THE NATURE OF THE INFLATIONARY SURPRISE IN EUROPE AND THE USA

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This paper was first published in March 2024 in The Euro in 2024, available here

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Abstract

This paper leverages insights from data and economic theory in order to construct a narrative account of how the nature of inflation has evolved over time in the euro area, United Kingdom and United States since the onset of the Covid-19 pandemic. To this end, I decompose the recent 'inflationary surge episode' into four periods: The Covid shock period (2020 Q1 - 2020 Q2), characterised by joint a negative demand and supply shock; the economic reopening period (2020 Q3 - 2021 Q4), characterised by conflicting positive demand and negative supply shocks; the post-reopening period (2022 Q1 - 2023 Q1), also characterised by conflicting positive demand and negative supply shocks, where the latter is driven by an exogenous increase in energy prices; and the post-energy shock period (2023 Q2 - present), characterised by falling consumer price index (CPI) inflation alongside still-elevated and broad-based underlying inflationary pressures. Having established this 'inflation story', I conclude with some brief comments on the European Central Bank, Bank of England and Federal Reserve monetary policy responses during this time.

Acknowledgments

1. Introduction

In the decade prior to the Covid-19 pandemic, consumer price index (CPI) inflation in the euro area, United Kingdom and United States averaged between 1-2 per cent while central bank policy rates were, for the most part, close to or below zero. As a result, the policy debates in this decade often centred around the 'new normal' of near-zero interest rates. At the time of writing, inflation has been above central banks' typical 2 per cent target in all three economies for over two years, and the European Central Bank (ECB), Bank of England (BoE) and Federal Reserve (Fed) have embarked on the most aggressive global monetary policy tightening cycle recorded in these independent central banks' histories. Making sense of where inflation and monetary policy might be heading in the medium-term firstly requires a careful analysis of the nature of the inflationary surprise that changed our post-pandemic economic landscape.

The nature of inflation in the past three years has not been homogeneous, neither within economies nor between economies. For instance, the extent to which inflation has been demand-driven or supply-driven has varied across time and space. Additionally, there have been multiple inflationary surprises in Europe and the USA within the last four years. Despite this, the various inflationary surges that have taken place since the onset of the pandemic have marked a significant departure from the previous 'new normal', and so have naturally been characterised as one monolithic inflationary surprise. Clarifying how the nature of each of the inflationary periods in the euro area, the United Kingdom, and the USA has evolved since the Covid-19 pandemic is therefore of central importance.

This article proceeds as follows: section 2 combines insights from data and economic theory to describe the post-Covid 'inflation story', beginning with the impact of national lockdowns and finishing with the latest data available at the time of writing. With the obvious benefit of hindsight, section 3 uses the story established in section 2 to broadly comment on central banks' actions in this post-Covid inflationary era. Section 4 concludes.

2. The post-Covid inflation story

There have been a variety of sources of economic disruption that have stoked inflationary pressures since the onset of the Covid-19 pandemic. On the demand side, the main drivers of inflation have been generous fiscal stimulus packages, expansionary monetary policy, and shifts in consumer preferences/behaviour. On the supply-side, the main drivers have been supply chain bottlenecks, goods and labour shortages, and energy and food price increases following Russia's invasion of Ukraine. Of course, 'second-round' inflationary effects, such as increases in

wages and profits in response to elevated inflation, must also be taken into account. Understanding how the nature of inflationary pressures has changed over time and affected the wider macroeconomy is crucial for assessing the monetary policy response to high inflation.

To this end, I decompose the recent 'inflationary surge episode' into four periods, where the first three are as identified via sign restrictions[1] in the vector autoregressive model in Ascari et al. (2023): the Covid shock period (2020 Q1 - 2020 Q2), characterised by a joint negative demand and supply shock; the economic reopening period (2020 Q3 - 2021 Q4), characterised by conflicting positive demand and negative supply shocks; the post-reopening period (2022 Q1 - 2023 Q1), which also contains positive demand and negative supply shocks, but the latter is driven by an exogenous increase in energy prices resulting from the Russian invasion of Ukraine. The latest data at the time of writing suggest that a fourth period has since materialised (2023 Q2 - present), denoted here as the post-energy-shock period, characterised by falling CPI inflation alongside still-elevated and broad-based underlying inflationary pressures. The effect of these shock periods on core CPI inflation and real GDP can be seen in figure 1.

One caveat to bear in mind is that the foundations for high inflation were laid well before the pandemic. For example, accommodative monetary policies since the global financial crisis alongside factors such as an increased importance in global commodity prices in determining domestic inflation altogether facilitated this inflationary surge (Forbes 2019). However, these considerations exceed the scope of this analysis, which focuses solely on describing the post-Covid inflation story.

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[1] Sign restrictions can help inform whether a shock is demand or supply-driven: for example, if an identified shock has a negative effect on both output and inflation then this is typically understood as a negative demand shock, in contrast to a negative supply shock which would generally involve a negative sign on output and a positive sign on inflation.

Figure 1: Core CPI inflation and real GDP in the euro area, United Kingdom and USA

a) Core CPI inflation   b) Real GDP
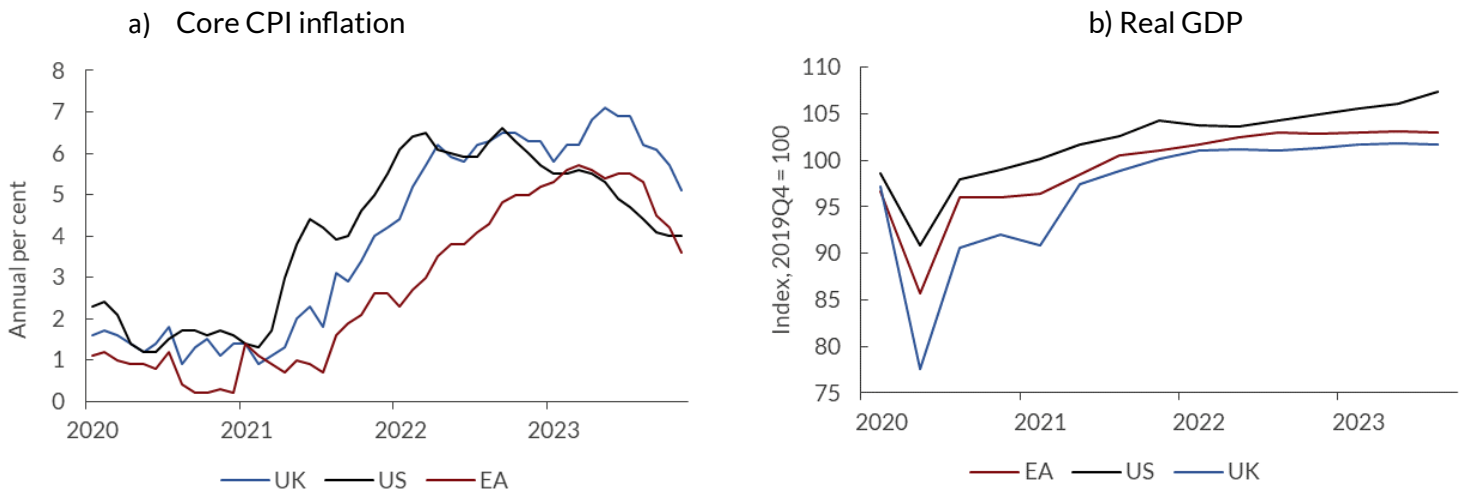
Sources: NiGEM database, FRED, ONS, Eurostat, Datastream

Notes: In the UK and EA, core CPI inflation refers to CPI inflation excluding food, energy, alcohol and tobacco. In the USA, the calculation only excludes food and energy.

2.1 The Covid shock period (2020 Q1 - 2020 Q2)

The economic disruption caused by national lockdowns occurring in the first half of 2020 was evidently of secondary consequence to the large loss of life caused by the Covid-19 pandemic, but the lockdowns nonetheless had significant immediate ramifications for economic activity and consumer/firm behaviour. Figure 2 illustrates how the implementation of 'stringent' government policies, such as stay-at-home requirements and workplace closures, coincided with a sharp decline in real economic activity from March 2020 onwards.

The partial economic shutdown in the first half of 2020 caused an abrupt and steep fall in real GDP in all three economies and simultaneously generated disinflation (Figure 1). Ascari et al. (2023) take the joint falls in GDP and inflation to mean that, on aggregate, the effects of the deep negative demand shock dominated those of the negative supply shock. Intuitively, this can be thought of as the disinflationary effects of negative preference shock to contact-intensive goods and services, and the subsequent output constraint on affected sectors, overtaking the inflationary effects of a cut in the supply of these goods and services.

Guerrieri et al. (2022) suggest that this Covid shock can also be thought of as a 'Keynesian supply shock,' in which an asymmetric and transitory supply shock can induce a large negative demand shock. The intuition is as follows: a shutdown of the contact-intensive portion of the economy (hence, asymmetric) lowers the potential output of this sector, which reduces the

overall set of goods available to consumers as well as the need for labour in this sector. This has two counteracting corollary consequences: firstly, it becomes less attractive to spend overall, inducing consumers to delay spending; and secondly, it incentivises a reallocation of spending into the active non-contact-intensive sector. The decreased need for labour in the contact-intensive sector causes a reduction in its workers' incomes, which, paired with delayed spending, can be sufficiently large to drive an aggregate demand deficit despite some reallocation of spending. So, this type of supply shock can induce a recession and disinflation.

Ultimately, the Covid shock is likely to have been a combination of negative demand and supply shocks[2]. Importantly, this explains the need for fiscal stimulus in this time (as a response to the supply shock to the contact-intensive sector) and indicates that the demand deficit was always going to be as transitory as the pandemic itself. Both elements would prove to be important drivers of inflation during the economic reopening period.

Figure 2: Covid shock indicators

a) Stringency index   b) Real activity index
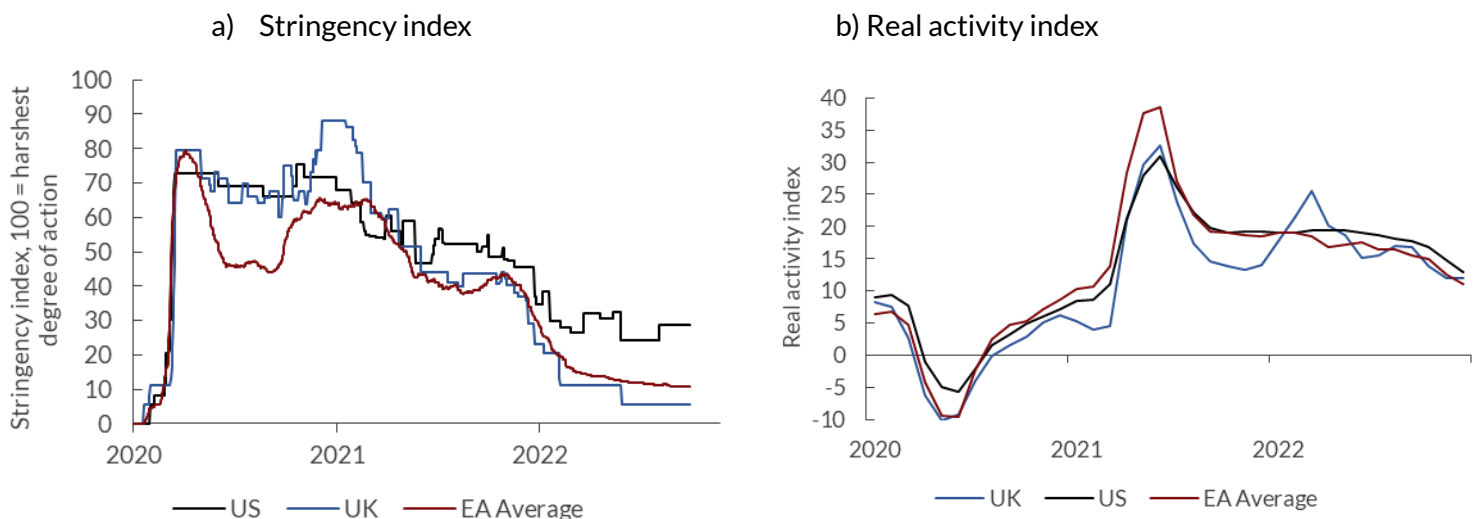
Sources: Hale et al. (2023), Brookings Institution (2023).

Notes: The Stringency index, part of the wider Oxford Covid-19 Government Response Tracker, captures the degree to which government policies employed during the pandemic were stringent, including variables such as stay-at-home requirements and workplace closures. 100 represents the harshest, or most stringent, degree of government action in response to Covid-19. The Brookings real activity index compiles 9 indicators, such as retail sales and capacity utilisation. Negative numbers represent contractions in real activity.

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[2] Several other papers provide alternative, though complementary, ways of thinking of the Covid shock. See, for instance, del Rio-Chanona et al. (2020); Inoue and Todo (2020); Fornaro and Wolf (2023).

Fiscal stimulus during the initial Covid shock period - necessary to protect households and reduce the overall output loss in this time - was generous in all three economies and targeted similar programs[3]. For example, direct grants to firms in affected sectors, increased healthcare spending, self-employed income support and furlough/unemployment benefit schemes were common insurance policies implemented in the United Kingdom, USA and across euro area countries in this time. That said, there were large differences in countries' abilities to provide stimulus during this period. Fiscal support was the largest in the USA relative to other countries, not just in cash terms, but also in terms of deviations from pre-Covid projected spending (de Soyres et al. 2023). The initial USA government fiscal stimulus, via the $2.2 trillion CARES act, went as far as providing an unconditional cash transfer to all taxpayers. This contrasts to Spain, for example, where fiscal stimulus often took the form of public guarantee schemes, or contingent liabilities, resulting from limited fiscal space (EBA 2020). Using NiGEM data, I estimate that government transfers accounted for 15, 57, 17, and 8 per cent of growth in aggregate real personal disposable income in the second quarter of 2020 in the United Kingdom, USA, Germany and Spain, respectively.

The fiscal stimulus, paired with inability to spend due to lockdowns and increased intertemporal substitution led to an overall rise in savings. In the United Kingdom, USA, Germany and Spain, quarterly gross household savings as a percentage of personal disposable income reached 27, 25, 21 and 13 per cent in 2020 Q2, respectively, compared to their 1997-2019 quarterly averages of 8, 5, 10 and 4 per cent. That said, the possible inflationary effect of aggregate augmented savings is dependent on who holds these savings and the reason why they've increased. To explain: households at the lower-end of the income distribution are usually credit constrained, and therefore have high marginal propensities to spend windfall increases in income (which is why targeting fiscal stimulus at this demographic is seen as a good automatic stabilisation mechanism). Separately, whether savings have risen because households are forced to save (e.g., because desired service sector spending has been shut-down) or because of a precautionary motive (e.g., fear of expected recession) matters.

Several papers have sought to decompose pandemic-related 'excess' savings (savings that exceeded their level as implied by the pre-pandemic trend) by motivating force. Empirical modelling for the United Kingdom and the euro area suggests that an inability to spend, rather than precautionary or intertemporal substitution motives, drove the increase in savings in the

[3] Bayer et al. (2023) estimate that fiscal transfers reduced pandemic-related output loss by 2 percentage points at its trough. Though fiscal support measures were broadly similar in this time, key differences in fiscal policy among countries would generate diverging macroeconomic dynamics between them, including differences in the nature of inflation, as is described in further detail in the sections below.

second quarter of 2022 (See, for instance: Dey-Chowdhury et al., 2022; Dossche and Zlatanos, 2020; Alcidi and Shamsfakhr, 2022). Turning to the USA context, research by the Fed suggests that the bottom quartile of the income distribution held around $116 billion in excess savings in 2022 Q2, representing a 1,023 per cent change on the quarter (Aladangady et al., 2022). These findings suggest that credit-constrained households or agents viewing savings as 'forced' represented a significant portion of holders of total excess savings, feeding the positive demand shock that ensued during the economic reopening period.

During this initial Covid shock period, monetary policy was just as accommodative as fiscal policy. Not only did central banks loosen interest rates back to near-zero territory, but they also conducted quantitative easing (QE) at an unprecedented scale. Between March and June 2020, the Fed balance sheet expanded by some $3 trillion, surpassing the expansion witnessed in the aftermath of the Global Financial Crisis. BoE and ECB asset purchase announcements totalled around £300 billion and €1.8 trillion, respectively. Though there is significant debate in the literature on the overall effectiveness of QE, estimates by Delgado and Gravelle (2023) suggest that 10-year government bond yields declined by 19, 16 and 24 basis points in the euro area, United Kingdom and USA, respectively, within one day of initial asset purchase program announcements in March 2020. Jointly, aggressive QE and fiscal stimulus at the onset of the pandemic were needed to stabilise welfare and prevent illiquidity (and indeed there has been almost an absence of expected adverse macro-financial feedback effects given how aggressive the current monetary tightening cycle has been). This stability, however, was achieved at the expense of large fiscal deficits and expanded balance sheets, and the initial stoking of inflationary pressures.

2.2 The economic reopening period (2020 Q3 - 2021 Q4)

As economies began to re-open during summer 2020, aggregate demand increased sharply, driving a quick recovery in GDP (Figure 1). This was partly caused by pent-up or delayed spending, as well as loose fiscal and monetary policies providing further cushions to households, firms and the macroeconomy. Moreover, a shift in consumer preferences that occurred during lockdowns, alongside still-stringent government policies in this time led to a mismatch in supply and demand which, jointly with the excess aggregate demand, led to the first signs of an inflationary surge as early as the second half of 2020, particularly in the USA. Throughout 2021, this mismatch would be exacerbated by supply chain disruptions.

As established above, households – on aggregate – accumulated a significant amount of excess savings during the Covid shock period. Credit and debit card data indicate that, as restrictions began to be lifted in the second half of 2020, spending rose accordingly, in line with the theory that these accumulated savings had been 'forced' and that this behaviour could be characterised as 'pent-up' or delayed spending (See, for instance: BEA 2023, Byrne et al. 2020; ONS 2023). In addition, the continuation of accommodative fiscal and monetary policy during the economic reopening period throughout all three economies, most notably in the form of ongoing QE, the \$1.9 trillion American Rescue Plan, the €750 billion Next Generation EU Fund and the suspension of EU fiscal rules, further improved household and firm balance sheets. Meanwhile, housing and stock market revivals increased wealth for some. Altogether, these conditions drove an initial 'overheating' of the three economies, in which aggregate demand could not be met by supply.

One important consequence of this excess demand was a rise in commodity prices. Bernanke and Blanchard (2023) calculate the first principal component of the 19 commodity price series included in the Commodity Research Bureau (CRB) commodity price index. Essentially, this component can be thought of as a common trend shared by all 19 commodities, which the authors find explains two-thirds of the overall series' variance since 1990. The common trend component in these price series steepened between 2020 Q2 and 2021 Q2, most probably resulting from the large increase in demand following the initial stage of economic reopening[4]. The resulting increase in commodity prices was significant. For example, by 2021Q3, energy prices were 50 per cent above their 2019 level (Celasun et al. 2022) and already contributing a significant amount to CPI inflation (Figure 6).
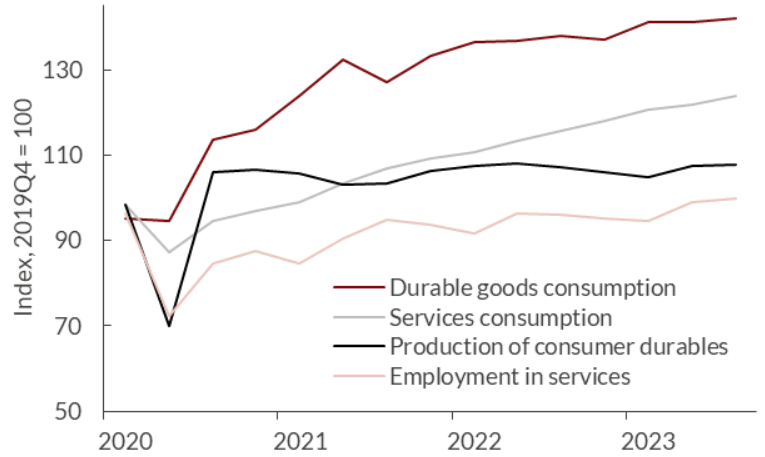
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[4] Given that the CRB index spans commodities ranging from metals to food, changes in their supply between 2020 Q2 and 2021 Q2 were most likely idiosyncratic. Bernanke and Blanchard (2023) therefore interpret the increased common trend as reflecting a global aggregate demand shock in this time.

Figure 3.   Some supply and demand indicators

a) United Kingdom
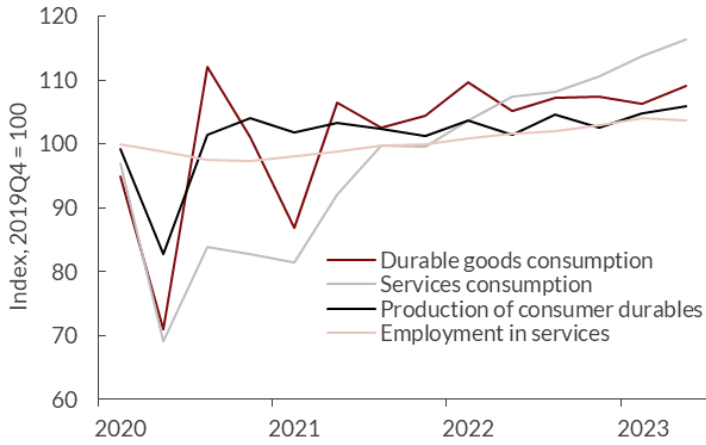
b) USA

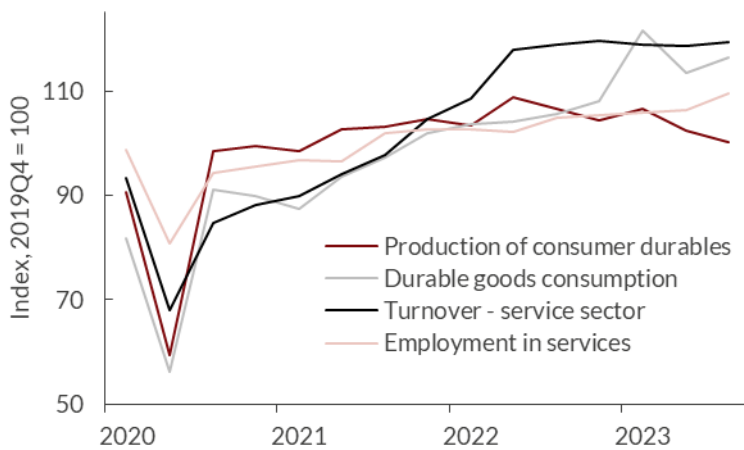c) Spain

Source: Datastream, OECD

Notes: 'Durable goods consumption' in all three charts refers to household final consumption of durable goods; the same applies to 'services consumption' for the UK and USA. In the absence of EA data, I use Spain as an example. Due to missing Spanish data on final household consumption of services, I use an index of total turnover in the services sector.

Demand dynamics during the economic re-opening period were further complicated by sectoral demand shifts. Consumer behaviour changed during the first half of 2020 in response to the pandemic-related economic shutdown, and some of these behavioural changes – such as increased remote working or decreased spending in services – may have proven persistent. Spending data from the economic reopening period suggest that stay-at-home restrictions induced lifestyle changes, such as an increased preference for lockdown-friendly hobbies like gardening or contact-non-intensive travel (cars), as seen by increased spending in related goods alongside decreased spending in similar contact-intensive industries (ONS 2022; Bernanke and Blanchard 2023). This type of sectoral demand concentration induced inflation because there was not a corresponding decrease in prices in the sectors experiencing decreased demand due to supply constraints facing *both* sectors. Figure 3 illustrates (in a simplified way) how a sharp rebound in durable goods consumption from the second half of 2020 onwards outpaced domestic production capacity as well as supply and demand for services (which was partially, if not fully, restricted during this period). Once production capacity had been reached and inventories began to dwindle, goods shortages propelled price rises further.

Supply chain disruptions – or the hindering of a business' ability to receive, produce, ship, and sell their products – occurred during the Covid shock period as a result of the partial economic shutdown, and re-emerged during the economic reopening period, further aggravating supply and demand mismatches (Adriantomanga et al. 2023). As shown in figure 4, in late 2021, global supply chain disruptions were over 4 standard deviations above their historical average. These bottlenecks, such as increased shipping costs, delivery backlogs and reduced inventories, all contributed to rising prices in this period, even in industries that did not face huge demand increases or reduced labour supply. At their peak, supply chain issues may have contributed around 50 per cent of the increase in manufacturing producer price inflation and some 2 percentage points to CPI inflation in 2021 in all three economies (Celasun et al. 2022; Gordon and Clark 2023; Haskel et al. 2023). Bernanke and Blanchard's (2023) decomposition of the CRB price indices' principal component suggests that the common trend in commodity prices steepened once again in the fourth quarter of 2021, likely due to this global negative supply shock.

**Figure 4.   Global supply chain pressure index**

In the case of the semiconductor industry, for example, a large increase in demand for electronics during 2020 alongside work restrictions led to a scarcity of this input, which has no substitutes and a lengthy production process largely concentrated in Asia (LaBelle and Santacreu 2022). As a result of an inability to increase production capacity, supply chain disruptions emerged in industries that use semiconductors as a direct input in 2021. For instance, the demand increase for new cars (possibly driven by a newfound anti-contagion preference) could not be met due to the automobile industry's reliance on semiconductors, leading inventories to fall to record lows and prices to spike, contributing significantly to inflation in the USA in particular (Bernanke and Blanchard 2023). Dunn and Leibovici (2021) estimate that disruptions caused a 4 percentage point gap in the average price change between semiconductor-dependent and non-dependent industries by September 2021 – where the former is calculated to account for 39 per cent of total USA manufacturing output. This semiconductor shortage had similar effects in the United Kingdom and euro area, though at a smaller scale. The manufacturing component of producer price index (PPI) inflation were 6 and 10 percentage points higher in 2021Q2 than their 2017-2019 averages, in the United Kingdom and euro area respectively, compared to 14 percentage points higher in the USA (Celasun et al. 2022). All three economies have since announced policies in the form of the National Semiconductor Strategy (United Kingdom), European CHIPS Act and CHIPS Act (USA) in a partial attempt to reduce domestic reliance on global supply chains in this industry. However,

these types of policies, if successful, take some time to implement, indicating how difficult it can be for policymakers to ease such supply shocks in the medium-term.

Labour markets also experienced demand and supply mismatches in this period. Figure 5a illustrates how, during the economic reopening period, unemployment rates fell back towards pre-Covid levels, most notably in the USA, which had a very different labour market experience during the Covid shock relative to Europe. Nonetheless, weakened labour force participation - which may have resulted from factors such as anti-contagion preferences, an increase in long-term sickness, and discouragement following unemployment or furlough - decreased labour supply relative to labour demand, particularly in services industries (Celasun et al. 2022). Labour shortages were worst in the USA, where around 40 per cent of producers were reporting labour shortages in late 2021, compared to around 20 per cent in the euro area and 15 per cent in the United Kingdom (Celasun et al. 2022; ONS 2021).

Figure 5. Labour market indicators
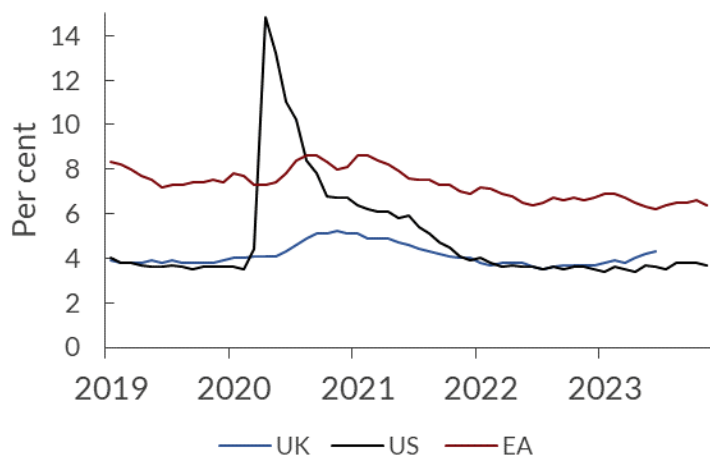
a) **Unemployment rates** b) **Tightness indicators**
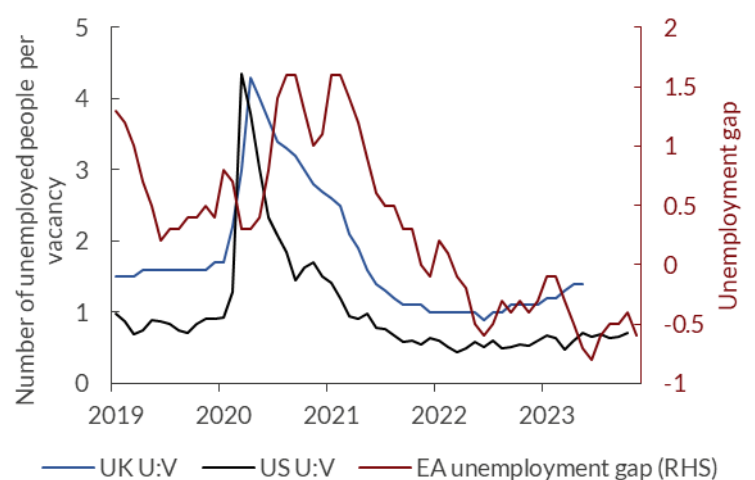
Sources: ONS, FRED, Eurostat, IMF, Author's calculations

Notes: Due to data collection issues with the Labour Force Survey, the ONS has not published updated UK unemployment data since July. However, ONS experimental estimates of the unemployment rate suggest that it has not moved much since summer, and NIESR calculations also indicate that U:V has not moved much in this time (Bejarano Carbo 2024).

Unemployment rates alone do not convey the full post-Covid labour market story. For example, measures such as the unemployment-to-vacancy ratio (U:V) in the USA and United

Kingdom, and the gap between the unemployment rate and its natural rate[5] (U-U*) in the euro area illustrate the extent to which labour market tightness increased, particularly during the economic reopening period (Figure 5b). In the euro area, unemployment has remained below the IMF's estimate of its natural level since 2022. In the United Kingdom and the USA, U:V fell below their respective 2017-2019 averages of 1.69 and 0.98 by June 2021, and have yet to recover. Figures 5a and 5b plot significant falls in U:V during the first half of 2021, despite unemployment rates not moving much during this time; we can therefore infer that the sudden increase in labour market tightness was driven by an increase in vacancies, possibly signalling that a higher search effort became required to fill positions[6]. Bernanke and Blanchard (2023) take this as a sign of a material deterioration of the efficiency of the employee-worker matching process. An intuitive way to think about this friction might be, for instance, a substantial number of workers seeking to move away from a contact-intensive sector following furlough/unemployment due to an anti-contagion preference, requiring employers in this sector to increase their search intensity. Alternative interpretations include, for instance, digitalisation reducing the cost of job search (enabling companies to maintain unfilled vacancies for extended periods), and economic uncertainty hindering employers' ability to identify a decrease in search-and-matching efficiency (See, e.g. Hensvik et al. 2021). Ultimately, a tightening in all three labour markets would amplify the external, energy-driven, inflationary shocks that occurred in the post-reopening period in the form of 'second-round' effects.

While these goods and labour market mismatches, exacerbated by supply chain disruptions, occurred in parallel across the three economies, from the economic reopening period onwards we begin to see differences in these economies' dynamics, partly due to idiosyncrasies in policies implemented during the Covid shock period. For instance, figure 3 depicts a notable difference between United Kingdom's and the USA's employment in services– most probably explained by the former's implementation of a generous furlough scheme to avoid the rise in unemployment seen in the latter. Most notably, the demand shock in the USA in this period was much larger than in the United Kingdom or the euro area. De Soyres et al. (2023) find that pandemic-related fiscal support boosted goods consumption during times of increased mobility but had no effect on the supply of goods, explaining why the American economy overheated more in this time compared to Europe. It is not just the case that fiscal packages were larger in the USA, but also that they were targeted as demand stimuli rather than insurance mechanisms, as in Europe. At

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[5] Following from Dao et al. (2023), I use the IMF's 2022 estimate of the natural rate of unemployment in the EA of 7.0 per cent to construct this 'unemployment gap' measure.

[6] An equivalent way to conceptualise this is by noticing the upwards shift in the Beveridge curve, which plots the relationship between vacancy and unemployment rates, that has occurred since 2020 (Dao et al. 2023).

the same time, labour shortages in the USA, which figure 3 depicts did not recover to pre-pandemic levels during the economic reopening period despite a recovery in demand, generated significant inflation in the services sector. As shown in figure 6, inflation rose substantially more in the USA during the economic reopening period than in Europe, with strong contributions from services.

Non-policy developments also caused divergences in these economies' macroeconomic dynamics during this second inflationary period. For instance, the United Kingdom was hit strongly by Covid-19 variants towards the end of 2020, prompting a rise in stringency policies (Figure 2). Unlike the USA and the euro area, in March 2021, mobility levels in the United Kingdom were comparable to those in March 2020 and nearly one in five private sector workers remained furloughed (Haskel et al. 2023), explaining the marked difference in the United Kingdom's real GDP trend in this period (Figure 1b). This touches on a wider point that emerges from this paper's simplification of decomposing the post-Covid era into four period: there was not just one lockdown stage, but several, which were implemented distinctly over time in the three economies. However, in order to present a cross-country comparative analysis in a coherent way, this four-period simplification is necessary. Indeed, despite many differences and nuances, overall, demand and supply shocks had counteracting effects on the recovery in real GDP during the economic reopening period but moved inflation in the same direction for all three economies.

2.3 The post-reopening period (2022 Q1-2023 Q1)

The economic effects of Russia's invasion of Ukraine in February 2022 were immediate. Following the implementation of sanctions on Russian gas and oil supplies and given Ukraine's role as a key exporter of certain foods, energy and food prices skyrocketed from February onwards. Gas prices rose by 43 per cent between February and March, peaking in August 2022 at over 14 times their March 2020 level; oil prices rose by 20 per cent between February and March, peaking in June 2022 at nearly 3 times their March 2020 level (IMF 2023). At the same time, price rises in categories such as bread and cereals, and meat became noticeable contributors to CPI inflation within months. Figure 6 decomposes the contributions of different aggregates to monthly CPI inflation, illustrating the significant role of energy and food inflation during the post-reopening period in the euro area, United Kingdom and USA. However, figure 6 also shows a large variance in the compositions of monthly CPI inflation among these economies. At their 2022 peak, energy and food price inflation explain about one third, one half,

and two thirds of USA, United Kingdom and euro area CPI inflation, respectively. This variance is partly reflective of differences in items weightings in countries' CPI calculations and heterogeneous abilities to substitute away from Russian energy and Ukrainian food, but also partly a story of distinct shock compositions during this period.

Bernanke and Blanchard (2023) build a model of wages, prices and inflation expectations to understand the drivers of inflation in the USA. In their model, a temporary, but persistent, shock to food and energy prices leads to a rise in inflation as workers bargain for higher nominal wages to offset real income losses, firms increase prices to protect real margins, and inflation expectations rise. Separately, a shock to labour market tightness causes long-term inflationary pressure following an initial increase in inflation. The extent to which inflationary pressures are raised following these two types of shocks depends most importantly on the degree of labour market tightness, how well inflation expectations are anchored (determining whether a wage-price spiral ensues) and how rigid wages are (determining how prolonged the wage 'catch-up' episode becomes). They estimate their model based on US data to show that, while energy and food prices drove an inflationary impulse at the start of the post-reopening period, from 2022 Q3 a 'labour market tightness shock' largely explains US inflation (See: their figure 12). Haskel et al. (2023) replicate the Bernanke and Blanchard model in the context of the United Kingdom, also finding that the effect of energy price increases faded rather quickly and were replaced by food inflation, goods shortages and a labour market tightness shock as the key drivers of inflation from 2022 Q2 onwards (See: their figure 14). Lastly, Dao et al. (2023) build a similar model to account for differences in euro area and American inflation, finding that energy and food price shocks, and their pass-through to wages and profits ('second round effects'), can account for the bulk of CPI inflation in the euro area during the post-reopening period (See: their figure 14).

Figure 6: Contributions of components to monthly CPI inflation

a) Euro area

b) United Kingdom

c) USA
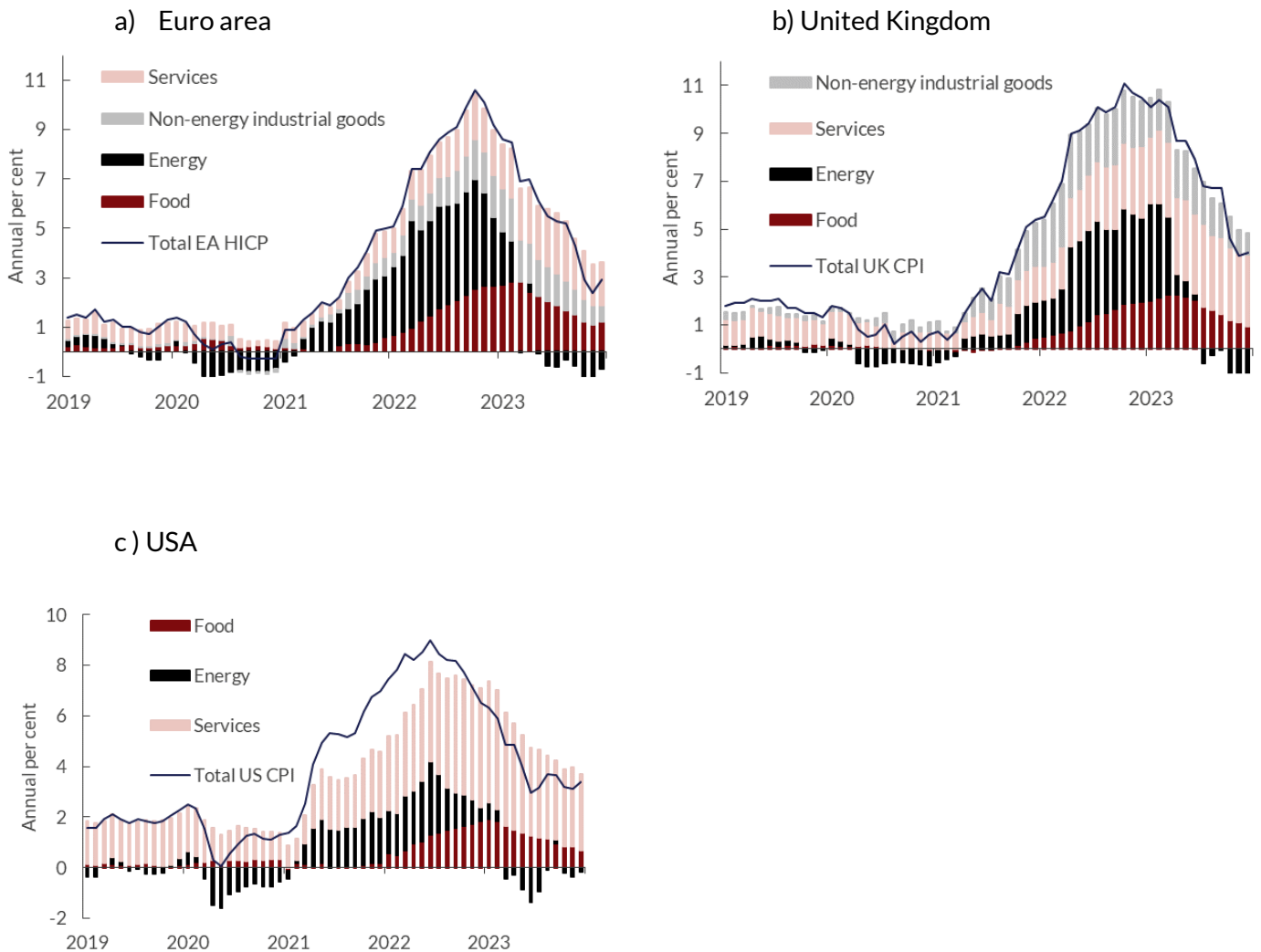


Sources: Eurostat, ONS, OECD, Author's calculations

Notes: In all three charts, 'Food' refers to food and non-alcoholic beverages. The OECD does not publish the data on contributions of non-energy industrial goods to overall USA CPI. For the EA, the harmonised index of consumer prices (HICP) is used.

Not only do the above papers provide insights into differences in the nature of inflation in these three economies during the post-reopening period, they also help explain two common talking points that emerged in this time: fears of a wage-price spiral, and 'greedflation'. On the former, Bernanke and Blanchard provides a simple explanation as to why worries that a vicious cycle where wage rises would lead to price rises, and vice-versa, never materialised: inflation expectations have remained remarkably well-anchored throughout this inflationary shock. The greedflation story, or the notion that inflation has been driven by an increase in firms' profit, is shown by the above papers to partially explain 'second-round' inflation as one of several contributors to overall inflationary dynamics. It is true that the combination of a steep recovery

in demand, supply and demand mismatches, and labour market tightening facilitated workers' bargaining power while simultaneously increasing firms' ability to pass on higher input costs during this post-reopening period. Indeed, a theory by Weber and Wasner (2023) postulates that firms with market power experience temporary monopoly power following supply shocks, which can drive a 'seller's inflation'. That said, data on profit as a share of GDP, alongside evidence on the contributions of other factors, indicate that greedflation alone cannot explain inflationary dynamics during this third inflationary period.

Finally, expansionary fiscal policies were implemented to mute the impacts of energy price increases, helping to dampen European households' experienced inflation. Dao et al. (2023) estimate that policies such as the EU Market Correction Mechanism gas price cap reduced euro area CPI inflation by 2.2 percentage points in 2022, while in the United Kingdom, the similar Energy Price Guarantee reduced CPI inflation by some 2-3 percentage points over its lifetime (Dixon 2023). That said, fiscal support was often not sufficiently targeted to those who needed it the most - households at the bottom tail of the income distribution who spend a higher proportion of their budgets on energy. Idiosyncratic fiscal policies throughout the first three inflationary period alongside structural differences across countries generated an increased variance in CPI inflation rates within the euro area, rendering the ECB's job even more difficult during this post-reopening period (Figure 7). That said, it is encouraging that this dispersion narrowed from 2023 onwards.

Figure 7. Euro area inflation dispersion
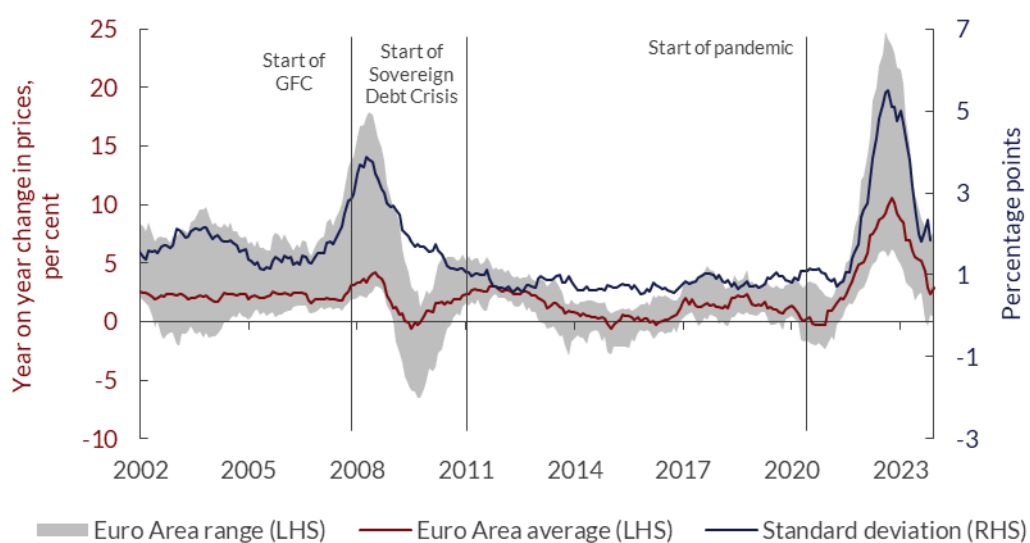
Source: OECD and NIESR Calculations *in* National Institute Global Economic Outlook

2.4 The post-energy-shock period (2023 Q2 - present)

With the steep energy price increases 'dropping out' of the CPI inflation calculation in all three major economies in the first half of 2023, we have now entered a post-energy-shock period (Figure 6). In December 2023, the annual rate of CPI inflation stood at 4.0 per cent, 2.9 per cent and 3.4 per cent, in the United Kingdom, euro area and USA, respectively. Given that the recent downward trend in the headline rate of CPI inflation has been driven by volatile price movements, I turn to examining a variety of measures of underlying inflation. Indicators of underlying inflation help separate the signal (the 'true' underlying trend rate of inflation) from the noise (volatile price movements). Understanding the underlying trend of inflation is essential for monetary policymakers, who typically do not respond to transient changes when setting interest rates.

It is important to analyse a variety of measures of underlying inflation as each gives you a distinct insight into inflationary dynamics. Two common statistical approaches for measuring underlying inflation are exclusion-based and trimming-based measures. Exclusion-based measures omit certain items from the price index when performing the CPI inflation calculation; for example, core CPI inflation excludes items such as food, energy, alcohol and tobacco because these components often face volatile price movements that might not cause a sustained change in the general price level. Equally, the services CPI inflation measure omits all goods from the basket. Trimming-based measures eliminate a percentage of items on both ends of the distribution of price changes in order to disregard outliers from the CPI inflation calculation. Another common indicator is the GDP deflator, which gives us a good sense of domestically generated inflation.

Despite significant falls in the headline rate of CPI inflation, underlying inflationary pressures remain elevated. In December 2023, core CPI inflation was 5.1 per cent, 3.4 per cent and 3.9 per cent in the United Kingdom, euro area and USA, respectively (Figure 1a). Core inflation being higher than the headline figure aligns with the story told in figure 6 that recent falls in CPI inflation have been partially driven by downward movements in energy prices, alongside an easing in food price inflation. Further, this measure indicates that the underlying inflationary pressures that central banks target are higher than those indicated by the headline CPI figures. To elaborate, the United Kingdom and euro area in particular import a substantial amount of their food and energy, but monetary policy can really only influence domestically generated inflation. In fact, the latest data indicate that in the third quarter of 2023, the GDP

deflator grew on the year by 8.4 per cent, 5.8 per cent and 3.3 per cent in the United Kingdom, euro area and USA, respectively. Additionally, the annual rate of services inflation – which is most heavily influenced by labour costs - was 6.4 per cent, 4.0 per cent and 5.3 per cent in December 2023 in the United Kingdom, euro area, and USA, respectively. Given that labour markets remain tight by historical standards, it is possible that we will continue to see elevated services inflation drive the headline CPI rate in the coming months (Figure 6). Altogether, these measures indicate that the underlying inflationary trend that central banks target is higher than that suggested by the headline rate of CPI, and that inflationary pressures remain embedded in domestic economies.

These elevated inflationary pressures are also broad-based. For instance, the Federal Reserve Bank of Cleveland's trimmed-mean CPI inflation rate omits the 8 per cent most volatile price increases and decreases in the distribution of price changes, finding that in December 2023, this figure was 3.9 per cent in the USA. Trimming all price changes except for at the 50th percentile yields the median CPI, which was 5.1 per cent in the USA in December. NIESR's measure of trimmed-mean inflation (omitting the 5 per cent largest price increases and decreases) in the United Kingdom was 5.5 per cent in December. In the euro area, 51.3 per cent of CPI basket components had an inflation rate above 4 per cent in November (Baudchon et al. 2023). Thus, while the supply and demand shocks that drove inflationary impulses during the first three inflationary periods have largely faded out, their pass-through or permeation into the general price level, both through goods and services, may continue to generate persistence in inflation (e.g., it may take longer than generally expected to stabilise fully at the conventional 2 per cent target).

The post-energy shock period is also characterised by the observed transmission of monetary tightening throughout the macroeconomy. In the euro area and United Kingdom, subdued economic growth and tightened financial conditions are particularly reflective of the cumulative effects of monetary policy. Annual GDP growth in both economies will no doubt have been lacklustre by historical standards in 2023, while survey data such as Purchasing Manager's Indices indicate that their manufacturing sectors have been declining since 2021 Q3 and their services sectors have not sustained growth since 2022 Q2. The TIGER Financial Activity Indicator - which covers a range of variables such as equity market, credit growth and volatility indices – indicates that financial activity in the United Kingdom, USA and euro area has been subdued throughout 2022 and 2023 following significant growth during 2021 (Brookings Institution 2023). Despite similar signs of financial tightening in the USA, American economic growth surprised forecasters in 2023, proving to be rather strong; in fact, the December 2023

Blue Chip forecast for annual USA GDP growth in 2023 was 2.6 per cent, revised upwards from a previous forecast of -0.1 per cent in December 2022 (CEA 2023). However, the effects of monetary tightening will take longer to manifest themselves in the still-tight labour markets in the USA and United Kingdom, so we will likely see more policy impact throughout 2024.

Therefore, while it is positive that headline CPI has seen significant falls over the course of this post-energy-shock period and most measures of underlying inflation have already peaked, it remains the case that inflationary pressures remain elevated relative to target, domestically embedded and broad-based. That said, there is plenty of evidence that monetary policy tightening has propagated through the macroeconomy. Taken together, these characteristics suggest that we still have some way to go before inflationary pressures are fully tamed, but we can expect to return to target in the medium-term.

### 3. The post-Covid monetary policy response

The BoE, Fed and ECB have embarked on the most aggressive global monetary tightening cycle since the early 1990s. Having established the nature of different inflationary surges since the onset of the Covid-19 pandemic, we can now attempt a broad assessment of central banks' monetary policy response.

Given that inflationary pressures in this episode have been at least partially demand-driven in all three economies, the monetary tightening cycle can be safely assumed necessary – an evaluation which has been contested by some authors in the US context in particular, arguing that inflation has instead been supply-driven or microeconomic in origins (See e.g., Stiglitz and Regmi 2022). However, the composition of demand-side inflationary pressures has been distinct across the three economies, requiring slight differences in monetary policy responses and timing among their central banks (though overall, monetary tightening has occurred in concert, which is to some degree reflective of spillovers). In the USA, for instance, demand-side inflation during the economic reopening period was far more characteristic of a general overheating, requiring the Fed to conduct more aggressive hikes than its counterparts at the start of its cycle (Figure 8a). On the other hand, in the euro area, core CPI did not rise much past historical levels until the post-reopening period, partly explaining why the ECB's tightening cycle began later than its counterparts' (Figures 1a, 8a).

With the obvious benefit of hindsight, it is possible that central banks were 'behind the curve,' or arriving late to tighten monetary policy during the post-Covid inflationary surge. As shown in figure 8a, the BoE, Fed and ECB did not begin their interest rate hikes until December

2021, March 2022, and July 2022, respectively, when their CPI inflation rates stood at 5.4 per cent, 8.5 per cent, 8.9 per cent and their core CPI inflation rates at 3.8 per cent, 6.5 per cent, and 5.1 per cent. Evidently, central banks would not have been expected to start tightening policy when the first inflationary surge signs emerged: the starting conditions (i.e., emerging from a deep, unprecedented recession) alongside central banks' remits (e.g., dual mandates and secondary objectives), and governance and decision-making processes need to be considered. Additionally, it is true that fiscal policy was at times better placed to offset certain price rises in this episode, such as in the form of energy price caps in Europe. Still, a more decisive monetary policy response to early signs of general economic overheating and of distorted price/wage setting could have made taming inflation less costly.

Figure 8. Central banks' post-Covid monetary tightening

a) Interest rate comparison

b) Speed of monetary tightening cycle
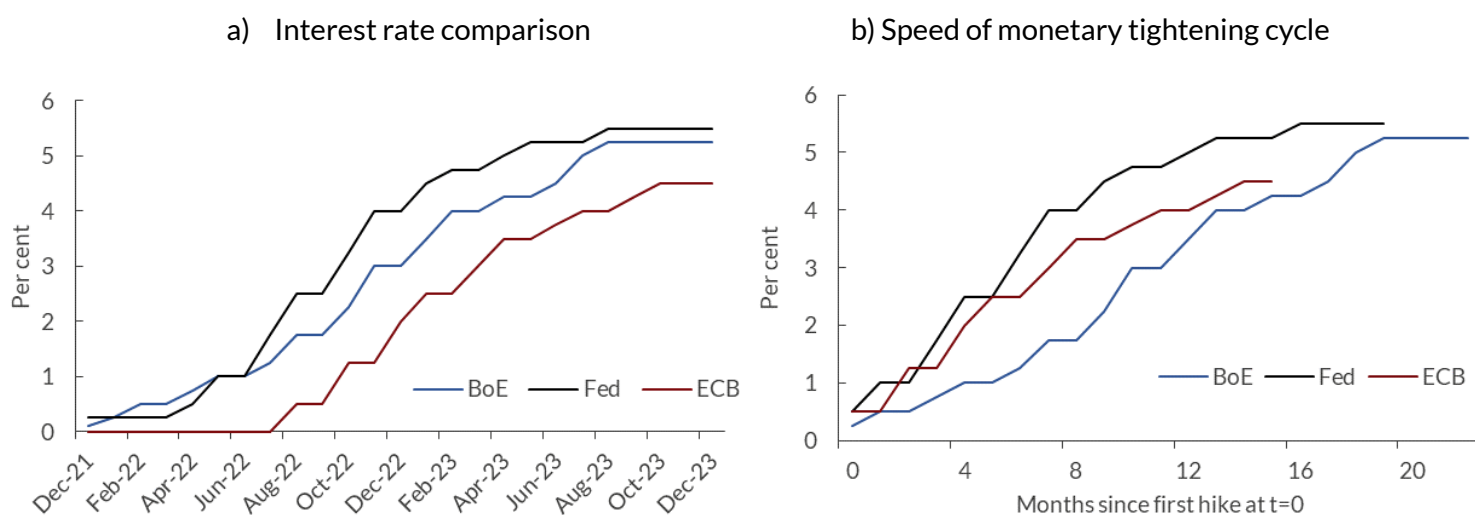

Sources: BoE, Fed, ECB, Author's calculations

To illustrate this point on decisive action in a very simplified way, one can observe the correlation between the speed of monetary tightening (figure 8b), and CPI inflation as well as underlying inflation rates (Figures 1a, 6). Though the BoE was the first central bank to begin its interest rate cycle (figure 8a), when we plot rate hikes by months since the start of the tightening cycle (figure 8b), the BoE appears to have conducted the slowest monetary tightening cycle of our three central banks. As we stand, headline CPI inflation and all measures of underlying inflation in the United Kingdom are above those of the USA and euro area. On the other hand, the ECB's very late but decisive tightening cycle may have contributed to decreased persistence in headline CPI inflation. Of course, these are two very different economies which have experienced different inflationary surges: as noted above, for instance, inflation during the post-

reopening period in the United Kingdom was partially driven by a labour market tightness shock, while in the euro area, volatile but transitory energy and food price shocks were the biggest contributors. Moreover, the cost for the BoE to raise interest rates to the level needed to bring inflation down to target by 2023 would have been incredibly high; Tenreyro (2023) estimates that this would have implied interest rates peaking at around 9.5 per cent in 2022. Additionally, earlier rate rises in the United Kingdom might have meant earlier rises in mortgage rates, which would have aggravated the negative effects of steep energy and food price increases on households. However, whether central banks were too slow to react in this time remains an open and contested question even when taking these nuances into account.

It must be acknowledged that the need to react earlier to inflationary impulses was not clear in real-time, especially under the conditions of radical uncertainty in which policymakers found themselves. Nevertheless, central banks starting their tightening cycles behind the curve is partially a story of forecast failure, as defined by Clements and Hendry to occur when a forecast is "significantly less accurate than expected given how well the model explains the data over the past, or compared to an earlier forecast record" (2008, pg. 2). Figure 9 illustrates the ECB, BoE and Fed's inflation forecasts compared against the data outturn. These charts are sometimes called 'hedgehog' charts because of their resemblance to the spikes protruding from a hedgehog's back; such charts are indicative of a failure to update information, causing the same type of error in consecutive forecasts. It is clear that we cannot blame forecasts for not foreseeing unpredictable events, from the Covid shock to Russia's invasion of Ukraine. That said, economists often refer to the famous saying by George E.P Box that "all [economic] models are wrong, but some are useful" to remind us that forecasts are only as good as their ability to inform forecasters or fulfil other explicit objectives (such as central bank forecasts' role as vehicles for communicating monetary policy to the public). By this metric, it can be argued that central bankers did not have the adequate tools to react in time to inflationary developments during the second and third inflationary periods. While this can be partially attributed to other factors, namely high uncertainty, it remains the case that forecasts consistently under-predicted inflationary dynamics during this episode. Consequently, an important takeaway for central bankers emerging from this inflationary surge has been the re-assessment of how best to utilise modelling capabilities during times of such deep uncertainty – as seen for instance by the commissioning of the Bernanke Review at the BoE and the announced monetary policy strategy review by the ECB expected in 2025.

Figure 9. Central banks' inflation forecasts (dotted) compared against data outturns (solid)
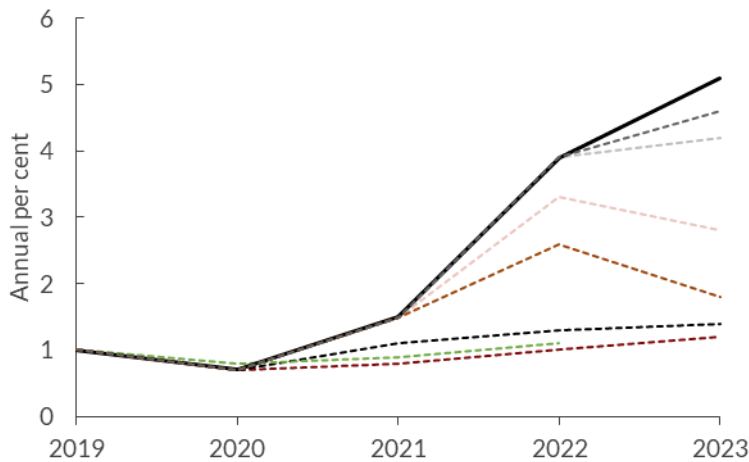
a) Monetary Policy Committee CPI forecasts
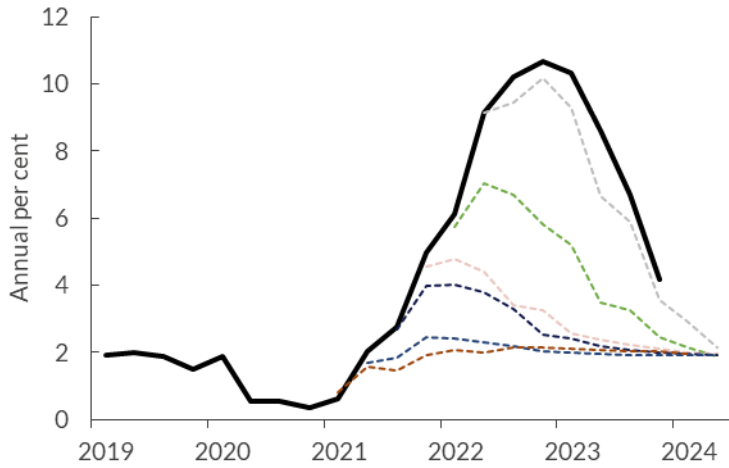
b) FOMC PCE forecasts
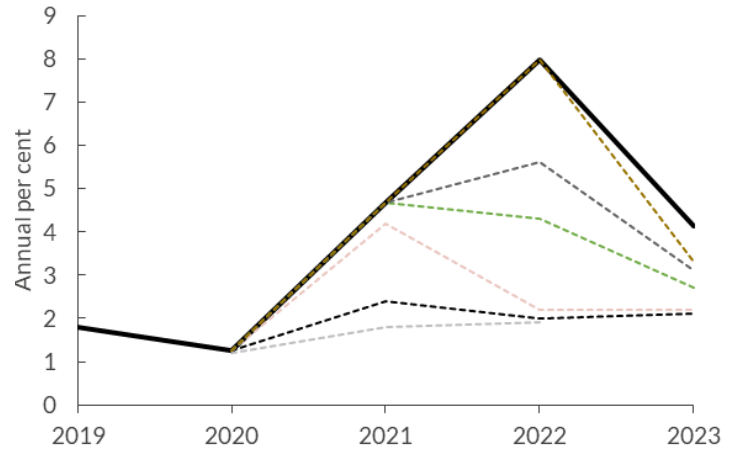
c) ECB staff CPI excl. food and energy forecasts

Sources: NiGEM database, BoE, Fed, ECB

Notes: The MPC forecasts represent select quarterly modal UK CPI forecasts conditioned on the market-implied path of interest rates. The FOMC Personal Consumer Expenditures (PCE) inflation forecasts represent select median forecasts reported in Summary of Economic Projections. The ECB staff projections are only available for median forecasts of CPI inflation excluding food and energy.

4. Conclusions

The nature of the various post-Covid inflationary surprises has evolved over time, and differently in the three economies considered in this paper. The United Kingdom, USA, and euro area all experienced a partial economic shutdown and a correspondingly steep loss in GDP at the onset of the Covid-19 pandemic. However, divergent contagion rates, differences in the breadth, magnitude and composition of fiscal and monetary policy support, and, ultimately, structural differences in their economies, led to vastly different starting conditions for the inflationary impulses that would emerge from the second half of 2020 onwards. During this first period, negative supply and demand shocks were jointly disinflationary. From 2020 Q3 to 2021 Q4, general overheating associated with economic reopening and fiscal stimuli, supply and demand mismatches, and supply chain disruptions all drove inflationary surges, particularly in the USA. From 2022 Q1 to 2023 Q1, energy and food price increases following Russia's invasion of Ukraine led to large increases in inflation in all three economies, particularly in Europe, while labour market tightness shocks generated significant wage and price pressure in the USA and United Kingdom. During the second and third inflationary periods, these conflicting positive demand and negative supply shocks were jointly inflationary. Since 2023 Q1, energy price decreases have facilitated significant falls in headline CPI inflation rates in the three economies while the cumulative effects of the global monetary tightening cycle have materialised.

We have now likely reached the end of this post-Covid global monetary policy tightening cycle. As we stand, underlying inflationary pressures remain elevated, domestically embedded and broad-based by historical standards; however, there is clear evidence that monetary tightening has propagated throughout the macroeconomy and inflation can be expected to return to target in the medium-term. In that sense, central banks have done enough to control inflation, though with the benefit of hindsight, earlier action might have reduced the costs of achieving price stability.

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