What's driving inflation: wages, profits, or energy prices? – speech by Jonathan Haskel

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Speech

I am delighted to be at the Peterson Institute here in Washington DC today. I will talk today about the UK economy and monetary policy, with some comparison to the US and euro area.

Let me summarise my main points at the outset.

1. My reading of official UK inflation data is that the contribution of rising business profits to recent inflation is small.
2. Looking forward, the labour market is still very tight in an absolute sense: for example, the vacancies-to-unemployment ratio remains historically very high, as does unit wage growth.
3. I prefer to lean against the risks of inflation momentum. As difficult as the economy's current conditions are, embedded inflation would be worse. Further increases in Bank rate cannot be ruled out.

Inflation in the UK: costly energy and a tight labour market

Since this is an international audience, let me start by giving you a quick overview of the UK inflation environment. The headline measure of inflation in the UK, the Consumer Price Index (CPI), has risen 8.7% in the year to April 2023. This is down from its recent peak of 11.1% in December 2022, which was the highest on record since the CPI officially began in 1988. Historic modelled estimates from the UK Office for National Statistics (ONS) suggest that inflation in the UK was last higher in February 1982.

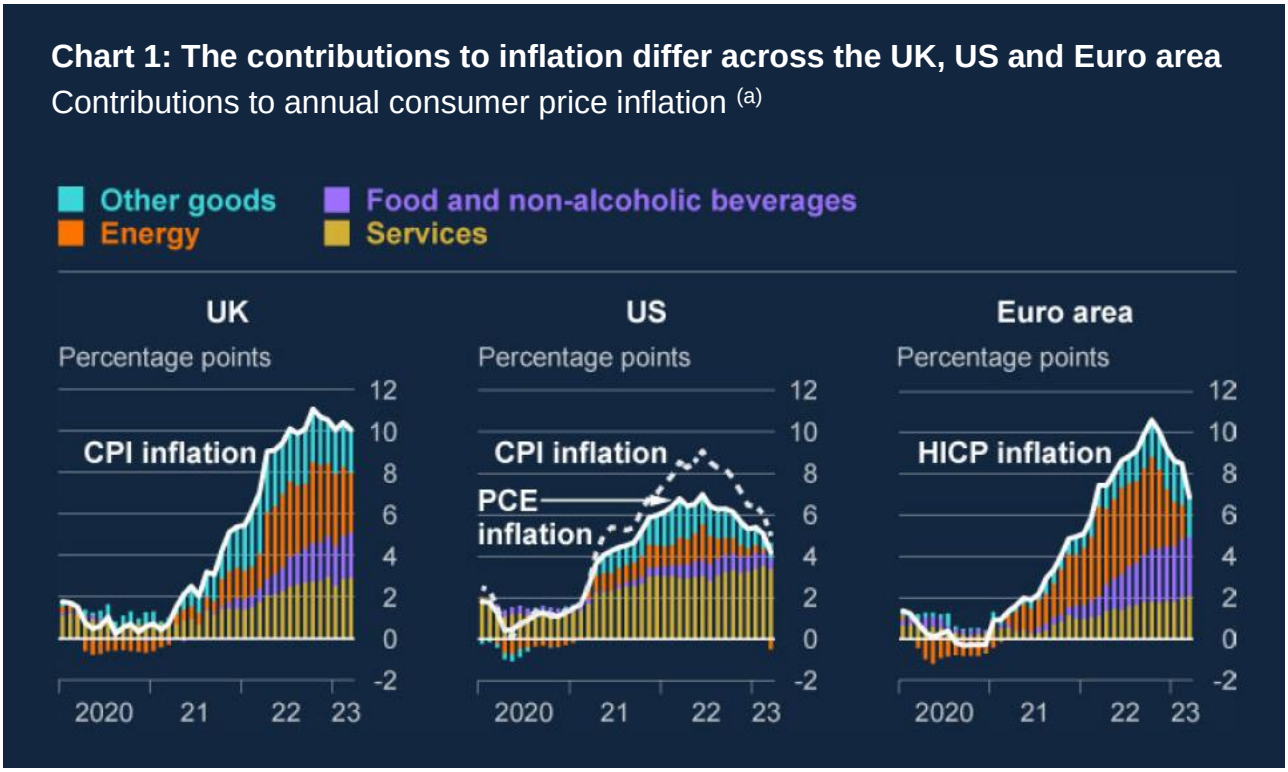
The current high inflation in the UK is due to a range of factors, which we explore shortly. Chart 1 shows inflation "component accounting". Based on the components of the CPI basket, services and energy were each accounting for about 3pp of inflation in the early part of this year, with 'food and non-alcoholic beverages' and 'other goods' each accounting for about 2pp. Relative to average contributions over the recent past, almost all parts of the CPI basket are contributing more than usual. That was especially true of energy until the April outturn, when base effects reduced the contribution significantly.[1]

A word on energy. In the US, the wholesale price of pipeline natural gas, expressed in terms of barrel of oil equivalents, rose from around $10 over 2020 to $50 in August 2022, before falling back to $12.50 in April 2023. In Europe, it has risen from approximately $20

[1] The inflation rate in the 12 months to March 2023 was 10.1%, and in the 12 months to April 2023 was 8.7%, according to data released the day before giving this speech. This illustrates the power of base effects: in April 2022, household energy bills rose 54%, and as they dropped out of the annual comparison, which contributed to a fall in inflation between March and April 2023 of 1.75 percentage points.

per barrel of oil equivalent to $80, although at its peak it was just over $400 in August 2022. The level of wholesale prices in the UK have largely tracked that in Europe, as the UK and European gas markets are highly integrated.[2]

Chart 1: The contributions to inflation differ across the UK, US and Euro area
Contributions to annual consumer price inflation (a)



Source: **Bank of England May 2023 Monetary Policy Report**, Chart 2.4.
(a) Energy includes fuel and household energy bills. Other goods is the difference between overall inflation and the other contributions identified on the chart, and therefore includes alcohol and tobacco. The latest data are March 2023 outturns.

The UK inflation's exposure to the energy crisis in Europe, initiated by Russia's illegal invasion of Ukraine just over a year ago, is both large and staggered. First, the UK is a large consumer of natural gas, but gas is also the 'marginal' fuel in electricity generation, which means it has an oversized effect on the consumer price of electricity in the UK. Second, household energy prices in the UK are set intermittently by a regulator (Ofgem), based on a number of factors including very importantly wholesale gas prices. As such, UK households saw staggered increases in their energy bills in April 2022 and again in October 2022, at which point the UK government implemented an energy price cap alongside other support.

[2] The **UK System Average Price of natural gas** was 25p/therm on average in 2020, peaking at 377p/therm in August 2022, and was 100p/therm in April 2023. The relative changes are similar to those reported for European natural gas prices, in different units. (A therm is 100,000 British thermal units: a British thermal unit is the heat needed to raise the temperature of one pound of water by one degree Fahrenheit).

Given these sharp and staggered increases last year, UK inflation is set to fall quite sharply this year as the past price level increases drop out of the annual comparison. The Bank of England's latest forecast in the **May 2023 Monetary Policy Report (MPR)** expects inflation to fall to 5.1% in 2023 Q4, driven notably by the decline in the direct contribution of energy to CPI.

Of course energy is used all along the supply chain as well, and this is one reason why the price of many other products has also risen markedly. Inflation in food, in particular, is very high, due in large part to the price of energy used in agriculture, food manufacturing, and transportation.[3]

Alongside high energy prices, the UK has also experienced a very tight labour market, with the ratio of vacancies to unemployment exceeding one towards the end of 2022. This is a near doubling on typical levels: in late 2022 there was at least one vacancy for every unemployed person, while pre-pandemic there was typically about one vacancy for every two unemployed people in the UK. The US, and to a lesser extent the euro area, have also experienced large rises in the vacancy to unemployment ratio relative to their respective norms.

The tight labour market has been exacerbated in the UK by a decline in labour market participation, or equivalently a rise in economic inactivity. This is likely due partly to demographic change, but also a large extent by an increase in long-term sickness in the working-age population and lifestyle changes, including amongst students and the over 50s. While the inactivity rate rose during the pandemic and fell again afterwards in most developed countries, in the UK it remains about 0.7pp higher at the end of 2022 than in 2019.[4]

Thus the UK has a US-style tight labour market, and a European-style tight energy market.

Inflation accounting: value added

I will shortly return to the differences and similarities in the drivers of inflation between the UK, US and euro area, and the resultant impacts on different groups in society. In order to do so, I'd like to set out a little framework for thinking about such things.

To get started, I'm going to describe inflation in the price of GDP. As you know, GDP measures the flow of domestic production in the economy over a year. So you can think of GDP prices as telling you something about inflation, roughly, in domestically produced goods and services. In the next section, we'll relate this to consumer price inflation: since

[3] See **Dhingra (2023)** for more on the pass-through of energy prices through the supply chain.
[4] See **Haskel (2022)** and **Haskel and Martin (2022)** for discussions of UK economic inactivity.

consumption includes imported goods, that is where import prices, including imported gas prices, will come in. But let us stick to GDP, or value added, prices for the moment.

Following National Accounting principles, income from production activities accrues broadly to either labour or capital. Of course capital income also returns to at least some households eventually, through dividends, pension accruals, and so forth. But let us equate labour income to the return of workers, and capital income to the return of capital owners.

Value added in the National Accounts can thus be broadly decomposed into labour income (compensation of employees) and capital income (gross operating surplus).[5] This is immediately helpful if we are to trace what is happening to profits and wages as contributors to price rises.

But we need to be careful when interpreting 'profits'. The National Accounts measure 'capital income'. Capital in the National Accounts includes domestic housing (in the National Accounts called "dwellings"). Thus capital income is not just profits on capital employed by businesses, but also incomes ascribed to dwellings. This is quite legitimate: owner-occupier households receive flow of domestic housing services when they live in their house. This value is calculated as an imputed rent i.e. the value mirrors what households would have to pay if they were renting a house (actual rental payments are recorded as income to businesses or the self-employed). As we shall see, measured capital income has risen in the UK, but not principally due to an increase in business capital income.

To be explicit, the measure of capital income in the National Accounts (gross operating surplus) includes the following:

- depreciation costs of using capital assets in production (consumption of fixed capital)
- the residual business income after depreciation costs are deducted (net operating surplus)
- income from housing, both that of landladies/landlords (actual rental) and of owner-occupiers (imputed rental)

[5] There are a number of complications here set out in the appendix. We mention two. First, the income of the self-employed, which is a combination of both labour and capital income (hence its name, 'mixed income'). To ensure comparability across regions using the OECD quarterly national accounts, however, we treat mixed income as part of capital income, alongside gross operating surplus. Second, various statistical adjustment to the counting of GDP, specifically the "alignment adjustment" are additional income sources but are hard to know where to be allocated.

- (and in international data) income of the self-employed (mixed income), which is a combination of labour and capital income (which is in turn a combination of the first two components above: depreciation costs and residual business income)

Although depreciation is part of the payments to business capital assets, I consider this term reflecting more a cost of doing business than profit.

This leads to a problem of interpretation when using unit capital, rather than say a 'profit margin' or 'mark-up' measure.[6] It is quite possible for net operating surplus to increase without an increase in the profit margin or mark-up. For instance, firms might be expected to invest in more capital to substitute for other factors of production that get more expensive (such as energy and labour). This would lead to 'capital deepening', which is a larger capital stock relative to other inputs (especially labour). A larger capital stock implies more income to capital, for a given profit rate (profit per unit of capital). Thus, greater unit capital costs need not necessarily reflect increasing mark-ups or profit margins, although that could also explain the data. It could simply be that there is more capital that is being remunerated.

We must also account for taxes and subsidies on products and production.[7] Taxes reflect income generated from production activities, but not accruing to labour or capital, instead paid to government. Thus, taxes are a positive component of the income approach to GDP. By contrast, subsidies provide income to either labour or capital, but that income is not generated from production activities. Instead, it comes from the government, although of course they may in turn have been funded through taxation. Thus, we add taxes and deduct subsidies from factor incomes, giving GDP.

This decomposition of GDP by the income approach is an identity in values, but a dual exists in prices. That is, the price of value added (the GDP deflator) can be expressed as a weighted average of unit labour costs, unit capital costs, unit taxes, and (less) unit

[6] This is also illustrated by Banca D'Italia staff in **Colonna, Torrini and Viviano (2023)**. They show that the profit share of value added can increase due to increases in the share of intermediates in total cost, or when marginal cost increases faster than average cost, even if mark-ups are flat or falling. In the UK, as shown in Figure 11, the capital share (one minus the labour share) has in fact fallen relative to 2019, but has risen in the past few quarters. The more narrowly-defined 'profit share' has changed little on 2019 levels in the UK.
[7] In the income approach to GDP, taxes on products (including VAT) and on production are added, and subsidies on products and on production are deducted. Under National Accounts definitions, taxes are compulsory, unrequited payments, in cash or in kind, made by institutional units to government units, and subsidies are current unrequited payments which general government units make to resident producers. As examples, furlough payments were a subsidy on production, since they related to the volume of production and not to any particular product. The payments to energy companies to facilitate the energy price caps are subsidies on products (energy), since they compensate firms for charging a price below the market price. The windfall tax on energy producers is not counted as a tax on production, but rather a tax on income, and so does not adjust GDP.

subsidies. Barring some statistical discrepancies, we can thus decompose almost exactly the change in the GDP deflator into these factors. This is shown in equation 1.[8]

$$P_V V = WL + RK + TxS \quad (1)$$

$$\Rightarrow$$

$$dp_V = s_V^L \underbrace{(dw - (dv - dl))}_{\text{Unit labour costs}} + s_V^K \underbrace{(dr - (dv - dk))}_{\text{Unit capital costs}} + s_V^T \underbrace{(dT - dv)}_{\text{Unit taxes}} - s_V^S \underbrace{(dS - dv)}_{\text{Unit subsidies}}$$

Where unit cost growth of each component is weighted by their shares in GDP in the base period, updating each quarter.[9] See the appendix for more details.

The UK

We shortly show these decompositions using comparable data across countries, but as a slight digression, we show the data for the UK first, since we have more detailed data to break down some of the categories. Full data are shown in the appendix, but Chart 2 shows the annual change in 2022 Q4 (relative to 2021 Q4). This is useful, since the furlough scheme ended in the UK at the end of 2021 Q3, and so the taxes/subsidies in the year to 2022 Q4 do not relate to furlough payments, and are instead mostly support for those facing high energy prices.

The left column shows the contributions to the inflation in GDP of 7.3% between 2021 Q4 and 2022 Q4. The contributions of unit labour costs and unit capital costs are similar, at 3.1pp and 3.4pp respectively. Notice that subsidies lowered GDP inflation by 1.4pp.

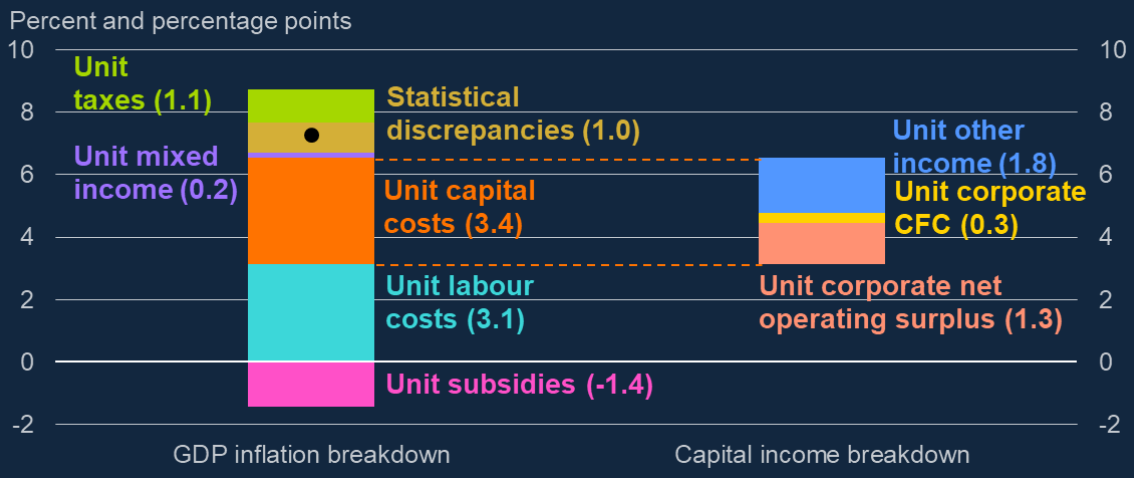
Second, as we have mentioned, capital income covers a number of different headings. The second column breaks out unit capital costs into the contributions of corporate net operating surplus, corporate depreciation (consumption of fixed capital), and other capital income (including depreciation in the non-market sector, and housing income). That shows that a fair part of the capital income bar in the UK is actually a rise in this ‘other’ capital income. Rising business profits (corporate net operating surplus) contributed 1.3pp.

The bottom line to all this is that finding out the contribution of business profits to (GDP) inflation cannot be easily gleaned from aggregate gross operating surplus data. On our

[8] P_V is the price of GDP, V is real GDP, W is the average unit price of labour (wage), L is the volume of labour, R is the average unit rice of capital (rental price), K is the volume of capital, T is taxes on products and production, and S is subsidies on products and productions. Terms preceded by d and in lower case represent annual changes. S_V^x is the share of x in (current price) GDP in the base period.
[9] For instance, annual growth to 2022 Q3 is weighted by the shares of GDP in 2021 Q3, and annual growth in 2022 Q4 is weighted by the shares of GDP in 2021 Q4.

reading of the official UK data, the contribution of business profits to this measure of "domestically generated" inflation, in the year to 2022 Q4, is small.

Chart 2: Detailed decomposition of UK GDP deflator growth, 2022 Q4 (a)



Sources: ONS, author's calculations.
(a) CFC stands for consumption of fixed capital, which is the term for depreciation in the National Accounts. Unit other income includes owner-occupied housing income, and the consumption of fixed capital of government and the non-profit institutions serving households (NPISH) sector. Statistical discrepancies includes both the quarterly income alignment adjustment and the statistical discrepancy on income.

Comparable data: UK, US and Euro area

Charts 3 to 5 show a comparable decomposition of annual growth in the GDP deflator for the UK, US and euro area. Table A summarises the contributions for two time periods: the annual growth to 2022 Q4 (the latest data) and the average over 2022. In this decomposition, for reasons of data availability, unit capital costs includes all mixed income and gross operating surplus, thus including imputed rents on dwellings and various statistical discrepancies, as well as business profits.

These charts and Table A show a number of facts. First, a comparison of the left and right hand side panels in the table (the annual change to 2022 Q4, and the average annual change over 2022), shows that the exact numbers vary greatly depending on the time period. This immediately points to the importance of 'base effects'. The furlough scheme in the UK ran until the end of 2021 Q3 and so the annual comparison to 2022 Q4 is the first not to be affected by furlough. It therefore reflects mostly the period of energy prices rises and energy subsidies. The average of annual comparisons over 2022 reflects both the incoming energy subsides, but also the winding down of the furlough scheme over 2021.

Second, the contribution of unit labour costs has been consistently large in the US, and also large in the UK in recent quarters. In the euro area it has been a more modest contributor, although also picked up in 2022 Q4. This is in line with the tightness of labour markets, especially in the US and UK, and to a lesser extent in the EA.

Third, regarding the contribution of unit capital costs, it has been relatively modest in the UK until recently, with negative contributions in 2021 and early 2022, before increasing through 2022 as inflation increased. It has been consistently positive, albeit still relatively modest, in the US, but perhaps a bit higher in Europe in the second half of 2022. Fourth, subsidies have been an important variable contributor, especially in the UK. It is worth considering subsidies in more depth.

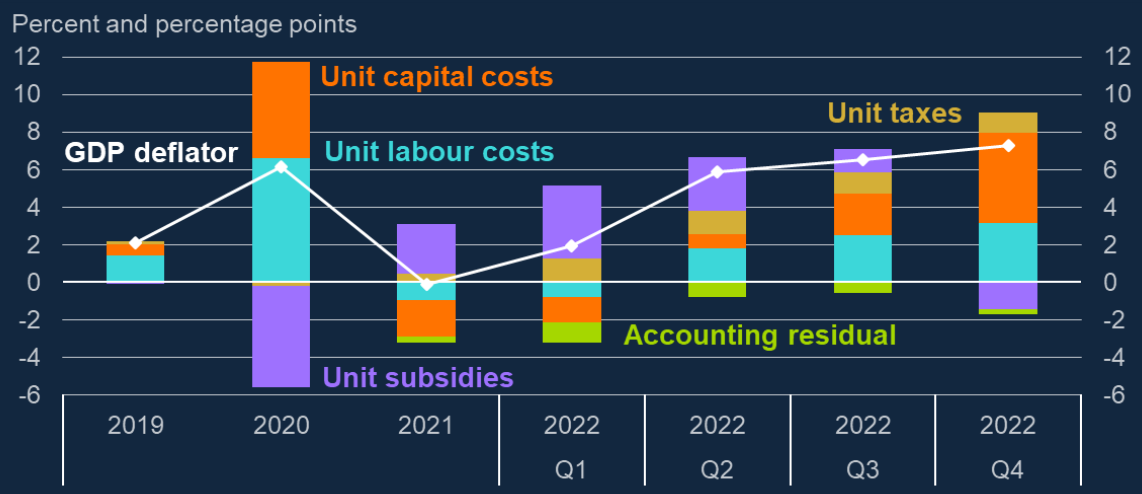
Table A: Decomposition of annual GDP inflation
Percent and percentage points [(a)]

Component	Quarter 4 2022			2022 average		
	UK	US	Euro area	UK	US	Euro area
GDP deflator (%)	7.3	6.4	5.8	5.4	7.0	4.6
Unit labour costs	3.1	3.3	2.3	1.6	3.4	1.7
Unit capital costs	4.8	1.7	3.5	1.6	2.0	2.0
Unit taxes	1.1	0.2	0.2	1.2	0.3	0.5
Unit subsidies	-1.4	0.7	-0.3	1.7	1.6	0.5
Accounting residual	-0.3	0.5	0.0	-0.7	-0.3	0.0

Sources: BEA, Eurostat, OECD, ONS, author's calculations.

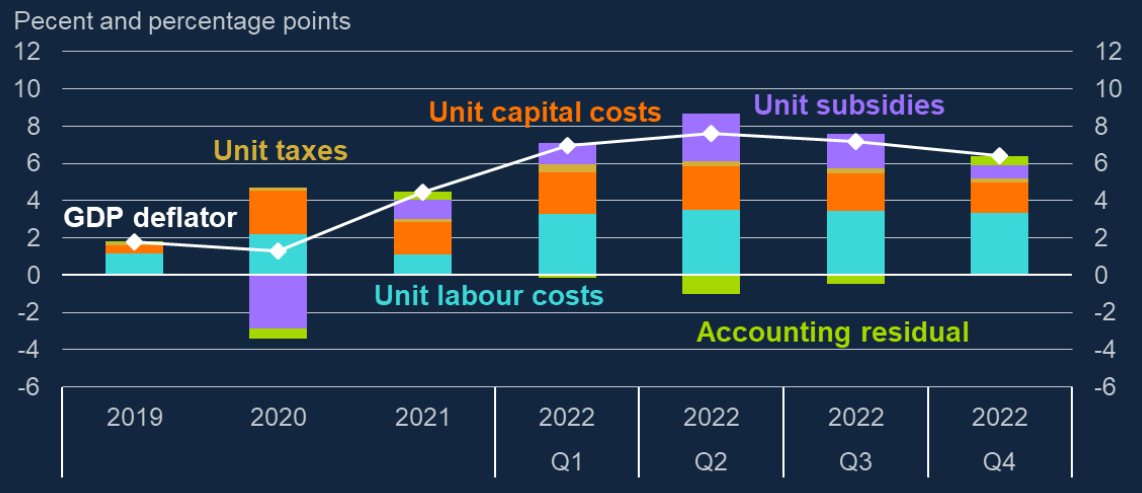
(a) Unit capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment. Accounting residual is the different between the income components of GDP and headline GDP, in the UK known as the statistical discrepancy on income.

Chart 3: Decomposition of UK GDP deflator growth, 2019 to 2022 Q4



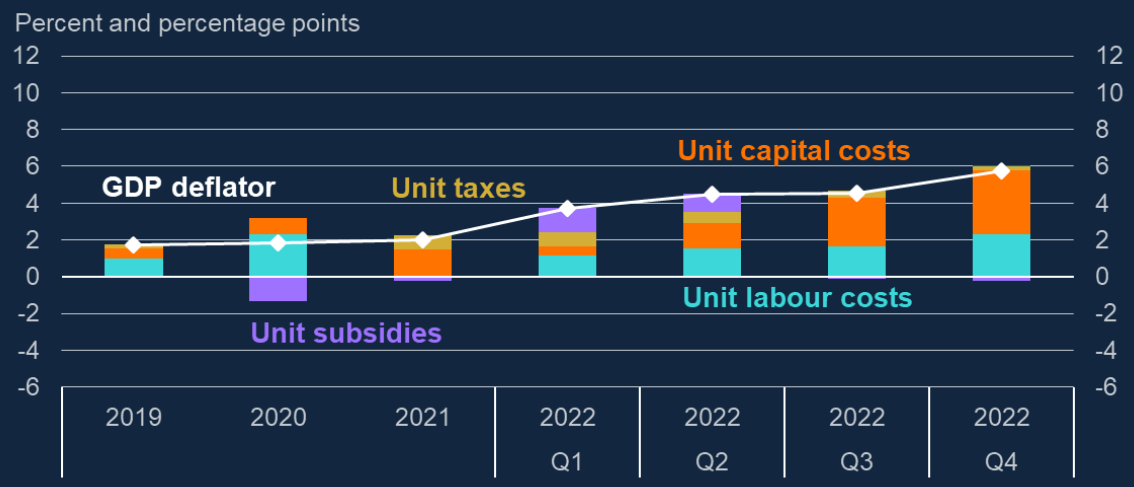
Sources: OECD, ONS, author's calculations.
(a) Unit capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment. Accounting residual is the different between the income components of GDP and headline GDP, in the UK known as the statistical discrepancy on income.

Chart 4: Decomposition of US GDP deflator growth, 2019 to 2022 Q4



Sources: BEA, OECD, author's calculations.
(a) Unit capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment. Accounting residual is the different between the income components of GDP and headline GDP, in the UK known as the statistical discrepancy on income.

Chart 5: Decomposition of euro-area GDP deflator growth, 2019 to 2022 Q4



Sources: Eurostat, OECD, author's calculations.
(a) Unit capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment.

Subsidies provide income to factors of production that is not generated through economic activity (think of furlough payments for furloughed workers for example), which is why we deduct subsidies when adding up income in GDP. Thus, the presence of subsidies makes some other factor income appear 'too big' relative to their role in explaining the income corresponding to produced value added in the economy.

In the UK, we have had two large waves of subsidies recently: furlough, and now energy payments. The furlough payments during the pandemic supported labour income, and can be seen in Chart 3 as the large negative subsidies bar in 2020, which can be thought of as offsetting the large positive unit labour costs bar in 2020.

Furlough payments ended in 2021 Q3, and since then the lower level of subsidies relative to the year before have appeared to push up on GDP deflator growth during 2021 and the start of 2022. This is because we express inflation in terms of annual changes. For instance, inflation in early-2022 is relative to early-2021, which was in the height of the pandemic, when there were large subsidy payments (furlough). Compared to 12 months prior, subsidies had fallen sharply, and so pushed up on GDP inflation, for a given rate of growth in the other components. Since furlough ended in 2021 Q3, it is not until 2022 Q4, the latest quarter for which we have data, that we get an annual comparison which is clear of these furlough base effects.

More recently, subsidies have been paid to energy-supplying businesses in the UK to compensate them for applying a government-mandated cap on retail energy prices, for both households and other businesses. Thus, the capital income of energy companies appear larger than it 'should' be, on account of these subsidies.[10] This can be seen in Chart 3 in 2022 Q4, when the subsidies bar again goes negative, and the unit capital costs bar increases – the parallel to the furlough experience in 2020. I believe it is useful to account for these subsidies when considering the apparent increase in unit capital costs.

What of the EA? Various policymakers and commentators[11] have remarked on the role of increasing profits in driving inflation in the euro area, motivated in part by decompositions like those shown in Charts 3 to 5. I am much less knowledgeable about European economics than they are, and do not intend to give out policy advice. But I would note a number of things on the interpretation of the role of profits in this analysis.

First, recall that capital income encompasses far more than just profits, and that it is possible for capital income to increase without an increase in profit margins. In the UK data, the contribution of business profits (corporate net operating surplus) to recent GDP inflation appears small.

Second is the role of subsidies. Chart 5 shows that, in 2022 Q4, unit profits are making an apparently substantial upward contribution to value added inflation in the euro area, with, unlike in the UK, unit subsidies appearing to make only a modest negative contribution in the euro area in 2022 Q4. Does this mean that rising unit profits really are driving up inflation in the euro area? Unfortunately, this is not a simple question.

There have been various responses to the energy crisis across European countries, but they have taken many forms.[12] Some have been direct payments to households – these are not subsidies, as measured in GDP, but transfer payments. Some have been reductions in taxes, such as fuel duties – these would clearly show up in the unit taxes contribution, instead of as subsidies. Some have been subsidies to energy-supplying businesses (like in the UK) or to energy-using businesses. There have also been some increased taxes on the profits of energy companies (such as the Energy Profits Levy in the UK) – these are taxes on income, rather than production, and thus do not affect GDP.[13]

There is also a timing effect, which can affect the impact on inflation. The UK has the price cap mechanism which delayed the full effects of rising gas prices on household energy

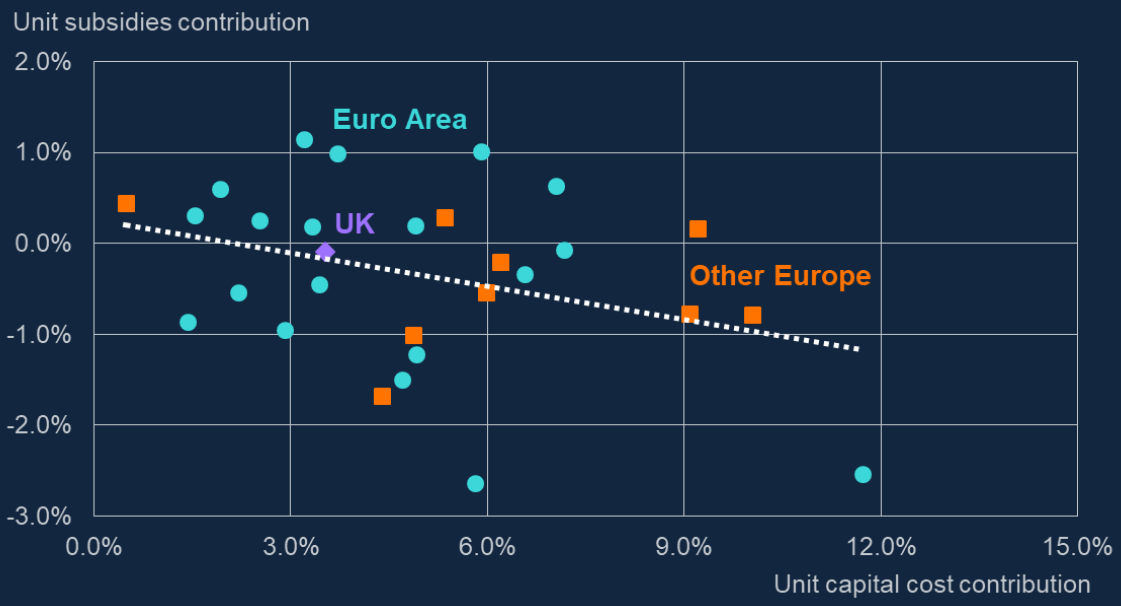
[10] This is not a comment on the profits of such companies reported in financial markets, but merely a comment on the treatment in National Accounting.
[11] Including **Panetta (2023)**, **Lane (2023)**, **Lagarde (2023)**, and **Arce, Hahn and Koester (2023)**.
[12] See work by Bruegel (**Sgaravatti, Tagliapietra, Trasi and Zachmann, 2023**) for an account of the various national fiscal policy responses to the energy crisis across European countries.
[13] Taxes on income, including business profit income, are accounted for in the "secondary distribution of income account" in the sequence of accounts, but do not impact GDP directly. This is different to taxes on production, which are applied irrespective of the level of income (profit).

bills until October 2022. In countries with different arrangements for their retail energy prices, consumers may have faced higher prices earlier or later than this. Thus, some subsidies relating to the energy crisis would have been paid and recorded before the end of 2022. And the largest energy-related subsidy in Europe, Germany's 'Economic Defence Shield', comes into effect mostly in 2023 Q1, and so is likely not (yet) visible in Chart 5.

To explore the role of subsidies in the apparent increase in unit capital costs in the euro area, Chart 6 compares the unit subsidies component with the unit capital costs component for European countries in the second half of 2022.[14] Countries with a greater negative contribution from the subsidies component saw on average a larger contribution from the unit capital costs component. So while the euro-area aggregate does not show much role of subsidies, this hides significant heterogeneity at the country level. For the UK, the relationship is more apparent in 2022 Q4, when the energy subsidies were introduced, as seen in Chart 3.

Chart 6: Countries with a larger unit capital cost contribution tend to have a larger offsetting contribution from unit subsidies

Contribution of unit subsidies and unit capital costs to GDP deflator annual growth, second half of 2022, European countries [(a)]



Sources: Eurostat, author's calculations.

(a) Data are for an average of 2022 Q3 and 2022 Q4. Countries covered are EU27, UK and Switzerland. Data from Eurostat. Best fit line is unweighted by country size. $R^2 = 0.12$.

[14] I have used the second half of 2022, rather than just 2022 Q4, due to the differences in timing of energy price increases and subsidies as described in the text. The result is similar if working with the 2022 Q4 data.

All of this means, in my view, that it is difficult to be sure of the role that unit capital costs are playing in inflation right now. This is especially true for the euro-area aggregate, given the variety of policies being implemented across countries. It is nonetheless important to be mindful of the distorting effect of subsidies on these data.

Consumer price inflation

Theory

With this in hand, let us turn our attention back to explaining consumer price inflation. The price of GDP (the GDP deflator), useful as it is, is not the price of consumption (the consumption deflator). The target of the Bank of England is 2% inflation according to the Consumer Price Index (CPI), and similarly for the ECB. The Fed instead focuses on headline Personal Consumption Expenditure (PCE) inflation. So let us relate our discussion of the various factor incomes back to this.

What is the connection between GDP price inflation and consumption price inflation? Suppose the UK economy produces value added entirely for consumption or export, and imports energy, some of which is used to produce domestic goods and some consumed directly by consumers. Then CPI inflation would be value added inflation plus the difference between imported and exported price inflation (weighted by the shares of imports and exports in consumption, respectively). In reality, domestic value added is used to produce investment and government goods and services as well as consumption and exports, and there are various index number complications. This is explained more fully in the appendix, but it leads to an expression for CPI inflation of the form in equation 2.[15]

$$dp_C = dp_V + s_C^M (dp_M - dp_X) + \psi' \qquad (2)$$

Where Ψ are the index number distortions, investment and government prices relative to GDP prices. For brevity in these equations we will assume that the share of imports and exports in consumption is the same (which is roughly the UK case), but in practice we shall weight each by their respective shares.

Recall that we can express the GDP price as the weighted average of the factor income prices (equation 1). So we can substitute this in for the GDP deflator in equation 2. This

[15] p_C is the price of consumption, p_M is the price of imports, and p_X is the price of exports. See also text and footnote 7.

gives us a comprehensive decomposition of the National Accounts consumption deflator[16], but we will make one more amendment.

We will separate unit labour costs into nominal labour costs and labour productivity, using a suitable measure of the volume of labour input, namely total hours worked. We can do likewise for unit capital costs, using a measure of the capital stock[17] to separate capital productivity and nominal capital costs. Labour productivity and capital productivity combined, with appropriate weights, is a measure of TFP. So the GDP deflator is decomposed into share-weighted nominal labour and capital income, share-weighted unit taxes and unit subsidies, and (less) TFP. This is shown in equation 3.[18]

$$dp_V = s_V^L dw + s_V^K dr - dtfp + s_V^{TxS}(dTxS - dv) \quad (3)$$

Bringing it all together by substituting equation 3 into equation 2, we can decompose CPI inflation as in equation 4.

$$dp_C = s_V^L dw + s_V^K dr - dtfp + s_V^T(dT - dv) - s_V^S(dS - dv) + s_C^M(dp_M - dp_X) + \psi'' \quad (4)$$

In words, CPI inflation is:

- share-weighted change in nominal labour cost
- share-weighted change in nominal capital cost
- (less) change in TFP
- share-weighted change in unit taxes relative to GDP volume
- (less) share-weighted change in unit subsidies relative to GDP volume
- share-weighted change in import price relative to GDP price, net of share-weighted change in export price relative to GDP price (terms of trade effect)
- plus ‘other’, comprising:
    - (less) share-weighted change in government and NPISH expenditure price relative to GDP price
    - (less) share-weighted change in investment price relative to GDP price

[16] If we want to decompose CPI rather than the National Accounts consumption deflator, we will need to also account for the difference between the two. This will be driven by the treatment of expenditure items which are included in household consumption in the National Accounts, but are not in the CPI basket, most notably owner-occupied housing costs (imputed rental) and the implicit cost of some financial and insurance services (FISIM). The Bank’s remit is 2% inflation according to the Consumer Price Index (CPI). I use the National Accounts consumption deflator here because it is the closest measure in the National Accounts framework, not because I judge it to be a better measure for UK monetary policy.

[17] For international consistency, we use the EU KLEMS dataset, created by **Bontadini et al. (2023)**, as our estimate of the capital stock in the UK, US and euro area. We take annual estimates up to 2019, extrapolate forward to 2022 using the perpetual inventory method, and then interpolate linearly to generate quarterly levels.

[18] $dtfp$ is the growth in total factor productivity. See also text and footnotes 7 and 14.

- difference between changes in National Accounts household consumption deflator and CPI
- various statistical discrepancies

This is an accounting identity, which conveniently summarises the claims of various parties in the economy on real resources. We can use it to work through what are called “first” and “second” round effects. First round effects are that, arithmetically, if the price of imports rises relative to the price of exports, and all other terms are unchanged, inflation must rise.[19] (Indeed, to get some sense of this in the British data, the share of fuel imports in consumption is about 7% in 2022 Q4, up from about 3% before the recent price rise. The price of fuel imports has, between 2019 Q4 and 2022 Q4, more than doubled (having peaked in 2022 Q3 and fallen somewhat in 2022 Q4). Thus CPI rises, arithmetically, by about 3% in 2022 Q4 relative to 2019 Q4. This is however offset by an increased price of UK fuel exports, and obscured by the price cap mechanism in the UK.)

What of second round effects? Suppose the increase in the import price, relative to the export price, is permanent and the import price stops rising, staying at a higher level. This ‘first-round’ effect has generated inflation, which now falls to zero when the import price stops rising (a year after, if inflation is measured in annual changes). Even though inflation (*growth* in the price level) is zero, the consumer price *level* has risen: consuming goods is more expensive than before. That means, again arithmetically, that the ‘real’ returns of labour and capital have fallen (i.e. labour and capital income in terms of their purchasing power have fallen). What is called a ‘second-round’ effect can be seen arithmetically. An attempt by labour or capital to restore their returns to their former purchasing power level, will, again arithmetically, raise inflation, even though there is no further increase in the import price beyond the initial increase.

What can prevent this from occurring? To answer that question fully we need a behavioural model of wages, prices and their interaction with monetary policy, which I do not consider here. But looking at our decomposition shows some effects. First, rising TFP potentially ‘enables’ increases in labour income or capital income without an increase inflation. This is as it should be: TFP is a resource-free increase in total output (and thus total income) and hence can increase real factor earnings.

Second, for a given level of nominal factor income, rising subsidies would lower inflation, other things equal. Recall that subsidies are income to either labour or capital that is not earned through production. Thus, subsidies could restore factor incomes to some higher level, without causing inflation to increase, at least in the short run. Of course, any such

[19] Inflation would rise by the share-weighted change in the import price less the share-weighted rise in the export price. Note that since imports includes intermediates, the imports share is the share of both final and intermediate imports in consumption.

subsidies need to be funded, likely by future taxation, but I do not discuss that here. The ultimate economic incidence of such subsidies is a matter of economic theory.

Data

Charts 7 to 9 put this decomposition into practice for the UK, US and euro area, using official National Accounts data, for the years 2019-2021, and the quarters of 2022. Table B summarises the results. Chart 10 and Table C summarise the cumulative change over a longer time period. I stress that I do not make a value judgement as to which returns should have risen or fallen, or any causal claims about what is driving inflation. This is merely an arithmetic decomposition to look at which returns have, in fact, risen or fallen.

Starting with the UK, as of Quarter 4 2022, CPI inflation was 10.8%. That is, consumer nominal expenditure grew 10.8% faster than real consumption. Of this extra expenditure, about 3.1pp went to nominal labour cost growth, 4.2pp went to nominal capital income growth, 1.1pp went to growth in unit taxes, 0.6pp went to a negative terms of trade effect, and 0.6pp went to a decline in TFP. This was offset somewhat by a -1.4pp contribution from unit subsidies. There is also a large ‘other’ component of 2.5pp, encompassing the difference between the National Accounts consumption deflator and the CPI, differential price changes in capital investment and government services relative to GDP, and other statistical discrepancies.

The following points are worth noting. First, the contribution of capital income seems large, but as we saw above, this is partly ‘enabled’ by subsidies. Offsetting the capital income component by the subsidies component gives a 2.8pp contribution, which still represents an increase on the previous quarter, but a much smaller one. Recall as well, that this includes much more than just profits, including deprecation and imputed rents to dwellings.

Second, the terms of trade effect in total adds just 0.6pp to UK inflation in 2022 Q4, having added much more in previous quarters. If one were to consider just the fuels component (not shown), this is close to zero in 2022 Q4. This reflects a sharp fall in the wholesale price of gas, and thus a sharp fall in the import price of fuels.

Why is this different to the component-based decomposition of UK inflation in Chart 1? As noted previously, the consumer price of gas and electricity is fixed in the short-term due to the Ofgem price cap mechanism. This explains the discrepancy between the still-large energy contribution in the component-based decomposition of inflation in 2022 Q4 in Chart 1, and the much smaller terms of trade contribution in the National Accounting cost-based decomposition of inflation in Chart 7.

Table B: Decomposition of consumer price inflation, 2022 Q4 and 2022
Percent and percentage points [(a)]

Component	Quarter 4 2022			2022 average		
	UK	US	Euro area	UK	US	Euro area
Consumer price inflation (%)	10.8	5.7	10.0	9.0	6.3	8.4
Nominal labour costs	3.1	2.7	2.1	1.9	2.8	1.6
Nominal capital costs	4.2	1.1	3.6	2.6	2.0	2.8
TFP	0.6	1.1	0.1	-1.2	0.7	-0.8
Unit taxes	1.1	0.2	0.2	1.2	0.3	0.5
Unit subsidies	-1.4	0.7	-0.3	1.7	1.6	0.5
Terms of trade	0.6	-0.2	2.5	1.9	-0.3	3.8
Other	2.5	0.0	1.7	1.0	-0.8	0.0

Sources: BEA, BLS, EU KLEMS, Eurostat, OECD, ONS, author's calculations.
(a) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment.

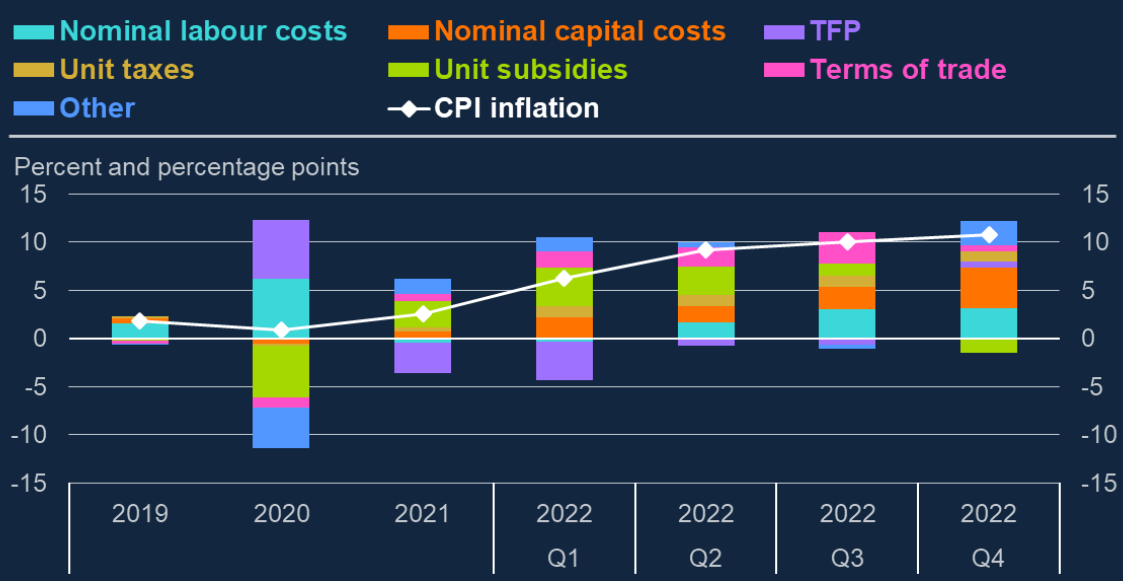
Turning to the US, the inflation rate[20] is lower than in the UK or euro area, but the contribution from nominal wage growth is still large, such that it makes up a larger proportion of total inflation according to this decomposition. This is consistent with a tight labour market in the US. There is limited effects of terms of trade on US inflation, in part because the US is now a net fuel exporter, and the role of nominal capital income growth is falling. Unit subsidies are pushing up inflation in the US in recent quarters (for a given level of nominal factor income growth), reflecting continuing withdrawals of covid-era

[20] For the US I use inflation according to the PCE measure, on which the Federal Reserve focuses, but for the UK and euro area I use the CPI and HICP respectively. The equivalent of the PCE for the UK and euro area may also be lower than the CPI and HICP.

support for firms. Negative TFP growth, reflecting an unwinding of positive compositional effects during the pandemic, also pushes up inflation in recent quarters.

In the euro area, there has been a much larger contribution from the terms of trade shock, and while this reduced in size in 2022 Q4, it is still a large contributor to euro-area inflation. This reflects a larger weight on imports and exports in euro-area consumption than in the UK[21], as well as slightly faster import price growth relative to export price growth. The role of nominal labour income growth is smaller, likely reflecting a less tight labour market. The role of nominal capital income growth is somewhat larger than the US and increasing slightly in recent quarters, although again this may not reflect profits as discussed previously. There is a large 'other' bar in 2022 Q4, partly reflecting the difference between the National Accounts consumption deflator and the HICP (as in the UK).

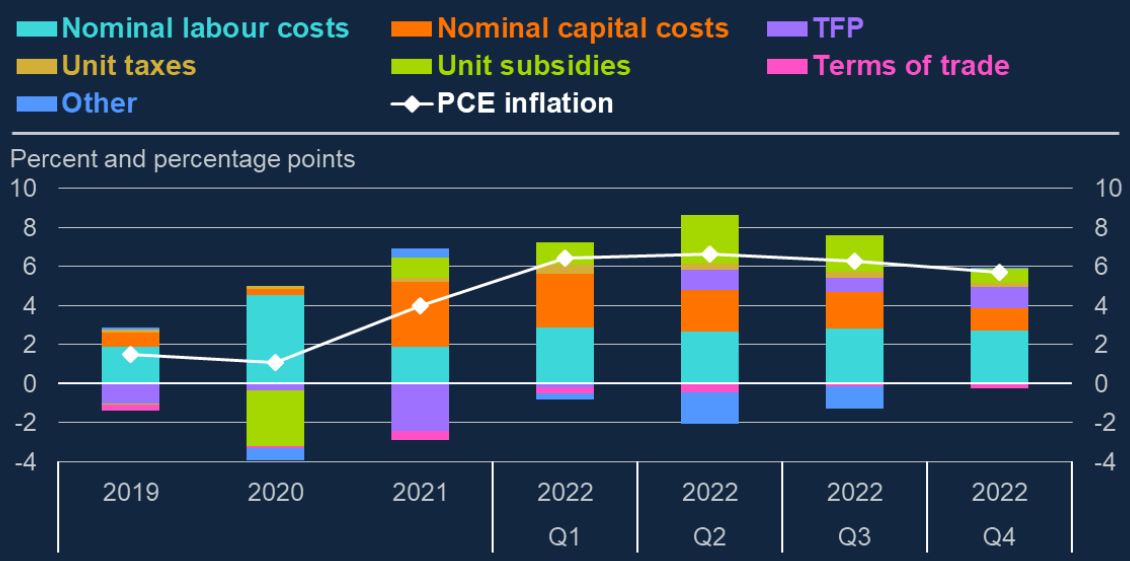
Chart 7: Decomposition of UK CPI index growth, 2019 to 2022 Q4 (a)



Sources: EU KLEMS, OECD, ONS, author's calculations.
(a) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, imputed rental on dwellings, and the quarterly alignment adjustment.

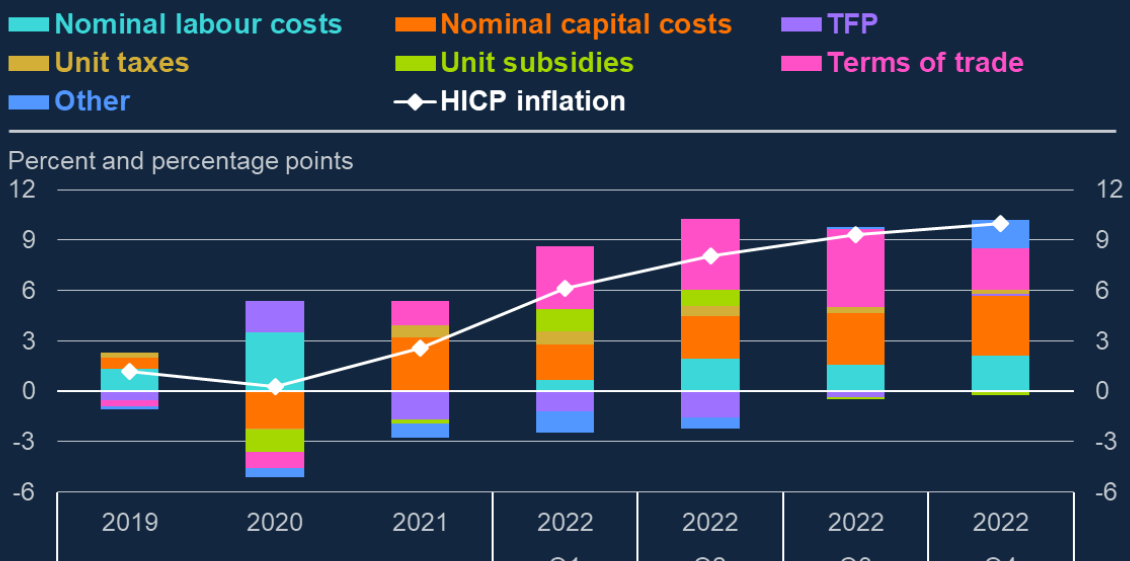
[21] This will, in part, reflect intra-euro area trade. For instance, imports to Germany might be exports from France. Viewed as a single country block, only imports and exports with countries outside the euro area would be included – imports to Germany from France would cancel out, and only the factor incomes would be left. This would be much smaller, as about half of all international trade in the euro area is intra-EA trade. The contribution of imports and exports for the euro area in these decompositions would thus be around half the size relative to single-country data as for the UK and US. However, the net position would be relatively unaffected, since the rescaling would apply to both imports and exports, and hence net out to a large degree. There may also be differences in price growth of intra- and extra-EA trade, given different product compositions. I am grateful to Catherine Mann for this insight.

Chart 8: Decomposition of US PCE deflator growth, 2019 to 2022 Q4 [(a)]



Sources: BEA, BLS, EU KLEMS, OECD, author's calculations.
(a) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings.

Chart 9: Decomposition of euro-area HICP index growth, 2019 to 2022 Q4 [(a)]



Sources: Eurostat, EU KLEMS, OECD, author's calculations.
(a) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings.

While useful, these quarterly charts are somewhat difficult to interpret. Base effects from the pandemic have significant impacts on the annual growth rates, especially on the subsidies, taxes, and TFP components. One way to see-through this is to consider the cumulative change in prices since before the pandemic. Chart 10 and Table C show the same decomposition, applied to the total increase in prices between 2019 Q4 (just before the start of the pandemic) and 2022 Q4. This also reduces somewhat the effects of the different timing of the inflation spike across countries.

Chart 10 and Table C suggest the following. Over the past 3 years, the UK has had around 17% of cumulative price increase, compared to around 15% in the EA, and 13% in the US.[22]

On this cumulative basis, it is still the case that the euro area has the largest contribution from the negative terms of trade shock, which has contributed around 4pp to the total 15% inflation. The UK has also had a negative terms of trade shock, but smaller, contributing just over 2pp of the total 17% inflation. By contrast, the US has had a small positive terms of trade shock.

It is worth noting that these terms of trade contributions are the net position of the share-weighted increase in import prices, and the share-weighted increase in export prices (each relative to the GDP price). The import term alone adds 6.3pp to UK CPI inflation, but this is offset by 4.0pp from an increase in the price of UK exports. Higher export prices bring income into the country, which will flow to either labour or capital, albeit only (directly) to exporting firms – a relatively small share of the economy. The net position of the import and export price contributions shows the impact on aggregate real national income. The US, being a fuel exporter, has a small fall in its import price relative to its GDP price. The euro area saw a larger negative import price contribution than the UK, although this reflects a larger weight on imports (and exports) than the UK (see footnote 15).

The role of labour income is largest in the US at about 10pp, followed by the UK at close to 9pp and then the euro area around 6pp. This is broadly consistent with the relative tightness of the labour markets.

[22] Here we are comparing the CPI in the UK, the HICP in the EA, and the PCE deflator in the US, in line with their respective inflation mandates. If all were on the basis of the National Accounts consumption deflator, then all would be quite similar, with the UK at 15%, and euro area and US at 13%.

Table C: Decomposition of cumulative change in consumer prices, 2019 Q4 to 2022 Q4

Percent and percentage points [a, b]

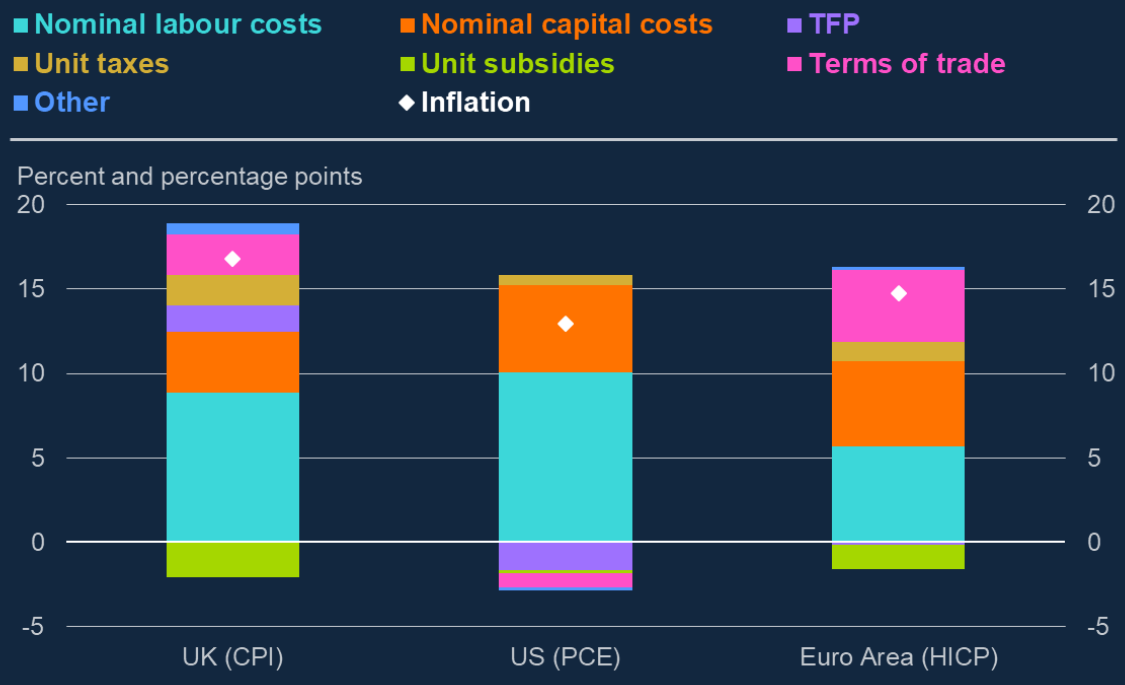
Component	UK	US	Euro area
Consumer price inflation (%)	16.8	13.0	14.7
Nominal labour costs	8.8	10.1	5.7
Nominal capital costs	3.6	5.1	5.0
TFP	1.6	-1.7	-0.2
Unit taxes	1.8	0.6	1.2
Unit subsidies	-2.1	-0.2	-1.4
Terms of trade	2.4	-0.8	4.2
of which: import price	6.3	-0.4	NA
Other	0.7	-0.2	0.2

Sources: BEA, BLS, EU KLEMS, Eurostat, OECD, ONS, author's calculations.

(a) Consumer price inflation is measured by the Consumer Price Index (CPI) for the UK, the Personal Consumption Expenditure (PCE) deflator for the US, and the Harmonised Index of Consumer Prices (HICP) for the euro area. Import price contribution is the share-weighted change in the import price relative to the GDP price. The import price contribution for the euro area is not available (NA) on a comparable basis, and so is not included – see text and footnote 15 for more details.

(b) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment.

Chart 10: Contributions to cumulative change in consumer prices, 2019 Q4 to 2022 Q4 (a, b)



Sources: BEA, BLS, EU KLEMS, Eurostat, OECD, ONS, author's calculations.
(a) Consumer price inflation is measured by the Consumer Price Index (CPI) for the UK, the Personal Consumption Expenditure (PCE) deflator for the US, and the Harmonised Index of Consumer Prices (HICP) for the euro area.
(b) Nominal capital costs includes corporate consumption of fixed capital, corporate net operating surplus, mixed income, non-market consumption of fixed capital, and imputed rental on dwellings. At least for the UK, and to an unknown extent for the US and euro area, it also includes the quarterly alignment adjustment.

Capital income contributes to inflation across the board. The contribution of capital income to cumulative inflation in this period is 5pp in the euro area and US, and less than 4pp in the UK. Differences between countries will reflect differences in the capital share of GDP, as well as differences in the 'price' change of capital. Recall that this does not necessarily mean that firms are increasing profit margins or mark-ups. Rather, this reflects increases in total nominal capital income (including self-employment income and housing rental), which will at least in part reflect higher prices to replace depreciated capital goods and the ongoing opportunity cost of holding capital.

The positive contributions from labour and capital income, and (in the case of the UK and EA) terms of trade, are somewhat offset by other factors. The US has seen some TFP growth over the period, which enables higher real incomes without inflationary pressure.

By contrast, TFP is estimated to have been roughly flat in the euro area and fallen in the UK (which adds to inflation).

In the UK and EA, increases in unit subsidies somewhat offset increases in nominal factor income growth – by just over 1pp in the euro area and around 2pp in the UK. Think of this as subsidies paying for some of the labour and capital income, such that growth in these factor incomes is 'too big' relative to GDP inflation. By the nature of this cumulative exercise, the effect of furlough subsidies should have largely cancelled out, so the remaining subsidies contribution will likely be energy-related subsidies introduced in late 2022.

What can we say about real wage and capital income changes? The contribution of labour and capital income growth are weighted by their shares of GDP, so do not tell us about real wage growth or real capital income growth directly. As a result of the terms of trade shocks, total real factor income (the sum of labour and capital income) has fallen in the UK and EA, which can be seen by the sum of the labour and capital income bars being less than consumer price inflation (the white diamond) in Chart 10. By contrast, total real factor income has actually risen slightly in the US. How changes in total real income are distributed depends on the respective shares of income.

If we divide the labour costs contribution by the share of labour costs to recover the absolute change, we find that average real (that is, in terms of CPI) labour income in the UK is broadly unchanged over this period, since growth in average nominal labour income broadly matches CPI inflation.

That labour incomes are unchanged may seem a surprise. One reason is that this is relative to 2019 Q4. Real labour incomes rose between 2019 Q4 and 2022 Q1. They have since fallen, which is the figure often cited, but since the end of the pandemic have remained broadly flat.

Another is that our labour income measure is derived from the UK National Accounts, and includes bonuses payments and non-wage labour income including employers' and employee's pension and National Insurance contributions. Across a range of wage measures for the UK, there has been relatively little change in average real wages since pre-pandemic, although the precise estimate depends on the measure used.[23] For instance, UK real average weekly earnings in 2022 Q4 relative to 2019 Q4 are down just 0.7% in terms of total pay including bonuses, but down 1.5% in terms of regular pay. Recipients of bonuses, which are prevalent in some industries more than others, appear to have been relatively less affected by the shock. However, these aggregate figures mask

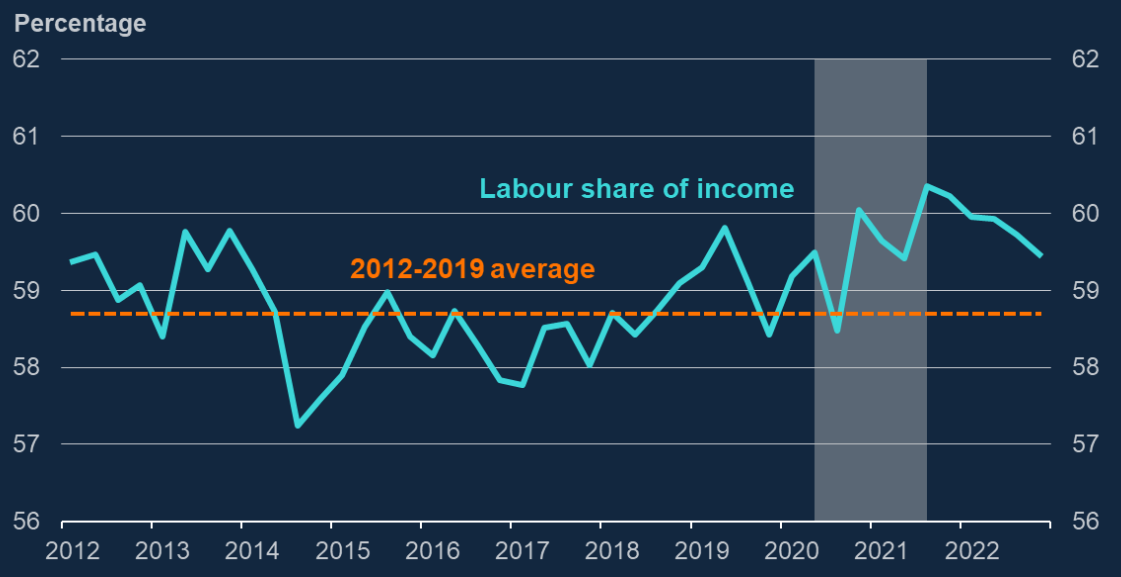
[23] For instance, whether or not bonus payments are included, whether the measure is for the whole economy or private sector, and precisely which time periods are considered.

considerable heterogeneity, and some individuals will be worse of in real terms, while some will be better off in real terms.

How have overall shares in national income changed? Chart 11 shows the labour share of income in the UK based on official data; the capital share is one minus this share.[24] In the UK, the labour share of income increased somewhat during the pandemic. Between 2012 and 2019, the labour share of income in the UK averaged 58.7%. During the pandemic, in part due to the furlough scheme (subsidies for labour income), the labour share increased, and peaked at around 60.3% in the second half of 2021. Since then it has been decreasing back towards its normal range. The final quarter of 2022 saw a relatively sharp decline, consistent with the increase in the capital income contribution in 2022 Q4 in Chart 7. However, the labour share is still above its 2012 to 2019 average (and slightly above the 2019 average).

Chart 11: The labour share of income rose during the pandemic, but has fallen in recent quarters

Labour share of income, UK, quarterly, 2012 Q1 to 2022 Q4 (a)



Sources: ONS, author's calculations.

(a) The **official ONS labour share measure,** defined as a share of GDP at factor costs, goes to 2022 Q2. We extend it to 2022 Q4 using essentially the same method as ONS, as much as possible from published data. Furlough period shaded.

[24] This measure uses GDP at factor cost in the denominator, which is different to the decomposition of the GDP deflator in this paper, which uses the shares of GDP at market prices. GDP at market prices includes net taxes, whereas GDP at factor cost does not. The ONS measure of the labour share also deducts employment subsidies from labour income, and splits mixed income into labour and capital income, which I do not do here for international comparability, since the necessary data are not available.

In contrast to the declining labour share in the US, the labour share has remained relatively constant in the UK and euro area over a long period of time.[25] As such, a sustained increase in the labour share would amount to a notable deviation from the recent past.

As we said, second-round inflation effects occur when economic actors try to restore their real returns after an inflation shock. In the UK, real (average) labour income has changed remarkably little since 2019, supported by a small increase in the labour share of income. By contrast, real (average) capital income has fallen. If this is a sustainable equilibrium, then there might be no further changes in real factor incomes, and thus no second-round inflation effects. To the extent that economic actors try to restore their real returns to some earlier level, then there might be further developments in labour and capital income to come.

In reality, it is not some abstract notion of labour and capital in aggregate that act out this dynamic. Instead it is individual workers and firms who may be responding to a change in their level of real income. Indeed, inflation has differential effects on households and groups of society reflecting their consumption patterns. And while aggregate real wages are down relatively little on 2019 levels, this hides significant heterogeneity between workers of different industries, occupations, and circumstances. Monetary policy can do little to influence these distributional effects, but can help to return inflation to target sustainably.

Monetary policy

Let me end with some summary remarks about the UK and monetary policy.

First, the clear winners over recent quarters from inflation have been those selling the UK (and euro area) imported goods. As a result, UK aggregate real national income (that is, GDP in terms of its purchasing power over consumption goods) fell by 2.4% between 2019 Q4 and 2022 Q4. That fall in aggregate real national income must result in either lower real labour income, or lower real capital income, or both. The labour share increased somewhat during the pandemic, reducing the hit to aggregate real labour income. The labour share has begun to move back towards its long-run average in recent quarters, meaning that capital has gained relative to labour recently, although in aggregate the labour share is still just above pre-pandemic levels. Thus the data shows little evidence of UK inflation being disproportionately due to firms raising prices. The share of national income going to capital is lower than its pre-pandemic average.

[25] See **Gutiérrez and Piton (2020)** for a discussion on measuring the labour share, and trends across countries.

As far as inflation is concerned, what happens next remains uncertain. Inflation could persist well beyond the terms of trade shock if dynamics in labour and capital income become embedded. Fundamentally, we do not have comparable periods in the recent past on which to base analysis and models of potential embeddedness. The last time inflation was this high was in the 1970s and 1980s, but a lot has changed in the structure of the economy since then, not least the introduction of inflation-targeting central banks and changes in product and labour market institutions which affect the response of an economy to supply shocks (Bruno and Sachs; see also Bean, Blanchard and Wolfers, Layard, Nickell and Jackman, and Newell and Symons). The period since the Bank of England's independence in 1997 has not seen a series of shocks like this before.

How do we make good policy with little past information and when we are so unsure of the future? First, the tightness of the labour market is a critical measure for which we have a range of measures of levels and change, with some more backward- and some more forward-looking. I would propose to focus closely, as discussed in previous speeches[26], on indicators such as vacancies, redundancies, and hiring and firing intentions. I am also closely monitoring developments in economic inactivity, since that has bearing on the tightness of the labour market and the potential supply of the economy.

I also think it is important to continue to monitor closely indicators of potential inflation persistence, including core and services inflation, and wage growth. Bank staff have also produced an 'underlying inflation measure' for the UK (**Potjagailo, Wanengkirtyo and Lam, 2022**), and explored the shares of core inflation accounted for by items that have historically proved more persistent (**May 2023 MPR**, Chart 3.2).

My current reading is that while some indicators suggest that the labour market is loosening somewhat, I view it as still very tight in an absolute sense: for example, the vacancies-to-unemployment ratio remains historically very high, as does unit wage growth. The co-incidence of high core inflation and subdued activity suggests the supply side of the economy may have deteriorated.

Second, with such uncertainty, I believe it is prudent to reduce the focus we place on forecasts of the medium-term and put more weight on the near-term data. Third, I prefer to lean against the risks of inflation momentum. As difficult as our current circumstances are, embedded inflation would be worse.

The MPC remains committed to bringing inflation sustainably back to the 2% target, and that is what we will do. But to do this, further increases in Bank rate cannot be ruled out.

[26] See for instance **Haskel (2021)**, **Haskel (2022)**.

I am grateful to Josh Martin and Julian Reynolds for their help preparing this speech. Thanks also to Andrew Bailey, Catherine Mann, Chris Duffy, Fabrizio Cadamagnani, Fergal Shortall, Huw Pill, Jamie Lenney, Lennart Brandt, Martin Seneca, Nick Bate, Oliver Davies, Silvana Tenreyro, Sophie Piton and Swati Dhingra for helpful comments, and Charlie Bean and Ron Smith for helpful discussion.