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Strong business investment appetite

- Over the past decade, business investment appetite has been consistent with patterns seen during previous crises and upswings. Investment has picked up as available production capacity has been exhausted, and three years into the boom investment is high.
- The sharp drop in investment in the wake of the financial crisis was driven primarily by high economic uncertainty and low demand from Denmark's trading partners. The recovery in Danish investment was delayed by the debt crisis in several European countries.
- Aggregate investment has been structurally reduced by the shrinking weight of capital-intensive sectors such as agriculture and manufacturing in the Danish economy, reflecting a smaller investment need.

In recent years, business investment has fully recovered after the crisis

Danish business investment appetite has fully recovered as the Danish economic upswing has matured. In Denmark, as in many other countries, investment plunged during the financial crisis in 2009-10. Despite substantial interest rate cuts by central banks around the world, it took years for the level of investment to recover. Therefore, slow investment growth after the crisis raised concerns that business investment was insufficient and would cause the economies to remain in a low growth scenario, often referred to as secular stagnation, cf. e.g. OECD (2015), IMF (2015) and ECB (2017a).

Business investment is key to maintaining and expanding the capital stock, which is a prerequisite for the long-term production capacity and productivity of the economy. Investment covers purchases of assets used to produce goods and services over a period of more than one year. Examples of investment are expenditure on machinery or buildings, but also include intellectual property rights such as, say, the development of patents or software purchases, cf. Chart 1.

Investment is highly cyclical

Business investment is highly dependent on firms' expectations of future sales of goods or services. Hence, investment fluctuates widely over a business cycle, cf. Chart 2. When a crisis occurs, firms' expectations about future returns on investment worsen,

making firms more cautious about launching new projects. At the same time, lower demand reduces the need for new investment due to excess capacity in the production facilities of many firms.

The pattern of business investment during and after the financial and debt crises has mirrored that seen in previous business cycles. But the overheating of the Danish economy in the pre-crisis years reinforced the downturn of the Danish economy in 2009, contributing to a correspondingly abrupt and dramatic drop in business investment.

Corporate savings rose after the financial crisis, driven, inter alia, by substantially lower interest expenses. Combined with the relatively long recovery time for business investment, higher savings helped to boost Denmark's current account surplus in the post-crisis years and the early years of the upswing, cf. Jørgensen, Kramp and Mortensen (2017).

Statistical model shows that investment has followed the pattern seen in previous crises

The historical correlation between business investment and economic activity can be used to estimate investment based on GDP in a statistical model known as an accelerator model. This model is described in Box 1 in the Appendix. With this model, it is possible to assess whether business investment has followed the pattern seen in previous crises and subsequent upswings.

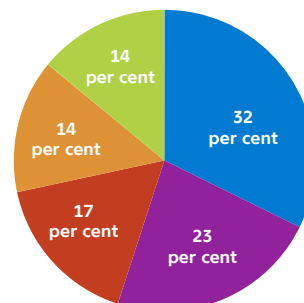
The model shows that business investment in recent years has been higher than immediately warranted by economic activity, cf. Chart 3. However, it is a well-known pattern that the model does not fully explain investment. The deviation between investment and the estimated level of the accelerator model is correlated with capacity pressures in the economy.

In previous boom periods, investment also exceeded the model level when capacity pressures in the economy were at their highest. This was seen both in the 1990s and in the pre-crisis years. In other words, the current investment level is within the historical variation and thus not unusually high relative to economic activity.

According to the model's estimates, the sharp drop in business investment during the financial crisis is not surprising either. The crisis was exceptionally deep, causing GDP to contract by almost 5 per cent and leading to substantial excess capacity in many

Firms primarily invest in intellectual property rights and equipment

Chart 1

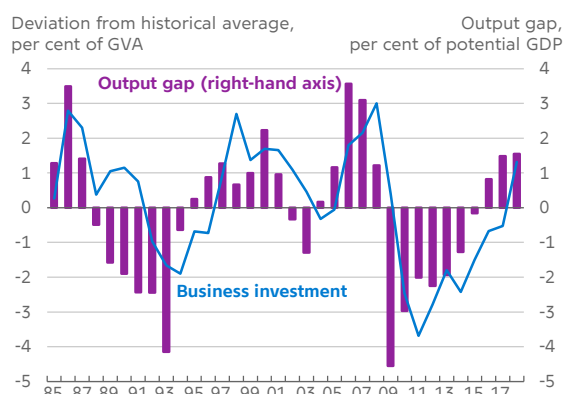


■ Intellectual property rights ■ Structures
■ ICT equipment and other machinery ■ Other buildings
■ Transport equipment

Source: Statistics Denmark.

The investment ratio has increased in line with capacity pressures

Chart 2



Source: Statistics Denmark and Danmarks Nationalbank.

Danish firms. So it was only natural that it took time for investment levels to recover. Even so, the recovery was slower than immediately warranted by the model.

Debt crisis in several European countries delayed the recovery of investment

The recovery of the Danish economy was delayed, inter alia, by the debt crisis in a number of European countries from 2011. The crisis resulted in high yields on the government bonds of the crisis countries because the financial markets found that the government finances of these countries were unsustainable, cf. Abildgren and Malthe-Thagaard (2012). As a result, fiscal policies in Europe were tightened while the economies were still below their potential. The weakened European economy and increased uncertainty meant that business investment was slow to accelerate.

In a study, the International Monetary Fund, IMF, suggests three reasons why Danish investment was struggling after the crisis, cf. Poghosyan (2018).¹

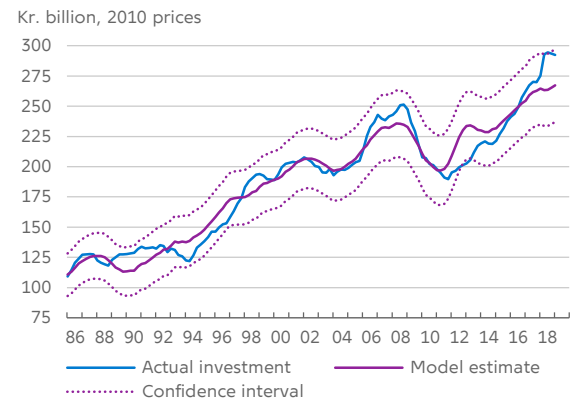
Firstly, economic uncertainty played a role in the early post-crisis years.

Secondly, Danish firms were generally highly leveraged when the crisis hit. This conclusion is in line with the findings of a Danish study of register data, showing that especially highly leveraged firms reduced their investment in the early crisis years, cf. Kuchler (2015).

Thirdly, the IMF analysis suggests that, for a period of time, investment was constrained by rising corporate market power, proxied by markups. Firms with market power are able to charge a markup over marginal costs. Higher prices reduce the number of goods they can sell and thus the need for investment. Other countries have also seen investment constrained by rising corporate market power, cf. IMF (2019a). However, rising corporate power does not necessarily translate into weaker competition. It may simply ensure that high fixed costs associated with investment in, say, research and development, can be recouped.

During the upswing, investment has generally mirrored economic activity

Chart 3



Note: 4-quarter moving averages. The broken lines indicate a 95 per cent confidence interval, generated by running a series of simulations. The model estimate is the median estimate of the estimation. See Box 1 in the Appendix for the approach applied.

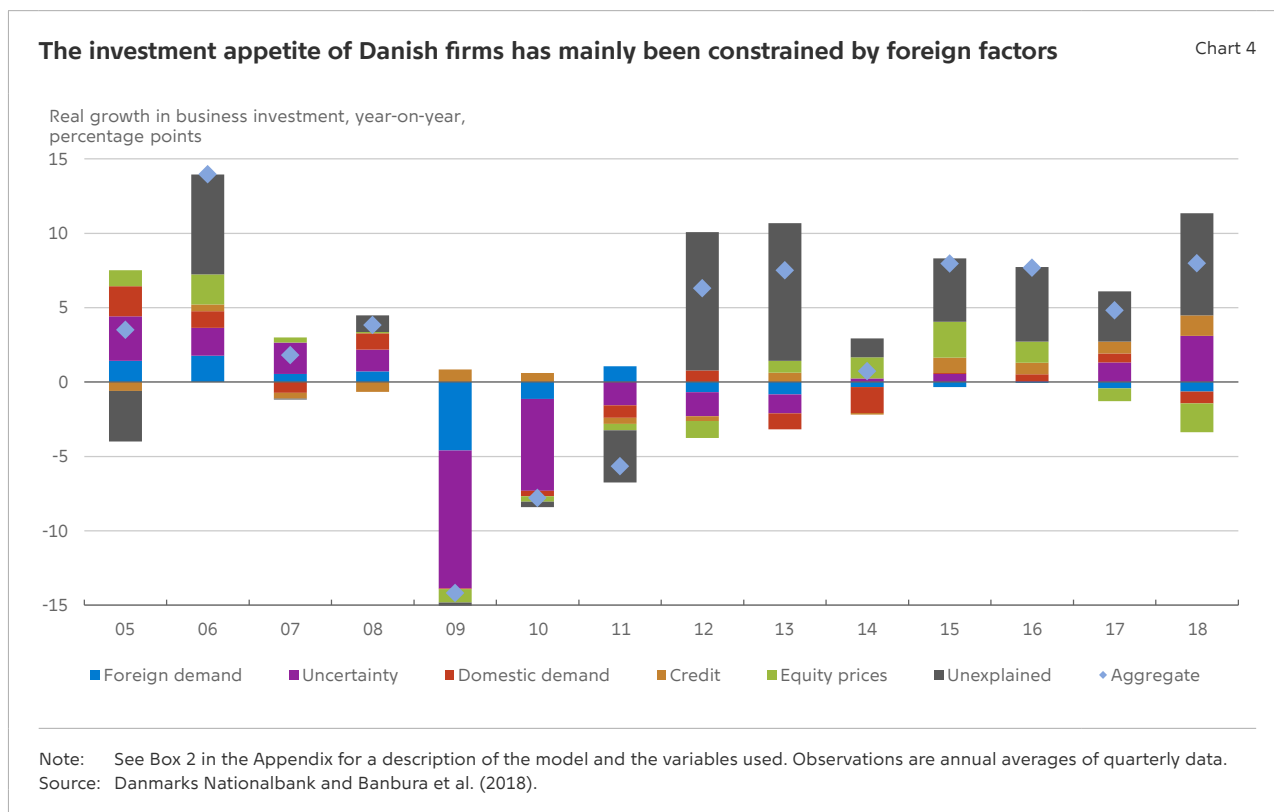
Source: Danmarks Nationalbank and Banbura et al. (2018).

Historically, it is not unprecedented for business investment not to mirror the rise in economic activity in the early stages of an upswing. In the 1990s, business investment also lagged that warranted by economic fundamentals until the economy was at a fairly advanced stage of the upswing. But in previous upswings, the investment appetite was presumably constrained by other factors than in the present upswing.

VAR model shows that especially foreign factors constrained investment after the crisis

The drivers of business investment during and after the financial crisis can be illustrated by supplementing the accelerator model with a vector autoregression, VAR, model, cf. Box 2 in the Appendix. The VAR model estimates business investment based on factors described in the economic literature as important drivers. These include, for instance, foreign factors such as export market growth and euro area uncertainty and domestic factors such as consumer demand and corporate access to funding.

¹ The analysis used investment in the overall economy, not just in the sectors.



Foreign factors have been the primary drivers of the fluctuations in business investment, cf. Chart 4. This is not surprising given that Denmark is a small open economy. Much of the decline in and around 2009 was due to euro area uncertainty.² But low demand from Denmark’s primary trading partners as a result of the financial crisis also constrained investment growth.

During the years in which the debt crisis was the cause of great uncertainty and slowdown in the recovery, the model results suggest that business investment was constrained both by increased uncertainty and by low growth in foreign and domestic demand. Low domestic demand may reflect substantial consolidation needs following the build-up of leverage among households during the overheating of the Danish economy in the pre-crisis years.

But some factors also acted in support of business investment. One example is increasing equity prices,

which underpinned business investment in the early stages of the upswing by ensuring access to cheap market funding. The same conclusion is found in other studies, cf. Hensch and Spange (2019).³ The correlation between rising equity prices and investment applies to both Danish and foreign firms based in Denmark. Overall, firms’ access to loans has played a limited role, according to the model.

Recent years have seen a fair increase in business investment, driven by lower overall uncertainty. In the uncertainty measure used in the VAR model, political uncertainty generally has a lower weight than financial measures. Consequently, political uncertainty is implicitly assumed to play a secondary role in Danish business investment.

Viewed in isolation, foreign demand has continued to slow down growth in business investment a little. Decreasing demand may be associated with the decline in international trade intensity charac-

2 A euro area uncertainty measure has been applied as no measure is available for Denmark.

3 As real interest rates are not included in the VAR model estimation, part of the impact of lower interest rates may be attributed to equity prices in this model.

terising the world economy since the financial crisis. This dampens growth in foreign demand for Danish goods and services.

Several other European countries share the same post-crisis experience

In many respects, the results of the accelerator and VAR models for Denmark are in line with the patterns seen in other European countries. There is no immediate evidence to suggest that business investment in the euro area and many European countries is substantially out of sync with economic activity, cf. Banbura et al. (2018).

To a great extent, the key drivers of the decline in business investment since 2009 have been the same in the euro area as in Denmark: uncertainty and foreign demand acted as a drag on investment during the financial crisis and delayed the recovery during the European debt crisis.

Low interest rates presumably provided only a small direct stimulus to investment

The reason why investment is not higher in view of the highly favourable funding costs with very low short and long-term interest rates has been the subject of sustained economic debate internationally.

When interest rates are low, it is inexpensive to finance investment and, at the same time, market conditions are favourable. But it is important to keep in mind that lending rates to firms and others have not been reduced at the same pace as monetary policy interest rates. Studies also show that interest rates are less significant for business investment than e.g. the level of economic activity.⁴

At the same time, the natural real interest rate in Denmark is likely to have declined since the 1990s, cf. Adolfsen and Pedersen (2019). The natural real interest rate is the real interest rate level that brings actual economic activity in line with potential economic activity. Due to the decline in the natural real interest rate, the low interest rate level after the crisis has not had the expansionary impact that a similar interest rate level would have had 20 years ago.

Another reason why the fall in interest rates does not provide the same stimulus to investment as

previously is that the required rates of return on, for instance, equities globally have remained relatively unchanged since the onset of the crisis, cf. ECB (2017b). This suggests that risk premia have increased during the same period as risk-free interest rates have fallen.

Although a number of factors reduce the direct impact of low interest rates on investment, low interest rates have still underpinned investment by shoring up economic activity in a broader sense.

Globalisation and technological advances are changing investment needs

Beneath the cyclical development of investment, the economy undergoes a number of structural changes that impact investment needs over time. The ratio of business investment to gross value added, GVA, in the private sectors has increased from 16-18 per cent 50 years ago to around 20 per cent since 2000. However, it is important to bear in mind that some politically initiated investments such as the Great Belt link and the Copenhagen Metro are included in private investment in the national accounts, cf. e.g. Ministry of Finance (2014). Previously, such investment was typically tax-funded and thus part of the investment in general government and service.

The composition of investment has changed over time, and investment now consists more of investment in equipment and less of investment in buildings and structures, cf. Chart 5. Overall, business investment has been reduced by the declining trend in construction investment over a number of years.

There are three underlying trends behind the structural changes: (1) The key driver is increased economic integration in the global economy. (2) Research and development accounts for a growing share of investment. (3) The weight of industries with lower investment needs has increased in the Danish economy.

The factors underlying the structural changes are not new phenomena; they are natural for a dynamic

⁴ See the elaboration in Box 1 in Kramp and Pedersen (2015).

economy such as Denmark's. However, structural economic changes may complicate comparisons of investment levels over time.

The past 20 years have seen further integration of Danish firms into global value chains. One result of internationalisation is that many Danish firms have production abroad, so-called factoryless production. Production takes place at foreign manufacturing facilities or subsidiaries of Danish firms abroad through foreign direct investment, FDI, in, for instance, China. FDI is the value of firms located abroad but either wholly or partly owned by Danish firms.

Foreign direct investment does not crowd out investment in Denmark

There are no indications that increased FDI has weakened business investment in domestic real capital. The investment ratio has especially mirrored the pattern of FDI as a percentage of GVA over business cycles. Moreover, industries with high FDI levels have generally also recorded higher domestic real capital investment, cf. Chart 6 and Isaksen, Klausen and Kramp (2016).

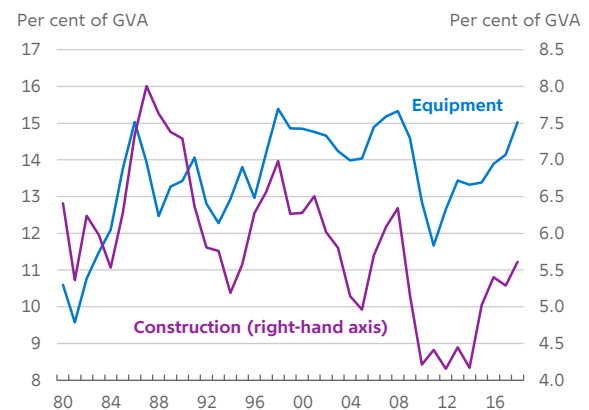
An analysis also shows that Danish firms relocating production abroad invest more in research and development in Denmark, cf. Andersen (2019). In other words, the development of the firm's products typically still takes place in Denmark although the facility manufacturing the products is relocated to, say, China. So there are no immediate indications that Danish FDI crowds out domestic investment. This is presumably a contributory factor to the steep increase in research and development investment, in particular, in recent years, cf. Chart 7. Thus, the share of research and development investment in equipment investment has increased over recent years, to 16 per cent now.

Denmark's outward FDI exceeds inward FDI. This is typical of countries such as Denmark with sustained current account surpluses, cf. Isaksen, Klausen and Kramp (2016).

Declining capital ratio could be due to increased uncertainty in the compilation of capital and GDP

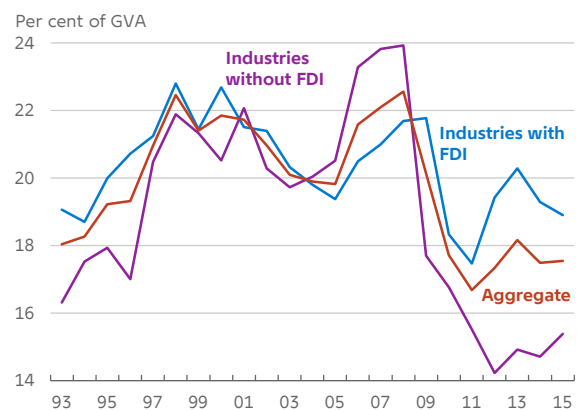
The capital-output ratio, K/Y (the capital stock as a ratio of GDP), has been declining since the mid-1990s. This fall could indicate that Danish business investment has not fully mirrored the increase in output. If this is the case, it could constrain GDP growth. However, the decline in the capital ratio could also

The composition of business investment has changed over time Chart 5



Note: Ratios are based on nominal quantities.
Source: Statistics Denmark and the ADAM data bank.

Industries with FDI continue to invest in Denmark Chart 6



Note: See the note in Chart 10 in Isaksen, Klausen and Kramp (2016). Data has been updated.
Source: Statistics Denmark, Danmarks Nationalbank and own calculations.

be due to increased uncertainty in the compilation of both capital and GDP.

The compilation of capital stock is more uncertain, as the capital stock is increasingly composed of patents and other intellectual property rights. The real value of these is typically more difficult to determine than the real value of traditional capital such as buildings and machinery. Add to this challenges in relation to determining the capital depreciation rate. Thus, difficulties in determining the real value and depreciation could lead to underestimation of the capital stock.

Compiled GDP as a measure of economic value creation in Denmark could potentially be overestimated due to the increase in factoryless production, cf. Jørgensen, Kramp and Mortensen (2018). Quantifying the share of value added attributable to each sub-component or service in the compilation of factoryless production is difficult. So is quantifying the share of value added attributable to processes and capital in Denmark or, say, China.

If the capital stock is underestimated while GDP is overestimated, the Danish capital ratio could be underestimated. The decline in the capital ratio since the 1990s is not seen if value added generated outside Denmark is eliminated from GDP, cf. Ministry of Economic Affairs and the Interior (2018). However, this is based on a very strict assumption that value added generated outside Denmark involves no Danish capital whatsoever. And factoryless production is, in fact, characterised by drawing on Danish registered capital stock such as knowledge and patents, cf. Knudsen (2018).

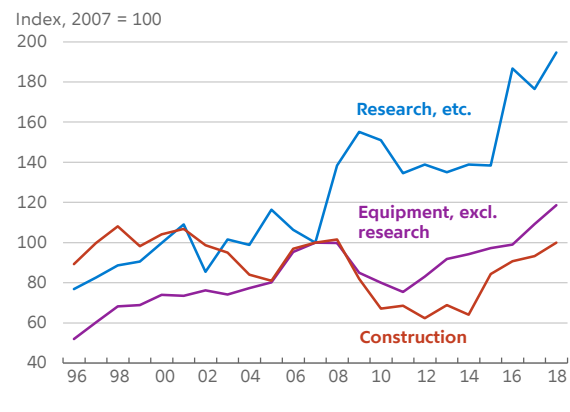
The growing weight of services in the Danish economy structurally reduces investment

The globalisation of the Danish economy may also contribute to amplifying the very long-term trend, with service industries accounting for an ever larger share of the Danish economy and manufacturing and agriculture accounting for an ever smaller share.

In 1996, one-third of value added in the private sector was derived from agriculture and manufacturing. Since then, this share has declined and in 2018 the two industries accounted for just one-fourth of value added. At the same time, services now account for two-thirds. Viewed in isolation, the sectoral shift reduces business investment, as services are less investment-intensive than, say, manufacturing and

Notable increase in research and development investment since the crisis

Chart 7



Note: Chained values. Investment has been compiled for the private sector and hence deviates slightly from other compilations in the analysis. Research etc. is part of investment in intellectual property rights.
Source: Statistics Denmark and the ADAM data bank.

agriculture, cf. Chart 8. Moreover, the composition of investment varies greatly.

To illustrate the impact of the sectoral shift on aggregate business investment, counterfactual ratios are calculated for equipment investment and construction investment. These ratios are calculated by weighting developments in the individual industries' investment ratios with their GVA shares for the years 1996 to 2000.

Overall, the sectoral shift implies that business investment has been more than 1 per cent of GVA lower each year during the upswing compared with a (counterfactual) situation with a sectoral distribution identical to that of the late 1990s, cf. Chart 9. The difference is attributable to both equipment investment and construction investment. The subdued growth in investment ratios is attributable mainly to the decline in the share of private sector GVA accounted for by agriculture and parts of the manufacturing industry.

The calculations should be interpreted with caution. The sectoral shift leads to lower investment levels, but this should not be regarded as inexpedient. In short, less investment is needed in an economy based primarily on services.

However, certain elements of the sectoral shift do not per se result in less investment. This applies,

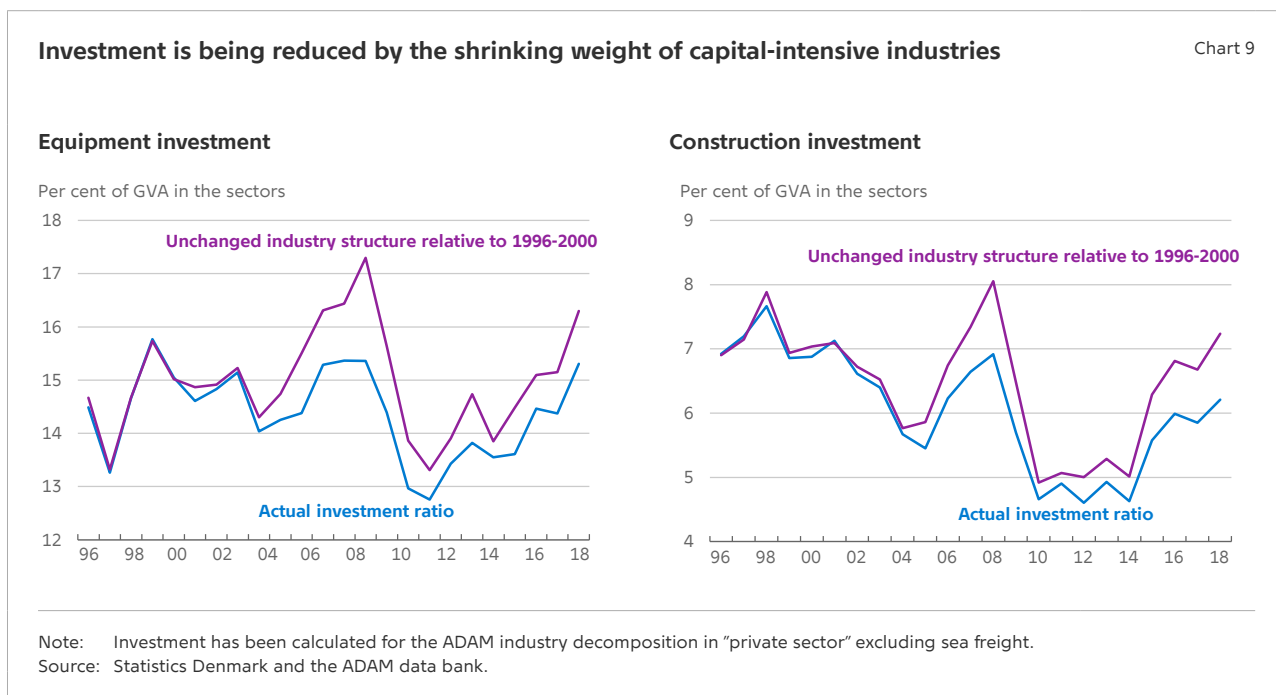
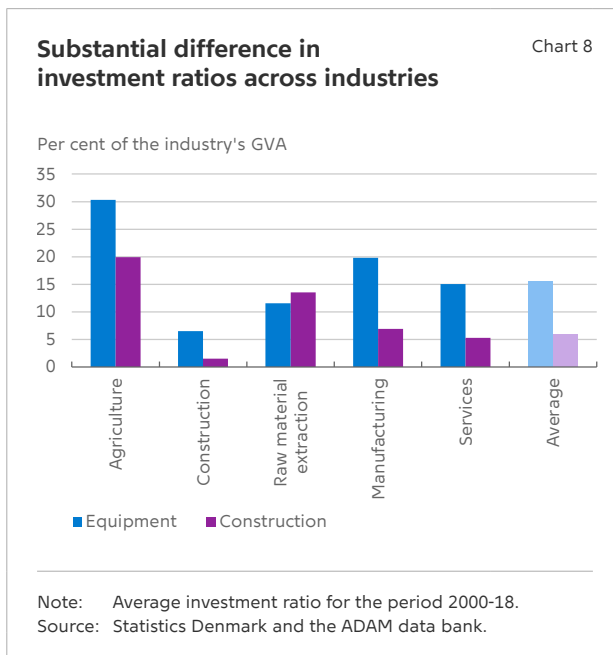
for instance, to increased specialisation, with the manufacturing industry outsourcing a number of services that were previously produced in-house to firms in other industries. One example is cleaning services.

Lower investment prices and new technology also contribute to structural shifts in investment

In addition to increased globalisation and sectoral shifts, the introduction of new technology may also reduce demand for certain types of investment. As a case in point, new technology can make it possible to optimise use of the existing capital stock. In relative terms, this reduces demand for buildings and equipment, thereby contributing to a structurally lower investment ratio, cf. VoxEU (2014).

Moreover, there are indications that a smaller share of GDP is required in order to meet a given investment need. The reason is that relative investment prices⁵ in Denmark have fallen over time, cf. Kramp and Pedersen (2015).

International trade has been a key driver of the decline in relative investment prices. Higher productivity growth in capital goods than in other goods has been another driver, cf. IMF (2019b). Cheaper invest-



⁵ I.e. the ratio of the investment deflator to the GDP deflator.

ment contributes to a structurally lower investment ratio, as it is possible to buy the same amount using a smaller percentage of income.

On the other hand, rapid technological advances could also mean that investment becomes obsolete more quickly. This necessitates faster replacement, reflected in faster depreciation of the capital stock than 30 years ago. Faster depreciation of the capital stock will, to some extent, increase the investment need and lead to an upward trend in the structural investment ratio.

Appendix

Accelerator model description

Box 1

The underlying idea of the accelerator model is that changes in the desired capital stock are assumed to be proportional to changes in output. Thus, it provides a simple approach to assessing whether the level of business investment is consistent with aggregate demand.

The approach generally follows Clark (1979), but the model has been estimated using a Bayesian approach. The approach and choice of variables have been harmonised through Danmarks Nationalbank's participation in an ECB working group to ensure cross-country comparability, cf. Banbura et al. (2018).

The point of departure is the following model¹:

$$\frac{I_t}{K_{t-1}} = \frac{\alpha}{K_{t-1}} + \sum_{i=1}^p \beta_i \frac{\Delta Y_{t-i}}{K_{t-1}} + \delta + \epsilon_t$$

1. See Banbura et al. (2018).

where I_t is business investment, K_t is the capital stock and Y_t is GDP. Given that data for the capital stock is not available for some countries, potential output has been used as a *detrending* variable in the model estimation. This has been done to ensure cross-country comparability in the study and has been retained in this analysis. However, this choice does not materially alter the results.

The model has been estimated for the period from the 1st quarter 1985 to the 1st quarter 2019. If the estimation period is shortened to, say, 2005 or 2013, this does not materially alter the results. A 12-quarter lag has been chosen in the model.

Vector autoregression, VAR, model

Box 2

To explain the drivers of developments in business investment, a VAR model based on a Bayesian approach is estimated. An approach with standard priors in the spirit of the Minnesota prior, cf. Litterman (1986), with recursive Cholesky identification has been adopted.

The following model is estimated using data for the period 1995-2018:

$$Y_t = c + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \beta_4 Y_{t-4} + u_t$$

where the following variables are included in Y_t :

- Foreign demand measured by import growth in Denmark's export markets (trade-weighted) and Danish exports
- Domestic demand measured by private consumption
- Measure of economic policy uncertainty (see below)
- Credit impulse measured by the change in lending growth to non-financial corporations deflated by nominal GDP
- Equity prices measured by Nasdaq OMX C25 deflated by the GDP deflator
- Business investment.

All variables are in real terms and trending variables are expressed as year-on-year growth rates. The choice of variables has been harmonised among a number of EU member states to ensure comparability, and the model is described in further detail in a study conducted by an ECB working group, cf. Banbura et al. (2018).

However, due to data limitations, there are some deviations relative to the other countries in the study:

- A euro area uncertainty measure has been applied rather than a specific measure for Denmark, cf. Gieseck and Largent (2016). However, uncertainty in Denmark must be presumed to be fairly closely correlated with that of the euro area as a result, inter alia, of Denmark's close links to the euro area in terms of international trade, financial conditions and the fixed exchange rate policy.
- No real interest rate measure is included, as Denmark has no appropriate measure of inflation expectations for this purpose. Inflation expectations for the euro area are not applied as an alternative indicator, given that this indicator may not be representative of Denmark. Although the fixed exchange rate policy entails that inflation in Denmark is aligned with that of the euro area in the medium term, it may deviate for individual years. This presumably means that inflation expectations are formed based on different assumptions for individual years.
- No measure of corporate profits is included.

The degree of explanatory power of a variable using this type of model is sensitive to the ordering of variables in the estimation. For instance, when placed before the uncertainty variable, the equity variable explains a greater proportion of the variation. Presumably, this is because of the dependence of equities on uncertainty, but it illustrates that this type of model has its limitations.

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ABOUT ANALYSIS



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

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

The analysis consists of a Danish and an English version. In case of doubt regarding the correctness of the translation the Danish version is considered to be binding.

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