Received: 22 December 2023 | Accepted: 13 June 2024

DOI: 10.1111/sjpe.12396

ORIGINAL ARTICLE

Scottish Journal of Political Economy WILEY

# Monetary policy and heterogeneous price effects in the United Kingdom

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## Abstract

This paper examines the heterogeneous effects of monetary policy on consumer prices in the United Kingdom. We estimate a proxy Structural Vector Autoregressive (SVAR) model, using extended high-frequency monetary surprises from Cesa-Bianchi et al. (*European Economic Review*, 123, 2020, 103375) to instrument shifts in UK monetary policy. We then analyze the impulse responses for various components of the UK Consumer Price Index. Our findings reveal that while monetary policy tightening leads to a persistent decline in aggregate consumer prices, the impact on disaggregated components is highly heterogeneous. Notably, we observe that energy price changes offset movements in food, beverage, and tobacco prices, resulting in identical responses of core and headline consumer CPIH inflation measures. The contrasting effects across different CPI components highlight the importance of examining disaggregated data when assessing the transmission of monetary policy to consumer prices.

KEYWORDS
heterogeneous price effects, monetary policy transmission, proxy-SVAR

JEL CLASSIFICATION
E31, E32, E52, E58

# 1 | INTRODUCTION

Understanding the intricate relationship between monetary policy and price heterogeneity is of great importance for central banks, as it directly influences their ability to maintain price stability. Previous studies by Clark (2006), Altissimo et al. (2009), and Ellis et al. (2014) have shed some light on the substantial disparities in the responses of aggregate price inflation and its sub-components to monetary policy shocks. However, the empirical assessment of these heterogeneous price effects of monetary policy remains a subject of debate. For instance, while Baumeister et al. (2013) and Ellis et al. (2014) observe that monetary policy shocks have significantly different effects on disaggregated components of personal consumption expenditures, Boivin et al. (2009) argue that monetary policy shocks contribute relatively little to variations in individual prices. Rather, Boivin et al. (2009) argue that the majority of price fluctuations stem from sector-specific factors rather than monetary policy changes. Given this ongoing debate, we provide new empirical evidence based on recent developments in monetary policy identification using high-frequency data and considering a broader decomposition of the Consumer Price Index, including owner-occupiers' housing costs (CPIH).

In this paper, we examine the heterogeneous price effect of UK monetary policy on aggregate and disaggregated components of CPIH using monthly data for the period of 1992:01–2021:03. Specifically, we estimate a proxy Structural Vector Autoregressive (proxy-SVAR) model in the spirit of Cesa-Bianchi et al. (2020) and use their extended high-frequency monetary surprises to instrument shifts in UK monetary policy. The monetary surprise series is constructed based on intra-daily changes in 3-month Libor Futures within a 30-min window of the Bank of England's monetary policy announcements. We then estimate the impulse responses of aggregate and sub-components of CPI to the monetary surprises, adding one component at a time to the proxy-SVAR. In addition to analyzing the responses of traditional CPI decomposition (headline, core, food, and energy), we also examine the responses of the official 12 sectoral decomposition as well as some sub-sectoral and goods and services decomposition.

We contribute to the literature by providing new empirical evidence on the impact of monetary policy shocks on disaggregated consumer prices, particularly for the UK economy. In this regard, our paper distinguishes itself from existing literature in two ways. First, we expand on Ellis et al. (2014) by analyzing the effect of monetary policy on a much wider range of disaggregated CPI components for the UK. While Ellis et al. (2014) focus on three sub-components of CPI (durable, non-durable, and services), we analyze about 25 components and sub-components of CPI. Our study also differentiates itself from existing literature with the high-frequency identification of monetary policy surprises, which is robust to VAR ordering and generally recognized as more credible for identifying structural monetary policy shocks (Rogers et al., 2018). Whereas previous studies in this area mostly employ FAVAR models which rely on recursive ordering for the identification of monetary policy shocks. Our identification method follows the approach of Stock and Watson (2012), Mertens and Ravn (2013), Gertler and Karadi (2015), Rogers et al. (2018), Jentsch and Lunsford (2019), and Cesa-Bianchi et al. (2020), using narratively identified external events as proxies for latent shocks.

Our findings reveal the nuanced effects of monetary policy across CPI components. We find that a contractionary monetary policy shock reduces aggregate CPIH on impact. However, the impact diverges across CPIH components, with the Food, Beverage & Tobacco component showing a more pronounced decline, while Energy prices increase. These differential impacts likely reflect the varied monetary policy transmission mechanisms across sectors. We also observe further heterogeneity across the 12 sectoral CPIH components, as categorized by the Office for National Statistics (ONS), enhancing our understanding of monetary policy's diverse effects.

The remainder of the paper is organized as follows. Section 2 presents a brief review of the literature. In Section 3 we present a brief exposition of the proxy-SVAR methodology employed in this paper and discuss the data and estimation strategy. Empirical results and findings are presented in Section 4, and in Section 5, we provide a brief conclusion.

## 2 | LITERATURE REVIEW

There are significant differences in the response of aggregate inflation and its sub-categories to monetary policy shock as noted by Altissimo et al. (2009), Baumeister et al. (2013), and Clark (2006), among others. In their examination of the dynamic impacts of monetary policy on overall, sectoral, and disaggregated inflation in India, Kumar and Dash (2020) assert the paramount importance of monetary authorities understanding how individual components or various elements of the Consumer Price Index (CPI) react to policy shocks. This perspective aligns with Aoki (2001) viewpoint that the central bank's most effective objective is stabilizing the relative prices of different commodities around their optimal values. Similarly, Bunn and Ellis (2012) emphasize that policymakers must be well-informed about the frequency and extent of individual price fluctuations, a crucial consideration for effective monetary policy decisions. Therefore, it is imperative to study the impact of monetary policy shocks on individual or sub-categories of the CPI to enhance policy formulation. This echoes the sentiments expressed by Balke and Wynne (2007) that relying solely on the aggregate price index may not be appropriate or sufficient as a guide for policy-making. Our paper makes a valuable contribution to the existing literature on the effects of monetary policy shocks on disaggregated prices particularly in the United Kingdom (UK).

In the context of the UK, Bunn and Ellis (2012) conducted a meticulous examination of individual price dynamics at a micro-level. Their analysis, employing hazard functions, revealed that, on average, approximately 19% of the prices within the UK CPI basket undergo changes each month. Additionally, Bunn and Ellis (2012) noted that the likelihood of a price change varies over time. Furthermore, they highlighted the presence of significant variations in price behaviour across different components of the CPI. In a related study, Ellis et al. (2014), using sign restrictions within a Factor-Augmented Vector Autoregression (FAVAR) framework, among other things, investigated the impact of monetary policy shocks on three major sub-categories of the UK CPI, namely, durable, non-durable, and services. Their findings indicate that approximately 60% of durable and semi-durable goods experience price decreases in response to a contractionary monetary policy shock during the inflation-targeting era (post-1992). A similar pattern is observed for non-durable goods, with approximately 62% experiencing price declines. In the case of services, approximately 51% of the CPI components within this category also witness price declines. Our paper builds upon and enhances the existing literature by examining how various components of the UK CPI respond to a credibly identified monetary policy shock within a proxy-SVAR framework, contributing to a more comprehensive understanding of these dynamics.

In related studies, Boivin et al. (2009) posited that United States monetary policy shocks contribute to a relatively smaller portion of variations in individual prices. Their method relied on a FAVAR framework with monetary policy shock identified by a recursive ordering of the variables. In contrast, Baumeister et al. (2013), utilizing a time-varying FAVAR approach and identifying US monetary policy shocks through recursive methods, uncovered a notably heterogeneous impact of such shocks on various components of personal consumption expenditure. Their results imply that monetary policy actions exert a significant effect on relative prices within the US economy, contrary to the findings of Boivin et al. (2009). Munir (2018) investigated the effect of monetary policy on output and prices in Pakistan at the disaggregate level relying on FAVAR and recursive identification of the shocks. This study found that in Pakistan, a contractionary monetary policy shock resulted in deflationary trends in the prices of food, beverages, and tobacco, as well as in housing rents. However, this shock did not produce statistically significant effects on the prices of apparel textiles and footwear. Conversely, the same monetary policy shock yielded inflationary tendencies in the categories of fuel and lighting expenses, household furniture and equipment costs, and expenditures related to recreation and entertainment. It is worth highlighting that, in general, the observed impulse responses in Munir (2018) are often not statistically significant. Nonetheless, they did point to considerable variations among the sub-categories of the CPI in Pakistan following a monetary policy shock. Our present study extends and builds upon these earlier studies by employing high-frequency data to identify monetary policy shocks and estimating a proxy-SVAR model to assess the effect of monetary policy shock on sub-categories of the UK CPI.

In summary, our paper distinguishes itself from prior research on the effects of monetary policy shocks on disaggregated prices through two key differences. Firstly, we expand the literature on the effect of monetary policy on disaggregated prices by analyzing its impact on a much broader array of disaggregated CPI components for the UK. Whereas Ellis et al. (2014) concentrate on three sub-components of the CPI—durable goods, non-durable goods, and services—we examine approximately 25 distinct components and sub-components of the CPI. This comprehensive approach provides a more detailed and nuanced understanding of the heterogeneous effects of monetary policy across various categories of consumer prices. Secondly, we diverge significantly in our methodology for identifying the shock. Unlike much of the existing literature, which predominantly relies on FAVAR models and typically derives the monetary policy shock through recursive ordering of variables, our approach relies on high frequency and instrumental variable identification of the shock using proxy SVAR. Methodologically, our paper follows the strand of the literature in which the relevant shock is identified by proxying the latent shock with changes in a narratively identified external event within an appropriately specified window as in Stock and Watson (2012), Mertens and Ravn (2013), Gertler and Karadi (2015), Rogers et al. (2018), Jentsch and Lunsford (2019), and Cesa-Bianchi et al. (2020). We specifically utilized the high-frequency and credibly identified monetary policy shock series developed by Cesa-Bianchi et al. (2020) to investigate the dynamic effects of monetary policy shocks on various sub-categories of the UK CPI.

## 3 | THE PROXY-SVAR MODEL AND ESTIMATION

To study the heterogeneous effects of a monetary policy shock on aggregate UK CPIH and its sub-components we employ the following proxy-SVAR model similar to Cesa-Bianchi et al. (2020) and other proxy-SVAR literature such as Stock and Watson (2012), Mertens and Ravn (2013), Gertler and Karadi (2015), and Rogers et al. (2018).

We begin with a typical structural VAR model of the form:

$$\boldsymbol{AY}_t = \boldsymbol{BY}_{t-1} + \boldsymbol{u}_t, \tag{1}$$

where $\boldsymbol{Y}_t$ is an $n \times 1$ vector of endogenous variables and $\boldsymbol{A}$ is an $n \times n$ matrix of contemporaneous structural coefficients. $\boldsymbol{Y}_{t\text{-}1}$ is an $m \times 1$ vector (where $m = kn + 1$) containing a constant and $k$ lags of $\boldsymbol{Y}_t$ and $\boldsymbol{B}$ is conformable slope coefficient matrices. $\boldsymbol{u}_t$ is a vector of structural shocks. Then the reduced form representation of Equation (1) is

$$\boldsymbol{Y}_t = \Phi \boldsymbol{Y}_{t-1} + \varepsilon_t, \tag{2}$$

where $\Phi = \boldsymbol{A}^{-1}\boldsymbol{B}$ and $\boldsymbol{u}_t = \boldsymbol{A}\varepsilon_t$, that is, $\varepsilon_t$ is the vector of reduced-form innovations, which is a linear combination of the structural shocks, $u_t$.

To identify the structural shocks, we need to impose restrictions. In this case, we employ an instrumental variable approach, in which the shock of interest is ordered first and proxied with an external instrument. From (2) above, suppose $\varepsilon_t$ is partitioned into $\varepsilon_t^{\mathrm{MP}}$ (shock to monetary policy indicator which is order first) and $\varepsilon_t^{X}$ (shocks to other endogenous variables, which are not identified in this model, per see), such that:

$$\varepsilon_t = \begin{pmatrix} \varepsilon_t^{\mathrm{MP}} \\ \varepsilon_t^{X} \end{pmatrix}. \tag{3}$$

Then, we can define a vector of external instruments of monetary policy, $Z_t$, that satisfies the canonical instrument relevance and exogeneity conditions of valid instrumental variables as follows:

$$E\left[\varepsilon_t^{\mathrm{MP}}, Z_t'\right] = \alpha \neq 0, \tag{4}$$

$$E\left[\varepsilon_t^{\mathrm{MP}}, Z_t'\right] = 0, \tag{5}$$

**TABLE 1** VAR lag length selection.

| Lag | AIC | HQIC | SBIC |
|---|---|---|---|
| 0 | 25.20 | 25.23 | 25.28 |
| 1 | −0.10 | 0.15 | 0.53[a] |
| 2 | −0.50[a] | −0.03[a] | 0.68 |
| 3 | −0.46 | 0.24 | 1.28 |
| 4 | −0.43 | 0.48 | 1.86 |
| 5 | −0.38 | 0.75 | 2.46 |
| 6 | −0.27 | 1.08 | 3.13 |
| 7 | −0.41 | 1.16 | 3.54 |
| 8 | −0.41 | 1.38 | 4.09 |
| 9 | −0.40 | 1.62 | 4.66 |
| 10 | −0.35 | 1.88 | 5.26 |
| 11 | −0.34 | 2.12 | 5.82 |
| 12 | −0.31 | 2.37 | 6.41 |

[a]Optimal lag length. Sample included: 1993M1–2021M3.

such that the external instruments are correlated with the monetary policy shock $(\epsilon_t^{\mathrm{MP}})$ but orthogonal to other shocks $(\epsilon_t^{X})$. We can then obtain a consistent estimate of the contemporaneous matrix, $\boldsymbol{A}$, through two-stage least square regression: first, regress the reduced-form residual of the monetary policy indicator $(\epsilon_t^{\mathrm{MP}})$ on the external instrument

$$\epsilon_t^{\mathrm{MP}} = \Theta Z_t + \eta_t, \tag{6}$$

and obtain the fitted values $\left(\hat{\epsilon}_t^{\mathrm{MP}}\right)$. Then regress the reduced-form residuals of other equations $(\epsilon_t^{X})$ on the fitted values obtained in the first stage $\left(\hat{\epsilon}_t^{\mathrm{MP}}\right)$. That is

$$\epsilon_t^{X} = \Gamma \hat{\epsilon}_t^{\mathrm{MP}} + \zeta_t, \tag{7}$$

where $\hat{\epsilon}_t^{\mathrm{MP}}$ is orthogonal to $\zeta_t$ under the assumption in Equation (5). Lastly, given a consistent estimate of $\boldsymbol{A}$ and an OLS of Equation (2) which gives $\Phi = \boldsymbol{A}^{-1}\boldsymbol{B}$, we can obtain estimates of $\boldsymbol{B}$ to compute the impulse response functions of all variables to a monetary policy shock. Similar to Cesa-Bianchi et al. (2020), confidence bands in this Proxy-SVAR environment are obtained following the recommendations of Jentsch and Lunsford (2022) and Jentsch and Lunsford (2019) to use the moving block bootstrap as described in Brüggemann et al. (2016).

We estimate the above proxy-SVAR model for the UK using monthly data for the period 1992M1–2021M3. We include two lags of the endogenous variables in the VAR model similar to Cesa-Bianchi et al. (2020) and supported by both Akaike (AIC) and Hannan-Quinn (HQIC) information criteria [see Table 1]. Our data coincide with the beginning of the inflation targeting regime, while the end of the sample period coincides with the period before the recent surge in inflation as a result of the COVID-19 pandemic recovery. As in Cesa-Bianchi et al. (2020), the baseline specification comprises a vector of seven endogenous variables: 1-year nominal interest rate, log of CPIH, unemployment rate, log of nominal effective exchange rate, UK corporate and mortgage bond spreads, and US corporate bond spread to capture global liquidity effects.[1]

[1]This set of variables encompasses both domestic and foreign channels of monetary policy transmission and quite standard in the literature. Similar variable set has been used by Cloyne and Hürtgen (2016), Jarociński and Karadi (2020), Miranda-Agrippino and Ricco (2021), and Görtz et al. (2023). Adding other variable sets, such as global commodity prices and VIX, does not improve the model.

TABLE 2 Descriptive statistics: 12-month CPIH inflation components, 1992M1–2021M3.

| | Mean | Median | Standard deviation | Min | Max | Correlation (headline) | AR(1) |
|---|---|---|---|---|---|---|---|
| Headline | 2.09 | 2.05 | 0.93 | 0.2 | 6.1 | 1 | 0.95 |
| Core | 1.91 | 1.78 | 0.76 | 0.52 | 6.23 | 0.83 | 0.93 |
| Food, beverages & tobacco | 2.63 | 2.4 | 2.15 | −2.1 | 10.26 | 0.75 | 0.96 |
| Energy | 3.48 | 3.27 | 5.93 | −12.42 | 26.26 | 0.6 | 0.95 |
| Food & non-alcohol | 1.96 | 1.66 | 2.67 | −3.31 | 12.41 | 0.65 | 0.96 |
| Alcohol & tobacco | 4.15 | 4.2 | 1.99 | 0.3 | 13.16 | 0.67 | 0.89 |
| Clothing & footwear | −2.65 | −2.49 | 3.22 | −10.99 | 4.53 | 0.19 | 0.96 |
| Housing costs & services | 2.53 | 2.27 | 1.34 | −1.11 | 6.78 | 0.63 | 0.96 |
| Furniture & HH equipment | 0.94 | 0.58 | 1.6 | −2.32 | 5.66 | 0.62 | 0.92 |
| Health | 2.79 | 2.79 | 1.48 | −3.49 | 9 | 0.36 | 0.68 |
| Transport | 2.79 | 2.65 | 2.58 | −2.81 | 10.66 | 0.61 | 0.93 |
| Communication | 0.05 | 0.45 | 3.16 | −9.59 | 6.26 | 0.11 | 0.95 |
| Recreation & culture | 0.83 | 0.94 | 1.38 | −2.89 | 5.55 | 0.23 | 0.94 |
| Education | 6.73 | 5.17 | 3.63 | 1.97 | 19.49 | 0.3 | 0.94 |
| Restaurants & hotels | 3.23 | 3.22 | 1.11 | −2.81 | 9.71 | 0.71 | 0.89 |
| Miscellaneous goods & services | 2.13 | 2.13 | 1.33 | −0.98 | 6.4 | 0.44 | 0.94 |
| All goods | 1.04 | 1.08 | 1.66 | −2.38 | 5.94 | 0.88 | 0.96 |
| All services | 2.96 | 3.01 | 0.89 | 0.99 | 6.81 | 0.64 | 0.95 |
| Durable goods | −0.6 | −0.97 | 2.15 | −5.07 | 6.44 | 0.35 | 0.96 |
| Semi-durable goods | −1.5 | −1.15 | 2.27 | −7.37 | 3.37 | 0.3 | 0.96 |
| Non-durable goods | 1.78 | 1.59 | 1.56 | −1.16 | 8.04 | 0.77 | 0.94 |
| Food | 1.94 | 1.67 | 2.82 | −3.4 | 13.62 | 0.61 | 0.96 |
| Seasonal food | 1.95 | 2.25 | 4.77 | −13.2 | 15.6 | 0.25 | 0.9 |
| Non-seasonal food | 1.91 | 1.59 | 2.82 | −3.33 | 15.03 | 0.67 | 0.97 |
| Non-alcohol beverages | 2.13 | 1.9 | 2.87 | −4.9 | 10.35 | 0.68 | 0.93 |

The CPIH data and the unemployment rate are obtained from the Office for National Statistics (ONS). The 1-year interest rate, the nominal effective exchange rate, the UK mortgage rate, and the UK corporate bond rate are taken from the Bank of England. The US corporate bond spread (BAA-10Y) is taken from the Federal Reserve Economic Data (FRED). The UK mortgage bond spread is calculated as the difference between the UK mortgage rate and the 10-year UK Government Bond rate. Analogously the UK Corporate Bond Spread is calculated as the difference between the UK corporate bond rate and the 10-year UK Government Bond rate. We also estimate an alternative augmented VAR specification with individual components of CPIH, adding one component at a time. First, we consider core, food and energy CPIH. Then, we consider each of the 12 main CPIH components according to ONS, as well as other major sub-components of CPIH.

In Table 2, we present descriptive statistics for the 12-month inflation rates of the various components comprising the UK Consumer Prices Index, which includes owner-occupiers' housing costs (CPIH). The mean inflation rate across all CPIH components during this period was 2.09%, with a median of 2.05%. Notably, there was significant variability in inflation rates across these components, evident from the standard deviation. Communication

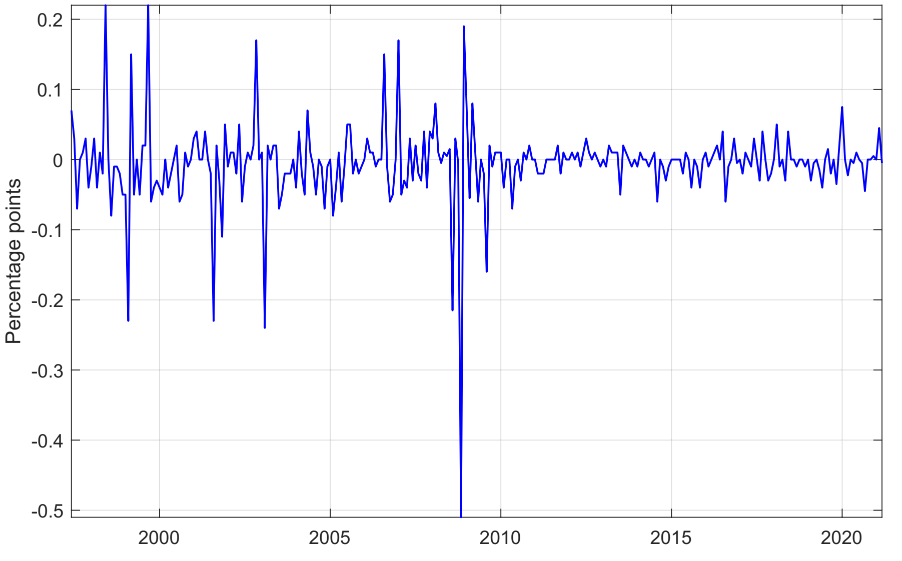


**FIGURE 1** UK monetary policy surprises. *Source*: Cesa-Bianchi et al. (2020).

exhibited the lowest volatility, with a standard deviation of 3.16%, while energy showed the highest volatility, registering a standard deviation of 5.93%. The range of minimum and maximum inflation rates also displayed substantial disparities. For instance, energy experienced a minimum rate of −12.42% and a maximum of 26.26%, while clothing and footwear ranged from −10.99% to 4.53%. In terms of correlation with the headline CPIH inflation, all goods showed the highest correlation at 0.88, while communication displayed the lowest correlation at 0.11. Most components exhibited a strong positive autocorrelation (AR1 coefficient), indicating persistent inflation rates over time. Health had the lowest AR1 coefficient of 0.68.

For the proxy variable, we use the high-frequency monetary policy surprises constructed by Cesa-Bianchi et al. (2020) as our external instrument.[2] The surprise series is constructed as intra-daily changes in the price of 3-month Libor futures within a 30-min window (10 min before and 20 min after) of the Bank of England's monetary policy announcements from June 1997.[3] The series is cumulated to obtain a monthly frequency. In months when there are no monetary announcements, the monetary surprise series is set to zero.[4] Figure 1 plots the extended series of UK monetary policy surprises. Our choice of this monetary instrument is motivated by recent evidence that shows the robustness of high-frequency identification strategy in correctly identifying monetary policy shocks relative to other competing strategies (Altavilla et al., 2019; Jarociński & Karadi, 2020; Miranda-Agrippino & Ricco, 2021; Nakamura & Steinsson, 2018; Swanson, 2023). Also, see Braun et al. (2023) for a detailed review of recent literature.

## 4 | RESULTS

We begin the discussion of our empirical results by first presenting impulse responses of macroeconomic and financial variables to the identified monetary policy shock. Figure 2 presents these responses of the baseline proxy-SVAR model. In this figure and all figures in this section, the solid blue line is the median response to a 25-basis

[2]The slope coefficient from regressing the reduced-form residual of the monetary policy indicator on the external instrument is 0.8161 with a p-value of 0.003, indicating significance and relevance of the instrument in the chosen sample and specification at 5% significance level.
[3]The series ends in 2021 because the Bank of England discontinued the use of LIBOR as a benchmark interest rate that year.
[4]See Cesa-Bianchi et al. (2020) for further details on the construction of the monetary policy surprises.

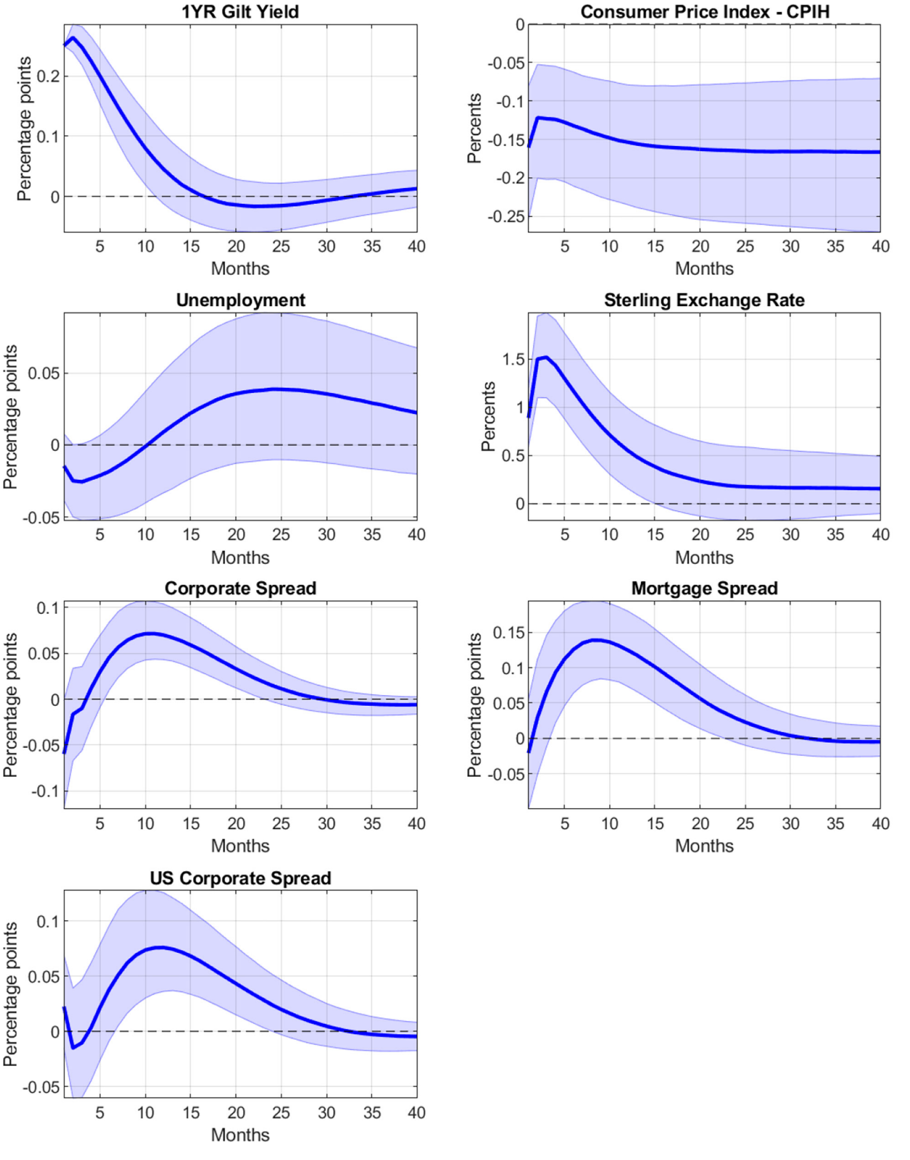


FIGURE 2 Baseline proxy-SVAR model: Impulse responses to a 25-basis point increase in 1-year interest rate. The solid blue line is the median response while the light-shaded region blue area provides the corresponding 68% credibility region.

point increase in the 1-year interest rate (contractionary monetary policy shock) while the light-shaded region blue area provides the corresponding 68% credibility region. The analysis spans a 40-month horizon, tracking the dynamics of key macroeconomic variables, including CPIH inflation, the unemployment rate, the exchange rate, domestic bond spreads, and US corporate bond spreads.

The contractionary monetary policy shock leads to a decrease in CPIH inflation that reaches about −0.18 percentage points after around 20 months. This decline remains persistent remain over the 40-month horizon. In contrast, the unemployment rate remains statistically insignificant across the forecast horizon following the 25-basis point increase in the 1-year interest rate. This suggests that the policy shock does not exert a significant impact on the unemployment rate during the modelled period. Furthermore, the exchange rate appreciates in

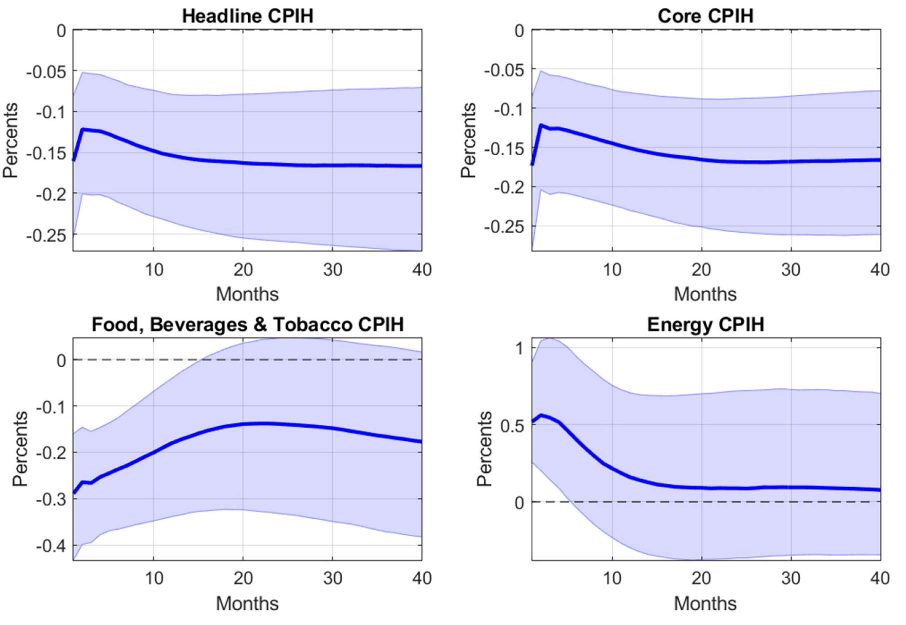


FIGURE 3 Impulse responses to a 25-basis point increase in 1-year interest rate: Heterogeneity in the headline CPIH and its main components. The solid blue line is the median response while the light-shaded region blue area provides the corresponding 68% credibility region.

response to the shock, aligning with the economic theory that higher interest rates tend to attract capital inflows, resulting in currency appreciation. This movement in the exchange rate reflects the underlying dynamics of the open economy. Lastly, the increase in US corporate bond spreads implies a tightening of financial conditions. This tightening suggests that the policy-induced interest rate hike has repercussions on corporate borrowing costs and the broader financial environment, with potential implications for investment and economic activity. Generally, the externally identified monetary policy shock series generate impulse responses of macroeconomic indicators that align with economic theory.

Figure 3 illustrates the responses of Headline CPIH, Core CPIH, Food, Beverage & Tobacco CPIH, and Energy CPIH to a 25-basis point increase in the 1-year interest rate.[5] A 25-basis point increase in the 1-year interest rate leads to a substantial decline in the Headline CPIH, a decline that endures over a 40-month horizon. The response of the core CPIH to the same interest rate hike mirrors that of the Headline CPIH. This observation is intriguing because, by design, the core CPIH is expected to exhibit lower volatility compared to the headline CPIH. Consequently, one might expect a contractionary monetary policy shock to have a less pronounced impact on the core CPIH than on the headline CPIH.

Even more intriguing is the distinct response of the two other sub-components within the Headline CPIH to a contractionary monetary policy shock. These responses seem to offset each other, ultimately reshaping the Headline CPIH to resemble the behaviour of the core CPIH. Specifically, a 25-basis point increase in the 1-year interest rate results in a 0.29 percentage point decline in the Food, Beverage, and Tobacco CPIH, a decline that gradually resolves itself over a 15-month period. In contrast, the Energy CPIH experiences a 0.51 percentage point increase in response to the same interest rate hike, followed by a similar 15-month resolution period.

This observation implies that higher interest rates might have an immediate, albeit complex, effect on energy prices. While it is acknowledged that global market dynamics predominantly drive energy prices, potentially moderating the direct influence of UK monetary policy, our analysis suggests a subtle yet observable

[5]Core CPIH by construction is Headline CPIH less Food, Beverage & Tobacco CPIH and Energy CPIH.

impact. Despite the overarching global market forces, UK monetary policy appears to exert a nuanced influence on energy prices. This effect could stem from the interplay between domestic regulatory frameworks and international price trends, which in turn, translate the shifts in monetary policy into measurable changes in the UK's energy market prices.

The rationale behind this phenomenon lies in the increased costs faced by domestic energy producers when interest rates rise.[6] These increased costs may ultimately transfer to consumers. This response sheds light on the presence of critical channels at the disaggregated level, such as the cost channel. This cost channel, often absent in macroeconomic models, assumes a central role in driving these differential effects, as highlighted in the study by Baumeister et al. (2013). On the contrary, the response of Food, Beverage & Tobacco CPIH aligns with macroeconomic expectations, reflecting the standard interest rate channel.

To further explore the heterogeneity in price effects of UK monetary shocks, Figure 4 plots the impulse responses to a 25-basis point increase in the 1-year interest rate of the 12 main components of CPIH as reported by the ONS. With regard to this result, it is worth noting that the United Kingdom has specific tax bands depending on the goods and services. Therefore, the response to a positive monetary shock, which should reduce consumption is going to be influenced by the fiscal policy on the specific goods.

Seven of the 12 components decline within a year after the initial impact of the monetary policy shock, while the rest are muted or marginally increased. The result shows that prices of Clothing and footwear, Food and non-alcohol, Alcohol and tobacco, and Communication decline by a much larger magnitude than the headline CPIH and are mostly persistent, while Housing Costs & Services, Recreation & Culture, and Restaurant & Hotels decline by a lesser magnitude than the headline CPIH. Transport CPIH exhibits a price puzzle on impact, reflecting the large share of energy in this price component.

We present Figure 5 to further highlight the heterogeneous responses of various CPIH components to a contractionary monetary policy shock. Initially, All Goods CPIH and All Services CPIH both declined, reaching approximately −0.2 and −0.1 percentage points, respectively, following the contractionary monetary policy shock. However, these effects are transitory, dissipating after 18 months for all goods and 8 months for all services. Durable Goods CPIH displays a delayed response, declining after 6 months and persisting until the 30th month. Semi-durable Goods CPIH exhibits the most prolonged decline, dropping to −0.6 percentage points and remaining significant until the 28th month. Conversely, Non-durable Goods CPIH shows the least persistence, declining to −0.15 percentage points on impact, with the effect becoming statistically insignificant after 2 months. This analysis provides valuable insights into the diverse and time-varying responses of CPIH components to changes in interest rates, highlighting the heterogeneous response of goods and services CPIH to a monetary policy shock. Furthermore, it underscores the need for central banks to understand the intricate relationship between monetary policy and heterogeneous prices. Figure 5 also reinforces the central theme of our paper that there are heterogeneous effects of monetary policy shocks across various components of consumer prices in the UK.

Relatedly, Figure 6 presents the impulse responses of food and non-alcohol CPIH, food CPIH, seasonal food CPIH, non-seasonal food CPIH, and non-alcohol beverages CPIH to a 25-basis point increase in the 1-year interest rate. It underscores the intricate dynamics within these subcomponents. Food and non-alcoholic CPIH initially declined by approximately −0.4 percentage points in response to the contractionary monetary policy shock. However, this effect is transient, dissipating after 10 months. Likewise, Food CPIH and seasonal food CPIH exhibit declines and transient responses to the policy shock, with the response of food CPIH becoming statistically insignificant after 12 months and seasonal food after 8 months. In contrast, non-seasonal food CPIH and non-alcoholic beverages CPIH show statistically insignificant responses to the policy shock over the entire 40-month horizon. This analysis unveils the nuanced and time-dependent reactions within food

[6]In a situation where energy firms are highly indebted, a contractionary monetary policy aimed at lowering aggregate inflation will increase energy firms' production costs which in turn leads to an increase in energy prices.

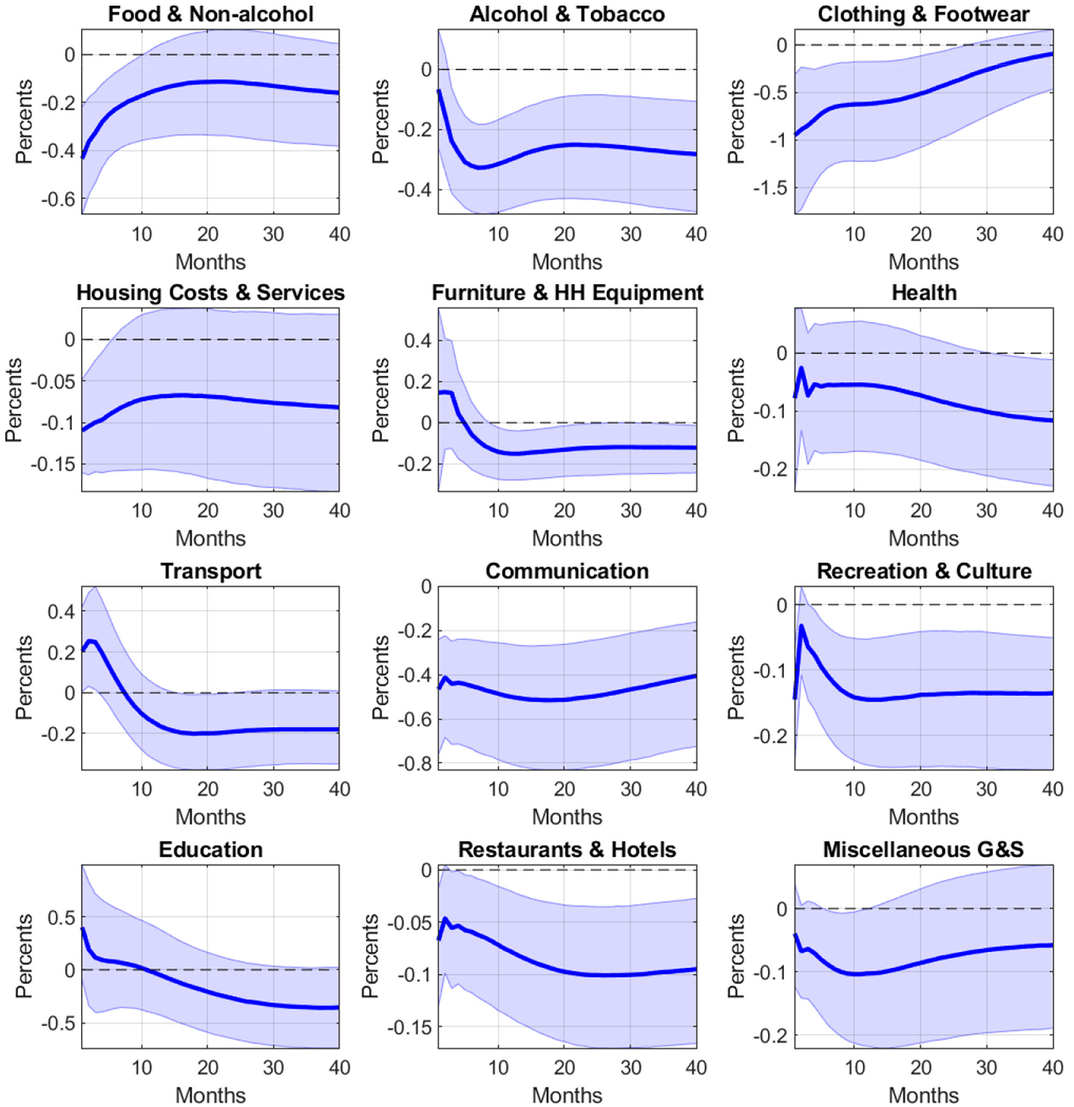


**FIGURE 4** Impulse responses to a 25-basis point increase in 1-year interest rate: Heterogeneity in the core divisions of CPIH. The solid blue line is the median response while the light-shaded region blue area provides the corresponding 68% credibility region.

and non-alcoholic beverage subcomponents, shedding light on the multifaceted nature of their responses to monetary policy shock. These insights shed light on the nuanced dynamics of price responses to monetary policy at the disaggregated level.

In summary, our disaggregated analysis largely aligns with aggregate measures in the short term, with Transport being the exception. A critical distinction is observed in the duration of the price response—whether it is transient or remains persistent. This variation can be explained by factors such as consumer behavior and sector-specific dynamics. The short-term price adjustments are often associated with the reintroduction of previously excluded goods into household consumption baskets. Conversely, the long-term impacts suggest shifts towards new stable states within individual sectors, where supply and demand reach a consistent balance, reflecting changes in

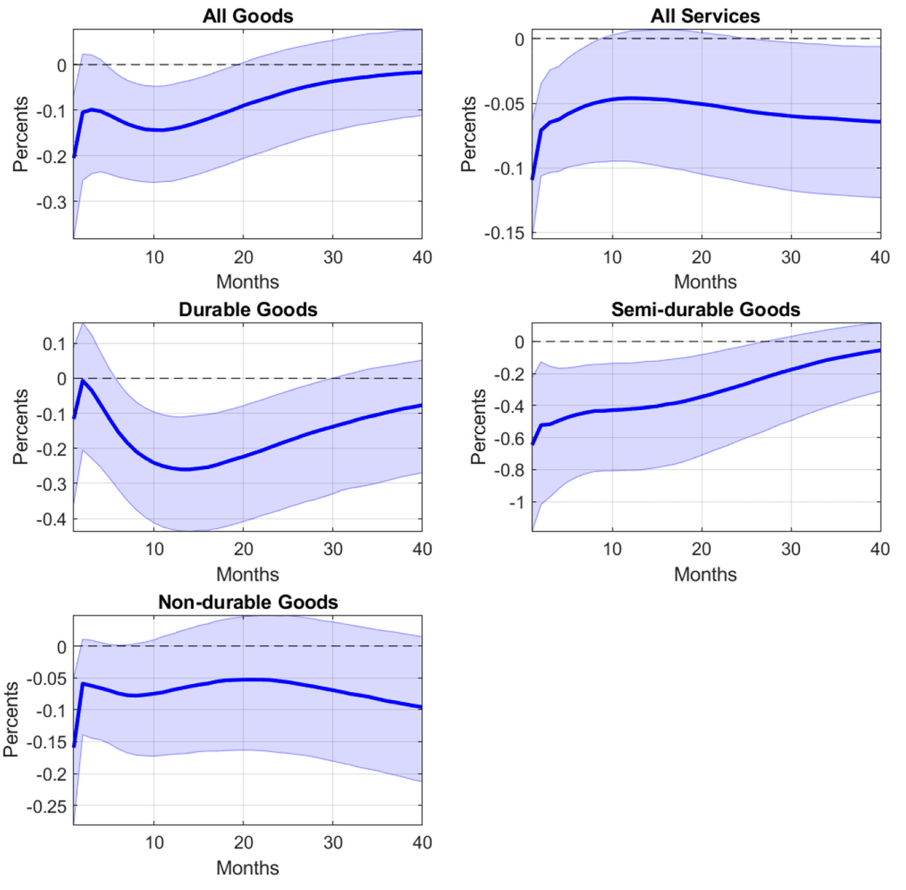


**FIGURE 5** Impulse responses to a 25-basis point increase in 1-year interest rate: Heterogeneity in goods and services CPIH. The solid blue line is the median response while the light-shaded region blue area provides the corresponding 68% credibility region.

consumption patterns and market dynamics. These findings offer a deeper understanding of the complex interplay between monetary policy and price movements at a granular level.

## 5 | CONCLUSION

This paper provides new evidence on the heterogeneous effects of monetary policy on disaggregated UK consumer prices. While some existing studies have analyzed the heterogeneous price effect of UK monetary policy shock on a few components of CPI, our study provides a more detailed analysis of 25 components and subcomponents of CPI. In addition, we use a high-frequency identification of monetary policy surprises, which is robust to VAR ordering and generally recognized as more credible for identifying structural monetary policy shocks.

We find that a contractionary monetary policy shock generally decreases the aggregate CPIH. However, the impact on CPIH components varies significantly. While core CPIH mirrors the behaviour of headline CPIH, the Food, Beverage & Tobacco components experience a more pronounced decline, whereas the Energy component shows a price puzzle. Further decomposition reveals substantial heterogeneity across industry sectors.

These findings have significant policy implications. First, they highlight the importance of considering disaggregated price measures when formulating and assessing monetary policy. Policymakers should recognize that

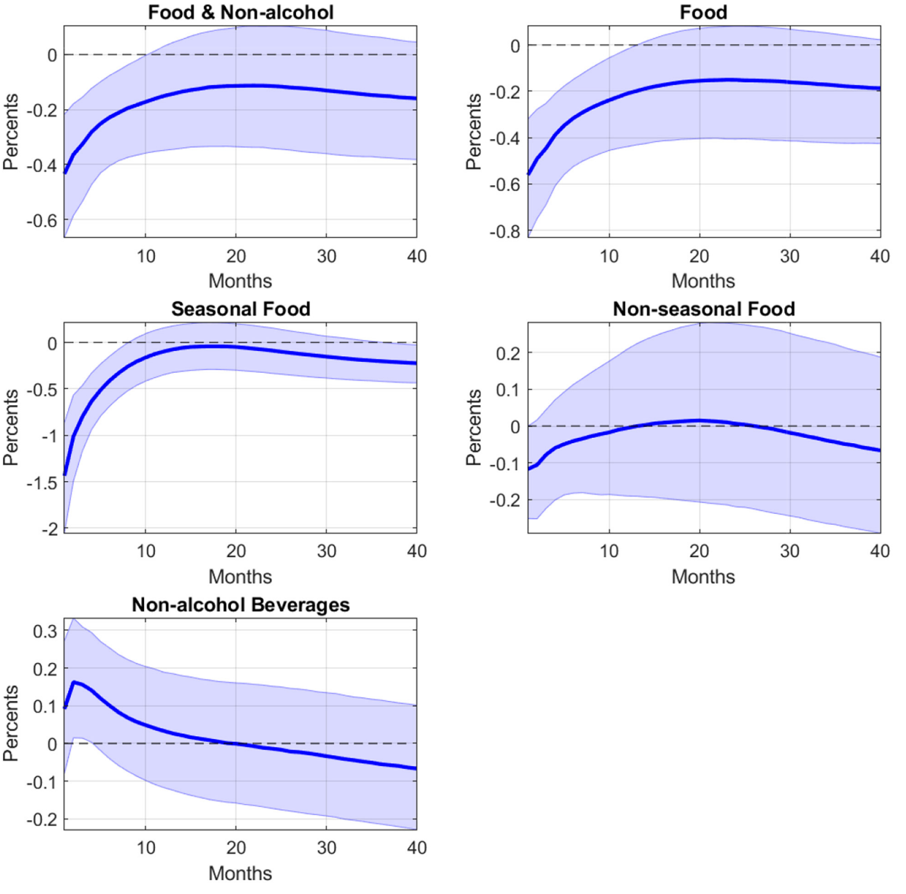


**FIGURE 6** Impulse responses to a 25-basis point increase in 1-year interest rate: Heterogeneity in food and non-alcohol drinks CPIH. The solid blue line is the median response while the light-shaded region blue area provides the corresponding 68% credibility region.

aggregate measures can mask important sectoral differences, which may lead to suboptimal policy decisions if not properly accounted for. For instance, a surge in food and beverage prices relative to aggregate CPI may disproportionately affect low-income households, thereby necessitating a targeted intervention for this group. Likewise, when there is an increase in energy prices despite a contractionary policy, then there is a need for targeted interventions in the energy sector to mitigate adverse impacts on consumers.

Second, the differential impacts across sectors suggest that monetary policy should be complemented with sector-specific policies. For example, understanding the cost channel's prominence in energy prices underscores the importance of monitoring energy producers' costs and their potential pass-through to consumers. This could involve regulatory measures to control cost escalations in the energy sector or subsidies to cushion the impact on consumers. Additionally, the observed persistence in price changes for durable and semi-durable goods implies that monetary policy alone may be insufficient to stabilize these prices, necessitating broader economic policies to address structural factors driving these price dynamics.

Furthermore, our findings underscore the need for continuous improvement in monetary policy tools and models. The use of high-frequency data and advanced identification techniques, as employed in this study, provides a more accurate and nuanced understanding of monetary policy effects. Central banks should therefore invest in enhancing their data collection and analytical capabilities to better capture the complex interplay between policy measures and price movements at a granular level.

## ACKNOWLEDGEMENTS

We are grateful to Ambrogio Cesa-Bianchi for sharing the extended high-frequency monetary policy surprises for the UK with us. We would like to thank the Coeditor (Christoph Thoenissen) and two anonymous referees for comments that greatly improved the paper.

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**How to cite this article:** Ilori, A.E., Dery, C., Murgia, L.M. & Nsafoah, D. (2024) Monetary policy and heterogeneous price effects in the United Kingdom. *Scottish Journal of Political Economy*, 00, 1–15. Available from: https://doi.org/10.1111/sjpe.12396