Firms' margins behaviour in response to energy shocks: Evidence from the UK

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December 2023

Abstract

How have profits behaved in the current period of sustained inflation? In part, the answer depends on how 'profits' are defined. Some broad measures suggest increasing profits, but conflate market and non-market sector dynamics and omit important corporate costs. This paper constructs an alternative measure of corporate profits to capture UK firm earnings in excess of all production costs. This measure has been declining since the start of 2022, consistent with evidence from historical energy shocks. This decline has not been uniform across firms, however: firms with higher market power have been better able to protect their margins; others have experienced large declines.

JEL: E25; E31; L11.
Keywords: Energy shock, Inflation, Mark-ups, Profit margins.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

1 Introduction

Energy prices increased sharply in 2022 following Russia's invasion of Ukraine, and have at least partly contributed to the recent surge in inflation (e.g. Castle et al., 2023, Bunn et al., 2022). Debates emerged as to whether the inflation response has been amplified by companies using their market power to raise prices above their increase in costs, thereby increasing their profit margins (e.g. Schnabel, 2023).

In this paper, we shed light on this debate by filling the gap on the lack of evidence on how margins behave in response to an energy shock. We start by clarifying the different concepts of firms' profits. We provide novel evidence on how they behave in past episodes of energy shocks, and compare this historical evidence with real-time firm-level survey data. Historically, firm profit shares and mark-ups decline in response to energy price shocks. This is consistent with an observed fall in both profit shares in national accounts and firm profit margins in firm-level data over 2022. However, the response to energy price shocks is heterogeneous across firms and industries. Energy intensity in production is associated with a larger impact; higher market power is associated with a smaller impact.

2 Corporate profitability: Measurement

We use three different measures of corporate profitability. First, we construct a measure of profitability from quarterly UK national accounts that are available from 1970Q1 to 2023Q1. National accounts data are affected by the 'mixed income' of self-employed, taxes and subsidies, and conflate two different dynamics: those of the market and non-market (real estate, public) sectors (Gutiérrez and Piton, 2020). We focus on the corporate sector and exclude self-employed, non-market sectors, and abstract from the role of taxes and subsidies. Thus, we focus on corporate gross value added (GVA, at factor costs) and initially split this into two components: employee compensations and 'profits', or corporate 'gross operating surplus' (GOS).

Following Barkai (2020), we can further decompose 'profits' into two components:

- Capital compensations, which capture firms' cost of capital. Following Hall and Jorgenson (1967), we measure these costs as the sum of capital depreciation, changes in its replacement cost, and the opportunity cost of holding physical rather than financial capital captured through ten-year government bond yields.

- 'Pure' profits, i.e. what a firm earns in excess of all production costs (including labour costs and the cost of holding and maintaining capital).

The share of pure profits in corporate GVA is the closest concept in national accounts to the measure of markups estimated in firm-level data. The pure profit share captures the price a firm sets relative to its average costs, markups capture the price a firm sets relative to its marginal costs – the two measures are directly related under the assumption of constant returns to scale (see Basu, 2019). Ultimately, however, it is markups that matter for inflation, as inflation is proximately driven by changes in marginal costs and changes in mark-ups (over those marginal costs) desired by firms. For robustness, we want to look at the response of markups to energy shocks. Unfortunately, our real-time firm-level data does not allow for the computation of markups. We use instead estimates for the 1987-2018 period from Haldane et al. (2018) constructed using the approach developed by Loecker and Warzynski (2012) using data from Worldscope to investigate the historical response of markups to energy shocks.

Finally, our third measure combines real-time firm-level data from the Decision Maker Panel (DMP) Survey with firms' balance-sheet data to investigate trends in profitability in the most recent period. We lack the required information from the survey to estimate markups directly. Instead, we focus on net operating profit share in sales, i.e. the ratio of earnings before interest and taxes net of depreciation (similar to net operating surplus) to sales (the sum of gross value added and intermediate inputs). Despite some conceptual differences, this measure is closest to the concept for gross operating surplus share in gross value added (profit share, including both capital and pure profit), and the two measures co-move strongly since the mid-1990s.

3 Estimating the response of margins to past energy shocks

First, we use local projections (Jordà, 2005) to estimate the dynamic effect of past energy shocks on various profit measures. To identify energy shocks, we use the oil-supply news shock series from Känzig (2021), identified via the response of oil-price futures in narrow windows around OPEC+ announcements. In a first step, we estimate the following equation:

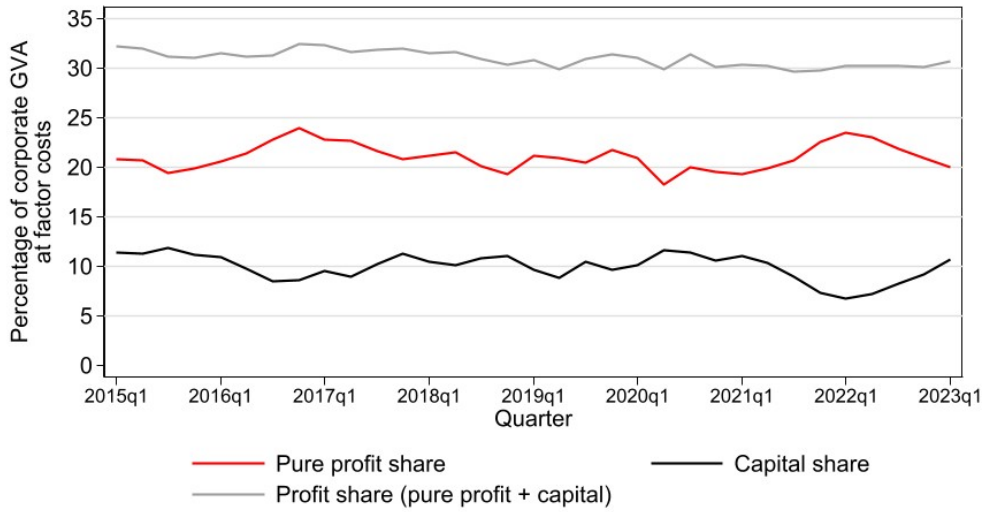
$$\Delta Y_{t+h} = \alpha^h + \beta^h \varepsilon_t + \gamma^h X_t + \mu_t^h \tag{1}$$

where $\Delta Y_{t+h} (= Y_{t+h} - Y_{t-1})$ is the h-period ahead cumulative change in the outcome variable of interest (alternatively the profit or labour share, or aggregate markups). X_t are (lagged) control variables including lags of the dependent variable and other variables capturing the state of the macroeconomy (e.g. GDP and inflation). ε_t is the oil-supply news shock. We also use local projection methods to investigate the impact of oil price shocks on *firm-level* markups, and explore the heterogeneity of these effects across firms (see online Appendix for more details).

4 Similarities and differences between current and past energy shocks

We start in Figure 1 by looking at trends in the shares of labour and profits in corporate GVA since 2015, and decompose the profit share further into capital/pure profit shares. The profit share is broadly flat over the period, broadly consistent with the findings in Haskel (2023). When decomposing this share into capital and pure profit parts, we can see pure profits increased in 2021, consistent with markups increasing during the high demand Covid recovery period (Glover et al., 2023). However, they started to decline in 2022, following the onset of the Ukraine war. This fall in pure profits also partly reflects higher capital costs for firms who are now experiencing higher interest payments to service their debt (due to rising interest rates since the start of 2022).

Figure 1: Profit, capital, and pure profit shares, 2015Q1-2023Q1



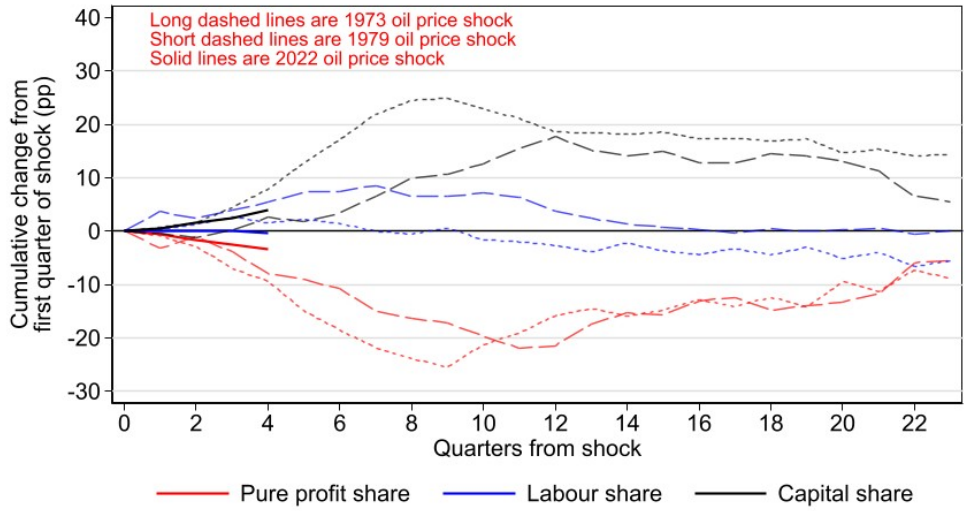
Notes: Authors' calculations using ONS data.

In Figure 2, we compare the evolution of these shares in the 2022 episode to the oil shocks in the 1970s. In Figure 3, we formalise the analysis using the local projection framework set out in the previous section, both for factor shares in national accounts (Panel A) and aggregate UK firm-level markups (Panel B). There are two main takeaways from this comparison:

The labour/profit share response in the 2022 episode is different from the 1970s, but similar to more recent energy shocks. In the 1970s, the labour share increased in the first couple of years followed by a decline in the following years. The rise and fall in the labour share was, at the time, thought to reflect the failure of wages to adjust to the adverse supply shocks in the short run (Blanchard et al., 1997). Consistent with this story, this pattern was stronger in countries with more rigid labour markets (Gutiérrez and Piton, 2020), such as continental Europe and Japan. By contrast, the labour share is broadly flat since the start of 2022. This might suggest a different labour market now than in the 1970s, after labour market reforms took place in the 1980s (Muellbauer and Soskice, 2022).

The pure profit share and markups decrease across all energy shocks, including that in 2022. More generally, oil price shocks lead to a significant decline in the pure

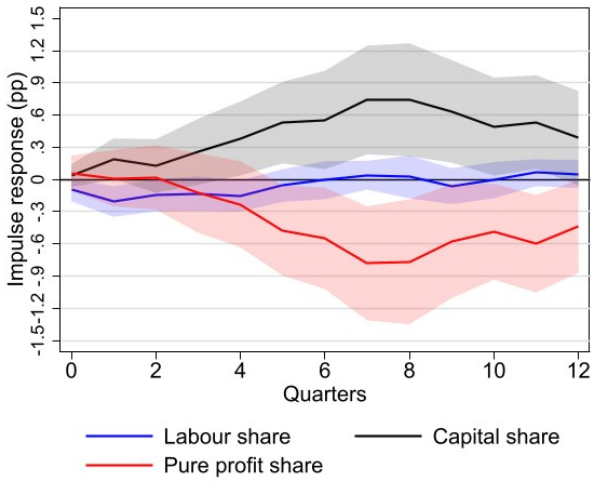
Figure 2: Profit, capital, and labour shares around energy price shock episodes



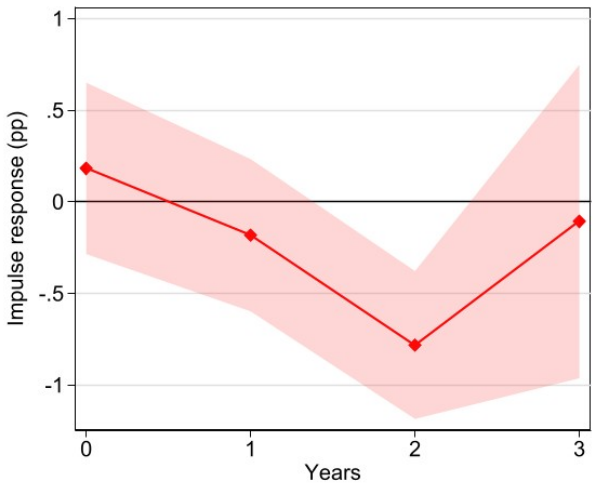
Notes: Authors' calculations using ONS data.

Figure 3: Impulse responses following a 10% increase in oil prices

Panel A: Impact on capital, labour, and 'pure' profit shares, 1984-2022



Panel B: Impact on firm mark-ups, 1987-2018



Notes: Estimates of β^h from equation (1) where the dependent variable is alternatively the labour, capital, and pure profit shares (panel A) and average de-trended markups weighted by firms' UK sales (panel B). Dotted lines denote 90% confidence intervals using Newey-West standard errors.

profit share in the first three years. The pure profit share declines by about 0.7 percentage points at the peak (year two) following a 10% oil price increase in the local projections. The confidence intervals suggest this impact at a one-year horizon is more uncertain, although the point estimate shows a decline of about 0.3p.p. at quarter 4 following a 10% increase in oil prices. By contrast, we observe a 3p.p. decline in the pure profit share in response to the 40% oil price increase a year after the 2022Q1 shock. The current response is larger than the point estimate from the local projections suggest, and this could be reflecting two facts: the fact that both oil and gas prices have increased recently while the local projections only use oil supply news shocks, and a combination of strong supply and demand at the moment amplifying the impact of the shock (see Bernanke & Blanchard, 2023). However, this response is smaller than what we observed in the 1970s (Figure 2), consistent with a smaller oil price increase in the recent period than in the 1970s. Note that the falling pure profit share reflects at least in part the rise in interest rates — an important component of the cost of capital that rises across all episodes (Karabarbounis and Neiman, 2019). This fall also occurs for the average markup. The markup falls significantly in response to the energy shock with the peak response in year two (by around 0.8 percentage points), where both the magnitude and time-profile of the response is remarkably similar to our findings for the pure profit share.

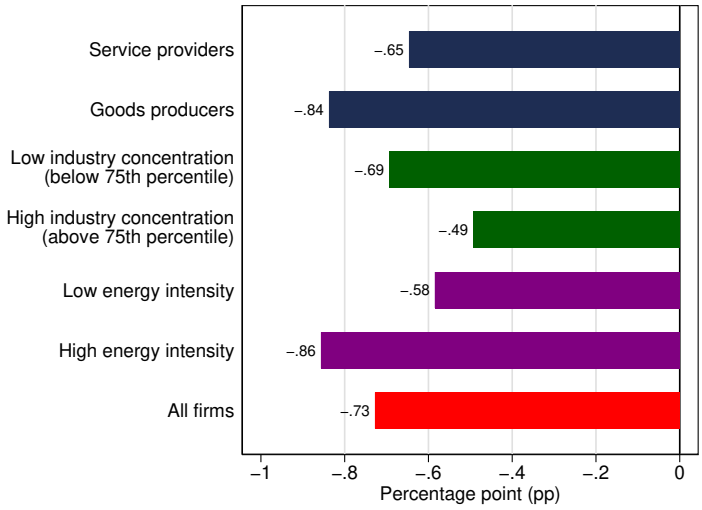
5 Different responses across sectors and firms

The aggregate fall in markups masks significant heterogeneities across industries. We find significant evidence that markups have historically risen by more (fallen by less) in response to energy shocks for firms that are: (i) in more concentrated industries (as measured by the Herfindahl–Hirschman index from Savagar et al., 2021); (ii) less energy-intensive (based on firms' intermediate consumption of energy goods); and (iii) have less sticky prices (based on firms' reported frequency of price changes). See online Appendix for more details.

In a last step, we investigate whether this heterogeneity holds in the most recent period using our measures built in the DMP survey. We find that firms in the DMP experi-

enced a small decline in margins since the start of the Ukraine war (Figure 4).[1] Consistent with past evidence, we see that profits were more negatively affected for firms in high-energy intensive industries, and less negatively affected for firms in more concentrated industries.

Figure 4: Changes in operating profit margins, 2022Q1 to 2023Q1



Notes: Energy intensity is estimated using industry data on energy costs from ONS Supply and Use Tables. Industry concentration is measured using a Herfidahl-Hirschman Index at the SIC2 level. The results are weighted by employment and industry shares.

6 Conclusion

To conclude, we have shown in this paper that the dynamics of firm profits do not appear to be vastly different in the past couple of years compared with previous energy price shocks, with various measures of profitability exhibiting a decline in UK data.

[1] This contrasts with ONS gross profit measure (grey line in Figure 1) that exhibits a flat profit share over 2022-2023. This could be related to the broad sample of firms in the DMP; e.g., there are usually few respondents from the oil sector, where profits tend to increase significantly following an oil shock.

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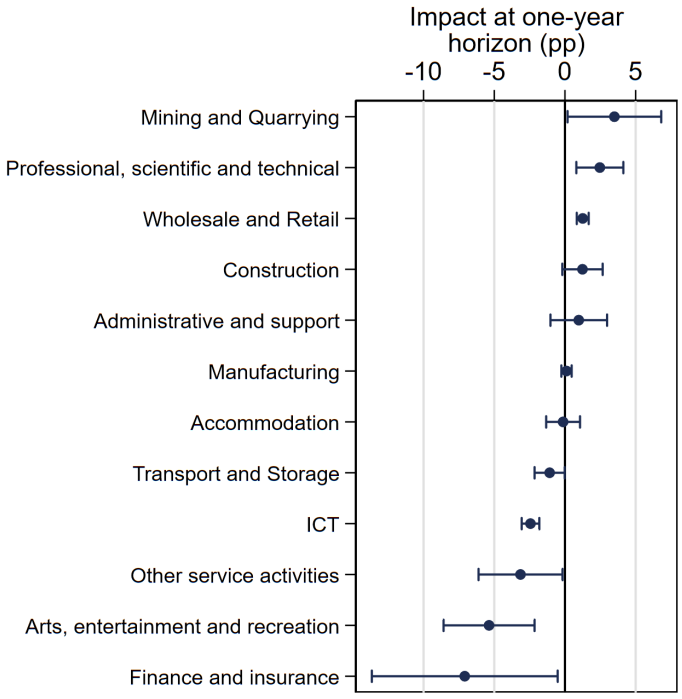
Appendix for online publication: Details on investigating heterogeneity in the response of margins to past energy shocks

We extend our local projection framework as described in section 3 to investigate markup responses at the firm level. First we estimate the following regressions for subsets of firms in each section-level industry S:

$$\Delta Y_{i\in S,t+h} = \alpha^h_{i\in S} + \beta^h_S \varepsilon_t + \gamma^h_S X_{i\in S,t} + u^h_{i\in S,t} \tag{2}$$

where $\Delta Y_{i\in S,t+h} (= Y_{i\in S,t+h} - Y_{i\in S,t-1})$ is the h-period ahead cumulative change in estimated markup for firm i in industry S. We collect and plot the one-year sector-specific markup responses β^1_S to highlight the heterogeneity across sectors.

Figure 5: Response of mark-ups to oil price shocks by industry



Notes: Dots show estimated response of markups for each industry (estimates of β^h from equation (2) at h=1), bands are 90% confidence intervals using Driscoll-Kraay standard errors. Estimates not shown for sectors with less than 15 firm observations on average per year – these are: 'Agriculture and Fishing', 'Real estate', 'Public admin', 'Education', 'Human Health and Social', and 'Electricity and gas'.

Figure 5 highlights a significant rise in markups in the Mining and quarrying sector

specifically following an energy shock.

Next, we investigate the drivers of this heterogeneity, estimating the following regression for the full sample of firms:

$$\Delta Y_{i,t+h} = \alpha_i^h + \beta^h \varepsilon_t + \delta^h \varepsilon_t \times Z_{i,t} + \gamma^h X_{i,t} + u_{i,t}^h \tag{3}$$

where $Z_{i,t}$ is a vector capturing a range of potential drivers of heterogeneity in firms' markup response to energy shocks. Table 1 plots the coefficients for the estimated interaction terms δ^h at the one-year horizon, where we test for various potential sources of heterogeneity simultaneously.

Table 1: Drivers of heterogeneity in mark-up response

Variable	**One-year impact on markup response to shock (p.p.)**
(Lagged) Markup	1.18
Energy Intensity	-1.03***
Employment	0.09
Concentration	0.62**
Price Stickiness	-0.73*

Notes: Estimates of interaction terms δ^h from equation (3) in Appendix at h=1-year horizon. The vector of interacted terms $Z_{i,t}$ have been normalised, such that the estimates can be interpreted as the effect of a one standard-deviation rise in each variable on the markup response. Standard errors calculated using Driscoll-Kraay. Asterisks indicate significance at 99% (***), 95% (**) and 90% (*) level.