The impact of energy costs on European firms' profitability

FOREWORD

The European Committee of Central Balance-Sheet Data Offices (ECCBSO) is an informal body whose members consist of experts either from the Central Balance-Sheet Data Offices belonging to or associated with the National Central Banks of the European Community or from National Statistical Institutes.

The Bank for the Accounts of Companies Harmonized Working Group (BACH WG) is one of ECCBSO's Working Groups. It was created within the foundation of developing and improving a European statistical database: the BACH database.

The BACH Database provides comparable aggregated data (both economic and financial) based on the annual accounts of non-financial incorporated companies from European countries. Freely available, BACH includes data from 11 countries: Austria, Belgium, Germany, Spain, France, Croatia, Italy, Luxembourg, Poland, Portugal and Slovakia.

We sincerely hope you can benefit from this analysis, and we invite you to visit the BACH database and explore it as much as possible by making your own analysis. Do not hesitate to share your results with the BACH WG.

The impact of energy costs on European firms' profitability

This study utilises BACH data from 11 European countries - including Austria, Belgium, Germany, Luxembourg, Spain, France, Croatia, Italy, Poland, Portugal, and Slovakia - to investigate the implications of energy cost fluctuations on firms' profitability. First, we present some stylised facts linking the energy market development to firms' cost items. Second, we perform a simple exercise to project the profitability components of firms' balance sheets in 2022. The exercise, accounting for the evolution of energy prices and inflation, suggests a stable development in firms' profitability. Further, it highlights that the degree to which firms might retain a higher share of profits critically depends on wage dynamics and whether wages ultimately catch up with inflation. Lastly, our preliminary analysis highlights a general negative correlation between energy price hikes and firms' profitability metrics through our sample period (2011-2021) and a positive correlation between price hikes and firms' costs across countries.

Overview

Energy shocks have profound implications on firms' financial health and operational performance. Recent literature (Bachmann et al. (2022), Ferriani and Gazzani (2022), Faiella and Mistretta (2020)) studies the relationship between disruption in energy prices and supply to firms' profitability. Such shocks often translate to increased operating costs, which can squeeze profit margins if not passed onto consumers. Moreover, energy price unpredictability can hinder firms' ability to forecast costs, leading to uncertainties in investment decisions and strategic planning.

The Cost of Energy and its Share in Firms' Costs

As a primary input in production, energy constitutes a significant portion of costs for many businesses, with considerable variation across industries. Consistent increases in energy prices can significantly alter firms' expense dynamics and trigger changes in their investment decision.

Drawing from Eurostat data[1] on energy prices (per GigaJoule) and consumption (in GigaJoule) for gas, electricity and oil, we compute the share of each energy component out of firms' cost of goods sold, materials and consumables (items I5) and External supplies and services (I6) as percentage of turnover in the BACH database[2]. Figure 1 plots the share of each energy source per country in 2019, 2020 and 2021.

Figure 1 highlights the relatively stable share of energy costs by country from 2019 to 2021. Electricity consumption is the largest source of costs for firms throughout Europe, followed by oil products. Gas is the smallest. Energy infrastructure is highly rigid. Countries cannot easily switch from one energy source to another, as this requires significant investments in plants, technologies and infrastructure. Moreover, long-term deals with supplying countries are also a matter of national security and subject to complex geo-political rules. Firms are also tight to specific energy sources for similar reasons. Energy consumption represented around

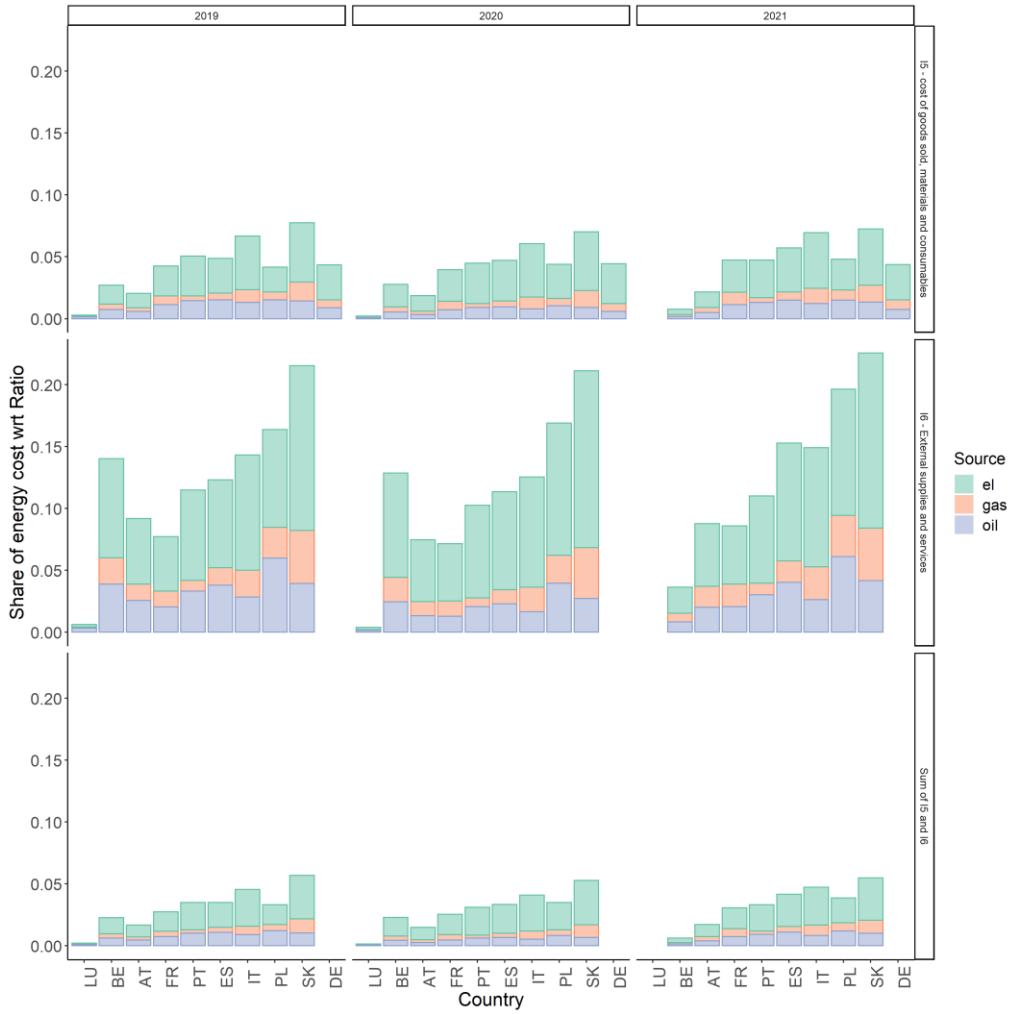
[1] Eurostat datasets extracted from Energy Statistics – Energy balances, corresponding to datasets coded "NRG_BAL_C" and "TEN00123".

[2] See appendix A for further clarification on coverage rate adjustments to the dataset.

5% of the cost of goods sold, materials and consumables (items I5) and around 12% of External supplies and services (I6) on average across the years, with substantial heterogeneity across countries likely due to the difference in industrial composition from country to country.

Share of energy cost out of total firm costs by source

Figure 1



Legend: AT - Austria; BE - Belgium; DE - Germany; ES - Spain; FR - France; HR - Croatia; IT - Italy; LU – Luxembourg; PL - Poland; PT - Portugal; SK - Slovakia. Item I5 corresponds to cost of goods sold, materials and consumables and I6 to external supplies and services, as percentage of turnover (see BACH database userguide for further details). Data sources: Eurostat and BACH.

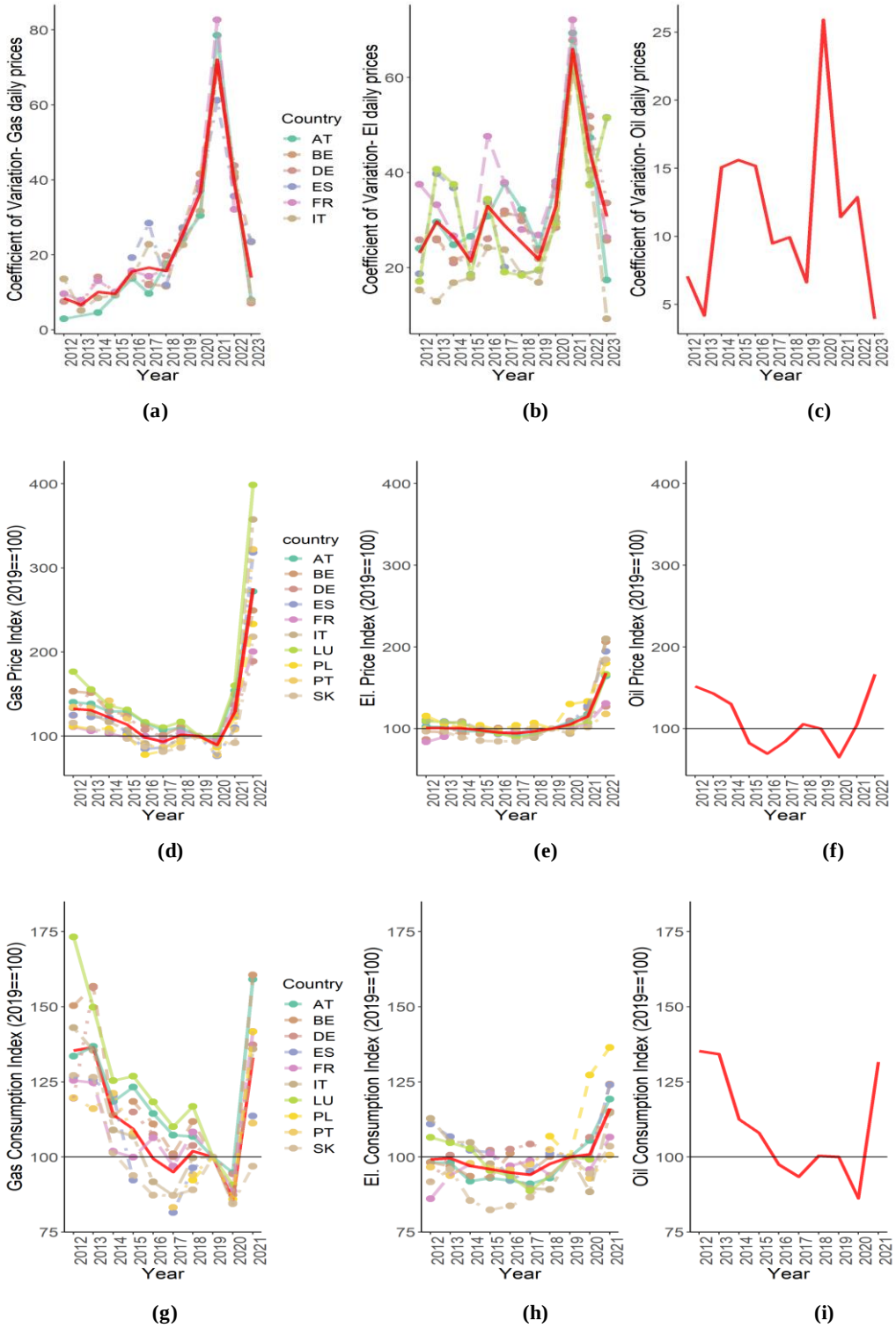
Evolution of energy prices and consumption

The past decade has seen general stability in energy prices across Europe, with occasional fluctuations influenced by geopolitical events and supply-demand imbalances. This stability ended abruptly in 2021 when energy prices began to increase substantially. Figure 2 dissects the dynamics in the European energy market. Panels (a), (b), and (c) show the coefficient of variation of daily spot prices obtained from Bloomberg for gas, electricity and oil, respectively, and cover the 2012-2023 period (up to May 2023). Panels (d), (e), and (f) depict an index of yearly prices from 2012 to 2022 obtained from the Eurostat database. Lastly, panels (g), (h),

and (i) show a consumption index of gas, electricity and oil obtained again from the Eurostat database until 2021. The red line denotes the yearly average across countries.

The price level and volatility began to increase in 2021 and were later exacerbated by the increasing tensions with Russia. However, it is the year 2022 that emerges as a complete outlier, looking at the developments in the previous decade, with gas prices increasing 400 per cent and electricity prices by up to 200 per cent. The increasing prices were mirrored by a staggering increase in market volatility and a slow uptake in consumption triggered by the rising industrial activity that followed the COVID-19 pandemic.

Figure 2



Legend: AT - Austria; BE - Belgium; DE - Germany; ES - Spain; FR - France; HR - Croatia; IT - Italy; LU – Luxembourg; PL - Poland; PT - Portugal; SK - Slovakia. Data sources: Bloomberg for price data and Eurostat for energy consumption data.

Main Findings, Methodology, and Predictions

We leverage the BACH dataset, which contains data until 2021, and Eurostat data, which contains energy consumption data until 2021 and energy prices up to 2022, to perform a simple exercise and shed light on the complex relationship between fluctuation in the energy market and firms' profitability.

The main result below focuses on the BACH item R33, which denotes EBITDA, earnings before interest, taxes, depreciation and amortization over net turnover. We project R33 in 2022 in two separate ways. In our first projection (dotted line in figure 3), we split EBITDA into its subcomponents and project each component to 2022, scaled by country-specific inflation rates. The only different adjustment we do concerns the energy cost component in R33, a subset of I5 and I6 items[3], which we project to 2022 assuming a fixed quantity of energy consumption and using 2022 energy prices. The second projection (solid line in the figure 3) starts similarly. Here, however, we selectively update only the more operational items in R33 using country-specific inflation data while keeping the financial and staff cost items at their 2021 level. We justify this assumption given the sticky nature of wages in several European countries and their differential adjustment speed.

Figure 3 depicts the results of this exercise[4] and presents several interesting facts. First, assuming all items in a firm's balance sheet adjusted to the new inflation level, the energy price hikes we saw in 2022 would not alter firms' profit margins, which would remain stable or slightly decrease. Second, assuming wages would not catch up with inflation in the short term would significantly change our results. In this second scenario, firms' profit margins would increase substantially across all countries, as the higher revenues due to the increase in output prices would more than compensate the increase in energy prices for a fixed cost of labour. In this second scenario, the increase in firm's profit margins would be highest in Austria, Germany, Poland and Croatia.

[3] Item I5 corresponds to cost of goods sold, materials and consumables and I6 to external supplies and services, as percentage of turnover (see BACH database userguide for further details).

4 In addition to the projections shown in Figure 3, we tested different scenarios for a 2%, 5% and 10% drop in electricity consumption, which yielded no significant changes to the outcome.

Projecting EBITDA (% net turnover, R33) over 2022 – Will firms manage to retain their profits?

Figure 3

Legend: AT - Austria; BE - Belgium; DE - Germany; ES - Spain; FR - France; HR - Croatia; IT - Italy; LU – Luxembourg; PL - Poland; PT - Portugal; SK – Slovakia. The doted line fully adjusted all ratios 'components for inflation and energy costs. The solid line (p) adjusts for inflation only for the more operational items in each ratio using country-specific inflation data while keeping the financial and staff cost items at their 2021 level.*

Predictions for 2022: Examining different profitability ratios

Figure 3 showcases our projection exercise for EBITDA over net turnover, as described by item R33 in BACH. This section delves deeper into the exercise, offering a broader perspective across various profitability metrics. Central to our explanation is the pivotal role of labour costs in shaping the trajectory of firm profitability.

For clarity, we refer to the metrics detailed in the following section, specifically items R31, R32, and R33. These represent the gross value added over net turnover, gross operating profit over net turnover, and EBITDA over net turnover, respectively. Table 1 provides a succinct breakdown of the elements constituting each metric. We undertake the same straightforward projection technique for each ratio detailed earlier. This involves adjusting subcomponents in two distinct manners: projecting the energy cost component—a proportion given by the weight of energy cost in total of items I5 and I6—by assuming static energy consumption paired with 2022 energy prices. Furthermore, we adjust most components based on country-specific inflation rates while maintaining 2021 levels for those subcomponents highlighted in red.

Database contents – components by ratio

Table 1

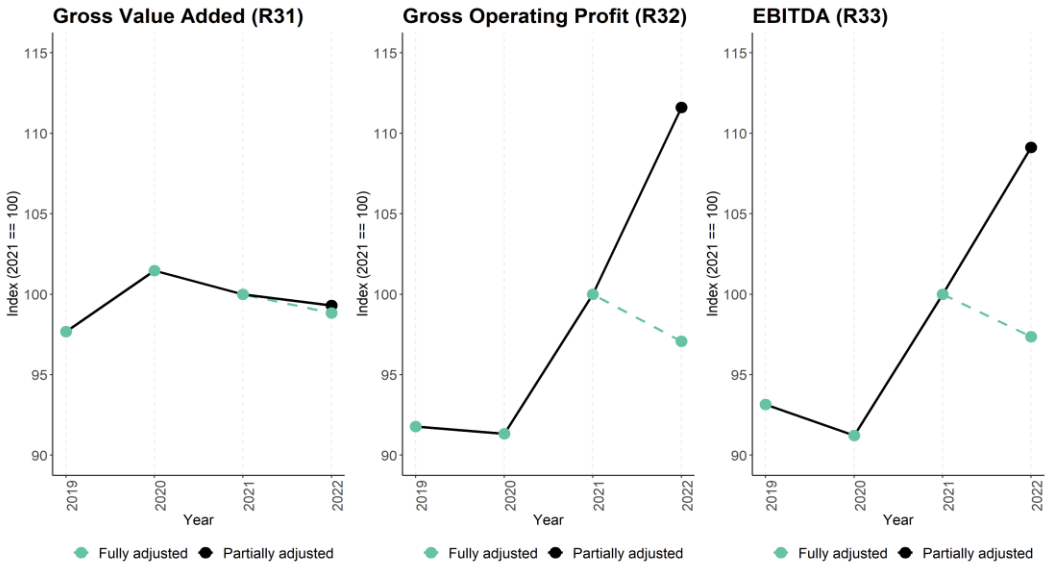
Component	Description	R31 Gross value added / Net turnover	R32 Gross operating profit / Net turnover	R33 EBITDA / Net turnover
I1	Net turnover	X	X	X
I2	Variation in stocks of finished goods and work in progress	X	X	X
I3	Capitalised production	X	X	X
I4	Other income			
I41	Of which: Operating subsidies and supplementary operating income	X	X	X
I42	Of which: Financial income			X
I43	Of which: Extraordinary income			
I5	Cost of goods sold, materials and consumables	X	X	X
I6	External supplies and services	X	X	X
I7	Staff costs		X	X
I8	Other expenses			
I81	Of which: Operating taxes and other operating charges	X	X	X
I82	Of which: Provisions (net of reversals)			
I83	Of which: Financial expenses other than interests on financial debt			X

Legend: based on BACH userguide. For the second projection (solid line), we adjust most components based on country-specific inflation rates while maintaining 2021 levels for those subcomponents highlighted in red.

The profitability ratios mostly mirror each other, yet they contain several differences. R32 omits financial income and expenses compared to R33, whereas R31 also excludes labour costs. Figure 4 visualizes the projections for each metric, depicting an average index across countries with 2021 as the reference point. The analysis underscores the pronounced impact of labour costs, given that it is the sole varying component between R31 and R32, accounting entirely for the observed discrepancy between them. In contrast, financial income and expenses, encapsulated in R33, have a negligible influence.

Projecting different profitability Ratios

Figure 4



Legend: each figure shows an average indexed Ratio across countries. The doted line fully adjusted all R33 components for inflation and energy costs. The solid line adjusts for inflation only for the more operational items in R33 using country-specific inflation data while keeping the financial and staff cost items at their 2021 level.

Energy and profitability

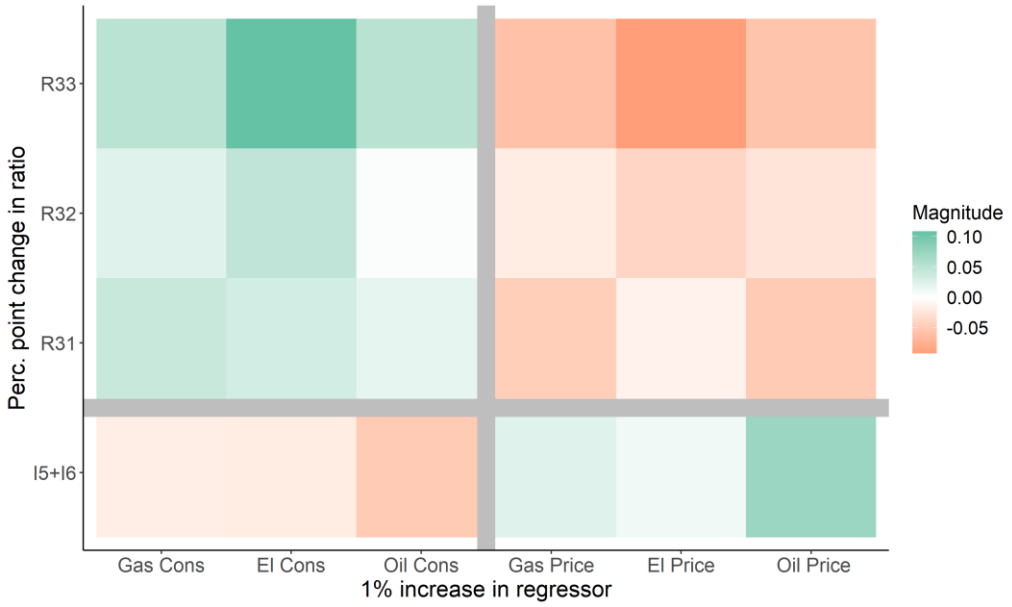
In this section, we shed some light on the complex dynamics between energy prices, energy consumption, and firm profitability. A simple regression analysis studies how fluctuations in energy prices and consumption patterns influence profitability ratios and specific cost items in firms' balance sheets. While insightful, it is crucial to note that our analysis is purely suggestive and does not pretend to establish a causal linkage. The methodological framework employed is a simple fixed effects model with country fixed effects and macroeconomic controls, including inflation and GDP growth rates. Figure 5 showcases our finding in a straightforward visual way. The heatmap reports magnitude and sign of coefficients capturing the effect of a one percentage increase in energy consumption (split by source) on the left-hand side and the effect of a similar price increase on the right-hand side. The effect is measured on four different profitability ratios (R31, R32 and R33) and on the sum of I5 and I6 denoting firm costs in the firms' income statement.

Focusing first on the impact of a one percentage increase in energy prices (right side of the graph), one notices how the effect is positive on the cost indicator while negative on all four profitability indicators. The reason is straightforward: for a given energy consumption, a price hike makes energy costlier and increases firms' cost items, decreasing their profitability. Shifting our attention to the effect of a percentage increase in consumption, we see that the signs are completely reversed. Here, the effect is negative on firms' costs and positive on their

profitability. This is because an increase in energy consumption, for a given price per unit of energy, strongly correlates with increasing output and turnover, which mechanically lowers all cost indicators.

Regression with country fixed effects and macroeconomic controls

Figure 5



Legend: R31: Gross value added / Net turnover ; R32: Gross operating profit / Net turnover ; R33: EBITDA / Net turnover.
The heatmap plots the value and sign of coefficients from a simple OLS regression capturing the correlation between hikes in energy prices and consumption on firms cost and profitability indicators. The regression model includes country fixed effect and macro controls such as country-specific GDP growth and inflation rate over time.

Limitations of the exercise and future research

We show a few interesting outcomes of the impacts of the recent energy cost hike on firms' profitability. The challenge of the exercise consists of assessing profitability for future periods and merging different data sources, each with its specificities. We must not close our analysis without a tale of caution regarding a few necessary assumptions. At the time of the analysis, because only data for energy prices is available for 2022 but not energy consumption, we assume that consumption of energy for all countries remains constant in 2022 in relation to 2021, which may turn out not to be completely accurate, although no strong evidence arises to suggest a large drop in energy consumption due to rising prices. Moreover, assuming a slight drop in energy consumption does not change the projected value enough to alter our conclusions.

Secondly, while assuming that operational variables should evolve linearly with inflation is reasonable, we are ignoring that raising interest rates may have strongly impacted firms' profitability. We minimized this concern by selecting EBITDA ratios, computed before the impacts of interest expenses on net margins; however, we cannot account for possible indirect effects of the raising interest rates on firms' profitability (for instance, through the

slowdown of economic activity). In future development and research, further emphasis should be given to the non-linear effects of raising interest rates on EBITDA.

Final remarks

Utilizing BACH data from 11 key European nations, we shed some light on the intricate dynamics between energy costs and firm profitability. The stability in energy prices over the past decade was disrupted in 2021 and 2022, leading to significant shocks to firms' cost structure across Europe.

We presented a simple projection exercise to forecast the profitability ratios of firms in 2022, making use of inflation and energy price data. The exercise suggests that the increasing revenues will entirely offset the increase in energy price; hence, firms will likely be able to pass through the higher energy costs to final consumers. Moreover, we show how the degree of profitability retention highly depends on the speed and degree of wage adjustments. If wages in Europe adjust quickly to inflation, firms' profit margins will remain relatively stable. If wages turn out to be extremely sticky, firms' profit margins will likely see a significant increase in 2022.

Complementing the previous exercise, we perform a simple regression analysis to highlight the inverse correlation between energy price hikes and firm's profit margins, juxtaposed against the positive correlation between heightened consumption levels and profit margins. In other words, for a given level of consumption, price hikes are correlated with a reduction in firms' profitability. In contrast, for a given energy price level, an increase in energy consumption strongly correlates with higher output and profits. The pattern holds across countries. This dynamic inverts entirely when we study the effects on firms' cost structures. Here, an increase in prices for a given level of consumption strongly correlates with an increase in costs. In contrast, a consumption hike for a given price mechanically lowers a firm cost indicator as it correlates with a booming output.

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Appendix A – Methodology notes

Data description and methodology

The Bank for the Accounts of Companies Harmonized - BACH is a database with aggregated and harmonized economic and financial information for non-financial firms from 11 European countries: Austria (AT), Belgium (BE), Croatia (HR), 1 France (FR), Germany (DE), Italy (IT), Luxembourg (LU), Poland (PL), Portugal (PT), Slovakia (SK) and Spain (ES).

The BACH Database is managed by the European Committee of Central Balance-Sheet Data Offices (ECCBSO). The ECCBSO is an informal body of experts from National Central Banks and National Statistical Institutes of Europe. Under the aegis of the ECCBSO, the BACH Working Group is responsible for maintaining and improving the BACH database. The BACH Database is available free of charge at https://www.bach.banque-france.fr/?lang=en.

Sample and coverage

BACH data[5] at our disposal underrepresents micro firms and selected activities for some countries. The disaggregation by NACE section or division reduces the effect of the sample composition on the results. The BACH User guide provides a complete description of the samples.

The BACH database contains statistics on economic and financial variables covering 11 European countries. The database provides the weighted mean and quartiles aggregated by sector and size class for each financial variable. Furthermore, it provides data according to different sampling procedures: we focus on the variable sample adjusted for turnover taking into consideration the coverage ratios of turnover, employees and number of corporations by NACE Section.

For the purposes of this Outlook, in order to match Eurostat data (country data at population level) and BACH data (country data at sample level which may not equal 100% in some countries), we conducted a coverage rate adjustment to BACH items so that both datasets are comparable in terms of energy costs as a percentage of BACH items I5+I6. The coverage rate adjustment variable follows the following prioritization scheme: employees coverage rate, turnover coverage rate if previous variable not available, number of firms coverage rate if previous variable not available.

[5] Database extraction date: August, 2023

Disclaimer

This analysis is based on BACH data. Therefore, the evidence provided reflects the different national samples used to calculate BACH data and might differ from other sources. More information regarding methodological limitations and national sample specificities can be found on the BACH website. The opinions of the authors of this document do not necessarily reflect those of the national central banks to which they are affiliated or those of the ECCBSO.