I. Euro area inflation shaped by two years of COVID-19 pandemic

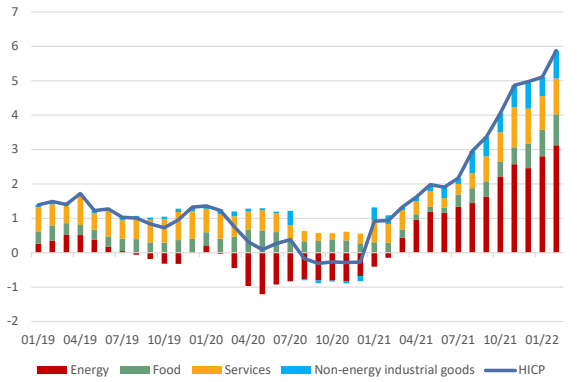
By Christian Buelens and Vaclav Zdarek

Abstract: *This section reviews inflation in the euro area over the 2 years that followed the outbreak of the COVID-19 pandemic and prior to the military aggression of Russia against Ukraine. In line with many key economic indicators, inflation has been very volatile, falling to multi-year lows following the outbreak of the pandemic, before increasing to multi-decade highs at an unexpectedly rapid pace. The pandemic has caused various supply and demand shocks – both aggregate and idiosyncratic in nature. These shocks hit the global economy with varying intensity – both across time, as the health crisis evolved, and across sectors, depending on how contact-intensive they are. The shocks, and the substantial policy response put in place to cushion their impact, have played a key role in overall and relative price movements over the past 2 years. The section assesses and discusses how large swings in commodity prices (particularly energy), disruptions to the supply side of the economy, and compositional shifts in demand towards spending on goods have impacted prices and inflation. It also illustrates the high degree of uncertainty that remains about the short-term outlook for inflation and how this may affect views on longer-term inflation ([1]).*

I.1. Introduction

The 2 years following the outbreak of the COVID-19 pandemic were marked by high volatility in the economy, including in relation to price developments ([2]). Inflation varied greatly during the pandemic, falling to multi-year lows following the outbreak of the pandemic, before increasing to historical highs at an unexpectedly rapid pace (Graph I.1). With the benefit of (some) hindsight, this section reviews the drivers and stylised facts of euro area inflation during that period. It studies the relative impact of disruptions directly resulting from the public health shock and the strong economic policy response to cushion the pandemic's short- and long-term effects (see Box I.1 for a simple conceptual framework). It also offers some considerations on the inflation outlook directly based on the experience of the pandemic.

Graph I.1: **Euro area inflation (% year-on-year (yoy) and percentage point (pp) contributions, January 2019 to February 2022)**



Source: Eurostat

I.2. Inflation dynamics during the pandemic

The inflation path since the beginning of the pandemic can be split into two phases, running until the end of 2020 and starting in 2021, respectively. The transition from the first phase to the second notably coincides with the roll-out of vaccination campaigns, which started in early 2021 and charted practical paths for exiting from the pandemic and for economic recovery.

([1]) The authors wish to thank an anonymous reviewer for useful comments. Box I.2 was prepared by Aron Kiss and Anneleen Vandeplas. This section represents the authors' views and not necessarily those of the European Commission.

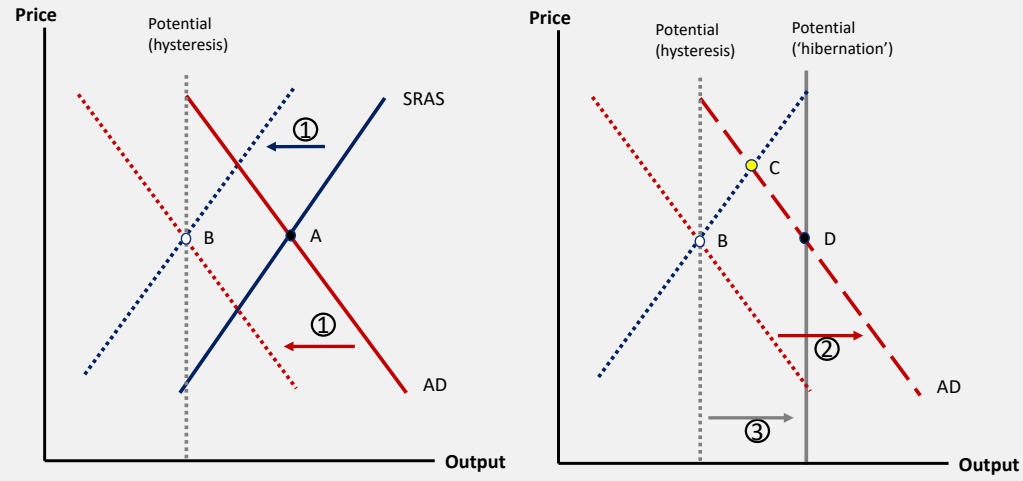
([2]) This section covers the period until end February 2022 and hence includes the start of the military aggression of Russia against Ukraine at the end of that month. This section refers to the impact of the aggression where necessary, but otherwise remains focussed on the pandemic. Readers interested in assessments of the economic impact of the Russian war of aggression against Ukraine on the EU economy, are invited to consult the European Commission's regular publications, in particular the forecast documents.

Box I.1: The effects of the pandemic on prices: a simple framework

This box discusses the effects of the pandemic on prices using a simple aggregate supply-aggregate demand (AS-AD) framework (see Graph A). The COVID-19 pandemic has been an unprecedented global health crisis, which has been met with an equally unprecedented and forceful policy response. While medical progress (e.g. vaccines or medical treatments) and behavioural (non-pharmaceutical) adjustments should help to overcome it, the deep recession triggered by the pandemic nonetheless has had the power to force permanent changes upon consumer habits and economic structures (1).

From a macro-economic perspective, the pandemic was an adverse exogenous shock (i.e. unrelated to the state of the economy), which has affected both supply and demand, often in an interrelated manner (2). The disease itself, fears of contracting it, and overall uncertainty in identifying the nature of the shock as a temporary or permanent one, initially led to a sharp contraction in activity. In line with the life-cycle hypothesis, this triggered higher precautionary savings and a drag on the general price level (i.e. a leftward shift of the AD schedule). On the supply side, the temporary suspension of production, notably because of non-pharmaceutical interventions to curb the spread of the virus (e.g. lockdowns), lowered effective supply, generating forced savings (for a given income stream). In turn, this exerted upward pressures on the general price level (i.e. a leftward shift of the AS schedule). While the pandemic's impact on activity was thus unambiguously negative, with the two shocks reinforcing each other, their respective impacts on the aggregate price level appear to have been mutually offsetting (illustrated by point B in the chart).

Graph A: Stylised framework: pandemic shock, policy response and hibernation



Note: at outbreak of the pandemic, economy is at A; pandemic jointly shifts both short run aggregate supply (SRAS) and AD (1) to left: at point B, output is unambiguously lower, price effect unclear; policy support offsets shift in AD (2) at least partially and ensures stability (hibernation) of long-run aggregate supply (LRAS) (3); in short/medium run, policy cannot shift AS to the right and economy moves to C: lower output than before the pandemic, higher prices; economy expected to eventually settle at a point D.

This health shock was countered by an unprecedented economic policy reaction (in the monetary, fiscal and financial policy areas) to both mitigate the adverse demand shock and minimise long-term scarring (hysteresis) of productive capacity, in an effort to put (segments of) the economy into a state of hibernation.

(1) Ball, *Long-term damage from the Great Recession in OECD countries*, European Journal of Economics and Economic Policies: Intervention. 2014 Sep 1;11(2):149-60.
(2) Guerrieri, Lorenzoni, Straub and Werning, *Macroeconomic Implications of Covid-19: Can Negative Supply Shocks Cause Demand Shortages?*, American Economic Review, 2022 (forthcoming).

(Continued on the next page)

Box (continued)

On the demand side, for example, reliance on job-retention schemes safeguarded incomes and employment, thus reducing household uncertainty and the need for precautionary savings. Lockdowns imposed for public health purposes precluded short-term stimulation of production, implying a constraint on effective supply and irrevocable losses of production. However, policy support measures appear to have succeeded so far in sheltering the economy from large hysteresis effects ([3]). In the short run, however, the combination of constrained measures to stabilise supply and demand has implied an upward effect on prices, as illustrated by point C in the chart. This approximately corresponds to a situation of recovering demand in a context of prevailing supply bottlenecks, which generates an upward price push, as has been observed in many economies in the reopening phase (see subsection 4).

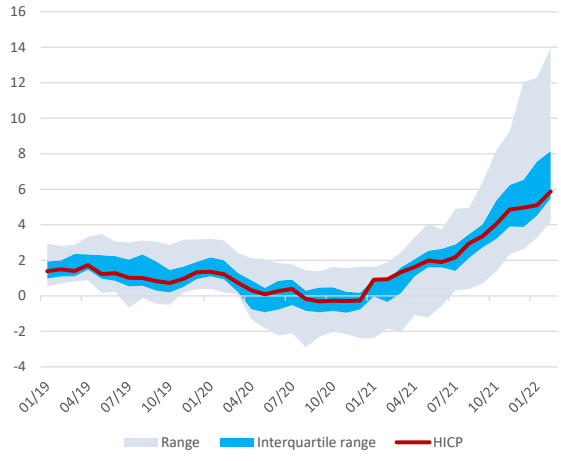
Meanwhile, in the longer run, the successful preservation of economic potential should ensure that the release of supply restrictions would enable the economy to move to a point D, with higher output and eventually lower prices. Importantly, in this comparative statics analysis, point C is a transitory episode in the economy's path from A to D. In the short run, point B is the counterfactual to the observed point C, where the price level would be lower, albeit at the expense of lower output. Likewise, with hysteresis effects, point B represents the long-run counterfactual to the targeted point D. While the implications for the price level would be ambiguous, this counterfactual would indisputably feature lower potential output, as shown by the dotted vertical LRAS curve.

This framework is necessarily a simplification, but it is a useful support in framing the analysis of price developments during the pandemic. A first significant limitation concerns the aggregate perspective, as it overlooks the unprecedented asymmetric effect of the pandemic across sectors, some of which saw demand increase (e.g. consumer electronics) or were lockdown-immune, given the possibility for employees to work remotely. Secondly, while the framework can be used for comparative statics, it does not show lagged and unsynchronised effects of the various shocks. Both limitations are elaborated on in subsections 4 and 5.

([3]) Policy support has suppressed some traditional cyclical relationships. Job-retention schemes, for example, 'broke' Okun's law by ensuring that the large drop in GDP did not translate into a proportional rise in unemployment. Likewise, liquidity support and the suspension of bankruptcy provisions have resulted in a 'bankruptcy gap', i.e. the non-materialisation of insolvencies that would typically be associated with a drop in activity of the observed magnitude (see Banerjee, Noss and Vidal Pastor (2021), *Liquidity to solvency: transition cancelled or postponed?*, BIS Bulletin March 2021).

In the first phase, the economic collapse was marked by falling prices, with inflation decelerating in all euro area countries and dipping into negative territory in 15 out of the 19 countries. From July to December 2020, aggregate prices in the euro area contracted for 5 consecutive months, matching an equally long period of contraction in 2009 after the global financial crisis (GFC). By contrast, the second phase, starting in 2021, was characterised by surprisingly vigorous inflation, culminating at a historical high of 5.9% in February 2022. The extent and speed of this rise came as a surprise, repeatedly exceeding both institutional and market forecasts throughout the year (see below).

Graph I.2: **Intra-euro area inflation dispersion (% yoy, January 2019 to February 2022)**

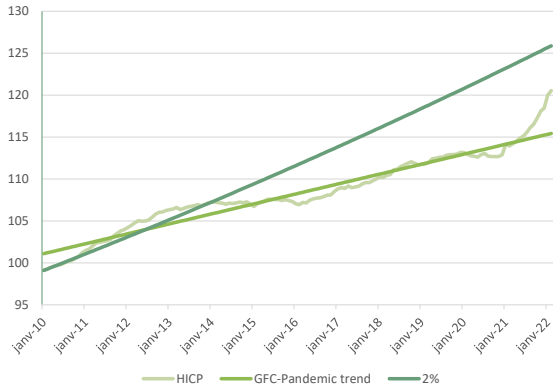


Note: the interquartile range shows the middle 50% of the sample.
Source: Eurostat, own calculations

To a large extent, this profile of inflation was shaped by energy prices, which dragged inflation down into negative territory in the second half of 2020, before substantially pushing it back up as of early 2021 (Graph I.1). However, price changes for non-energy industrial goods and services, have also been noteworthy. Non-energy industrial goods started to play a significant part in increasing headline inflation in 2021. The impact of services on headline inflation declined in 2020 before increasing again substantially at the end of 2021. Both non-energy industrial goods and services are discussed in more detail below.

The dynamics of euro area inflation are generally also apparent across individual Member States. While inflation dispersion picked up at the end of 2021 (Graph I.2), this primarily reflects the uneven impact of strong increases in oil and gas prices. The pandemic has not only led to higher inflation volatility ([3]), it also marks a clear break from the 'lowflation' period that followed the GFC, during which inflation remained persistently below the intended 2% path (Graph I.3) ([4]). Even with the elevated rates of inflation observed since mid-2021, the aggregate price level remains far below the one that would have corresponded to an annual price growth of 2% since the GFC, in line with the inflation target.

Graph I.3: **Medium-term HICP trend (January 2010 to February 2022)**



Note: HICP is seasonally adjusted. The trend is estimated from 2010 to 2019 (2010=100).
Source: Eurostat, own calculations

I.3. Commodity price swings and their impact on inflation

High price volatility is a distinctive trait of energy commodities. Nonetheless, the price swings during the pandemic were remarkable. The onset of the pandemic – and with it the bleaker growth prospects, lockdowns, drop in aggregate demand and mobility – led to a fall in demand for energy commodities. Oil demand in particular collapsed, while supply initially remained robust, as oil producers failed to agree on production cuts. With storage capacities approaching their limits, oil prices nosedived to all-time lows in April 2020. The West Texas Intermediate (WTI) crude oil price even turned negative for a day, a first in its history ([5]).

As global demand rebounded with the economic reopening that followed the first lockdowns and the more successful virus containment strategies, energy commodity prices strongly recovered from the mid-2020 troughs. Many commodities returned to or exceeded pre-pandemic prices, often climbing to multi-year highs. As an example, in January 2022 crude oil was trading 25% above its pre-pandemic price levels.

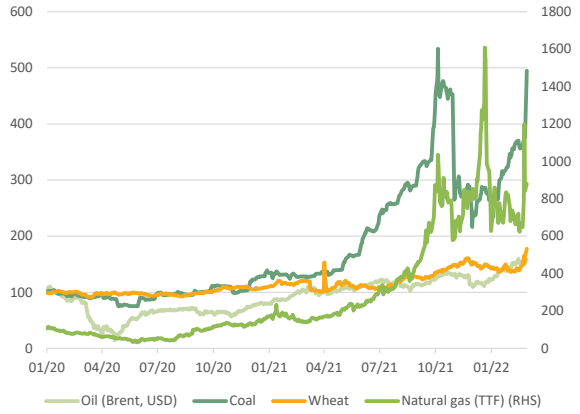
([3]) Several coinciding factors further amplified inflation volatility. These factors were either directly related to the pandemic (e.g. temporary changes in value added tax rates and shifts in seasonal sales periods) or were inherent to the way inflation is measured (e.g. revisions of the Harmonised Index of Consumer Prices (HICP) weights or imputation of prices). The relative importance of those factors has varied across countries.

([4]) Between 2010 and 2019, inflation averaged 1.4%. Between 2014 and 2019, inflation averaged 0.9%. Following its monetary strategy review, the ECB adopted a symmetric inflation target of 2% in July 2021, implying that negative and positive deviations from target being equally undesirable. Before this, the ECB had been aiming for inflation to be below, but close to 2%.

([5]) Naturally, low energy prices were of limited benefit to consumers, who at the time were generally under lockdown. Moreover, low prices dissuaded investment in the energy sector, a large share of which is solely aimed at upholding existing levels of supply (International Energy Agency, *Oil Market Report*, April 2020). This potentially drove up production costs and prices after the lockdown. In addition, temporary closures of oil fields and refineries triggered by the fall in demand were costly in their own right.

Still, a number of idiosyncratic factors – both geographic and commodity-specific, and not always directly associated to the pandemic – added to what had otherwise been a largely global price pattern. This is notably the case for natural gas prices in Europe, which have skyrocketed since the second half of 2021. While related to the tight global market for gas, upward pressure on wholesale gas prices was further accentuated by lower than expected gas supplies from Russia. This took place in a context of: (i) escalating geopolitical tensions that led to the Russian attack on Ukraine in February 2022; (ii) low gas stocks; and (iii) weather-related disruptions to renewable energy production. Two other factors also played a role – albeit a less significant one – in the high gas prices: infrastructure maintenance and higher carbon prices. Accordingly, gas prices in early 2022 were seven times higher than before the pandemic hit.

Graph I.4: **Prices of selected commodities, January 2020 to February 2022 (January 2020=100)**

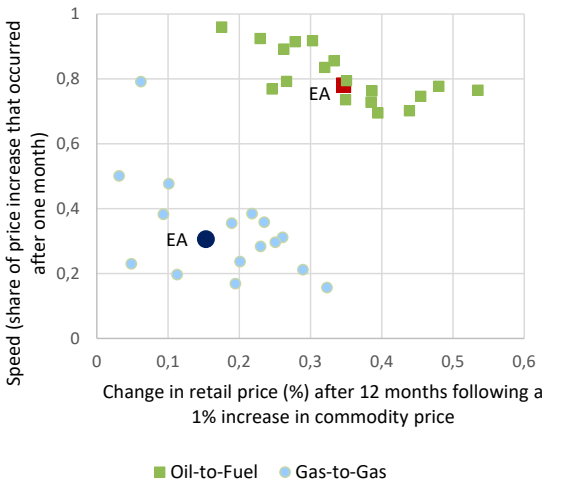


Source: IHS Markit

These swings have shaped consumer price developments. Households have been affected as direct purchasers of energy (e.g. for transport fuel or heating), the demand for which is typically inelastic. They have also been affected indirectly, as energy is a key input in production and hence represents a cost for firms in other sectors. As energy is a necessary good, price changes have significant income effects for households, and consequently affect the demand for – and price of – other consumption goods or services.

The time it takes for changes in commodity prices (e.g. of oil and natural gas) to feed through to consumer prices varies, and can be gauged by relating consumer prices to contemporaneous and past commodity prices. The results of such a pass-through estimation (6) are summarised in Graph I.5, which displays on its horizontal axis the cumulated effect of a 1% increase in crude oil and gas prices on retail fuel prices after 12 months, and plots this against the speed at which this occurs (7).

Graph I.5: **Pass-through of crude oil to retail fuel prices and of natural gas to retail gas prices**



Note: Cyprus, Finland and Malta are excluded from the analysis on the gas pass-through due to the negligible share (or absence) of gas in the HICP.
Source: Eurostat and own calculations

The direct effects differ across commodities: the pass-through from crude oil to fuel prices at the consumer level is found to be strong and immediate. For the euro area as a whole, a 1% increase in oil prices would imply around 0.3%

(6) The pass-through is estimated with an auto-regressive distributed lag model (ARDL) of the form:

$$dlog(P^H)_t = \beta_0 + \beta_1 dlog(P^H)_{t-1} + \sum_{j=0}^{n} \delta_j dlog(Commodity)_{t-j}$$

where P^H is the (seasonally adjusted) price index of HICP item H and $dlog$ is its rate of change (first difference of the log-transformed index). A fixed lag order is imposed with one autoregressive term and the contemporaneous value and 12 lags of the exogenous variable ($Commodity$), i.e. the price of the commodity. The model is estimated at monthly frequency from 1996 to 2021 (the sample is shorter for Member States for which HICP series start later). The cumulated impact of changes in the commodity over the past year is thus given by $\sum_{j=0}^{12} \delta_j$ and the transmission speed is defined as $(\delta_0 + \delta_1)/\sum_{j=0}^{12} \delta_j$.

(7) These pass-through estimates are based on linear relationships between the series in the past, which warrants some caveats. First, there may be non-linear effects, i.e. the pass-through may be different when prices are at an unusual level or change very rapidly. Second, structural changes in the functioning of markets over time, e.g. as a result of regulation and government intervention, may imply that past relationships no longer hold.

higher fuel prices one year later (as retail prices include distribution costs, taxes and profit margins, the pass-through will not be one-to-one). Most of that increase, about 80%, would already have occurred after one month. The size and speed of the pass-though is a characteristic that generally holds across Member States. By contrast, the transmission of natural gas prices to retail prices of gas has in the past been somewhat slower. For the euro area, a 1% increase in the natural gas price index would imply some 0.1% higher consumer prices one year later, with merely a quarter of this being priced in after one month. Variation in the size of the pass-through across Member States is similar for both transmission pairs, but variation in speed is higher for the gas pass-through. This reflects notably the diversity in taxation, distribution costs, national market structures and regulations ([8]).

I.4. Constrained effective supply

After the lockdown, inflation dynamics have become more broad-based (Graph I.1), affecting the prices of non-energy industrial goods in particular. In the second year of the pandemic, these prices have started to play a significant role in increasing headline inflation. The main reason for this appears to be insufficient supply to meet robust demand for goods. This demand has been bolstered by economic policies supporting incomes, and the shift in the composition of demand away from (contact-intensive) services (see next subsection).

Since the onset of the pandemic, supply shortages – often combined under the term 'bottlenecks' – have become a feature of the economy. Some firms' operations have been limited by missing inputs, while other firms have been limited in their ability to dispatch their output. These disruptions turned out to be more persistent than many observers had thought, and originate from a combination of interrelated factors set out below.

- **Production shortfalls** due to lockdowns are the primary explanation for the scarcity of intermediate and final goods with limited substitutability (shown by point C in the illustration in Box I.1) ([9]).

- **Lower transport capacity** has also played a role. This was due to restrictions on cross-border movement of shipping crews and transport operators, but also because of reduced aircraft 'belly cargo' capacity due to the lower number of international passenger flights. As a result, steep increases in transport costs have been observed across modes of transportation and materials carried (see Graph I.6) ([10]).

- Related to this, **frictions in supply chain logistics** have led to inefficient use of the available transport capacity. These frictions were similar to fluctuations in stop-and-go traffic, and led to repeated alternations between deceleration and acceleration of activity. These alternations replaced the steady and smooth logistic processes that otherwise enable world trade. Port congestions implied long waiting times for vessels to be unloaded (in turn reducing their ocean time). In many parts of the world, this situation eventually extended to other modes of transport, such as cargo trucks and trains, lengthening delivery time. Local disruptions – because carriers were unavailable or containers were stranded unemptied in other parts of the world – caused ripple effects across supply chains ([11]).

- **Bullwhip effects and precautionary hoarding caused further problems.** By holding input inventory buffers, firms can protect themselves against upstream supply disruptions. In just-in-time manufacturing

([8]) Transmission of commodity (natural gas) to electricity prices is related to a country's energy mix and market characteristics (e.g. regulation or share of long-term contracts). Under the 'marginal-pricing' model, the retail electricity price eventually depends on the price of the commodity used as a balancing power for electricity generation at a given point in time. While time series thus unsurprisingly suggest a low correlation and a small pass-through, EU electricity markets have been undergoing a number of structural changes, related both to pricing and to the transition to more renewable energy sources. In recent years, this has implied a closer association between natural gas and (retail) electricity prices.

([9]) Stopping and restarting production processes in an orderly way can rarely be done by simply turning on or off a switch, and it often takes time. Therefore, production shutdowns may entail additional fixed costs.

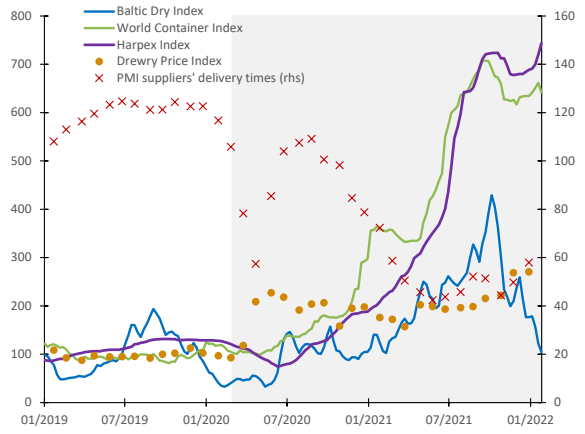
([10]) As transport costs typically account for a small share of the final cost of goods, the direct upward impact on consumer prices should be of second order. The United Nations Conference on Trade and Development (UNCTAD) estimates that elevated sea transport costs (throughout 2022) could add 1.5% to consumer price levels and 12% to the level of imported prices by 2023 (see UNCTAD, *Review of Maritime Transport 2021*, UNCTAD, November 2021).

([11]) These disruptions were aggravated by events unrelated to the pandemic, such as the temporary closure of the Suez Canal in March 2021 and of several ports in China in summer 2021 as a typhoon hit its east coast.

settings, such buffers are typically small, for example to absorb shortfalls arising from maintenance. In reaction to the actual and anticipated inventory depletion that followed pandemic-related production stops, many firms sought to secure inputs as a precaution, notably by placing multiple orders. This created 'bullwhip effects' ([12]), amplifying initial supply disruptions. Such a run on inputs would be rational behaviour for an individual firm, but it happened in a non-coordinated and simultaneous manner involving many firms, leading to suboptimal outcomes for all.

The broader impact of individual supply chain disruptions on downstream industries depends on the nature of the products affected. Among intermediate goods, for example, shortages of semiconductors stood out during this pandemic. They caused production stops and pushed up consumer prices of goods that use them intensively, such as cars or consumer electronics.

Graph I.6: **Evolution of transport costs (January 2019 to February 2022)**



Note: the indices show the cost of hiring vessels for major raw materials (Baltic Dry), shipping goods in containers (Harper), freight rates for major east-west trade routes (World Container Index) and airfreight rates (Drewry, last observation December 2021). The IHS Markit PMI suppliers' delivery times show the extent of supply chain delays for the euro area (2017–2019 indices average = 100).
Source: Bloomberg, Harper Peterson, IHS Markit, own calculations

The lockdown was not a 'one-off' event, but has been a permanent condition over the past 2 years, albeit of varying intensity and implication. Infections occurred in waves – not necessarily synchronised globally – but disruptions to both production facilities and logistics caused by individual infection clusters have been ongoing since the emergence of the virus. Greater disruptions occurred in parts of the world with particularly stringent lockdowns and comparatively low vaccination uptake, or at times when new variants emerged.

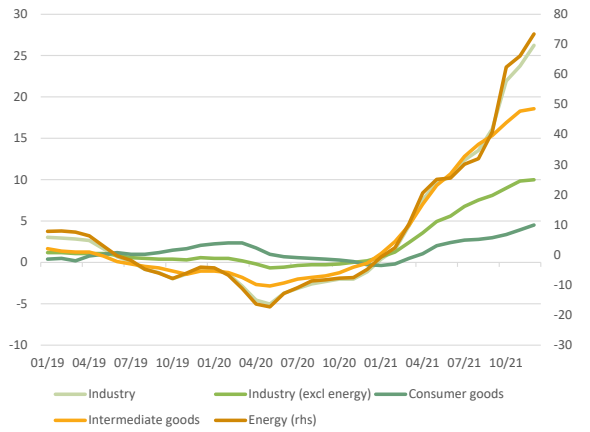
Graph I.7: **Shortage of equipment and materials and selling price expectations, industry (1985 to 2022)**

Source: European Commission (Business and Consumer Surveys)

In the Commission's business and consumer surveys, an unprecedentedly high share of managers (54% of managers in the latest January round) reported the scarcity of material and equipment as a factor limiting business activity. This has in turn translated into record-high selling-price expectations across sectors affected by shortages (Graph I.7). Intentions to raise prices have been fulfilled, as reflected in producer prices – which increased by 26% in the year to December 2021 (Graph I.8) – and consumer goods prices (see next section).

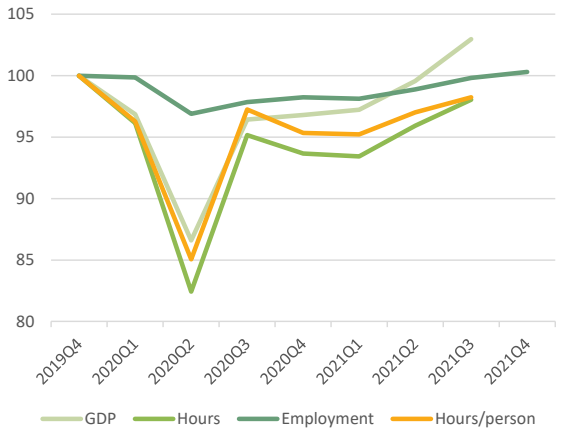
([12]) Rees, D., Rungcharoenkitkul, P., *Bottlenecks: causes and macroeconomic implications*, Bank for International Settlements, 2021.

Graph I.8: **Producer price inflation (% yoy, January 2019 to December 2021)**



Source: Eurostat, own calculations

Graph I.9: **Impact of COVID-19 on GDP, hours worked and employment (2019 Q4 to 2021 Q4; 2019 Q4 = 100)**



Source: Eurostat, own calculations

I.5. Wage dynamics

The labour market reaction to the pandemic largely consisted in reducing hours worked, as job-retention schemes ensured the resilience of employment against the background of the drop in GDP. GDP and hours worked were 14% and 18% lower respectively in the second quarter of 2020 than at the end of 2019. Employment, however, fell by merely 3%, limiting the risk of longer-term damages to the labour market (Graph I.9). The rebound in activity was matched by the recovery in labour markets, as the number of people employed reached its pre-pandemic level in the third quarter of 2021. While the number of hours worked has also recovered, it still remained almost 2% below pre-pandemic levels by the third quarter of 2021. As a result of these improvements, labour shortages have been reported by a record number of managers in the industry, services and construction sectors ([13]). Consistent with this, reliance on job-retention schemes (JRS) generally declined throughout 2021 ([14]).

Wages appear to have been relatively stable during the pandemic, and labour market improvements have not translated into upward pressures. The ECB indicator of negotiated wages remained at or below its pre-pandemic average throughout the pandemic ([15]). While the labour market recovery should ultimately sustain wage growth, the significant increase in the cost of living caused by elevated inflation may further drive up wage demands. In principle, this risks setting off a wage-price spiral, whereby compensation for lost purchasing power and firms' need to cover higher wage costs by raising their prices mutually reinforce each other. However, wage settlements concluded at the end of 2021 in large euro-area economies (see Box I.2), which provide some indication on whether the current elevated inflation can be expected to spill over to wages, have generally turned out rather moderate. This confirms the quantitative information from the negotiated wage indicator. At any rate, the flattening of the Phillips curve observed in recent years, i.e. the declining responsiveness of inflation to economic slack, would suggest that the recovery's impact on wage growth should remain contained, at least as long as inflation expectations remain well-anchored.

([13]) See Box 1.1 of the European Commission Winter Forecast 2022. Some of the labour shortages may be related to the Omicron wave and may thus be temporary.

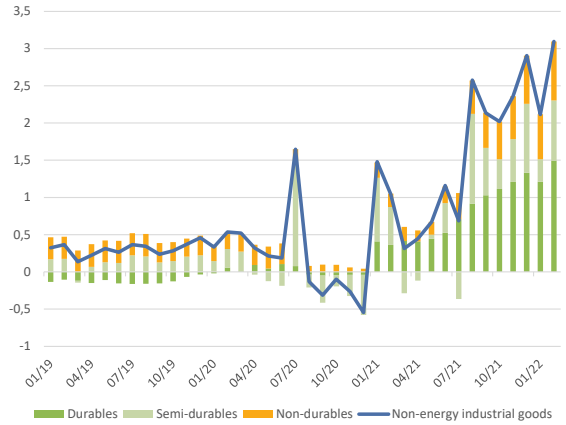
([14]) ECB estimates suggest that workers in JRS represented 1.6% of the labour force in December 2021, compared to 2.7% in July 2021 (ECB, Economic Bulletin 1/2022 and previous editions).

([15]) Many labour cost indicators are affected by national statistical institutes' practices for recording JRS in national accounts, and suffer from distortions. This makes them difficult to interpret.

Graph I.10: **Negotiated wages, euro area (% yoy, 2019 Q1 to 2021 Q4)**

Source: ECB

Graph I.11: **Non-energy industrial goods inflation (% yoy and pp contributions, January 2019 to February 2022)**



Source: Eurostat, own calculations

I.6. Compositional shifts in demand

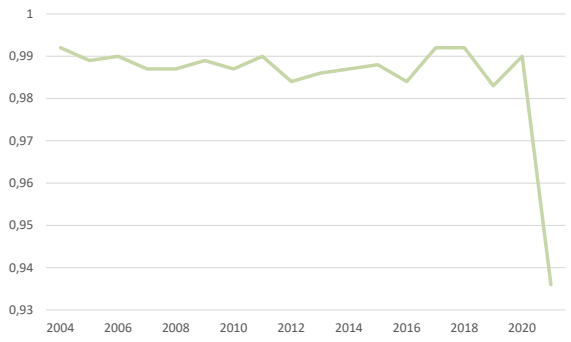
High goods prices are the outcome of constrained 'effective supply' combined with robust demand. However, the pandemic has also changed households' needs and preferences and has induced significant compositional shifts in households' spending behaviour. To some extent this was by lack of choice, as consumers simply redirected their spending from unavailable items (e.g. travel and movie theatres) to available ones (e.g. home entertainment or refurbishment). Furthermore, structural changes in the organisation of work, such as telework, increased the demand for office equipment and furniture. Likewise, preferences for non-collective – and hence non-contagious – activities increased. For example, shifts from collective to individual transport plausibly played a part in increasing demand for cars, motorcycles and bicycles, the price of which hit new peaks. Overall, price increases for non-energy industrial goods since 2021 (which averaged 0.4% yoy before the pandemic and 1.6% since 2021) were mainly driven by durable goods, but have become more broad-based over time (see Graph I.8).

These compositional shifts in spending also raised important issues for the measurement of inflation. While spending on items sold on markets that were closed down (e.g. restaurants or culture) inevitably dropped, they nonetheless retained their previously attributed (non-zero) weight in the inflation basket throughout 2020. Estimates of 'COVID-19 inflation' ([16]), allowing for an intra-year change in inflation weights, reveal significant differences compared to the conventional inflation rate in some countries ([17]). The HICP weighting scheme for 2021 took better account of consumption patterns during the pandemic and the lockdowns. Changes to the scheme were predictably exceptional, both at euro area and Member State level (Graph I.12).

([16]) See for example Cavallo, A., 'Inflation with Covid Consumption Baskets', *NBER Working Papers*, No 27352, 2020; Reinsdorf, M., 'COVID-19 and the CPI: Is Inflation Underestimated?', *IMF Working Papers*, No 20/224, 2020; Kouvavas, O., et al., 'Consumption patterns and inflation measurement issues during the COVID-19 pandemic', *ECB Economic Bulletin*, No 7/2020, 2020.

([17]) The direction of these differences is unknown and depends on the composition of a given jurisdiction's inflation basket. More generally, no relationship between changes in weights and their impact on inflation can be deduced.

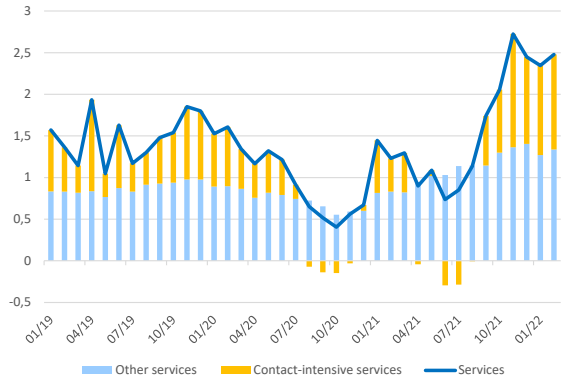
Graph I.12: **Similarity of HICP baskets over time (2004-2021)**



Note: the line represents the similarity of the HICP basket relative to that of the previous year. Similarity is defined as $SIM_t = \sum_i min(w_{t-1}^i, w_t^i)$, where w^i is the share of a given item in the HICP basket. Similarity is hence bounded between 0 and 1 (identical).
Source: Eurostat, own calculations

The lockdowns and other types of restrictive measures imposed during the pandemic mostly affected sectors requiring greater personal interaction (e.g. contact-intensive services) and in which physical distancing rules are difficult to apply (e.g. cultural activities, restaurants, hairdressers or collective travel) ([18]). Throughout the euro area, these firms have generally been supported by various government-sponsored compensation schemes, which helped them shoulder liquidity shortages, and prevented large-scale bankruptcies.

Graph I.13: **Services inflation (% yoy and pp contribution, January 2019 to February 2022)**



Source: Eurostat, own calculations

With the gradual reopening of contact-intensive sectors, a key question is how that reopening has affected their prices (and their price setting decisions), and whether and to what extent it has played a part in increasing inflation. To answer this question, services inflation is broken down into a group of contact-intensive services, such as air transport and hospitality, and remaining services ([19]). Contact-intensive services accounted for about 12% of the HICP basket in 2021, a combined weight that has dropped sharply from 16% in 2020, testimony to the substantial reshuffle within the consumer basket during the pandemic.

Services inflation during the pandemic owes much of its shape to the price dynamics of contact-intensive services (see Graph I.13). These dynamics dragged down services inflation between mid-2020 and mid-2021 – with a temporary uptick in the first quarter of 2021. Price growth in contact-intensive services accelerated from mid-2021 onwards, primarily reflecting the impact of tourism and restaurants. Overall, this points to a return of price levels to pre-pandemic trends rather than a lasting change in price dynamics.

I.7. Uncertainty and forecast revisions

The vicissitudes of the virus and the difficulty of predicting how it would develop have translated into unprecedented economic volatility and greater uncertainty around the outlook, including the outlook for inflation ([20]). A number of one-off factors added to inflation volatility. These one-off factors include: (i) temporary changes in value added tax rates; (ii) temporary changes in environmental taxation in some Member States; (iii) shifts in the timing of seasonal sales by retailers; and (iv) large changes in HICP weights. In addition, many data relevant for inflation analysis have become more challenging to interpret, making it difficult to infer information about the state of the economy. This has especially been the case for labour market and wage data, which have been distorted by JRS, making it more difficult to measure slack and the risk of wage pressures.

([18]) In some sectors, firms were able to adjust their offering, e.g. restaurants selling take-away rather than seated meals.

([19]) The following items are included in the index of contact-intensive sectors: passenger transport by air (cp0733), other purchased transport services (cp0736), recreational and cultural services (cp094), package holidays (cp096), restaurants and hotels (cp11), and hairdressing salons and personal grooming establishments (cp1211).

([20]) There was also uncertainty on potential policy support (volume, timing, etc.), notably in the early stages of the pandemic.

Box I.2: Wage dynamics in recent collective agreements of four large euro area Member States

The recent surge in inflation has raised the question of whether transitory upside deviations from the inflation target could spill over to wages. On the one hand, this would be undesirable as it could imply the onset of a wage-price spiral. On the other hand, if transitory spikes in inflation become protracted, this may give rise to concerns over the erosion of households' purchasing power. This box surveys evidence on wage negotiations in four large euro area economies (Germany, France, Italy and Spain) in 2021 and finds that wage settlements have turned out rather moderate so far ([1]). This was true even towards the end of 2021 when elevated inflation already translated into higher wage demands.

During the pandemic in 2020 and 2021, negotiated wage growth decelerated. In the first three quarters of 2021, negotiated wages in the euro area grew at an average rate of 1.5%, slower than before the pandemic (2.2% in 2019) ([2]). According to DG ECFIN's autumn forecast, wage growth was expected to pick up in 2022 and decelerate afterwards. This implies that real wages are projected to return, in 2022 and 2023, to growth rates similar to those seen before the crisis and to fall short of productivity growth.

In Germany, negotiated wages grew at an annual average rate of 1.4% in the first three quarters of 2021, against 3.2% in 2019 ([3]). Collective wage agreements concluded in October and November 2021 (in construction, wholesale and retail, and the public sector), in a context of elevated inflation, settled on wage increases below 3%, and considerably below unions' wage demands. As a compensation for lower increases in base pay, many agreements include one-off payments (or 'pandemic bonuses'). Wage agreements for about a quarter of the workforce will be renewed in 2022. However, a majority of these renewals will take place in the second half of the year ([4]), when inflation is expected to start moderating. A minimum wage increase to EUR 12 per hour (an increase of about 20% compared to January 2022 (EUR 9.82)) is planned for October 2022. This increase is expected to drive up low wages ([5]).

In France, the annual growth rate of base wages (both monthly and hourly) was 1.5% in the third quarter of 2021, somewhat below growth rates observed before the pandemic (1.7% in 2019) ([6]). Recent wage-contract renewals show significant differentiation across sectors. In light of the strong effect of the French minimum wage on collectively bargained minima, the automatic indexation of the minimum wage to inflation is likely to shape wage dynamics ([7]). However, government measures to offset inflation's effect on purchasing power may limit spillovers to wages.

In Italy, the growth rate of negotiated hourly wages was 0.6% in the first three quarters of 2021, which is below the growth rate observed from 2018 to 2019 (1.3% on average) ([8]). In industry, negotiated wage growth climbed back above 1% in June 2021, as collective bargaining resumed after having been interrupted during the pandemic. By the end of 2022, about 30% of collective contracts will expire. Negotiations on the renewal of these contracts could take place in an environment already characterised by a moderating inflation rate, especially considering the typical long delays in reaching an agreement.

([1]) OECD data for 2018 shows that collective bargaining coverage is 54% in Germany, 80% in Spain, 98% in France, and 100% in Italy. The box is based on information on wage agreements up to the beginning of December 2021.

([2]) At the same time, the indicator tends to react to changing labour market conditions with a lag; the pandemic may also have led to fewer wage agreements being concluded. The indicator is only available as a euro-area aggregate, not for individual Member States. See for example ECB, *Assessing wage dynamics during the COVID-19 pandemic: can data on negotiated wages help?* ECB Economic Bulletin 8/2021.

([3]) DESTATIS quarterly report on agreed earnings: www.destatis.de/EN/Press/2021/11/PE21_543_622.html. The figures include extra payments, such as one-off bonuses.

([4]) Ardagna, Cabau, Sapio, Cus Babic, Shelepko and Gudin, *Euro themes: Pay on display, Part I*, Barclays Economics Research, 10 November 2021.

([5]) At the time of drafting, the plan was reflected in a draft bill by the Federal Ministry of Labour and Social Affairs.

([6]) DARES survey, November 2021, https://dares.travail-emploi.gouv.fr/publication/evolution-des-salaires-de-base-et-conditions-demploi-dans-le-secteur-prive-T32021p.

([7]) In addition to past inflation, the minimum wage indexation formula also includes half of the past growth rate of hourly wages of blue-collar workers.

([8]) ISTAT, Contractual wages and salaries, July - September 2021'.

(Continued on the next page)

Box (continued)

In Spain, the growth rate of negotiated wages was moderate in 2021. The 415 collective agreements negotiated in 2021 up to October (covering about 10% of the workforce) settled on an average wage increase of 1.4% for 2021, a rate below the pre-pandemic average ([9]). Wage increases agreed for 2022 and 2023 were in line with pre-pandemic rates. The growth rate of low wages will additionally be supported by an increase in the monthly minimum wage of about 3.6% to EUR 1 000 from January 2022 ([10]). Only a small share of contracts (20%, covering about 5% of the workforce) have a guarantee clause factoring in compensation for higher realised inflation.

All in all, wage growth is set to pick up, but negotiated wages in the four largest economies in the euro area grew only moderately in 2021. Higher wage demands (against the background of the employment recovery and rising inflation) were not followed by correspondingly higher wage deals. Overall, there are no signs yet that a price-wage spiral has started. Moreover, the risk of persistent effects of past inflation is lower now than in past periods of high inflation, as automatic wage indexation has become much less widespread across the EU (and largely concentrated in Belgium, Cyprus, Malta and Luxembourg) ([11]). Nevertheless, elevated inflation for a longer period than is expected now would further erode purchasing power. This would likely translate into higher wage demands and a higher likelihood that these are reflected in agreements, especially in countries with tighter labour markets, where workers' bargaining power is stronger. Such a scenario would thus give rise to risks of second-round effects.

([9]) Calculations by Barclays economic research, paper cited above.
([10]) The decision was made retroactively in February. The monthly minimum wage is paid 14 times a year.
([11]) For a more detailed discussion, see Koester and Grapow: *The prevalence of private sector wage indexation in the euro area and its potential role for the impact of inflation on wages*, ECB Economic Bulletin 7/2021.

The degree of uncertainty and forecaster disagreement (e.g. simultaneous concerns about extreme outcomes, i.e. high inflation/deflation) has increased and large 'real-time' revisions to current-year inflation forecasts were made in both years. This was related primarily to unexpected departures from the commodity price assumptions used to inform those forecasts, but much can be attributed to the development of the pandemic, which at times seemed under control (e.g. summer season, vaccine roll-out) and then suddenly seemed to be out of control again (e.g. emergence of the Omicron variant).

Financial market participants' inflation expectations have fluctuated significantly, at both short and long horizons (see Graph I.14). At the beginning of the pandemic, sharp drops occurred across all horizons, albeit with larger falls at the shorter end, suggesting that markets initially expected a dominance of (disinflationary) demand-side drivers. The 5y5y inflation-linked swap (ILS) rate ([21]) dropped to 0.7% in late March 2020. It then recovered to over 1% during the summer, and has been steadily increasing since the end of 2020.

Graph I.14: **Market-based inflation expectations (%, January 2010 to February 2022)**

Note: 1y1y (5y5y) is the 1 (5) year inflation expectation in 1 (5) years' time, calculated from inflation-linked swaps.
Source: Bloomberg, own calculations

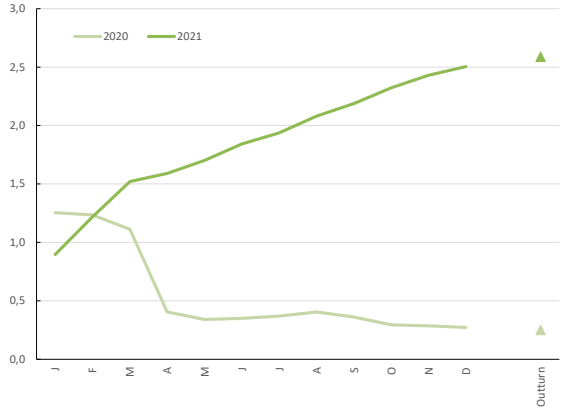
The scale of forecast revisions has been large and essentially one-sided in both pandemic years. This is illustrated in Graph I.15, which shows monthly survey-based inflation forecasts for the current year, as published by Consensus Economics in 2020 and 2021 ([22]). In 2020, the outbreak of the pandemic triggered a sharp downward revision to inflation forecasts. In 2021, inflation forecasts were

([21]) The 5y5y inflation expectation stands for five-year inflation in 5 years' time and is calculated from inflation-linked swaps. Market-based inflation expectations represent both 'true' inflation expectations and various risk premiums.

([22]) Consensus Economics forecasts are updated monthly. However, revisions to current-year inflation expectations are very representative of forecast revisions made by institutional forecasters during that period.

revised up in each month from 0.9% in January to 2.5% in December, still slightly below the eventual annual out-turn of 2.6%. This suggests that forecasters adapted their forecasts incrementally to integrate incoming monthly inflation surprises, but failed to predict the persistence of these increases.

Graph I.15: **Revisions of current-year inflation forecasts in 2020 and 2021**

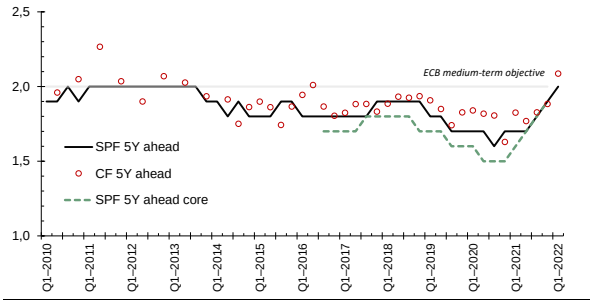


Note: 2020 (2021) displays the inflation expectation for 2020 (2021) in each month of 2020 (2021).
Source: Consensus Economics

Volatile inflation (and in particular the significant upside deviation of actual inflation from the ECB's inflation target more recently) may lead economic agents to revise their inflation expectations and adjust their price- and wage-setting behaviour in a way that is suboptimal for all. Despite the temporary nature of the shocks to inflation described in this section, the context could be conducive to potentially de-anchoring inflation expectations from the inflation target. However, while the 5y5y ILS rate briefly exceeded 2% in November 2021, it re-anchored around the inflation target more recently, following years of sub-target expectations in the pre-pandemic period. Longer-term survey-based expectations remained more stable throughout the pandemic, relative to longer-term market-based expectations (see Graph I.16). After initially easing somewhat, they recovered and stood at about 2% (ECB Survey of Professional Forecasters) to 2.1% (Consensus Forecast) in the first quarter of 2022.

Based on the information set available in early 2022, it appears that economic agents are 'looking through' the elevated inflation levels (i.e. expecting these current elevated levels to fall back in the future). Nevertheless, long-term inflation expectations are clearly higher than in the pre-pandemic 'lowflation' period. Their current level seems more consistent with the inflation target compared to then ([23]).

Graph I.16: **Survey-based inflation expectations (%, 2010 Q1 to 2022 Q1)**



Source: ECB (Survey of Professional Forecasters), Consensus Economics

I.8. Concluding considerations

This section has reviewed inflation dynamics during the first 2 years of the pandemic. Following the rapid increase to elevated inflation levels, a question that has often come up is whether these high rates are of a transitory nature or whether they could become entrenched. This is related to the question of whether the pandemic has marked a definitive break with the period of 'lowflation' that characterised the years before the pandemic and posed a number of challenges of its own, notably for monetary policy. While this section has focused on the effect of the pandemic on inflation, the transition to a post-pandemic steady state is occurring in the context of the war Russia has been waging on Ukraine since February 2022. This war will likely have significant negative consequences for the EU economy and will push up global commodity prices and inflation. Questions on the inflation outlook raised before the outbreak of the war remain valid, but the addition of new powerful price drivers has added further uncertainty and increased risks of inflation becoming entrenched.

As the pandemic is still ongoing, it is anyhow too early to offer conclusive answers. There is also no precedent of exiting a global pandemic that could serve as a benchmark. Still, based on the evidence reviewed here, some tentative considerations can help frame an answer.

([23]) As noted above, this may also reflect the ECB's adoption of a symmetric inflation target of 2% as of July 2021, following its monetary strategy review.

- The recent profile of inflation prior to the military aggressions, was directly linked to, and should not be dissociated from, the policy choices made around the globe during the pandemic. On the one hand, this includes the measures to contain the spread of the pandemic and ultimately save lives, which held back production. On the other hand, this includes economic policies to support demand and preserve economic potential. Without these policies, the inflation profile would plausibly have been a different one. However, as hinted at in this section, in a counterfactual scenario without resolute policy support, inflation would arguably have been lower, but also part of a different set of economic circumstances that would have included a weak recovery, high unemployment and 'scarring'.

- The events of the past 2 years have exerted both upward and downward pressures on prices. However, the dominance of one pressure over the other has varied over time. For example, disinflationary pressures dominated the first phase of the pandemic. More recently, upward pressures have dominated, with impacts on households' costs of living. While the directions of the changes in inflation have coincided with the changes in economic activity, the size of the changes has clearly been asymmetric: the fall in inflation in 2020 was contained, relative to the strong increase in 2021.

- Control of the pandemic would eventually imply the fading of many contingencies that have driven inflation since its outbreak. In this sense, these drivers can be considered transitory. That does not mean short-lived. The scale and duration of the pandemic and the many disruptions it caused have been hard to predict. Indeed, these disruptions have exceeded expectations. Moreover, the transmission lags of supply disruptions imply that high inflation volatility will likely remain with us for some time to come, even once the pandemic is under control. That said new supply side and logistics disruptions are likely appearing as a result of the aggression of Russia against Ukraine.

- Once the pandemic is over, these pandemic-related drivers should moderate and price pressures should ease. Nevertheless, two scenarios linked to the pandemic are possible under which inflation could remain elevated. In the first scenario, the supply-side disruptions could persist and further push up prices for some time. Such a 'more of the same'-scenario, marked by recurrent supply shocks, would imply losses in purchasing power. However, such a scenario should gradually lose its traction, as supply disruptions become less serious as producers and consumers adapt ('learning to live with the virus'). This has already become evident during the most recent infection waves. Transport backlogs also seem to be gradually improving and delivery times and costs seem to be normalising ([24]). In a second scenario, transitory inflation spikes could partly spill over to wages, as wage earners seek to limit the erosion of their purchasing power (see Box I.2). A wage-price spiral scenario would become more likely if inflation expectations were to become unanchored. So far, there is limited evidence of broad-based wage pressures emerging or unmoored inflation expectations. However, the persistence of elevated inflation and repeated upward inflation surprises, which has become more likely because of the war, raises the risk that economic agents will increasingly adapt their inflation expectations to actual inflation outturns.

- It is also possible and plausible that the pandemic fostered or accelerated some structural changes that may entail relative price adjustments (this is also the case for war). For example, the experiences of supply disruptions during the crisis may trigger changes in how firms manage risk in their supply chains and inventory strategies. In particular, firms may seek more resilient production models that provide more certainty but are more costly. Meanwhile, consumers may have adopted new habits, particularly digital ones. The aggregate impact of these potential structural shifts on both price levels and dynamics is uncertain, but transition to a post-pandemic steady state may entail higher inflation volatility and change exposure to future price shocks.

([24]) There are other scenarios that could affect future inflation volatility, including climate change, mitigation policies, and demographic ageing. As these structural drivers are unrelated to the pandemic, they go beyond the scope of this section.