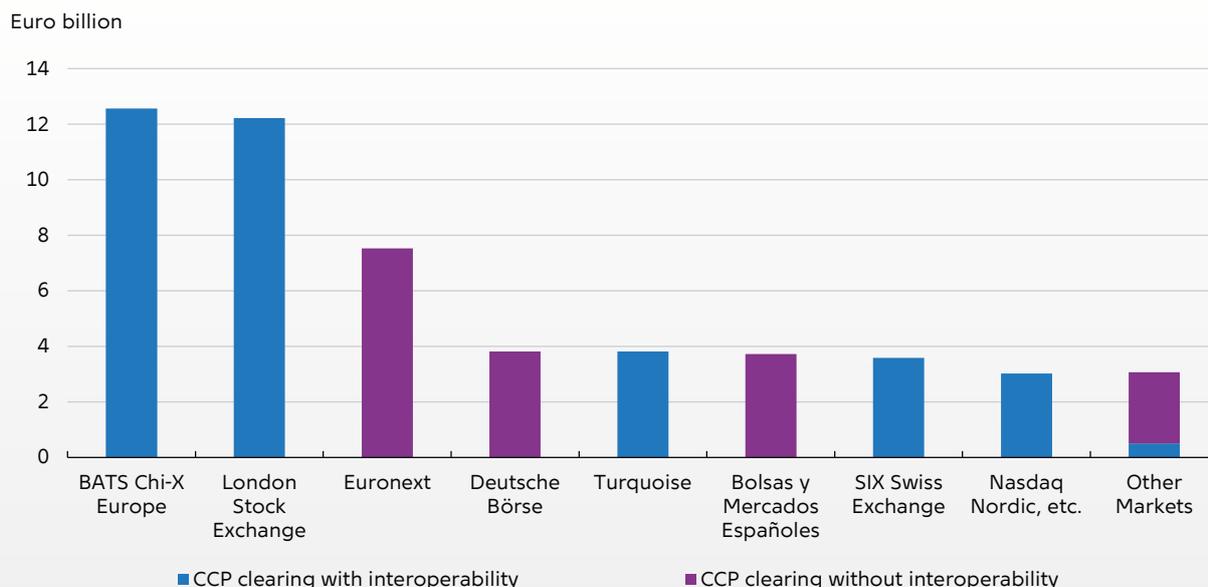
12 The Code of Conduct ([link](#)) was signed in October 2006 by Federation of European Securities Exchanges, European Association of Central Counterparty Clearing Houses and European Central Securities Depositories Association.

13 Regulation (EU) No 600/2014/EC of the European Parliament and of the Council of 15 April 2014 on markets in financial instruments.

14 These are the Dutch CCP EuroCCP, the UK CCP LCH Clearnet Ltd. and SIX x-clear, the latter comprising both the Swiss CCP SIX x-clear Ltd. and the Norwegian SIX x-clear Ltd. NB (Norwegian Branch).

Daily turnover in selected equity marketplaces with/without interoperable CCP clearing

Chart 5



Note: "Other markets" comprise other trading exchanges and venues that are members of the Federation of European Securities Exchanges, FESE, including Oslo Børs (stock exchange) with its interoperable CCPs.  
 Source: Data on turnover from the FESE [link](#) and CCP clearing data from the websites of trading exchanges and venues.

CCP and only post margin and contribute to the clearing fund of this CCP. This saves costs for the participant and reduces complexity.

Interoperability also helps to increase competition as several CCPs are able to clear transactions on the same marketplace without impairing the netting effect. Thus it is up to the CCPs to offer the most competitive terms to the participants within the regulatory framework for CCPs.<sup>15</sup>

### Risks of interoperability

A number of risks are associated with interoperability. In a transaction cleared between two CCPs, there is counterparty risk between the participant and the CCP, but also between the two CCPs. Thus, a CCP's default could potentially cause contagion to the other CCP and onwards to its participants. The system interaction between the two CCPs also means that the operational risk increases, since a cross-CCP transaction cannot

be completed in case of communication errors between them.

To address the risk of interoperability, each CCP sets up an interoperability fund, constituting the inter-CCP margin for the transactions cleared between the CCPs. The inter-CCP margin covers the scenario of default by one of the linked CCPs. The contributions to the fund are made by the participants who are thus subject to higher margin requirements than in a non-interoperability situation. The drawbacks to the participants will probably be outweighed by the liquidity advantages of the increased netting effect, cf. above.

The calculation of inter-CCP margin requirements is highly complex as different CCPs typically use different models for calculating margin requirements. Therefore, CCPs are under a regulatory requirement to take measures to reduce the risks involved in the use of different models<sup>16</sup>. To prevent unnecessary systemic risk,

15 CCP interoperability arrangements are regulated by EMIR; in addition, five guidelines and recommendations for CCP interoperability have been issued, cf. European Securities and Markets Authority, ESMA, Guidelines and recommendations for establishing consistent, efficient and effective assessments of interoperability arrangements, June 2013 [link](#).

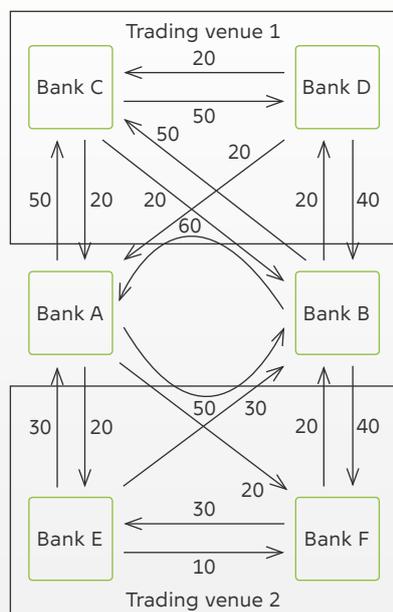
16 Cf. Article 52 of EMIR.

## Netting effect with and without interoperability

Chart 6

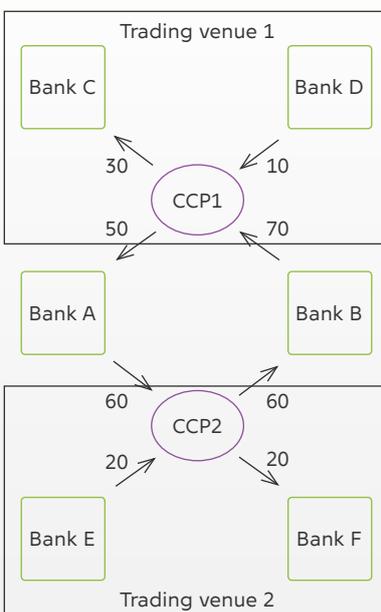
1) Gross positions (before CCP clearing) on the two trading venues

Total exposure: 600



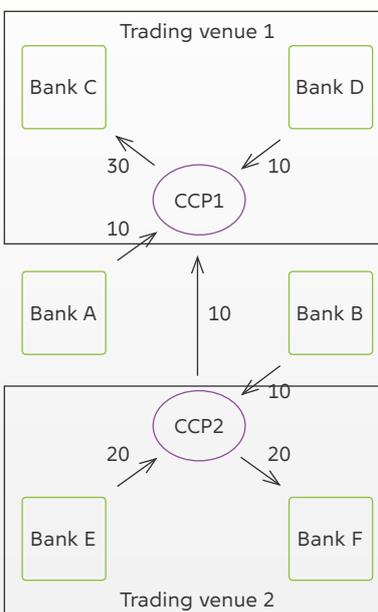
2) CCP clearing on the two trading venues without interoperability

Total exposure: 320



3) CCP clearing on the two trading venues with interoperability

Total exposure: 110



Note: The three charts are based on equity transactions on two separate trading venues. Banks A and B are large banks, trading on both venues, while banks C-F trade on only one of the venues. A CCP is clearing on each trading venue.  
 1) shows gross positions between the participants on the two venues;  
 2) shows CCP clearing without interoperability, positions are netted separately on the venues, banks A and B participate in both CCPs;  
 3) shows CCP clearing with interoperability, netted across venues, with bank A and B participating in CCP 1 and 2, respectively. This entails that bank A's outstanding transactions with participants in CCP 2 (-60) and bank B's outstanding transactions with participants in CCP 1 (-70) are netted, and the difference (10) is transferred from CCP 2 to CCP 1.

CCPs do not contribute to the clearing funds of each other.

CCP interoperability has attracted the attention of the European Systemic Risk Board, ESRB, which is responsible for macro-prudential supervision of the financial system in the EU<sup>17</sup>. The ESRB has analysed the systemic benefits and risks of CCP interoperability to financial stability, cf. Table 1.

The ESRB recommends that interoperability arrangements are continuously monitored closely by CCPs and regulators. The ESRB also stresses the need for maintaining robust management of the risks associated with interoperability and for risk management to be supported by sufficient financial resources in the CCPs.

## Development in the Nordic region

In June 2015, Nasdaq announced its decision to introduce free choice of three CCPs in the Nordic equity markets, including the Danish market. Nasdaq thus follows suit with a number of other European marketplaces offering interoperable clearing. The decision was implemented in November 2015 when LCH Clearnet began to clear equities on Nasdaq. SIX x-clear is expected to begin clearing on Nasdaq later in 2016.

Initially, increased freedom of choice will not necessarily have any major significance for Danish participants. Firstly because the process of changing CCP is fairly extensive, since the systems for handling collateral and for portfolio management, etc., need to be adapted. Secondly, the

<sup>17</sup> Danmarks Nationalbank is a member and contributes to the work of the ESRB via working groups and committees. The Danish Financial Supervisory Authority also participates in the ESRB.

## Overall conclusions from the ESRB report on CCP interoperability arrangements

Table 1

### Main benefits

- Reduced aggregate exposures
- Reduced aggregate collateral needs
- Reduced liquidity risk
- Reduced complexity for clearing members
- Substitutability

### Main threats

- Introduces the risk of inter-CCP contagion owing to:
  - Inter-CCP exposures
  - Possible under-collateralisation of inter-CCP positions
  - Operational risk/complexity in risk management frameworks of CCPs

Source: European Systemic Risk Board, ESRB report to the European Commission on the systemic risk implications of CCP interoperability arrangements, January 2016 ([link](#)).

Danish participants seem to be satisfied with the services provided by EuroCCP. As a case in point, the settlement rates, measuring the percentage of equity transactions settled on time, are relatively high for EuroCCP in the Danish market.<sup>18</sup> Settlement rates are an important parameter for CCP clearing effectiveness, and along with CCP prices and operational stability these rates are important factors in the competition.

With the expansion, some international participants will have easier access to the Danish equity market. Danish equity transactions may be conducted on MTFs such as London-based BATS Chi-X and Turquoise where the three CCPs mentioned above (EuroCCP, LCH Clearnet and SIX x-clear) also offer CCP clearing. Thus, international participants using one of the two “new” CCPs in the Danish market will be able to trade in Danish equities without participating in EuroCCP or having to enter into an agreement with a General Clearing Participant on indirect participation.

Danmarks Nationalbank finds that increased competition between CCP and easier access for international investors to trade in Danish equities are positive for the Danish equity market. However, this development entails increased interconnectedness between the Danish market and other European equity marketplaces offering interoperable CCP clearing. European legislation ensures that CCPs in the equity markets are subject to the necessary risk management requirements to reduce the risks associated with increased interconnectedness. It is important to regularly assess whether the regulatory requirements are complied with so as to effectively reduce the risk of contagion among CCPs and thus to a wider circle of market participants.

<sup>18</sup> Cf. Danmarks Nationalbank, *Oversight of the Financial Infrastructure in Denmark*, 2015, April.