

Harr, Thomas; Spange, Morten

**Research Report**

## Inflation - why did it rise and what are the drivers ahead?

Economic Memo, No. 3

**Provided in Cooperation with:**

Danmarks Nationalbank, Copenhagen

*Suggested Citation:* Harr, Thomas; Spange, Morten (2023) : Inflation - why did it rise and what are the drivers ahead?, Economic Memo, No. 3, Danmarks Nationalbank, Copenhagen

This Version is available at:

<https://hdl.handle.net/10419/298464>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# DANMARKS NATIONALBANK

---

9 FEBRUARY 2023 — NO. 3

## Inflation – why did it rise and what are the drivers ahead?

**Thomas Harr**

*Assistant Governor, Head of  
Economics and Monetary Policy*  
ECONOMICS AND MONETARY  
POLICY

*thha@nationalbanken.dk*

**Morten Spange**

*Chief Monetary Policy Advisor*  
ECONOMICS AND MONETARY  
POLICY

*mosp@nationalbanken.dk*

We would like to thank Per Callesen, Troels Kromand Danielsen, Rasmus Mose Jensen, Martin Nygaard Jørgensen, Signe Krogstrup, Thomas Sangill and Christoffer Jessen Weissert for useful comments and suggestions.

The viewpoints and conclusions stated are the responsibility of the individual contributors, and do not necessarily reflect the views of Danmarks Nationalbank.

## Inflation – why did it rise and what are the drivers ahead?

### Abstract

Since early 2021, consumer price inflation has risen sharply across the advanced economies, including the US, the euro area and Denmark. We argue that the surge in inflation in the three economies in 2021-22 reflects multiple factors, including the Covid-19 pandemic in 2020-21 and the Russian war in Ukraine in 2022, as well as the associated policy responses.

In 2023-24, at least three factors are likely to drive inflation across the three economies: (a) more stable energy prices, (b) an expected slowdown in aggregate demand growth caused in part by tighter monetary policy, and (c) improving supply chains. Well-anchored inflation expectations mitigate the risk of a price-wage spiral, but backward-looking wage expectations and expansive fiscal policy in the euro area pose risks.

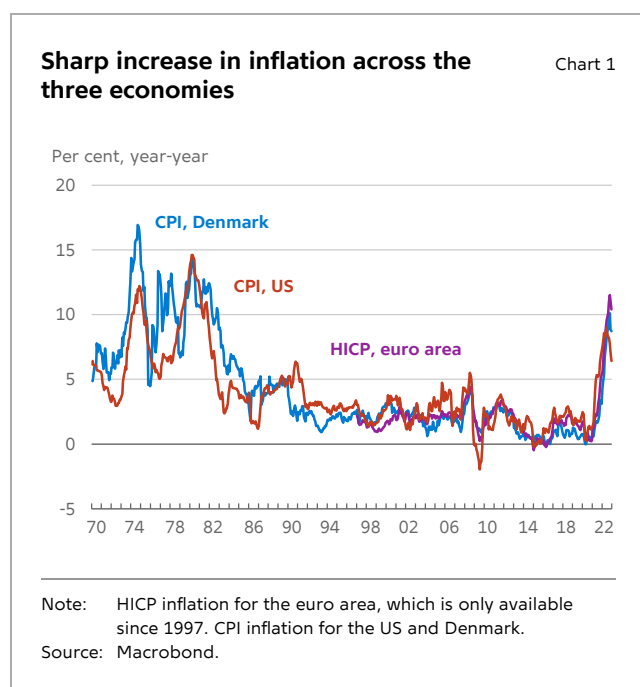
While there are a number of similarities with 1970s, there are also important differences. Importantly, central banks are more independent of political influence and they are endowed with explicit mandates for price stability. Moreover, wage indexation has become much less widespread.

### Introduction

Since early 2021, consumer price inflation has surged across most advanced economies, including the US, the euro area and Denmark. During 2022, inflation reached its highest level since the early 1980s in the US and Denmark and the highest level on record in the euro area since its inception in 1999, see chart 1. Inflation first picked up in the US in spring 2021, and from the second half of the year it rose sharply in Europe as well. The increase in inflation has manifested itself differently across countries, driven by divergent factors. In the US, increasing prices of services are contributing substantially to inflation, while energy and to a lesser extent food prices are the key drivers of inflation in the euro area and Denmark.

In this memo, we first summarise the most important forces behind the surge in inflation in 2021-22. We take both a global and a local perspective, zooming in on the US, the euro area and Denmark. In doing so, we focus on similarities as well as differences between the three economies. We argue that the covid-19 pandemic and Russia's war in Ukraine combined with the associated policy responses have affected aggregate demand as well as supply in ways that have driven up inflation.

Second, we discuss the key factors that are likely to drive inflation in 2023-24: (a) more stable energy prices, (b) an expected slowdown in aggregate demand growth caused in part by tighter monetary policy, and (c) improving supply chains. The risk of a price-wage spiral currently appears modest. However, potential attempts to quickly restore real wages to their pre-covid levels could pose a risk, as could expansionary fiscal policies in the euro area.



Third, we compare the current situation to the 1970s, a period defined by double-digit inflation across a large number of advanced economies. Like today, geopolitical changes influenced energy and commodity prices. The 1970s were also characterised by expansive fiscal policy which counteracted monetary policy, as well as price regulations and subsidies. There are similarities between the 1970s and the current situation, particularly in the euro area. However, there are also important differences. Importantly, central banks have become much more independent from political influences and they are strongly committed to securing medium-term price stability. In addition, wage indexation has become much less widespread.

## Why did inflation rise?

Below, we discuss in detail the three factors that led to the sharp rise in inflation in 2021-22:

- The nature of the crisis
- Monetary and fiscal stimuli, which supported private consumption
- Sharp increases in energy and commodity prices

### **Explanation 1): The nature of the crisis**

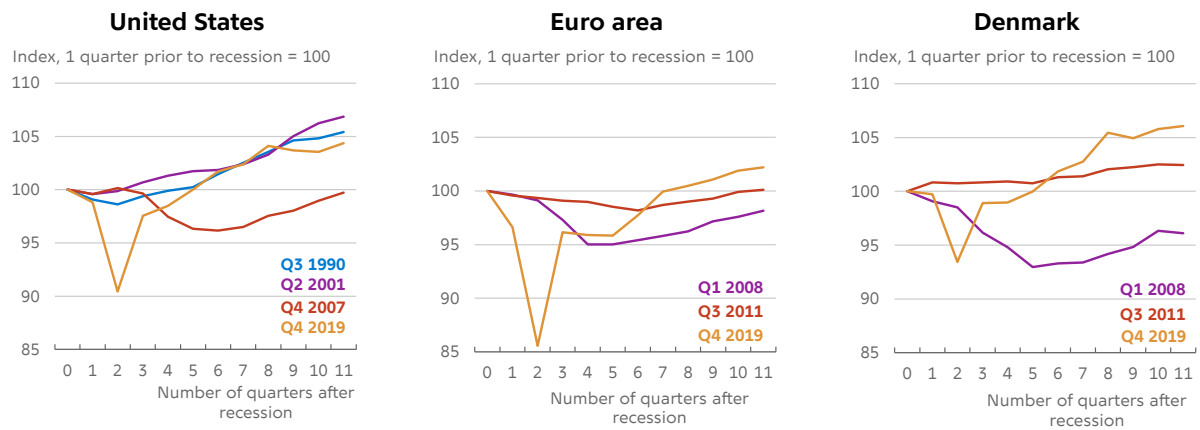
In spring 2020, the spread of covid-19 constituted a shock to the global economy of a nature that had not been seen since the 1918-20 influenza pandemic. Lockdowns were imposed in order to contain the spread of the disease, leading to a sharp reduction in the productive capacity of the economy. The supply disturbances ranged from local contact intensive services becoming unavailable to large-scale disruptions to global supply chains. As a consequence, there was a sharp reduction in the supply of services as well as many goods and intermediate inputs into production. Meanwhile, consumer demand initially fell, reflecting a substantial deterioration in business and consumer confidence.

Overall, the events of the initial phase of the pandemic can be interpreted as a combination of a large supply shock and a large demand shock. Together, these shocks resulted in a sharp decline in economic activity, see chart 2. While the fall in GDP during the spring of 2020 was much deeper in all three economies compared to recent recessions, the period of negative growth rates was short. For example, the NBER records that the covid recession in the US lasted only two months – from February to April 2020 – the shortest recession on record. The recession in the euro area lasted through the first half of 2020 according to CEPR, making it the shortest recession in the history of the common currency area. Denmark saw negative quarterly GDP growth rates from Q4 2019 to Q2 2020.

Following the sharp contraction, economic activity subsequently recovered strongly. This was partly due to the nature of the crisis. In contrast to the lead-up to the global financial crisis (GFC), in 2020 there was no clear evidence of imbalances and systemic risks in the global economy and the financial system. This meant that firms and households did not enter into a period of financial consolidation when the economies reopened. There was no financial crisis or prolonged period of credit disruptions. As a result, demand recovered forcefully.

**The pandemic led to an unprecedented decline in GDP followed by a rapid recovery**

Chart 2



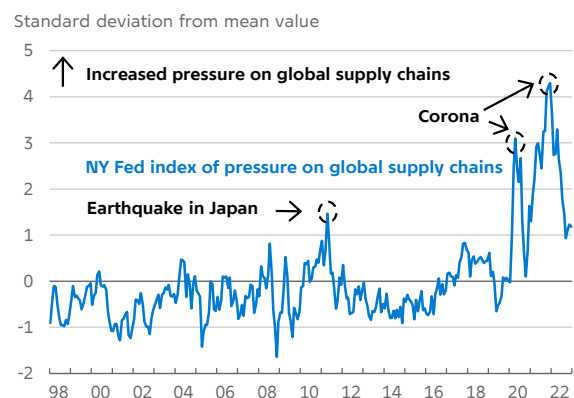
Note: US recessions are defined by NBER, whereas euro area recessions are defined by CEPR. For simplicity, we illustrate the same time periods for Denmark as for the euro area.  
 Source: Macrobond and own calculations.

However, the role and persistence of supply chain disruptions turned out to be much more severe than expected. In recent history, there had been no experience of such supply chain disruptions, which made their implications for the wider economy highly unpredictable. When the first covid-19 vaccines were approved by the US authorities in late 2020, there was widespread belief that global supply chains would improve during 2021.<sup>1</sup> However, according to the New York Fed Global Supply Chain Pressure Index (GSCPI), they deteriorated during the year, see chart 3<sup>2</sup>.

The persistence of supply chain disruptions may be due to repeated lockdowns in many countries that are central to global value chains. This happened in response to the spread of the delta and omicron variants. For example, the repeated lockdowns in China during 2021-22 due to the country's zero-covid policy have likely delayed the normalisation of global supply chains. Moreover, when restrictions were eventually lifted, relieving congested supply chains took time due to limited port and shipping capacity.

**Significant disruptions to supply chains in 2020-22**

Chart 3



Note: The index is normalised such that a value of zero indicates that the index is at its mean value. Positive values represent how many standard deviations the index is above its mean value (and negative values represent the opposite).  
 Source: Macrobond.

In the US, supply disruptions during 2021-22 were largely centered around the labour market. Despite employment in the US only surpassing pre-pandemic levels in September 2022, the number of job

<sup>1</sup> See e.g. [Minutes of the Federal Open Market Committee December 15-16, 2020 \(federalreserve.gov\)](#).

<sup>2</sup> For more details on the GSCPI, see Benigno et al. (2022).

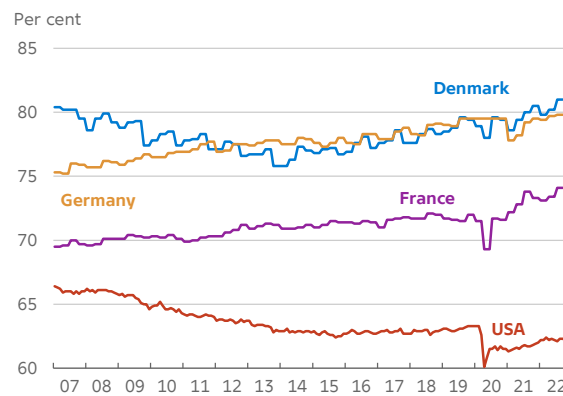
vacancies was well above their early 2020 levels during the whole of 2022. This is likely to at least partly reflect a decline in the labour force.<sup>3</sup> In January 2023, the labour force participation rate in the US remained below pre-pandemic levels whereas in Denmark, Germany and France labour force participation had increased since early 2020, see chart 4.

Differences between the US and Europe in terms of labour market performance may be linked to labour market policies during lockdowns. In Europe, a number of countries introduced wage compensation schemes, enabling employers to retain their employees.<sup>4</sup> In contrast, more than 20 million Americans lost their job in April 2020 alone, thereby severing links between employers and employees.

The covid-19 related shock to the economy had a substantial impact on inflation. Inflation for the most part fell during 2020, particularly in Europe.<sup>5</sup> This suggests that initially the fall in demand may have exceeded the reduction in supply. The subsequent pickup in inflation from 2021 onwards is likely to reflect that as the economies recovered strongly, global demand tended to outpace supply. This generated inflationary pressures in accordance with the short-run Phillips curve.<sup>6</sup> Research finds mixed evidence of the relative importance of supply versus demand factors in the US and the euro area, see Box 1.

The participation rate continues to be below pre-pandemic levels in the US

Chart 4



Note: The chart shows civilian labor force participation rate, women & men, 16 years & older for the US and activity rates from 15 to 64 year-olds for Denmark, Germany and France.

Source: Macrobond.

<sup>3</sup> Pizzinelli and Shibata (2022) argue that in the US, young mothers experienced a deep and persistent fall in employment, while the share of workers aged 55 and above who are not in the labour force rose.

<sup>4</sup> See Bess and Darougheh (2021) and Borgensgaard (2022) for evidence on Denmark.

<sup>5</sup> One caveat is that it was difficult to measure inflation properly during this period. This reflects a significant change in the composition of consumer demand as well a limited ability by the statistical agencies to collect prices in stores during lockdowns.

<sup>6</sup> The trade-off between inflation and the output gap is not necessarily constant, which would be reflected in a non-linear Phillips curve. This could explain why the US did not face deflation as demand contracted sharply in the aftermath of the global financial crisis (GFC) in 2008-09, whereas inflation rose strongly in 2021-22. See Harding et al (2022) for an example of a model where the Phillips curve is steeper during booms and flatter during recessions.

### Demand-driven versus supply-driven inflation

Box 1

A number of papers have analysed the importance of demand versus supply factors in explaining the surge in inflation during 2021-22. Shapiro (2022) argues that until April 2022 supply-related factors explained about half of the rise in US PCE inflation during the pandemic while demand factors were responsible for about one-third. Using the method of Shapiro on the euro area, Goncalves and Koester (2022) find that in the summer of 2022, supply and demand factors contributed in roughly equal proportions to inflation. Starting in Q3-2021 inflation was initially mainly supply-driven but the importance of demand factors gradually increased over time. Supply was more important for industrial goods, with demand being more important for services. The OECD has applied the approach to eight economies including Denmark. They find that while both supply and demand factors have pushed up inflation since mid-2020, supply-driven inflation is estimated to account for well over half of total inflation in Denmark, see Box 1.1 in OECD (2022).

Di Giovanni et al (2022) argue that negative supply shocks (domestic and foreign) accounted for a larger share of inflation in the euro area during Q4 2019 to Q4 2021 than in the US where aggregate demand shocks were the stronger driver.<sup>1</sup> They find that demand factors accounted for around two-thirds of US inflation compared to only half in the euro area. The authors argue that foreign demand and supply shocks played a large role relative to domestic shocks in explaining euro area inflation during Q4 2019 to Q4 2021. This reflects that being a relatively open economy, inflation in the euro area is exposed to global developments, including strong demand from the US.

<sup>1</sup> Note that this was before Russia's invasion of Ukraine, which has arguably caused greater supply chain disruption for the euro area and Denmark than for the US.

### **Explanation 2: Monetary and fiscal stimuli...**

The forceful economic recovery was supported by accommodative monetary and fiscal policies. While the policy responses were qualitatively similar across the three economies, the sizes of the stimulus programmes as well as the relative weights on monetary versus fiscal measures differed.

The policy response appears particularly strong in the US. There is widespread consensus that as the recovery set in, monetary policy was already significantly accommodative in the US as well as in the euro area and Denmark.<sup>7</sup> In March 2020, the Fed reduced the key policy rate by 150bp and enacted open-ended and unlimited QE alongside various credit programmes supporting individuals and companies. Consequently, US treasury and mortgage yields declined during 2020, see chart 5. This underpinned the pick-up in inflation.

Unlike the Fed, the ECB did not reduce its policy rates.<sup>8</sup> Instead, it announced the establishment of the pandemic emergency purchase programme (PEPP) in March 2020 with the objective of supporting the monetary policy transmission mechanism and the outlook for the euro area. Euro area government bond yields and mortgage rates were broadly unchanged during 2020 and the same was the case in Denmark. Danmarks Nationalbank did not purchase government bonds or other financial assets in response to the crisis. However, due to the fixed exchange rate policy, Danish bond markets are generally affected by ECB bond purchases in much the same way as bond markets in the euro area, see Jensen et al. (2017).

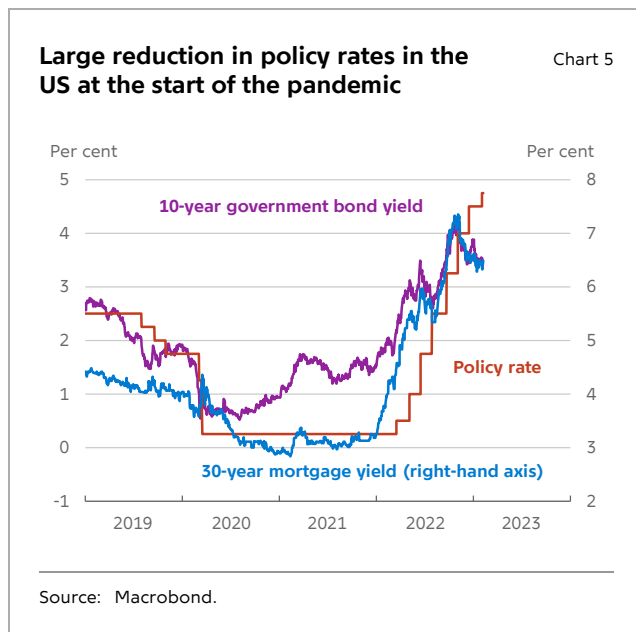
Monetary stimulus was accompanied by fiscal easing in the three economies. Overall, measured as the deterioration of the structural fiscal balance compared to pre-pandemic levels, fiscal support was more pronounced in the US than in the euro area and Denmark, see chart 6.<sup>9</sup> In the US, substantial fiscal stimulus was injected into the economy through fiscal transfers. These included an increase in unemployment benefits and handouts of cash payments to households. There are indications that the US fiscal stimulus in 2020-21 had a significant impact on the increase in inflation in 2021-22.<sup>10</sup>

<sup>7</sup> See e.g. Emmons (2022) for the US and Lane (2022d) for the euro area.

<sup>8</sup> This may in part reflect that the key policy rate was close to its effective lower bound.

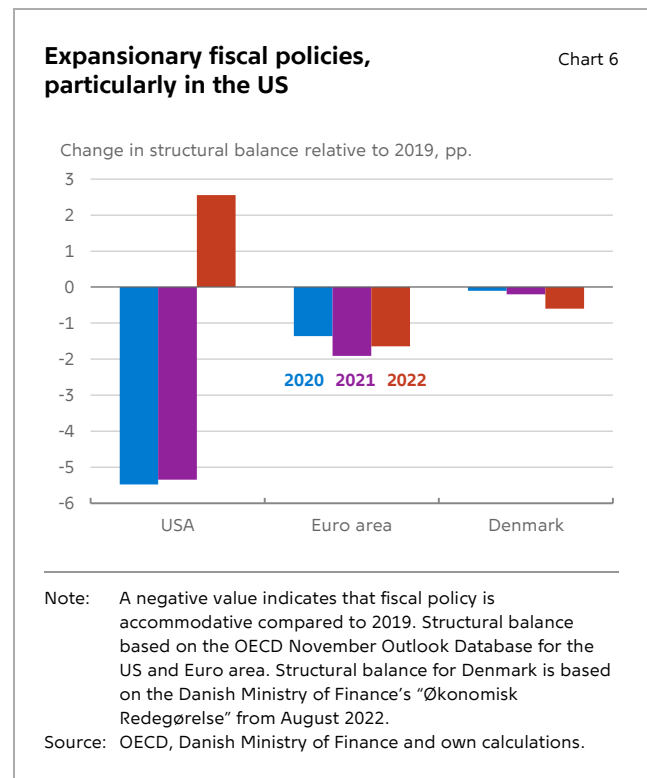
<sup>9</sup> Several euro area countries committed substantial state guarantees and liquidity support. However, this did not directly affect public finances as long as the borrowers remained solvent.

<sup>10</sup> There is a large theoretical literature on the effect of fiscal policy on inflation, see e.g. Sims (2011) and Cochrane (2023). In light of the pandemic, Bianchi and Melosi (2022) argue that fiscal inflation has accounted for approximately half of the recent rise in inflation in the US. Jorda and Nechio (2022) estimate that pandemic fiscal support in the US translated into roughly 2.5 percentage points of additional inflation after 1 year. De Soyres et al (2022) argue that US fiscal



In contrast to the US, fiscal support in Europe was largely aimed at providing replacement income for households and corporations during lockdowns.<sup>11</sup> Individual EU countries provided fiscal stimulus through various forms of compensation schemes, including, for example, a wage compensation scheme in Denmark and the *Kurzarbeit* scheme in Germany. Additionally, the Next Generation EU recovery package announced in May 2020 mitigated market fragmentation in the euro area and contributed to underpinning confidence in the region. However, the grants and loans provided by the fund were spread out over a number of years, and the immediate impact on the economy was relatively modest.<sup>12</sup>

In Denmark, disposable incomes were boosted by the early release of an accumulated and deferred holiday allowance. This amounted to kr. 87.2bn before tax and kr. 52.5bn after tax. The disbursement of holiday pay funds is not reflected in the government's budget balance.



#### ....which supported private consumption

Starting in Q3 2020, consumer goods consumption started to recover, see chart 7. While the recovery was particularly strong in the US, consumption also rose significantly above pre-pandemic levels in Denmark. In the euro area, however, the recovery was more sluggish. These differences are likely to reflect differences in the growth of real incomes. Strong fiscal support in the form of transfers in the US and the disbursement of holiday pay funds in Denmark led to a significant increase in household disposable incomes in the two economies, see chart 8. In contrast, household disposable income in the euro area rose more gradually throughout the period.

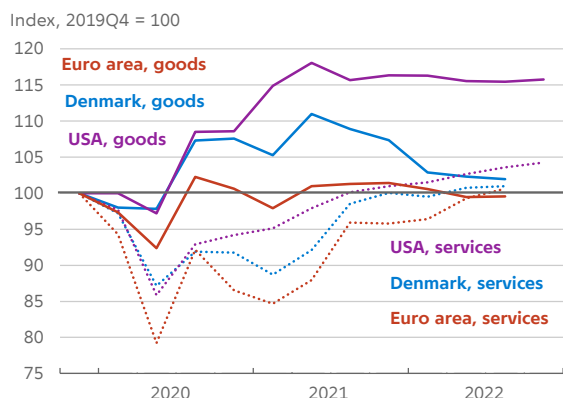
stimulus during the pandemic may have contributed 2.6 percentage points to inflation.

<sup>11</sup> See e.g. Gros (2021).

<sup>12</sup> See ECB (2022a) for an overview of grants and loans offered by the Next Generation EU and their economic impact.



**Strong consumption of goods while services consumption recovered later** Chart 7



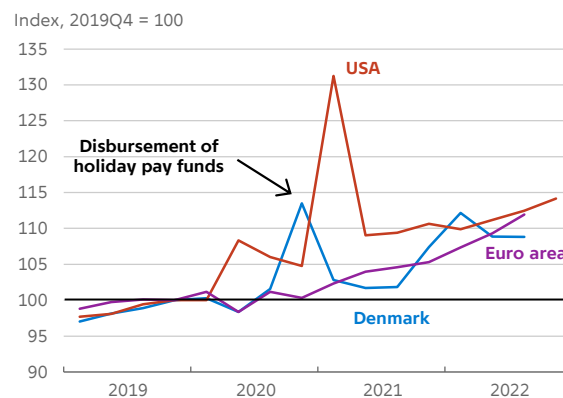
Note: Real consumption. Euro area is a weighted average of Germany, France, Italy and the Netherlands, where the weights are defined as the share of total GDP of the respective country in Q1 2019.

Source: Macrobond and own calculations.

The recovery in the private consumption of services was more sluggish across the three economies. This is likely to reflect that contact intensive services were subject to lockdowns and that the risk of being exposed to contagion affected consumer behaviour. As was the case with goods, the recovery in services consumption was stronger in the US than in Europe. In addition to differences in real incomes, this is likely to reflect the successive lockdowns of the service sectors in Europe with service consumption recovering following re-openings in Q3 2020, Q2 2021 and Q1 2022. In contrast, in the US the consumption of services has increased continuously since Q3-2020.

Sectoral reallocations and global spillovers are likely to have influenced the pick-up in inflation in all three economies. As goods consumption rebounded strongly while the disruption of global supply chains continued, good prices increased sharply in the US starting in 2021, see chart 9.<sup>13</sup> In 2022, goods price inflation also rose significantly in the euro area and

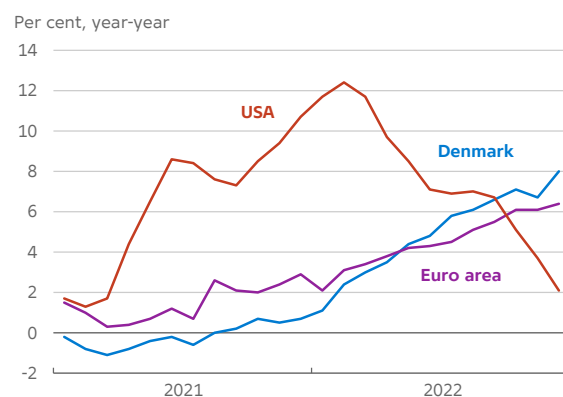
**Large increase in disposable incomes, particularly in the US** Chart 8



Note: The disbursement of a deferred holiday pay allowance has been included in disposable income for Denmark.

Source: Macrobond.

**US goods price inflation likely to have had spill-overs to Europe** Chart 9



Note: Commodities less food and energy commodities for the US. Industrial goods excluding energy for the euro area and Denmark.

Source: Macrobond.

Denmark. The sharp rise in goods prices in the euro area despite domestic demand being relatively muted is likely due to the global nature of goods markets.<sup>14</sup> This is reflected in a high correlation

<sup>13</sup> The sharp drop in US goods inflation during 2022 is partly due to the fact that used cars and trucks accounted for around half of the increase in core inflation in the US during January to July 2021. The large price increases for used cars and trucks dropped out of the year-on-year index during 2022.

<sup>14</sup> See Schnabel (2022c) and Lane (2022b) for a discussion. As mentioned in Box 1, Di Giovanni et. al, (2022) argue that the impact of foreign shocks played a larger role relative to domestic shocks in explaining euro area inflation during Q4-2019 to Q4-2021.

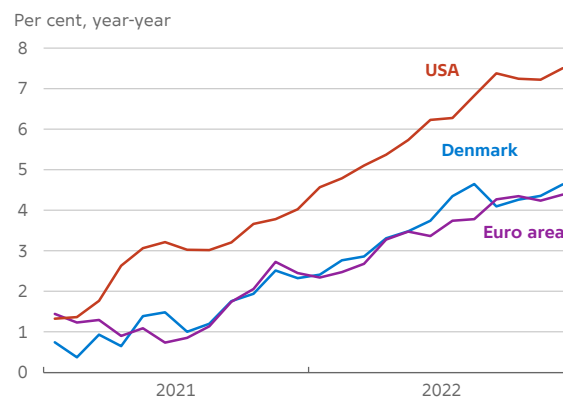
between export prices, import prices and consumer prices of goods in the euro area.

Services price inflation has been substantially higher in the US than in the euro area and Denmark, see chart 10. This is likely partly a reflection of the fact that as a range of services are not internationally traded, the price of services is to a large extent determined by domestic supply and demand. Also, due to services being relatively labour-intensive, unit labour costs is an important determinant of inflation in this sector. This suggests that relatively high wage growth in the US in low-income service jobs, for example in the leisure and hospitality sectors, could explain some of the higher services price inflation in the US. However, even in the euro area and Denmark, services price inflation at the end of 2022 was at its highest since the introduction of the euro in 1999. This is likely in part to reflect that higher energy and food prices add to the costs of producing services. Moreover, as the economies opened up there was substantial pent-up demand for certain services such as those provided by hotels and restaurants. This may have contributed to higher prices, particularly during 2022.

The recovery from the lockdowns illustrates that due to sectoral shifts, aggregate measures of economic slack may be an insufficient indicator of the impact of cyclical factors on inflation, see also BIS (2022a). Goods prices tend to be more flexible than the prices of services. This implies that a strong demand for goods relative to services may lead to higher aggregate inflation, see Ferrante et al (2022). Meanwhile, the shift in demand back to services as lockdowns were lifted may also have added to aggregate inflation. This may for example be the case if the producers of services laid off workers during the downturn and some of these subsequently left the labour force.

Services price inflation is higher in the US than in the euro area and Denmark

Chart 10



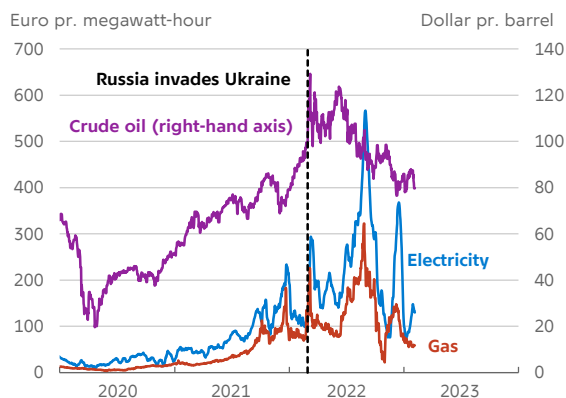
Note: HICP inflation for the Euro area and Denmark. CPI inflation for the US.  
Source: Macrobond.

### **Explanation 3): Sharp increase in energy and commodity prices**

As the economies recovered from the lockdowns, the price of a wide range of commodities rose sharply during 2021, see charts 11 and 12. This reflected strengthening demand as well as the ongoing disruptions to supply chains. Moreover, a period of lower investments in oil and gas production as part of the green transition is likely to have reduced the supply elasticity of energy, thereby contributing to the sharp pick-up in prices, see e.g. Schnabel 2022a.

**European energy prices rose sharply during 2021 and 2022**

Chart 11



Note: The price of electricity refers to the average price on Nord pool, the price of gas is based on TTF Natural Gas, and the USD price of oil per barrel is the Brent crude oil price. All prices are calculated as 14-days moving averages.  
Source: Macrobond and own calculations.

**Food prices rose sharply during 2021 and 2022**

Chart 12



Note: The UN Food and Agriculture World Food Price Index (FPI) index shown in the chart is a measure of the monthly change in international prices of a basket of food commodities.  
Source: Bloomberg.

With prices already higher, the Russian invasion of Ukraine in February 2022 caused a substantial shock to global and not least European energy markets. Russia is the world’s third-largest oil producer and the second-largest producer of natural gas. Whereas oil can be transported across the globe at relatively low cost, gas markets are more regional, with gas from Russia accounting for close to 40 per cent of overall consumption of gas within the EU prior to the invasion. Subsequently, Russia has cut supply, while the European economies have taken measures to gradually reduce their reliance of energy imports from Russia. Together with droughts and other weather-related events, this has substantially affected the energy situation in Europe and contributed to substantially higher prices on electricity and heating across Europe.

The Russian war in Ukraine also contributed to the rise in global food prices as Russia and Ukraine are among the world’s largest producers of food, see chart 12. The rise in food prices was underpinned by

higher energy prices as large quantities of energy are used in the production of food and fertilisers.

The impact of the energy shock was felt most strongly in Europe. The energy component of the HICP index rose 37 per cent in the euro area and 42 per cent in Denmark in 2022. There are two factors behind the somewhat larger increase in energy prices in Denmark. First, in part due to how contracts are formed, the pass-through from wholesale energy prices to retail prices happened faster. Second, government measures aimed at reducing the price of energy facing consumers have played a smaller role in Denmark than in many European countries.<sup>15</sup> The sharp rise in energy prices directly added 3.8 and 3.5 percentage points to inflation in 2022 in the euro area and Denmark, respectively. The larger direct impact on inflation in the euro area reflects the fact that euro area HICP assigns a larger weight to energy.

The sharp rise in energy prices in 2021-22 also affected inflation indirectly by increasing the costs of production.<sup>16</sup> In the euro area, there is evidence of a

<sup>15</sup> For details see Danmarks Nationalbank (2022).

<sup>16</sup> Using euro area data from 2002 to 2022, Corsello (2022) finds a sizable pass-through of higher energy prices to food price inflation and to core inflation from a persistent energy price shock.

faster pass-through of rising producer prices to inflation compared to what has historically been the case, see Lagarde (2022b). The ECB has argued that when inflation is high and supply is constrained, firms can more easily pass on cost increases to customers without losing market share, see Lagarde (2022b).<sup>17</sup> Also, a standard menu cost model of sticky prices would suggest that the large size of the shock makes it more likely to be passed on to consumer prices quickly.

There are indications that unit profits have increased in the US and the euro area, see chart 13.<sup>18</sup> In a high-inflation environment, businesses pay more attention to aggregate price growth and incorporate it into their pricing decisions, see Schwartzman and Ravindranath Waddell (2022). This may have supported unit profits and could be a reason why inflationary pressures have broadened to sectors that were not directly hit by bottlenecks. In the case of Denmark, the rise in unit profits primarily reflects higher profits in energy and transports. Focusing on the non-agricultural private sector excluding utilities and transport, Danish unit profits have been almost constant.

## Factors driving inflation going forward

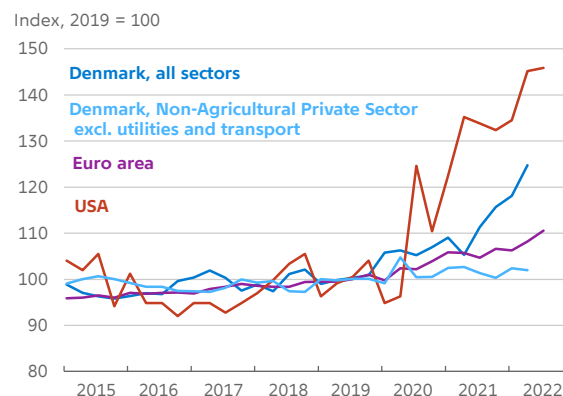
In this section, we summarise the factors that are likely to drive inflation in 2023-24 across the three economies.<sup>19</sup> We split the factors into three:

- More stable energy prices
- Expected slowdown in aggregate demand growth – in part caused by tighter monetary policy
- Improving supply chains

<sup>17</sup> This is supported by recent research by Harding et al (2022) who finds that cost-push shocks propagate more strongly in a high-inflation environment, suggesting that the Phillips curve is non-linear. BIS (2022a) argues that the pass-through of increases in energy and food prices to core inflation is higher in a high-inflation regime.

<sup>18</sup> Brainard (2022) points out that in the US, there is evidence at the sectoral level that margins remain high in areas such as motor vehicles and retail. Schnabel (2022c) argues that many firms in the euro area have been able to expand their unit profits, where the resilience of

**Rising unit profits in the United States contribute to high inflation worldwide** Chart 13



Note: Unit profit is defined as the gross surplus in the national accounts in relation to gross value added in volumes, GVA. The private non-primary sector includes the market part of the economy excluding agriculture, housing, raw material extraction, utilities and transport. Data for the United States refer to non-financial corporations.

Source: Statistics Denmark, Macrobond, OECD, U.S. Bureau of Economic Analysis and own calculations.

To assess the role of the three factors, we report rough and partial estimates of their effect on inflation. We also touch on the key role played by well-anchored inflation expectations in mitigating the risks of a price-wage spiral, and the risk to inflation associated with expansionary fiscal policies in Europe. Importantly, in the long run, assuming that governments stay committed to fiscal solvency, inflation is determined by monetary policy. This suggests that eventually, inflation will settle around 2 per cent as implied by the inflation targets of the Fed and the ECB.<sup>20</sup>

### **Factor 1: More stable energy prices**

In 2023, base effects associated with the sharp rise in energy prices during 2022 will mechanically contribute to a decline in year-on-year inflation rates provided that energy prices do not continue to rise

profits is most evident in those sectors heavily exposed to global conditions such as the industrial and the agricultural sector. Lagarde (2022b) argues that euro area firms have maintained, and in some sectors increased, their profit margins.

<sup>19</sup> For a detailed description of the drivers of Danish inflation and the forecasts of Danmarks Nationalbank, see Danmarks Nationalbank (2022).

<sup>20</sup> Forecasts of the central banks suggest that this is likely to happen during 2025.

at the same pace as last year. Futures markets indicate that while market participants expect energy prices to stay significantly above their pre-2020 levels, they do not expect them to reach the peak seen in 2022, see chart 14. In any case, the likelihood that the world, and in particular Europe, will be facing the same kind of energy price increases in coming years as they did in 2021-22 appears low. Assuming that energy prices will be at their 2022 average, which is in fact above what futures markets are predicting as an average across the different energy sources, this will directly subtract 3.8 and 3.5 percentage points from inflation in the euro area and Denmark, respectively, in 2023.<sup>21</sup>

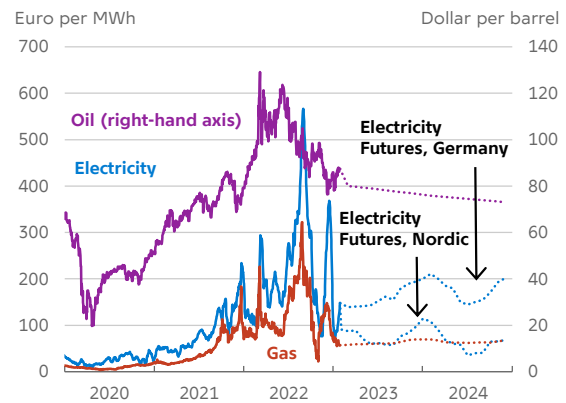
**Factor 2: Expected slowdown in aggregate demand growth – in part caused by tighter monetary policy**

An important driver of the likely decline in inflation is an expected fall in aggregate demand growth across the major economies as reflected in growth forecasts by e.g. the OECD and Danmarks Nationalbank, see chart 15. While China ending its zero-covid policy is likely to support global growth in 2023, growth in the US and Europe is still expected to slow this year. There are two primary reasons for this. First, higher inflation erodes household real incomes in the absence of a marked increase in nominal wages. Second, monetary policy has been tightened significantly across the globe.

Since 2020, real wages have declined markedly in the US, the euro area and Denmark as a consequence of high inflation, see chart 16. This is likely weighing negatively on demand. Note that at the global level, changes to prices are a zero-sum game in the sense that such changes reflect a transfer of wealth from the buyer to the seller. However, different economic agents have different propensities to spend. In the present case, this suggests that the transfer of wealth is likely to contribute to a slowdown in aggregate demand growth as energy companies and their

**Energy prices are likely to be more stable in 2023-24 compared to 2021-22**

Chart 14

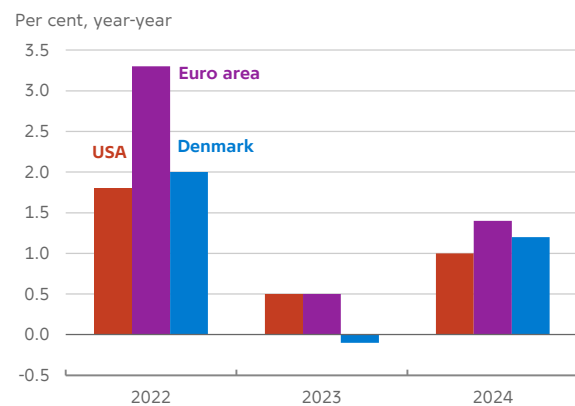


Note: The price of electricity refers to the average price on Nord pool, the price of gas is based on TTF Natural Gas, and the USD price of oil per barrel is the Brent crude oil price. All prices are calculated as 14-days moving averages. Dotted lines indicate futures prices. The chart both illustrates German and Nordic electricity futures.

Source: Macrobond.

**Slower growth ahead**

Chart 15



Source: Forecasts for the US and the euro area are from OECD, (2022). Forecasts for Denmark are from Danmarks Nationalbank (2022).

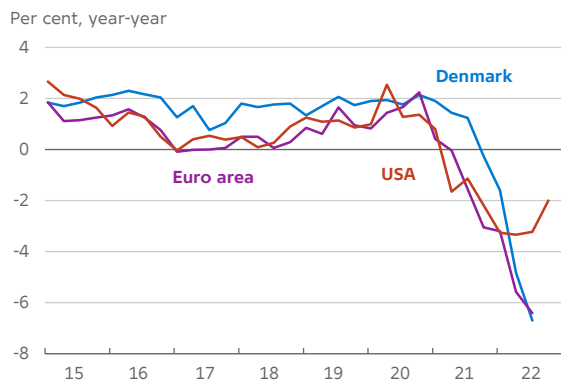
shareholders are likely to have a lower propensity to spend compared to the average household.

<sup>21</sup> As a comparison, in the US, which is a net exporter of energy, energy prices rose by 27 per cent in 2022, which added 2.1 percentage points to inflation. Again, assuming that the average energy prices in the US

will be in line with 2022, this would subtract 2.1 percentage points from inflation this year.

**Real wages have fallen significantly**

Chart 16

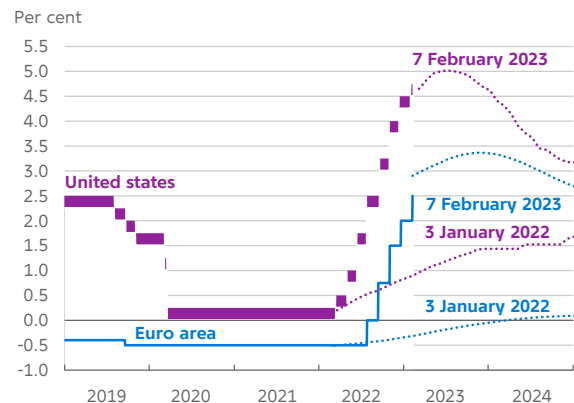


Note: HICP has been used as the price deflator for Denmark and the euro area, whereas CPI has been used as the price deflator for USA.

Source: Macrobond and own calculations.

**Significant monetary tightening from the Fed and the ECB**

Chart 18

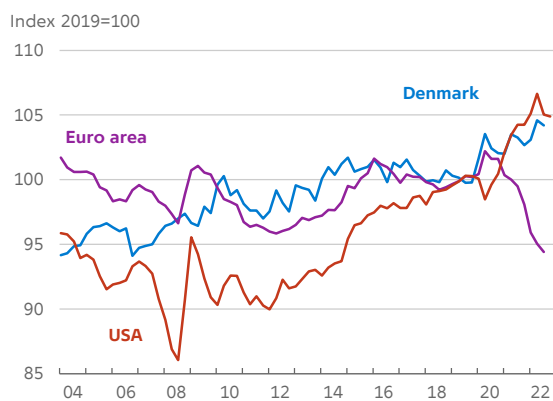


Note: Dotted lines indicate the implicit market expectations of policy rates in the US and the euro area.

Source: Macrobond and Scanrate RIO.

**Terms of trade have improved for the US but deteriorated for the euro area**

Chart 17



Source: Macrobond and own calculations.

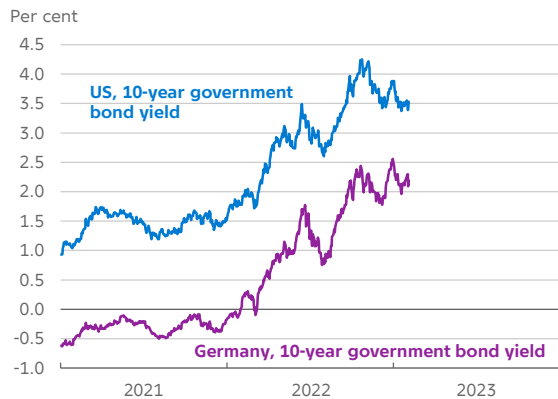
The decline in real wages – and its likely effect on aggregate demand – is greater in the euro area than in the US. This may to some extent be a reflection of the fact that the US is a net exporter of energy whereas the euro area is a net importer. As a consequence, the US has seen an improvement of its terms of trade, whereas the terms of trade of the euro area as a whole declined by 6 percent during 2022, see chart 17. Denmark's terms of trade have

improved since 2020, primarily reflecting higher freight rates as shipping constitutes a substantial share of Danish exports. A country experiencing an improvement of its terms of trade will be able to enjoy a higher real income for a given production of goods and services. However, as suggested above, the impact on aggregate demand depends on the distribution of revenues across different economic agents within each country.

The expectation of a slowdown in demand growth is underpinned by substantial monetary tightening across the world's major central banks. Since late 2021, the Fed and the ECB have tightened monetary policy through a combination of changes to forward guidance, adjustments to the size of bond holdings and increases in policy rates, see chart 18. This has led to higher market yields and a tightening of financial conditions, see chart 19. Due to the exchange rate peg, Danish monetary conditions have tightened in step with monetary conditions of the euro area.

**The Fed and the ECB influenced market rates prior to the rate rises**

Chart 19



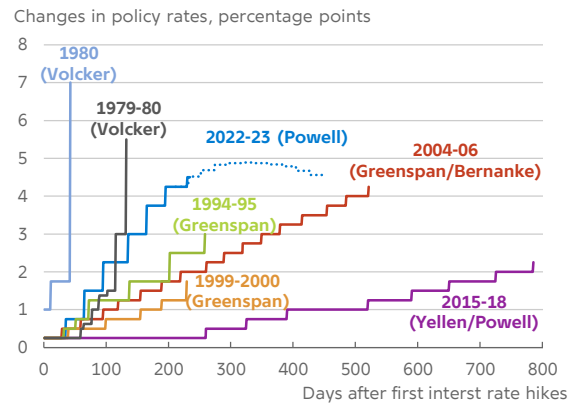
Source: Macrobond.

Recent monetary tightening has been unusually fast in a historical context. The Fed has raised interest rates at the fastest pace since 1980, see chart 20. While the ECB has never raised rates at the current pace, the increases are comparable to those of the Bundesbank in the late 1970s, see chart 21. The rapid tightening of policy should be seen in the context of the elevated levels of inflation relative to central banks' inflation targets as well as the low starting point for interest rates.

While further tightening is likely to be needed in the US as well as in the euro area, there is uncertainty as to exactly how much. The Fed and the ECB have stated clearly that monetary policy needs to move to a restrictive stance.<sup>22</sup> However, the levels that policy rates need to reach in order to be restrictive are unknown. While monetary tightening will tend to dampen inflation over time, its precise effect is uncertain. This relates to the speed of transmission

**The pace of the Fed's rate rises is the fastest since 1980**

Chart 20



Note: Market expectations of Federal Funds rate on 7 February 2023.

Source: Macrobond and own calculations.

as well as to the peak effect on inflation of a given increase in rates.<sup>23</sup> Uncertainty about the future path for policy rates also reflects uncertainty about the drivers of inflation in the years ahead, including the stance of fiscal policy.

Evidence suggest that the Fed's monetary tightening will primarily influence inflation during 2023-24. In her presidential address at the 2023 AEA meeting, Christina Romer estimated that based on historical relationships, the Fed's tightening is likely to dampen inflation by 1.5-2.0 percentage points over the coming years, see Romer (2023).<sup>24</sup> The inclusion of

<sup>22</sup> See e.g. Powell (2022) for the Fed and [Monetary policy decisions \(europa.eu\)](https://www.europa.eu).

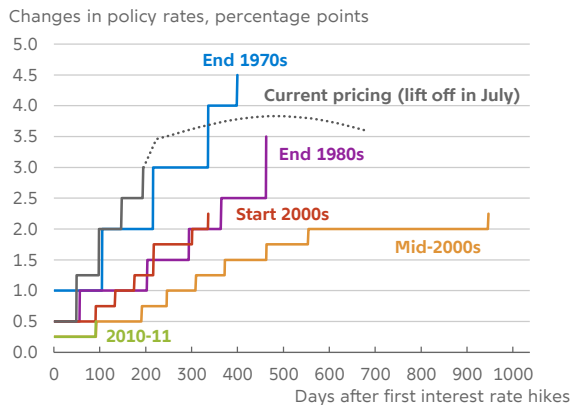
<sup>23</sup> There is a large literature on the effects of monetary policy on the real economy. One strand of the literature analyzes the effect of monetary policy changes through macro data, structural vector-autoregressive (SVAR) models, monetary policy shocks as well as dynamic stochastic general equilibrium models, see e.g. Romer and Romer (2004). A more recent strand of the literature analyses high-frequency identification of monetary policy shocks, see e.g. Gertler and Karadi (2015). Miranda-Agrippino and Ricco (2021) also consider information effects, i.e. the information about the state of the economy disclosed through the policy action. The literature reached substantially different conclusions

in terms of the lags in the effect of monetary policy shocks on the economy as well as the size of the effects.

<sup>24</sup> Romer argues that the Fed's action over the last year constitutes a monetary policy shock, while she estimates that there were no monetary policy shocks between 1988-2016. She identifies that the monetary policy shock in 2022 took place in July. Based on the identification of 10 previous monetary policy shocks between 1946-2016, she argues that inflation typically declines around 1 year after the shock and that the decline in inflation reaches 1.5-2.0 percentage points 2-3 years thereafter. Romer shows that the Fed's action this time has been a little stronger than the average during previous shocks.

**ECB has not previously raised their policy rates this fast**

Chart 21



Note: Periods with rate hikes by Bundesbank and ECB (Bundesbank for the two earliest periods). Dotted grey curve represents the implicit market expectations of the ECB's future deposit facility rate on 7 February 2023 based on the euro-OIS forward curve. The period at the end of the 1970s reflects the first period of rate hikes in that decade.

Source: Macrobond, Thomson Reuters, Scanrate RIO and Danmarks Nationalbank.

forward guidance and balance sheet policy may have shortened the lags in the transmission of monetary policy to inflation since 2009, see Doh and Foerster (2022). They argue that the peak effect on inflation may occur as early as one year after policy is tightened, although uncertainty is high.

For the euro area, analysis by the ECB suggests that the peak impact on inflation of a 1 percentage point shock to the policy rate is reached during the second year following the shock, see Lane (2022a). A suite of models indicates that the change in the short-to-medium term structure of interest and balance sheet expectations between December 2021 and October 2022 is expected to compress inflation in the euro area by more than 1 percentage point in 2024. While differences in economic and financial structures imply that the impact may differ somewhat, tighter financial conditions will also contribute to reducing inflation in Denmark.

Historically, economic recessions have typically been followed by a decline in inflation. Lagarde (2022b) points out that following past euro area recessions

back to the 1970's, headline inflation on average declined by 1.1 percentage points one year afterwards. The equivalent figure for Denmark is 1.25 percentage points, while US recessions have typically been followed by a larger decline in inflation than in the euro area and Denmark. While the international organisations are not forecasting a recession as their main scenario for 2023-24, aggregate demand growth is nevertheless expected to fall substantially.

Taken together, the evidence suggests that monetary tightening and the associated contraction of demand are likely to have a sizeable impact on inflation in 2023-24 in the US, the euro area and Denmark. As the slowdown is in part driven by tighter monetary policy, the impact of tighter monetary policy on inflation cannot simply be added to the impact of the slowdown. Nevertheless, the estimates could be taken as pointing to an impact on inflation of up to 2 percentage points from tighter monetary policy and weaker demand. The fact that the Fed was first to begin tightening policy and has tightened by more than the ECB and Danmarks Nationalbank suggests that the largest downward effect on inflation in 2023 might be seen in the US.

**Factor 3: Supply chains have improved but risks remain**

Alongside a reduction in aggregate demand growth, improving supply chains are likely to contribute to a reduction in inflation. Global supply chains improved during 2022 according to the GSCPI, see chart 3. This trend could continue in the near term as fewer countries are facing the threat of lockdowns. China's ending of its zero-covid policy in December 2022 may result in high infection rates and supply chain disruption over the short term. However, it is likely to reduce the risks of repeated lockdowns in the country over the coming years.

A more fundamental question is whether we are experiencing a long-term shift in the composition of global supply chains. Following the break-down of the Soviet Union and the integration of China into the global economy, economic globalisation thrived and global trade expanded. This accelerated following China's entry into the World Trade Organization in



2001. The increasing trend in global trade appears to have levelled off around the global financial crisis in 2008-09, see chart 22. The pandemic, Russia's war in Ukraine and, in particular, US-China rivalry may lead to a greater focus on security at the expense of efficiency in global value chains. This could trigger a shift towards reshoring and friend shoring where global firms diversify suppliers and focus on obtaining essential inputs from locations they feel confidence in.<sup>25</sup>

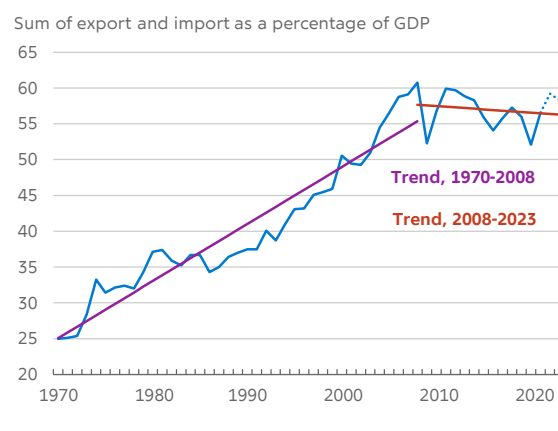
A broader trend towards more regionalized value chains could reduce efficiency, increase costs and slow productivity, thereby adding to inflationary pressures.<sup>26</sup> However, over the coming one to two years, the cyclical drivers behind lower inflation are likely to dominate potential structural reasons for higher inflation. There is evidence that supply related factors accounted for around 35 per cent of HICP core inflation in the euro area in August 2022, see Goncalves and Koester (2022). Based on this result and the fact that global supply chains improved during the latter part of 2022, a further improvement in global supply chains could possibly lower inflation in the euro area and Denmark by 0-1 percentage points.

### ***Modest wage growth but risks of a price-wage spiral***

How economic agents expect inflation to develop will in itself be an important driver of inflation over the next one to two years. While inflation expectations are difficult to measure correctly, we know that the longer inflation remains elevated, the greater is the risk that firms and households start expecting inflation to remain high and that high inflation thereby becomes entrenched. The key channel for

**Global trade has stagnated since GFC**

Chart 22



Note: The chart shows the sum of exports and imports as a percentage of GDP. The dotted line indicates a forecast for 2022-2023 based on data from IMF.  
Source: World Bank (World development indicators) and IMF (World Economic Outlook Database, October 2022).

inflation to become entrenched is via wage setting. If expectations of high inflation lead to higher wage growth, this will further increase production costs and thereby add to inflationary pressures. Below, we therefore discuss measures of inflation expectations as well as indicators of future wage growth.

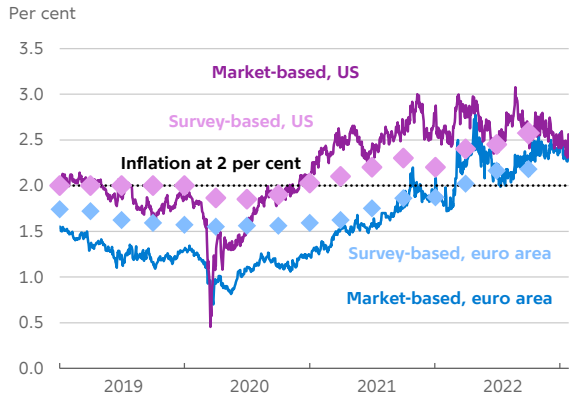
Most of the evidence points to medium and long-term inflation expectations being well-anchored in the US and the euro area. Both market-based and survey-based measures indicate that long-term inflation expectations are close to the Fed's and the ECB's inflation targets of 2 per cent, see chart 23. However, at the three-year horizon, households in the both the US and the euro area expect inflation to remain somewhat higher, although compared to mid-2022, household inflation expectations have fallen back somewhat in the US, see chart 24.

<sup>25</sup> See e.g. Lagarde (2022c). A recent study finds that almost 90 per cent of global firms were expecting to regionalise their production over three years, McKinsey (2021).

<sup>26</sup> In any case, while changes in production structures can affect inflation temporarily, they do not prevent central banks from achieving their 2

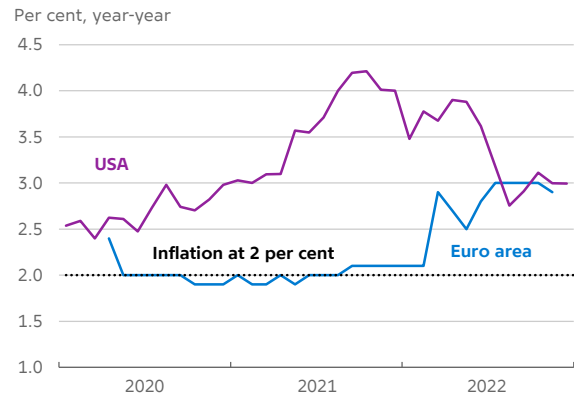
per cent targets in the medium to long run. However, it may imply that the contributions to rising living standards coming from increased globalisation will be put into reverse.

**Long-term inflation expectations are well-anchored** Chart 23



Note: The market-based inflation expectations are based on a 5y-5y inflation swap. The survey-based inflation expectations for the euro area reflect the expectations of inflation in five years in ECB's Survey of Professional Forecasters, while the survey-based inflation expectations of the US reflect the expectations of inflation in the next five to ten years in the Fed's Survey of Professional Forecasters.  
 Source: Refinitiv Eikon and Macrobond.

**Household inflation expectations in the US have fallen recently** Chart 24

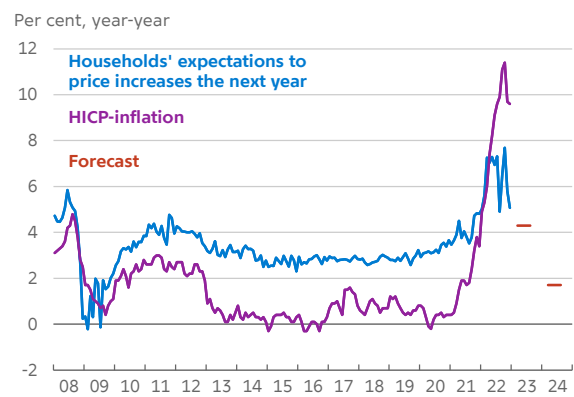


Note: The chart shows the median of the survey-based household expectations of inflation in 3 years.  
 Source: ECB, Federal Reserve Bank of New York and Macrobond.

For Denmark, there is a lack of reliable measures of inflation expectations as the only measure available is household's inflation expectations at the one-year horizon. As of December 2022, Danish households, when weighted according to the difference between actual and their own perceived inflation, on average expect inflation in 2023 to be around 5 per cent, see chart 25. However, households' one-year inflation expectations are volatile and Danish households have typically been overestimating inflation, as the chart illustrates.<sup>27</sup>

A key risk associated with higher inflation expectations is that they may fuel a price-wage spiral. Moreover, employees may seek to make up for the reduction in real wages that they have incurred even if they expect inflation to stabilise going forward. High inflation is reflected in a reduction in the purchasing power power of households in the near term. Going forward, however, purchasing power will

**Household inflation expectations are modestly above the projection from Danmarks Nationalbank** Chart 25



Note: Household questionnaire-based inflation expectations for the next 12 months are weighted by the difference between actual and perceived inflation. This means that households which neither overestimate nor underestimate the actual price increases are given a higher weight. HICP inflation refers to the EU Harmonised Index of Consumer Prices.  
 Source: Statistics Denmark, Macrobond and own calculations.

<sup>27</sup> In December 2022 unweighted expectations mean is at 8.1 per cent and the unweighted perception of current inflation is 20 per cent. This suggests that while the direction in which inflation expectations are

moving may provide useful information, one should be cautious when drawing evidence from the level of household inflation expectations.



inflationary pressures, increasing the risk of a price-wage spiral. This would require more monetary tightening by the ECB in order to avoid prolonging the period of high inflation, see Lane (2022c). In light of this, both the ECB and Danmarks Nationalbank have emphasised that any measures that seek to mitigate the effects of higher energy prices on consumers and firms should be temporary, targeted and tailored.<sup>28</sup> Moreover, as Denmark is experiencing significant capacity pressures, Danmarks Nationalbank has also called for any measures to be accompanied by measures that reduce aggregate demand. Finally, any measures should be non-price distorting in order not to incentivise the consumption of energy.

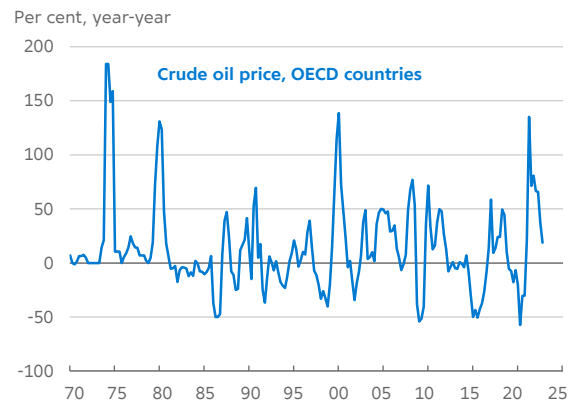
## Comparison to the 1970s

In this final section, we compare the current situation to the experience of the 1970s. The 1970s was the last time that double-digit inflation was seen across a large number of advanced economies. Moreover, just as we have been observing in 2022, rising energy prices played a key role in fueling inflation, see charts 28 and 29. The two oil shocks in the 1970s caused by OPEC's embargo and the Iranian revolution, respectively, influenced oil prices in years thereafter. This was due to the energy shocks being related to persistent geopolitical changes and the fact that the drop in the supply of oil could not be substituted by other suppliers, see e.g. Lagarde (2022c). Today, geopolitical changes are also influencing energy and food prices.

The 1970s were also characterised by expansionary fiscal policies which made it harder for monetary policy to control inflation. In addition, price regulations and subsidies were widespread.<sup>29</sup> There are similarities between the 1970s and the current situation where fiscal policy has been supporting

### The price of oil has increased substantially as in the 1970s...

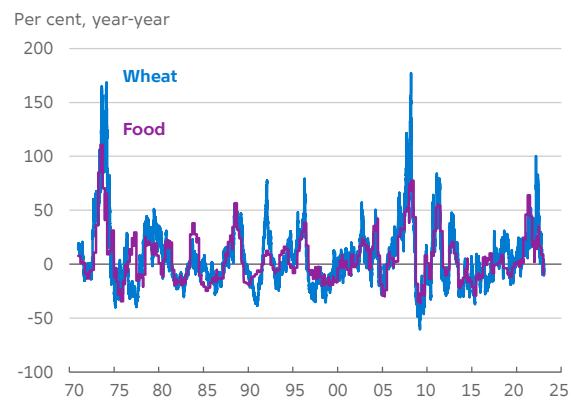
CHart 28



Note: Crude oil price, USD per barrel, spot Brent.  
Source: OECD, Macrobond.

### ... and the same applies for the prices of food and wheat

Chart 29



Note: The Wheat Index is from S&P GSCI while the food index is HWWI.  
Source: S&P, HWWI, OECD and Macrobond.

economic activity in the euro area, and subsidies or tax reductions in the region have been implemented.<sup>30</sup> It is key to restoring price stability that economic policies do not repeat the mistakes of the 1970s.

<sup>28</sup> See e.g. Lagarde (2022b) and Danmarks Nationalbank (2022).

<sup>29</sup> See e.g. Bernanke (2022) for the US, and Hoffmeyer (1993) for Denmark

<sup>30</sup> See e.g. ECB (2022c) and Bruegel (2022).

### Substantial innovations in monetary policy

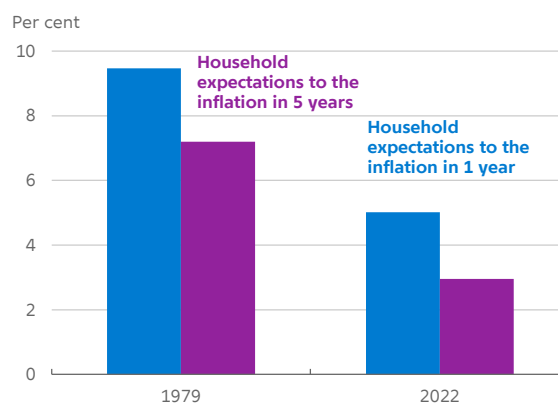
While there are a number of similarities between the current situation and the 1970s, there are also important differences. Crucially, substantial progress has been made in the area of monetary policy as a large number of central banks have adopted explicit inflation targets. Today, the Fed and the ECB both target an inflation rate of 2 per cent. As the Danish krone is pegged to the euro, the inflation target of the ECB also becomes a focal point for inflation in Denmark over the medium to longer run.

The second major advance in monetary policy since the 1970's is the strong move towards central bank independence, which has helped establishing credibility around central banks' commitment to achieving their inflation targets.<sup>31</sup> This is in contrast to the early 1970s. At that time, the independence of the Fed was significantly weakened as Fed chair Arthur Burns was perceived as supporting President Nixon's reelection in 1972 by pursuing expansive monetary policy.<sup>32</sup> Moreover, politicians as well as Fed officials held a cost-push view of inflation whereby monetary policy was viewed as having limited ability to control inflation.

In Europe, while the Bundesbank was highly independent in the 1970's, this was much less the case for the central banks of Italy, Spain and France, see Bernhard (1998). Reflecting the strong independence of the Bundesbank, German CPI inflation averaged approximately 5 per cent in the 1970's, whereas the figure for e.g. Italy was close to 12 per cent. Today, the independence of the ECB is secured by the Treaty of the European Union. In Denmark, monetary stability was lost through the 1970's and the early 1980's when consecutive governments resorted to devaluing the Danish krone against the D-mark. This changed in the years after the shift to a fixed exchange rate regime in 1982, with inflation gradually converging to the levels seen in Germany.<sup>33</sup>

**Differences between now and the 1970s – medium-term inflation expectations are better anchored**

Chart 30



Note: The chart shows annual averages of survey-based inflation expectations from University of Michigan's consumer survey.

Source: Macrobond and own calculations.

As a clear symptom of the move towards central bank independence and commitment to price stability, US inflation expectations have remained much lower than in the 1970s as illustrated in chart 30. High inflation expectations towards the end of the 1970s were also likely to reflect that inflation had been high for a long time. This highlights the importance of getting inflation down in order to ensure that inflation expectations remain anchored.

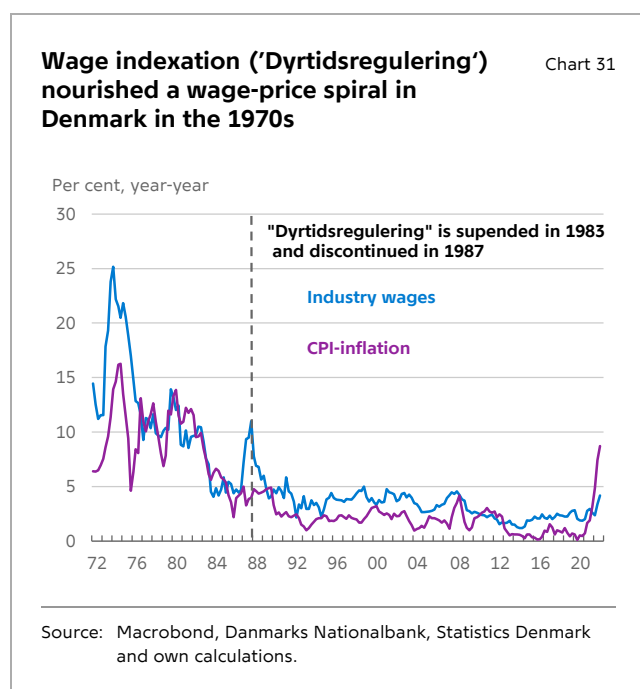
### Further differences between now and the 1970's

In addition to innovations in monetary policy, labour market structures have changed since the 1970's. Importantly, the use of wage indexation has become much less widespread across countries, see BIS (2022b). Wage indexation implies that an increase in prices is automatically reflected in a pick-up in wages, thereby adding to the risk that a pickup in inflation will translate into a price-wage spiral. In Denmark, wage indexation – the so-called 'dyrtidsregulering' – helped nourish a wage-price spiral through the 1970s and early 1980s, see chart 31. This was suspended in

<sup>31</sup> See e.g. Eijffinger and De Haan (1996) for evidence of the consequences of central bank independence for inflation.

<sup>32</sup> See Bernanke (2022) for a description of Fed policy in the 1970s.

<sup>33</sup> See Spange (2022) for an introduction to the role of monetary and fiscal policy in a fixed exchange rate regime.



1983 and later discontinued. In the euro area, only 3% of private sector employees currently have their wages and minimum wages automatically indexed to inflation, see Koester and Grapow (2021).

The absence of wage indexation in the current period of high inflation is clearly reflected in real wages. The decline in real wages in 2022 in Denmark is the largest for many decades. This is a significant difference compared to the 1970s, when real wage growth was positive from 1970-1976 in spite of elevated levels of inflation, see Hoffmeyer (1993). As mentioned earlier, the large drop in real wages in 2022 across the advanced economies mitigates the risk of a price-wage spiral as long as wage expectations are not backward-looking, see IMF (2022a).

The conduct of fiscal policy has also improved. Any credible monetary policy regime is dependent on public finances being sustainable in the long run. Otherwise, pressure for monetary financing might emerge. It has been discussed whether concerns about fiscal solvency may have played a role in connection with the high inflation levels in a number of European economies in the 1970s although the

evidence is not conclusive.<sup>34</sup> Today, a fiscal framework is in place within the European Union, and monetary financing is prohibited by the treaties.

## References

- Adrjan, Pawel and Reamonn Lydon, 2022, Wage Growth in Europe: Evidence From Job Ads, Central Bank of Ireland, Economic Letter, No. 7.
- Benigno, Gianluca, Julian di Giovanni, Jan J. J. Groen and Adam I. Noble, 2022, A New Barometer of Global Supply Chain Pressures, Federal Reserve Bank of New York.
- Bernanke, Ben S., 2022, 21st Century Monetary Policy: The Federal Reserve from the Great Inflation to Covid-19, W.W. Norton & Company.
- Bernhard, William (1998), A political explanation of Variations in Central Bank Independence, *The American Political Science Review*.
- Bess, Mikkel and Saman Darougheh, 2021, Three lessons from the Danish wage compensation scheme, Danmarks Nationalbank, Economic Memo No. 5.
- Bianchi, Francesco and Leonardo Melosi, 2022, Inflation as a Fiscal Limit, presented at the Jackson Hole Economic Symposium.
- BIS, 2022a, Inflation: A look under the hood, Annual Economic Report, June.
- BIS, 2022b, Are major advanced economies on the verge of a wage-price spiral? *BIS Bulletin*, no. 53.
- Borgensgaard, Pernille V., 2022, Job retention during the Covid-19 pandemic, Danmarks Nationalbank, Working Paper No. 186.

<sup>34</sup> See e.g. Gaiotti and Secchi (2012) for an assessment of the role of fiscal dominance in Italy in the 1970s.

- Brainard, Lael, 2022, Bringing Inflation Down, speech at The Clearing House and Bank Policy Institute Annual Conference.
- Bruegel, 2022, Dataset, National fiscal policy responses to the energy crisis, [National fiscal policy responses to the energy crisis \(bruegel.org\)](https://bruegel.org/publications/dataset-national-fiscal-policy-responses-to-the-energy-crisis)
- Cochrane, John H., 2023, The Fiscal Theory of the Price Level, Princeton University Press.
- Corsello, Francesco, 2022, Pass-throuth of energy prices to inflation in the euro area: implications for current modelling practices?, presentation at the SUERF workshop on Challenges and recent advances in modelling and forecasting inflation.
- Dall’Orto Mas, Rodolfo, Benjamin Vonessen, Christian Fehlker and Katrin Arnold, 2020, The case for central bank independence, ECB Occasional Paper no. 248.
- Danmarks Nationalbank, 2022, Outlook for the Danish Economy – the Pressure on the Economy Should be Eased, Analysis No. 11.
- de Soyres, Francois, Ana Maria Santacreu, Henry Young, 2022, Demand-Supply imbalance during the Covid-19 pandemic: The role of fiscal policy, Board of Governors of the Federal Reserve System, International Finance Discussion Papers, number 1353.
- Di Gioavnni, J., S. Kalemli-Özcan, A. Silva, M. Yildrihom, 2022, Global supply chain pressures, international trade and inflation, NBER working paper No. 30240.
- Doh, Taeyoung and Andrew T. Foerster, 2022, Have lags in Monetary Transmission Shortened?, Federal Reserve of Kansas City Economic Bulletin.
- ECB, 2022a, The economic impact of Next Generation EU: a euro area perspective, Occasional Paper Series No. 291.
- ECB, 2022b, Macroeconomic projections, December 2022
- ECB, 2022c, Fiscal policy implications of euro area countries’ 2023 draft budgetary plans, ECB Economic Bulletin, Issue 8/2022.
- Eijffinger, Sylvester C. W. and Jakob De Haan, 1996, The Political Economy of Central-Bank Independence, Special Papers in International Economics, No. 19, Princeton University, May.
- Emmons, William R., 2022, Measuring the Fed’s Monetary Policy Stance during Covid-19, Federal Reserve Bank of St. Louis Regional Economist, 14 April.
- Ferrante, Fancesco, Sebastian Graves and Matteo Iacoviello, 2022, The Inflationary Effects off Sectoral Reallocation, Federal Reserve Board of Governors, unpublished manuscript.
- Gaiotti, Eugenio and Alessandro Secchi, 2012, Monetary policy and fiscal dominance in Italy from the early 1970s to the adoption of the euro: a review, Banca d’Italia, Occasional Papers, no. 141.
- Gertler Mark, Peter Karadi, 2015, Monetary Policy Surprises, Credit Costs, and Economic Activity, American Economic Journal: Macroeconomics, Vol. 7, No. 1, January 2015.
- Goncalves, Eduardo and Gerrit Koester, 2022, The role of demand and supply in underlying inflation – decomposing HICPX inflation item by item, ECB Economic Bulletin, Issue 7, Box 7.
- Gros, Daniel, 2021, Recovering from Covid-19: A Transatlantic Comparion of Fiscal Policy, Intereconomics, Review of European Economic Policy, Volume 56, 2021, number 4.
- Harding, Martin, Jesper Linde and Mathias Trabandt, 2022, Understanding post-covid Inflation Dynamics, paper presented at the conference on ‘Inflation: Drivers and Dynamics, organised by the Federal Reserve Bank of Cleveland and the ECB.
- Hoffmeyer, Erik, 1993, Dansk Pengehistorie, Bind 5, 1965-1990, Danmarks Nationalbank (in Danish only).

Holston, Kathryn, Thomas Laubach and John C. Williams, 2017, Measuring the national rate of interest: International trends and determinants, *Journal of International Economics* 108, s. 59-75.

IMF, 2022a, Wage Dynamics Post-Covid-19 and Wage-Price Spiral Risks, *World Economic Outlook*, October, Chapter 2.

Jensen, Jacob Roager, Jakob Guldbæk Mikkelsen and Morten Spange, 2017, The ECB's unconventional monetary policy and the role of exchange rate regimes in cross-country spillovers, *Danmarks Nationalbank*, working paper No. 119.

Jordá, Oscar and Fernando Nechio, 2022, Inflation and Wage Growth Since the Pandemic, *Federal Reserve Bank of San Francisco*, working paper 2022-17.

Koester, Gerrit and Helen Grapow, 2021, The prevalence of private sector wage indexation in the euro area and its potential role for the impact of inflation on wages, Box 7 in *ECB Economic Bulletin*, Issue 7.

Lagarde, Christine, 2022a, Hearing of the Committee on Economic and Monetary Affairs of the European Parliament

Lagarde, Christine, 2022b, Monetary policy in a high inflation environment: commitment and clarity, Lecture organised by Eesti Pank and dedicated to Professor Ragnar Nurkse.

Lagarde, Christine, 2022c, Monetary policy in the euro area, Karl Otto Pöhl Lecture organised by Frankfurter Gessellschaft für Handel, Industrie und Wissenschaft.

Lane, Philip R., 2022a, The transmission of monetary policy, speech at the SUERF, CGEG|COLUMBIA|SIPA, EIB, SOCIÉTÉ GÉNÉRALE conference on "EU and US Perspectives: New Directions for Economic Policy".

Lane, Philip R., 2022b, Inflation Diagnostics, Blog post at The ECB Blog.

Lane, Philip R., 2022c, Monetary Policy and the Economic Outlook, Interview with *Milano Finanza*.

Lane, Philip R., 2022d, Monetary policy during the pandemic: the role of the PEPP, Speech at the International Macroeconomics Chair Bank of France – Paris School of Economics.

Mckinsey, 2021, How Covid-19 is reshaping supply chains.

Miranda-Agrippino, Silvia and Giovanni Ricco, 2021, The Transmission of Monetary Policy Shocks, *American Economic Journal: Macroeconomics*, Vol. 13, No. 3.

OECD, 2022, *Economic Outlook*, Issue 2.

Pizzinelli, Carlo and Ippei Shibata, 2022, Has COVID-19 Induced Labor Market Mismatch? Evidence from the US and the UK, *IMF Working Paper* No. 22/5.

Powell, Jerome H., 2022, Inflation and the Labor Market, speech at the Hutchins Center on Fiscal and Monetary Policy, *Brookings Institution*, November.

Romer, Christina D. and David H. Romer, 2004, A New Measure of Monetary Shocks: Derivation and Implications, *American Economic Review*, Vol. 94, No. 4.

Romer, Christina D., 2023, Does Monetary Policy Matter? The Narrative Approach after 35 years, *AEA Presidential Address*.

Schnabel, Isabel, 2022a, Monetary policy and the Great Volatility, speech at the Jackson Hole Economic Policy Symposium organised by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming.

Schnabel, Isabel, 2022b, Finding the right mix: monetary-fiscal interaction at times of high inflation, keynote speech and the Bank of England Wachters' Conference.

Schnabel, Isabel, 2022c, The globalisation of inflation, speech at a conference organised by the



Österreichische Vereinigung für Finanzanalyse und  
Asset Management, Vienna.

Schnabel, Isabel, 2022d, Reconciling the macro and  
micro evidence on the effects of monetary policy,  
Welcome address at the seventh ECB Annual  
Research Conference.

Schwartzman, Felipe F. and Sonya Revindranath  
Wadell, 2022, Are Firms Factoring Increasing Inflation  
Into Their Prices, Federal Reserve Bank of Richmond,  
Economic Brief, No 22-08.

Shapiro, Adam Hale, 2022, How Much Do Supply and  
Demand Drive Inflation?, FRBSF Economic Letter,  
2022-15.

Sims, Christopher A. 2011, Stepping on a rake: The  
role of fiscal policy in the inflation of the 1970s.  
European Economic Review, 55(1): 48-56.

Spange, Morten, 2022, Monetary and fiscal policy in  
Denmark, Danmarks Nationalbank, Analysis No. 12.

Woodford, Michael, 2003, Interest and Prices,  
Princeton University Press.

## PUBLICATIONS



### NEWS

News offers quick and accessible insight into an Analysis, an Economic Memo, a Working Paper or a Report from Danmarks Nationalbank. News is published continuously.



### ANALYSIS

Analyses from Danmarks Nationalbank focus on economic and financial matters. Some Analyses are published at regular intervals, e.g. *Outlook for the Danish economy* and *Financial stability*. Other Analyses are published continuously.



### REPORT

Reports comprise recurring reports and reviews of the functioning of Danmarks Nationalbank and include, for instance, the *Annual report* and the annual publication *Danish government borrowing and debt*.



### ECONOMIC MEMO

An Economic Memo is a cross between an Analysis and a Working Paper and often shows the ongoing study of the authors. The publication series is primarily aimed at professionals. Economic Memos are published continuously.



### WORKING PAPER

Working Papers present research projects by economists in Danmarks Nationalbank and their associates. The series is primarily targeted at professionals and people with an interest in academia. Working Papers are published continuously.

---

DANMARKS NATIONALBANK  
LANGELINIE ALLÉ 47  
DK-2100 COPENHAGEN Ø  
WWW.NATIONALBANKEN.DK

Danmarks Nationalbank's Economic Memos are published at [www.nationalbanken.dk](http://www.nationalbanken.dk). A free electronic subscription is also available at the website. The subscriber receives an e-mail notification whenever a new Economic Memo is published.

Text may be copied from this publication provided that the source is specifically stated. Changes to or misrepresentation of the content are not permitted.

Please direct any enquiries directly to the contributors or to Danmarks Nationalbank, Communications, [Kommunikation@nationalbanken.dk](mailto:Kommunikation@nationalbanken.dk).



**DANMARKS  
NATIONALBANK**