Appendix – Additional details and results of the local projections model

For all the inflation series we use **monthly inflation data from ONS** from January 1988 to September 2024. We create the various groupings of products described below using the 85 class-level COICOP products published in Table 57 of the CPI dataset. The aggregates are constructed as chained indices following standard methods.

In the model shown in **Chart 4** we divided CPI into the sub-components of: energy (which includes fuels and lubricants, electricity, gas, and other fuels); food (including food and non-alcoholic beverages); other goods (goods excluding energy, food and non-alcoholic beverages); and services. For wages, we use private sector regular pay available in the **ONS Average Weekly Earnings**. Prior to the start of the AWE in 2000 we use an in-house backcast of private sector regular pay AWE, similar to the backcasts **published** by ONS (which are only for total pay).

For the model by import intensity in **Chart 5**, we construct groupings of the CPI following the ONS breakdown of **Consumer Prices Index (CPI) by import intensity**. The import intensity of products according to the Classification of Products by Activity (CPA) are calculated using data from the Input-Output Tables, and relate to the percentage of final household consumption that is due to direct and indirect imports. The groupings are provided by ONS and are named according to their total import penetration: very low (less than 10%), low (10 to 25%), high (25 to 40%) and very high (more than 40%). Following ONS, energy products are excluded from these groups.

For the energy intensity calculations shown in **Chart A1**, we used the groupings provided in the ONS **Contributions to the Consumer Prices Index (CPI) by energy intensity** from April 2023. Following ONS, energy products are excluded from these groupings. Unlike ONS, we include rents in the “very low” energy intensity grouping.

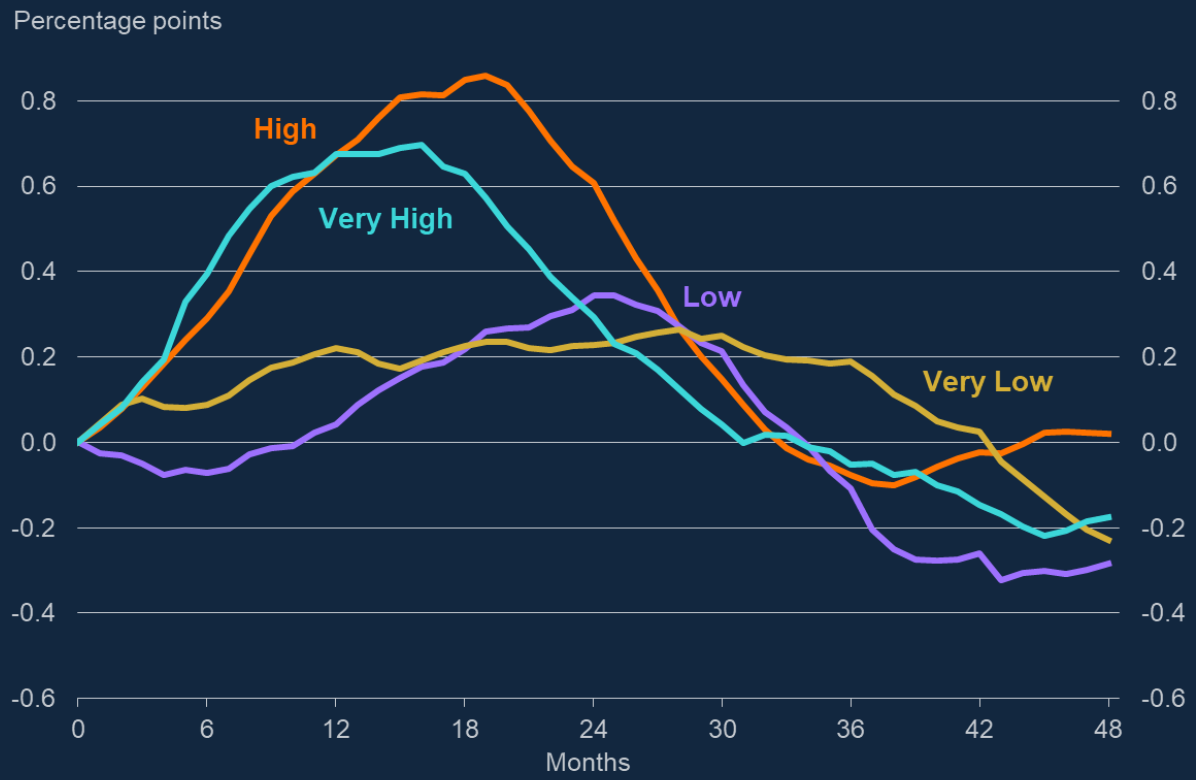
For the instrumental variable, we use **monthly Brent crude oil in Dollar prices** traded in Europe, sourced from the U.S. Energy Information Administration and accessed via FRED.

The local projections model estimated in **Chart 4** is the long difference of the rolling 3-month average of the dependent variable, estimated over 48 horizons (months). The right-hand side variables are two-period lags of CPI energy annual inflation, current and two-period lags of each of the CPI annual inflation sub-components and annual wage growth. We obtain the impulse and response of the model to an energy CPI shock, using annual changes in the oil prices series as the instrumental variable.

The model estimated in **Chart 5** is the long difference of the dependent variable, also estimated over 48 horizons (months). The right-hand sides include two-period lags of CPI energy annual inflation, and current and two-period lags of annual inflation of the four import-intensity groupings of the CPI. We regress the model using the same instrumental variable as in previous model.

Chart A1 illustrates the response based on energy intensity, and is estimated as for Chart 5 (described above). Responses of products with high energy intensities peak more quickly and recede faster, whereas products with lower energy intensities react more gradually, taking approximately 3 to 4 years to return to normal.

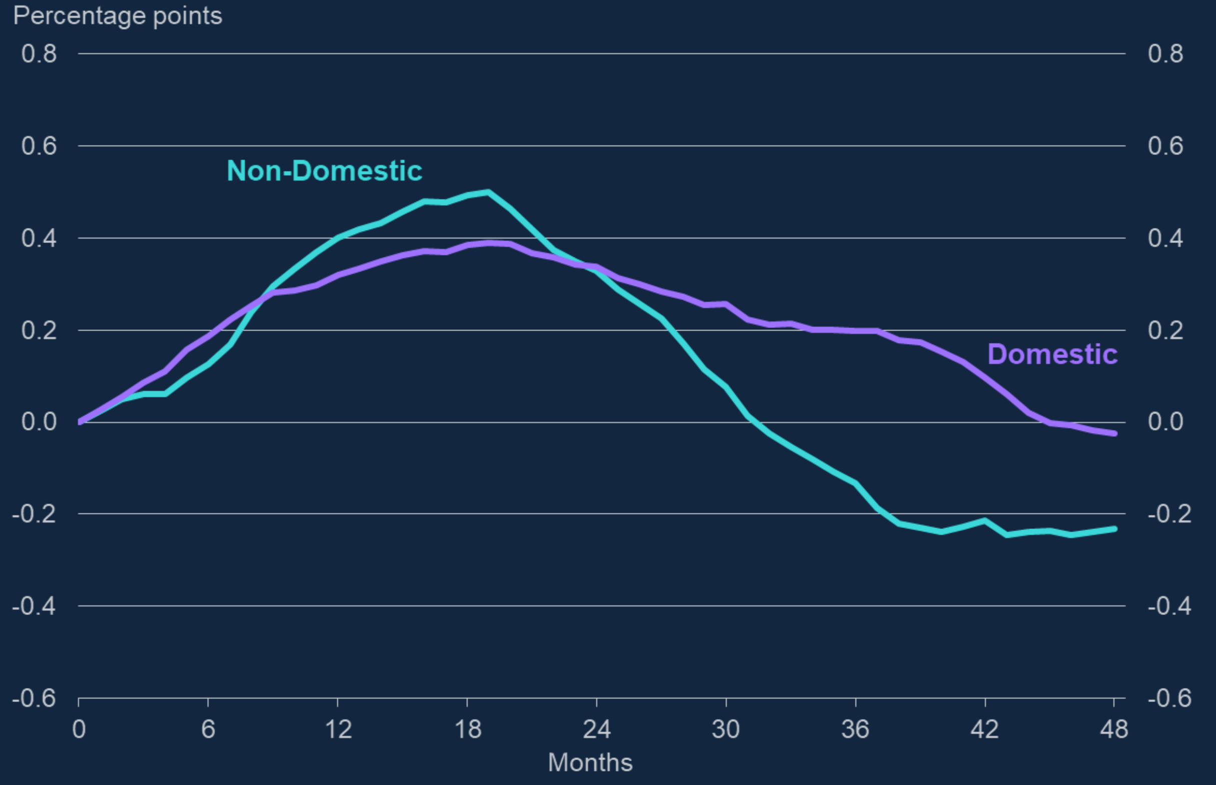
Chart A1: Estimated responses of products by energy-intensity groupings to energy price shock [(a)]



Source: ONS, US Energy Information Administration, author's calculations.
(a) Estimates from a local projection model, responses of year-on-year inflation rates grouped by energy-intensity on a rolling monthly basis, to an energy price shock. Energy intensity based on **ONS (2023)**.

Chart A2 uses the same local projections model described above but now split into domestic products and non-domestic products. For this calculation we replicate an approximate list used in the measure developed by the **ECB (2022)**. Again, we see a first spike in non-domestic inflation, and then a much slower transmission of the energy shock through domestic inflation. The impact on inflation of domestic products takes around 4 years from the initial energy shock to revert to baseline.

Chart A2: Estimated responses of products by share of domestic and non-domestic content (a)

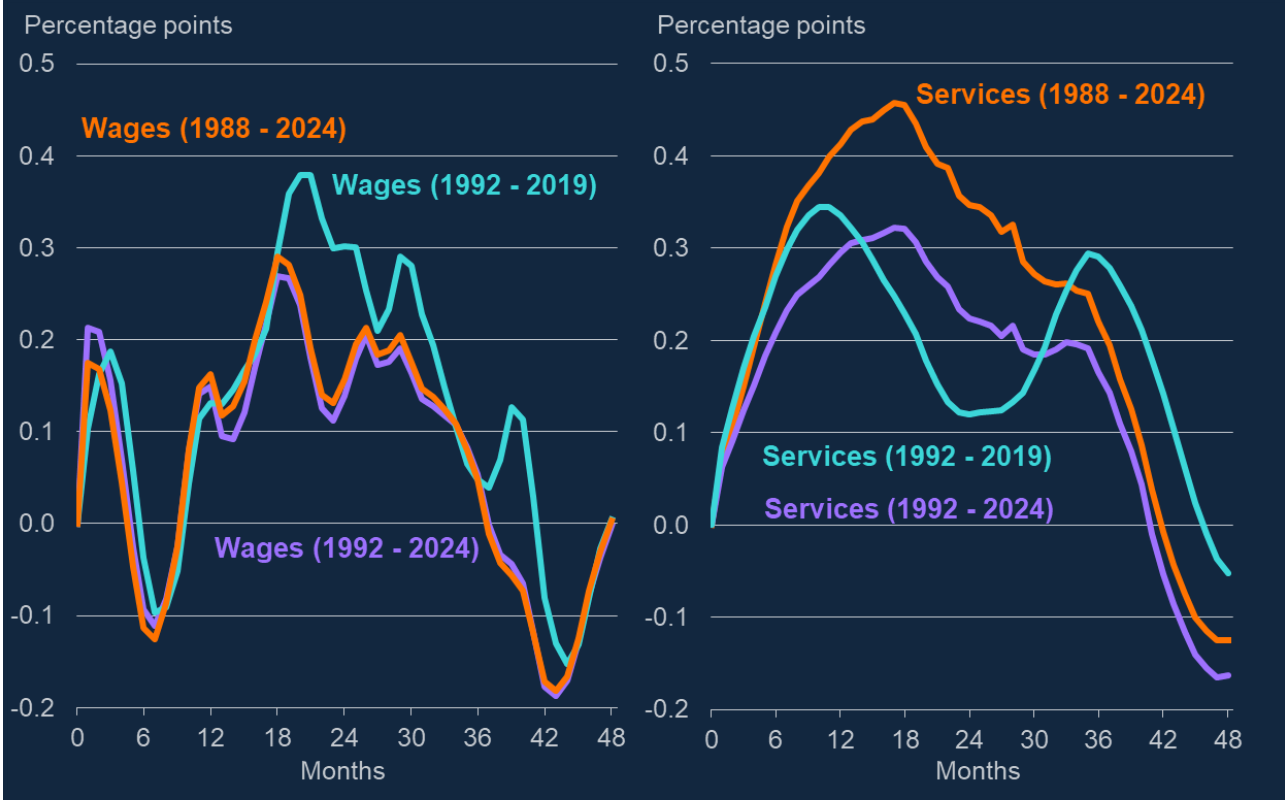


Source: ONS, US Energy Information Administration, author's calculations.
(a) Estimates from a local projection model, responses of year-on-year inflation rates grouped by domestic and non-domestic goods and services on a rolling monthly basis, to an energy price shock. The basket of goods that constitute each indicator is based on an approximation of the **ECB (2022)** list.

To assess the robustness of the model, we estimated the local projections model across different data samples, as shown in **Chart A3**. The response for variables with the slowest passthrough in Chart 4 (services and wages) are robust when limiting the sample to the period from 1992 to 2024, corresponding to the inflation-targeting era at the Bank of England.

To test whether the response of services inflation and wage growth had changed during the recent episode relative to the past, Chart A3 also shows local projections based on a sample from 1992 to 2019, thus excluding the pandemic and the subsequent energy shock. While the precise patterns change, the finding that wage growth and services inflation take around 3 years to return to baseline following an energy shock is robust.

Chart A3: Estimated responses of different wages and services samples to an energy shock (a)



Source: ONS, US Energy Information Administration, author's calculations.
(a) Estimates from a local projection model, responses of year-on-year services inflation rates and wage growth on a rolling monthly basis, to an energy price shock.

Other research on the passthrough of cost shocks to inflation

Other recent research aligns with these findings. In a **2024 paper**, former MPC member Jan Vlieghe finds a strong correlation between cumulative energy inflation between 2019 and 2023, and cumulative core inflation over the same period across OECD countries. Using a local projection fitted to data for 28 EU countries over 2015-2023, he estimates a response of core inflation to energy inflation of a similar shape to those in Charts 4 and 5, albeit somewhat stronger and quicker, since it peaks at around a year and fades to zero about two years after the shock. Features of the UK economy might cause the response in the UK to be slower than in the cross-country sample used by Vlieghe, or propagation might be quicker in the more recent time period used by Vlieghe compared to the longer time period we use.

The IMF in the **World Economic Outlook October 2024** uses a model similar to that of **Dao and others (2024)** and **Ball and others (2022)** which decomposes headline inflation into underlying inflation (measured by the weighted median) and headline shocks (which is the difference between underlying and headline inflation, and is split into energy and other shocks). Underlying inflation is then decomposed into the passthrough of those headline shocks (energy and other), slack (measured by the vacancies-to-unemployment ratio as a measure of labour market tightness), inflation expectations, and a residual. They find a considerable role for the passthrough of energy price shocks into underlying inflation in non-US advanced economies (including the UK).

Finally, a recent Barclays Research note[1] uses a three-equation model where supply shocks influence non-domestic inflation, which in turn influences domestic inflation, with the model identified by the ordering of shocks. Using quarterly data from 2003 to 2023, they estimate this model for the UK, Euro area aggregate, and selected major European countries. Consistent with the analysis presented above, they find considerable passthrough from non-domestic inflation to domestic inflation for the UK: they find a peak impact on annual inflation from an energy price shock to be four quarters after the shock, and remain positive for at least 12 quarters after the initial shock. Accordingly, they estimate that much of the increase in UK domestic inflation over 2022-23 was driven by non-domestic inflation, which in turn was driven by supply shocks.

[1] "Domestic inflation on the descent", Euro and UK Themes, Barclays Research note, 4 November 2024.