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COST-PUSH AND CONFLICT INFLATION: THE CASE OF FRANCE BETWEEN 2021 AND 2023

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ABSTRACT

In this paper, we analyse the recent inflation period (2021-2023) in the case of France. We first study the cost-push dimension of inflation with an Input-Output price model (Leontief price model) using the methodology developed by Weber et al (2024) for the USA, which we extend to include the sensitivity of the CPI to import prices; this allows us to identify, in the case of France, the 'systemically significant' sectors as defined by Weber et al (2024) (after Hockett & Omarova (2016)). In the second part, based on detailed National Accounts data, we study the evolution of price components and value sharing, accounting for the sector heterogeneity of the dynamics. In this section, we also provide elements to the debate on 'profit inflation'. Based on the results obtained, it seems that the term 'cost-push-profit-led inflation' (Nikiforos et al (2024)) appropriately describes the phenomenon observed in France over the period studied. These results call for a rethinking and renewing of the policy toolbox against inflation. These considerations prove particularly relevant in the context of ecological transition, because of the various issues it raises: in terms of energy, raw materials and provisioning (Miller et al (2023)), but also of satisfying essential needs through the production and distribution of specific goods and services in a post-growth context (Doyal & Gough (1984), Briens (2015), Millward-Hopkins (2020), Durand et al (2024)).

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Abstract

In this paper, we analyse the recent inflation period (2021-2023) in the case of France. We first study the cost-push dimension of inflation with an Input-Output price model (Leontief price model) using the methodology developed by Weber et al (2024) for the USA, which we extend to include the sensitivity of the CPI to import prices; this allows us to identify, in the case of France, the 'systemically significant' sectors as defined by Weber et al (2024) (after Hockett & Omarova (2016)). In the second part, based on detailed National Accounts data, we study the evolution of price components and value sharing, accounting for the sector heterogeneity of the dynamics. In this section, we also provide elements to the debate on 'profit inflation'. Based on the results obtained, it seems that the term 'cost-push-profit-led inflation' (Nikiforos et al (2024)) appropriately describes the phenomenon observed in France over the period studied.

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Introduction

Between 2021 and 2023, France faced inflation levels which had not been reached since the Great Inflation in the 1970s/1980s. During this period, the international economic environment was notably marked by two major events: the Covid-19 pandemic which disturbed global value chains, and the Russia's invasion of Ukraine which strongly impacted international agriculture and energy trade. The breakdown of the HCPI over the period 2020-2023, in figure 1, shows that price increases that have particularly affected French households are those of transport and housing-related energy (electricity, gas, other fuels) from 2021, and those of food from mid-2022.

Several common features of the inflationary dynamics between France and other countries of the Eurozone and the US were highlighted, notably regarding import prices, cost pass-through and profit increases. In France, Lafrogne-Joussier et al (2023) show that 30% of imported input price hikes and 100% of energy cost increases are passed on to prices. However, there is considerable sector heterogeneity in exposure to external shocks, and hence in inflationary dynamics. They especially underline the cases of the chemical and metallurgy sectors, which are considerably exposed, and whose producer price indices have risen by 9.5% and 13.9% respectively, as a result of imported inputs and energy price shocks. Furthermore, a June 2023 Institut National de la Statistique et des Etudes Economiques(INSEE) report[2] highlights the fact that unit margins (the share of gross operating surplus in total production) are the main factor driving prices up in the agri-food industries in early 2023.

Increases in the price of imported goods (particularly energy), cost pass-through and the drastic rise in profits was described in numerous studies[3], not only on France but also on other European countries and on the USA (ECB blog, 25 November 2022; IMF Working Paper Hansen et al (2023); OECD Economic Outlook 2023[4]; Italy Central Bank, Colonna et al (2023); European Stability Mechanism 12 may 2023[5], Arce et al (2023) on the ECB blog of 30 march 2023, among others)

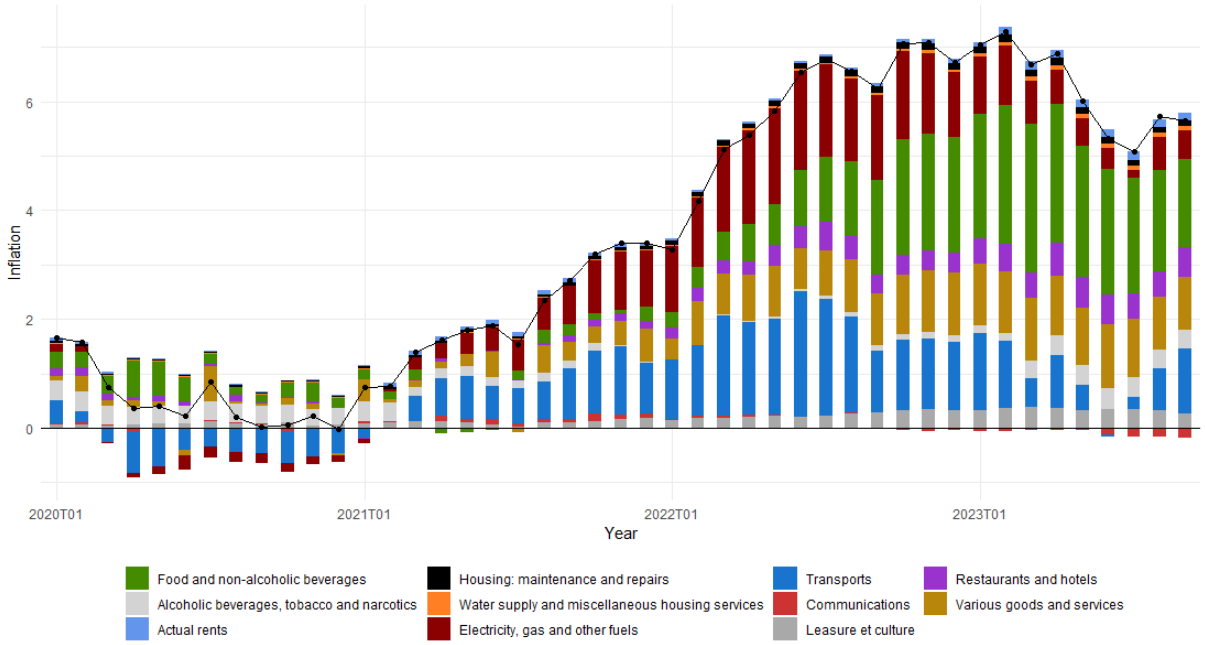
[2]https://www.insee.fr/fr/statistiques/7634656?sommaire=7634660

[3]and have sparked a debate: the controversy over 'super-profits' is just one example, as is the massive media investment by the head of the CMA CGM group, which specialises in maritime transport - a sector in which profits have soared in recent years.

[4]https://www.oecd-ilibrary.org/sites/7a5f73ce-en/index.html?itemId=/content/publication/7a5f73ce-en

[5]https://www.esm.europa.eu/blog/firms-profits-cure-or-curse

Figure 1.: HCPI inflation (year-on-year change)



Source: *Author's estimates - INSEE monthly data*

A range of measures was implemented in some countries to protect households from purchasing power losses (notably studied in Sgarvatti et al (2021) and Jaravel et al (2023)), as an alternative to the current monetary policy toolbox against inflation. Indeed, the recent inflationary episode raised once more the question of the relevance and the efficiency of this toolbox, whose framework is already being discussed (Perry & Cline (2016), Rudd (2021), Bandera et al (2023)). Its ability to face inflationary dynamics such as the one of the last years, but also the ones which could arise in the context of the ecological transition, is questioned (inflation surges in the ecological transition would require different tools, as underlined by Nersisyan and Wray (2019); or by Miller et al (2023)).

Weber & Wasner (2023) proposed an explanation of the recent inflation in the USA based on the ability of price maker firms to propagate, or even exacerbate, upstream price hikes to maintain - or increase, their profit margins. They call it "seller's inflation". Other scholars made similar considerations, such as Bivens (2022), Storm (2023), and Nikiforos et al (2024). According to post-keynesian theory, the conflict over value sharing is fundamental in inflation dynamics (Marie (2022)). Those analyses turned into a debate about the responsibility of firm markup in the inflationary phenomenon, which was joined notably by Lavoie (2023) (indeed,

while the striking increase in profits is not questioned, the fact that it results from firm pricing strategy is difficult to establish, and raises measurement issues and theoretical disagreements).

Studies on inflation analysing conflict over value sharing and cost-push dynamics are particularly relevant to understanding its dynamics; however, they are often conducted at an aggregated level. Yet, there is a vast heterogeneity among sectors concerning their importance for the productive structure (and thus the cost-push impact they can generate) and for consumption (and thus the purchasing power losses they can cause). Detailing the specific roles of the different economic sectors can help further understand inflationary dynamics. Moreover, accounting for this heterogeneity is also fundamental when thinking about policy toolbox against inflation: if most of inflation's causes arise within the supply side, precisely identifying and targeting them requires adopting a (cross-)sector approach. This is notably what Weber et al (2024) showed, building an Input-Output price model (Leontief Price Model) for the US economy and using it to identify "systemically significant" prices for inflation, based on the position of sectors within the productive structure, on their importance in household consumption, and on the price hikes they experience.

In this paper we study inflation in France between 2021 and 2023, giving special attention to sector-specific dynamics: we identify the sectors whose prices are the most important for overall price stability, and then we analyse the evolution of sector-specific price components, value-sharing and markups. This allows to underline the points and characteristics of the productive system on which it is necessary to focus in order to design relevant policies against inflation.

The cost-push dimension of inflation is first studied using an Input-Output price model (Leontief price model). We use the methodology proposed by Weber et al (2024) for the USA and extend it to include the sensitivity of inflation to increases in the price of imported products. This part allows us to identify, in the case of France, the 'systemically significant' sectors as defined by Weber et al (2024) (after Hockett & Omarova (2016)).

In the second part, based on detailed National Accounts data produced by INSEE, we study the evolution of price components and value sharing, accounting for sector heterogeneity. In this section, we also provide elements to the debate on 'profit inflation' in the case of France.

Finally, a general conclusion summarises the main results of this work and indicates the avenues for further research.

1. Cost-push Inflation - Leontief price model

1.1. The Leontief price model

In Weber et al (2024), the authors build a model to identify sectors whose prices are 'systemically important' for inflation (inspired by the work Hockett & Omarova (2016) on 'systemically important' prices and indices for finance). The Weber et al (2024) model is a Leontief price model, which they use to measure the impact on inflation of price rises in each sector of the production structure of the US economy. This impact depends on three factors: the sector's role in the domestic production structure (via cross-sector relationships[1], explicit in the Input-Output model), the weight of the sector's product in household budget (via a synthetic Consumer Price Index (CPI) based on household Final Consumption of the National Accounts Input-Output Table), and their price rises (producer prices). The price shocks used as inputs to simulations of inflationary impacts are based on observed data from three periods: the volatility (standard deviation) of the sector's output prices over the period 2000-2019; the increase in output prices between the fourth quarter of 2020 and the fourth quarter of 2021 (period of economic recovery after the periods of lockdown linked to the Covid-19 pandemic); the increase in output prices between the second quarter of 2022 and the second quarter of 2021 (period including the shock following Russia's invasion of Ukraine in February 2022). This work enables them to identify three groups of products of systemic importance for inflation: energy; basic necessities (food, chemicals, housing, electricity and water); and commercial and financial infrastructures.

Ipsen et al (2023), using Weber et al (2024) methodology and data from the *World Input-Output Database*[2] on EU28, build a stress-test framework and also conclude that there are systemically important sectors. By distinguishing between core and peripheral countries, the authors show that peripheral countries are particularly exposed to price variations in core countries, as well as to international price variations and that substitution effects are more limited in those countries. The main sectors of systemic importance they identify for EU28 are the real estate sector in France, the oil sector in Poland and the electricity and gas sector in the United Kingdom, the insurance and finance sector in the United Kingdom, and the real estate sectors in Germany, in the United Kingdom and in the Netherlands.

[1] via Intermediate Consumption, which is what production in one sector requires from other sectors.
[2] https://www.rug.nl/ggdc/valuechain/wiod/?lang=en

In Cucignatto et al (2023), which also uses an Input-Output price model, the authors investigate the role of profits in inflationary dynamics for Spain, Italy and France, by simulating an energy price shock followed by price control policies (using data from the *Inter-Country Input-Output Tables* of OECD[3]).

The aim of this part of our study is to apply the methodology developed in Weber et al (2024) to France, using National Accounts data provided by INSEE[4]. These data allow us to extend the analysis (compared to Weber et al (2024) who conducted it on domestic sectors only) to include imported products. This is done in a similar way to Ipsen et al (2023) (who, however, use data up to 2014 only, which is the latest year available in the *World Input-Output Database*).

Using a Leontief price model, we simulate the impact of sector-specific price rises on a synthetic Consumer Price Index (described below), in order to identify sectors that are particularly important for inflation, designated by the authors in Weber et al (2024) as 'systemically significant'.

Using standard notations, X the diagonal matrix of sector output, P the price vector, V the Value Added vector, M the vector of Imported Intermediate Consumption, and A the direct domestic technical coefficient matrix, we get (1.1). Equation (1.2) is obtained by multiplying by the sector output inverse matrix, and equation (1.3) by isolating vector P:

$$XP = XA'P + V + M \tag{1.1}$$

$$P = A'P + v + m \tag{1.2}$$

$$P = (I - A')^{-1}(v + m) \tag{1.3}$$

Following Weber et al (2024), we distinguish between sectors whose prices are endogenous in the model and sectors whose prices are exogenous. The latter therefore do not feed into the cost propagation dynamic represented by the model (this dynamic is described in detail below, and corresponds to equation (1.5)). As the authors explain, this distinction is in line with the work of Kaldor, who explains that the prices of certain goods are fixed on international markets (this is also the case in Kalecki, who distinguishes between prices determined by demand, those determined by costs, and the case of raw materials, which are also subject to speculative demand). Here, the sectors whose prices are considered to be exogenous are

[3]https://www.oecd.org/sti/ind/inter-country-input-output-tables.htm
[4]https://www.insee.fr/fr/statistiques/6793580?sommaire=6793644&q=comptes+nationaux

Extractive industries (BZ), Coking and refining (CD), Financial and insurance activities (KZ), Real estate activities (LZ), as well as Education (PZ), Human health activities (QA), Public administration and defence - compulsory social security (OZ), and Social and health care activities and social work activities without accommodation (QB). This assumption will be relaxed for the Extractive industries (BZ) and Coking and refining (CD) sectors in the model in which imported products price shocks are included (see below).

Once this distinction has been made, and by noting X the index referring to sectors with exogenous prices and E the index referring to sectors with endogenous prices, we obtain the following system:

$$\begin{pmatrix} P_X \\ P_E \end{pmatrix} = \begin{pmatrix} A'_{XX} & A'_{EX} \\ A'_{XE} & A'_{EE} \end{pmatrix} \begin{pmatrix} P_X \\ P_E \end{pmatrix} + \begin{pmatrix} v_X \\ v_E \end{pmatrix} + \begin{pmatrix} m_X \\ m_E \end{pmatrix} \tag{1.4}$$

From which we deduce the equation governing the prices of endogenous sectors P_E:

$$P_E = (I - A'_{EE})^{-1} A'_{XE} P_X + (I - A'_{EE})^{-1}(v_E + m_E)$$

When a sector-specific price shock is simulated, the price of that sector is considered to be exogenous (to avoid it being modified by the propagation of its own price shock). This sector shock propagates other sector-specific prices via cross-sector relationships, assuming that the other sectors, which use the product of the sector under study for their own production, do not adjust the quantities that their production requires: in other words, we consider that the technical coefficients[5] are fixed. This price increase in the sector under study is therefore translated into an increase in input costs for the other sectors, and is therefore passed on to their prices according to the following relationship :

$$\Delta P_E = (I - A'_{EE})^{-1} A'_{XE} \Delta P_X \tag{1.5}$$

To measure the impact on inflation, we build a synthetic Consumer Price Index (CPI) similar to Weber et al (2024) (initially proposed by Valadkhani & Mitchell (2002)). It is based on the shares of products in household Final Consumption: we consider a consumption basket whose price will change as a function of sector-specific price increases, balanced by their respective weights (noted c_x for sector x in the equations below). A price shock in sector x will be passed

[5] of which INSEE gives the following definition: 'The technical coefficient is the ratio between the value of intermediate consumption of a given product by a given industry and the value of the total production of this industry'. https://www.insee.fr/fr/statistiques/6793638?sommaire=6793644&q=coefficients+techniques#documentation

on both directly (IP_{dir} equation (6a)), and indirectly (IP_{ind} equation (6b)), leading to a total impact (IP_{tot} equation (6c)):

$$
\begin{aligned}
IP_{dir,x} &= c_x \Delta P_X \\
IP_{ind,x} &= \sum_{i \neq x} c_x \Delta P_E^i \\
IP_{tot,x} &= c_x \Delta P_X + \sum_{i \neq x} c_x \Delta P_E^i
\end{aligned}
$$

The five sectors accounting for the largest share of household budgets, via this synthetic CPI, are: 'Real estate activities' (24.6%), 'Wholesale and retail trade' (20%)[6], "Accommodation and catering" (9%), "Manufacture of food, beverages and tobacco products" (7,5%), and "Financial and Insurance activities" (5,9%).

As in Weber et al (2024), the simulations are based on three price shocks: the first simulation computes the impact on inflation for each sector when facing an increase equal to its price volatility over the period 2000-2019[7].; the second when facing an increase equal to the increase in the production production during 2021 (the period corresponding to the post Covid-19 recovery); the last when facing an increase equal to the increase in the production price during 2022 (the period following Russia's invasion of Ukraine in February 2022).

The factors determining the importance of a sector for inflation (the impact on CPI of an increase in its price) are therefore: its share in household budget, its role in the production structure (i.e. its importance for the production of other sectors via ICs), and the magnitude of its price increases.

[6]When we use data valued at purchaser prices, the values of an industry's Intermediate Consumption (IC) include the Trade and Transport margins applied to these inputs for their distribution. With data valued at basic prices, such as those we use, the Trade and Transport IC of a branch corresponds to what it paid as Trade and Transport margins for these inputs to be distributed; and the distribution costs of a branch's product are reflected in the Trade and Transport IC of the other branches, and in the household Final Consumption of the Trade and Transport sectors (example for year 2019. At purchase price: Household final consumption of Trade **and** Transport: 60685 M€, around 5% of household budget; at base price: 244326 M€, around 22% of household budget).

[7]Price volatility over 2000-2019:

$$
\sigma^x_{t_0,t_1} = \sqrt{\frac{1}{T} \sum_{t=t_0}^{t_1} (\Delta P^x_t - \Delta^{\overline{x}}_{t_0,t_1})^2} \tag{1.6}
$$

In this first model, neither wages nor profits adjust. In a second section, following Weber et al (2024), we construct two new models: one in which sectors set their prices so that the ratio between profits and income (i.e. unit profits) remains constant; the other in which real wages remain constant (i.e. wages increase like CPI).

Finally, we integrate imports more directly than in Weber et al (2024), by simulating shocks to the prices of products from external sectors (imported as intermediate consumption by domestic sectors, and as final consumption by households).

1.2. Results

Data comes from National Accounts, built by INSEE[8]. We use the Symmetric Input-Output table[9] (SIOT) of year 2019; and the evolution of the Production Price Index by sector[10].

Using the SIOT allows for breaking down imported intermediate consumption by product (necessary to extend the analysis of systemically important sectors to imports, and not just to domestic sectors as in Weber et al (2024)). The data are valued at base price (which is generally the case when using input-output tables). The most recent available SIOT is the one of 2019 - and, had the one of 2020 been available, it would have been better to use that of the previous year, due to the major disruptions associated with the lockdown periods in 2020. Finally, the 2019 SIOT proposes a division of the French economy into 38 sectors[11].

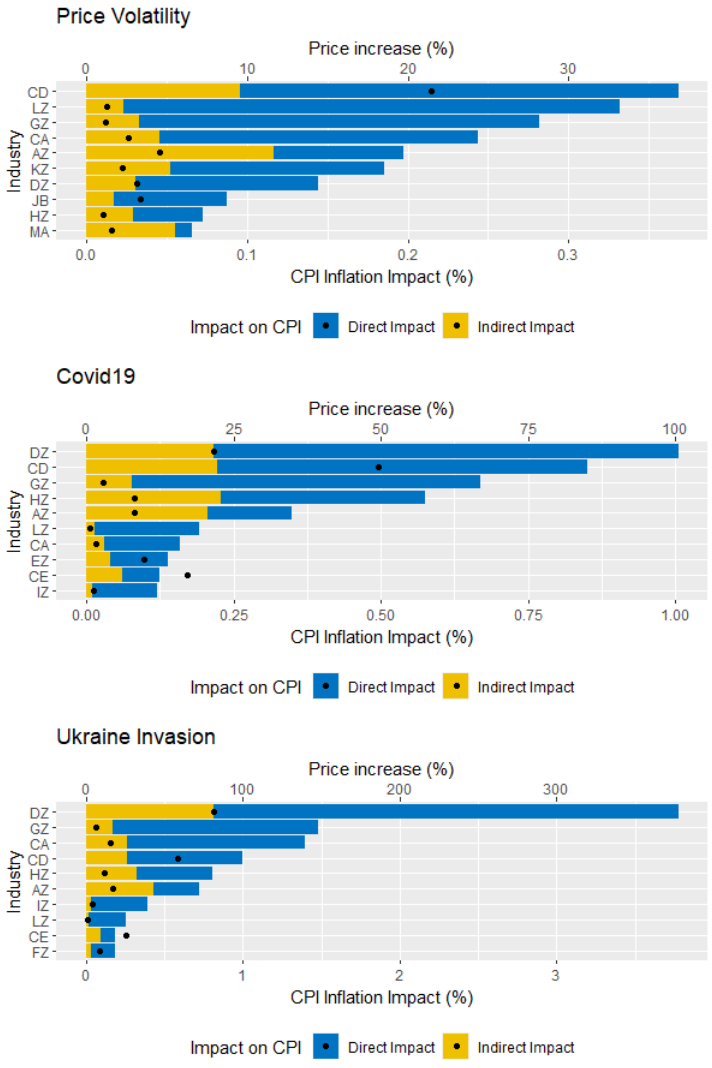
1.2.1. Standard model

Figure 1.1 presents the results obtained for the model without wages and profits adjustment. The top chart shows the ten sectors with the greatest impact on the synthetic CPI when facing a price shock equal to the price volatility of the sector over 2000-2019.

[8] https://www.insee.fr/fr/accueil
[9] https://www.insee.fr/fr/statistiques/6793638?sommaire=6793644
[10] https://www.insee.fr/fr/statistiques/6793598?sommaire=6793644
[11] https://www.insee.fr/fr/information/2406147

Notes. Top chart: without adjustment or substitution mechanisms, a price increase in sector CA (Manufacture of food, beverages and tobacco products) of 2,5% (equal to the volatility of its price over 2000-2019) leads to an increase of the CPI of 0,24%, approximately one-fifth from the indirect impact, i.e. via subsequent price rises in sectors that use products from sector CA as Intermediate Consumption for their production, and approximately four-fifths from the direct impact of the price rise on household final consumption. Nomenclature. CD: Coking and refining. LZ: Real Estate Activities. GZ: Trade. CA: Manufacture of food, beverages and tobacco products. AZ: Agriculture, forestry and fisheries. KZ: Finance and Insurance Activities. DZ: Production and distribution of electricity, gas, steam and air conditioning. JB: Telecommunications. HZ: Transport and storage. MA: Legal, accounting, management, architecture, engineering, control and technical analysis activities.

Figure 1.1.: Leontief price model



Source: *INSEE 2019 Symmetric Input-Output Table and Production Price Index*

While three quarters of the sectors have an impact on the CPI of less than 0.06%, the impact of the first sector, 'Coking and refining', is 6 times greater: 0.37%. 75% of this impact is due to the direct effect on the CPI of the rise in this sector's price, and 25% to the indirect impact, via cross-sector relations. It is also the sector subject to the largest price shock, 21%; the second being 'Activities of Households as Employers', with a price shock of 12%, but ranking 25th out of 37 in terms of impact on the CPI (0.013%), due to the absence of indirect effects and its low weight in the CPI. The second most important sector for the CPI is 'Real Estate Activities', which despite its low price variability (1.2%) has only a slightly lower impact than 'Coking and refining' products, notably because of its weight in household budgets.

We also note the importance of the 'Trade' sector, which is also subject to small price variations over the 2000-2019 period, but is the third most important sector for the CPI (0.28%) and the second largest item of household consumption[12]. These are followed by 'Manufacture of food, beverages and tobacco products' (0.24%) and 'Agriculture, forestry and fisheries' (0.20%); then 'Financial and insurance activities' (0.19%) and 'Electricity, gas, steam and air conditioning supply' (0.14%). While the Real Estate, Trade, Agri-food Industries (i.e the 'Manufacture of food, beverages and tobacco products' sector; denoted AFI from now on) and Financial and Insurance Activities sectors are among the main household expenditure items, this is not the case for the 'Coking and refining' and 'Agriculture, forestry and fisheries' sectors; however, these last sectors have high price variability (particularly the former) and significant indirect effects (particularly on the Agri-food Industries and on Catering, in the case of the 'Agriculture, forestry and fisheries' sector).

This first simulation highlights the most important sectors for inflation; Weber et al (2024) refer to them as systemically significant sectors. The results of the other two simulations confirm the key role of most of these sectors in inflationary dynamics: first, during the period of post-pandemic economic recovery (year 2021), then during the year following Russia's invasion of Ukraine (year 2022).

The middle chart shows the results of the simulation carried out using 2021 price rises as shocks. The impact of sector price hikes on the CPI is much higher here. The sector with the highest impact in this simulation is 'Production and distribution of electricity, gas, steam and air conditioning': the increase in its price is 22%, and the impact on the CPI is 1.01% (of which around 30% via cross-sector relations). The electricity sector is the second largest in terms of Forward Linkages[13] and the seventh largest item of household expenditure (3.6% of the budget); over the post-Covid period, the increase in its price is around 7 times greater than its variability over the period 2000-2019, making it the second largest relative price increase (relative to volatility over 2000-2019). The 'Coking and refining' sector is also facing a sharp rise in prices (twice its average volatility) and is causing the second biggest impact on the CPI, of 0.85% (a quarter of which are indirect effects), followed by the 'Trade' sector (price rise of 2.9% and CPI rise of 0.67%) and the 'Transport and storage' sector (price hike of 8.0%, i.e. almost

[12] cf note p.12

[13] As Weber et al (2024) point out, forward linkages provide information on the importance of a sector's product for the productive structure: this is the quantity of a sector's good required when final demand for goods from all other sectors increases by one unit. The forward linkages of a sector are computed by summing the row corresponding to that sector in the Leontief inverse matrix $L = (I - A)^{-1}$.

eight times its average volatility, and CPI impact of 0.58%). Agriculture, AFIs and real estate come next. The main impacts on the CPI in this simulation came from the energy and distribution (transport and trade) sectors, followed by food and real estate. The latter experienced a relatively small rise in prices (less than half its average volatility), as did the AFI sector (slightly more than half its average volatility).

Finally, the bottom chart corresponds to the period following the invasion of Ukraine, in 2022. Once again, the impact on the CPI is much greater than in the previous simulation. With a particularly sharp price rise (81.5%, i.e. 26 times its average volatility), the impact of the Electricity sector is a 3.78% rise in the CPI. The impact of the Trade sector, despite a less spectacular price rise of 6.5% (but still representing 5 times its average variability), reaches almost 1.5% of CPI increase; and the AFI sector has an impact of 1.40% of CPI increase caused by a rise of 15% of its price. Next comes the Coking and refining sector, with a price rise of 58% and an impact of around 1% on the CPI, as well as the Transport sector (11% price rise, more than 10 times its average variability, and an impact of 0.8% on the CPI). The 'Agriculture, forestry and fisheries' sector saw a sharp 16.7% rise in prices, leading to a 0.72% rise in the CPI. Next came the Catering and Real estate sectors. Once again, the sectors that are particularly important for inflationary dynamics are energy, distribution and food.

The results obtained here for France are similar to those obtained by Weber et al (2024) for the USA, not only in terms of the sectors identified (oil and coal, agriculture, AFI, housing, financial activities, etc.) but also in terms of price variability and impact on the CPI. However, there is an important difference concerning the energy sector; in the case of the USA, the 'Oil and coal products' sector is, by far, the sector with the greatest impact on the CPI, over the three periods studied. On the other hand, in our case, while the 'Coking and refining' sector is the most important for the CPI over the period 2000-2019, it is the 'Electricity, gas, steam and air conditioning supply' sector that becomes the most important over the post-covid period (just ahead of 'Coking and refining') and the post-invasion of Ukraine period ('Coking and refining' is, in this case, only the fourth most important sector for the CPI). What's more, the gaps between the most important sector and the subsequent sectors are much smaller than in the case of the USA. Finally, while the 'Petroleum and Coal Products' sector in the USA represents only 1.23% of household budgets and ranks fifteenth in terms of Forward Linkages, the 'Electricity' sector in France is the second most important in terms of Forward Linkages and represents 3.6% of household budgets. The importance of the Real Estate sector is also a characteristic of 'core' (as opposed to 'peripheral') European countries highlighted by Ipsen et al (2023); and the next most important sectors are Financial Activities and Insurance, Energy, and Food.

1.2.2. Model with wages and profits adjustments

The model in the previous section assumed that wages and profits did not adjust following price rises: their nominal values remained constant. As explained by Weber et al (2024), this made it possible to isolate the cost-push dimension from any price-profit or price-wage spirals that may result from initial price increases.

The adjustment mechanisms are the subject of two other versions of the model: one in which wages adjust to incorporate increases in the CPI (real wages remain constant), the other in which profits adjust so that unit profits (or the share of profits in the value of production) remain constant (which also corresponds to the application of a constant rate to the costs of domestic and imported intermediate consumption and wages). More precisely, these mechanisms are translated in the model as follows:

- Wage adjustment: a 'Labour' sector is added to the domestic cross-sector relations matrix. The intermediate consumption supplied by this sector to the others corresponds to their expenditure in labour; the intermediate consumption supplied by the other sectors to this sector is the final consumption of households. The 'price' of this sector is therefore the result of its inputs (final consumption) and is therefore affected by price rises in the other sectors and affects them in turn, and so on. Subsequent wage increases are therefore uniform across the different sectors. Wages are also removed from the value-added vector.
- Adjustment of profits: a diagonal matrix is added to the matrix of cross-sector relationships, the elements of which are the initial shares of profits in the value of production. In this way, the prices computed will produce an amount of profit proportional (via a fixed coefficient, equal to the initial share) to the costs. Profits are also removed from the value-added vector.

The results of the model with wage adjustment and the model with profit adjustment are similar to those of the first model in terms of ranking the importance of sectors; however, the inflationary consequences of sector price increases are higher, particularly in the case of wage adjustment (these results are similar to those of Weber et al (2024) for the USA). The cases of Real estate, Pharmaceuticals and Transport equipment are noteworthy: their impact on the CPI in the case of wage adjustment is much greater (30%) than in the case of profit adjustment. Price rises in these sectors therefore have a particularly strong impact on households.

1.2.3. Model extended to import price shocks

In this section, we propose an extension of the shocks of the Weber et al (2024) model to imported product prices, in order to integrate more directly the international dimension of the economy, as analysed in Ipsen et al (2023) for the case of EU. To do this, we integrate imported products (detailed by product, for each branch, in the INSEE Symmetric Input-Output Table) into the matrix of cross-sector relationships. The matrix equations then become:

$$\begin{pmatrix} P_X \\ P_E \\ P_M \end{pmatrix} = \begin{pmatrix} A'_{XX} & A'_{EX} & A'_{MX} \\ A'_{XE} & A'_{EE} & A'_{MX} \\ A'_{XM} & A'_{EM} & A'_{MM} \end{pmatrix} \begin{pmatrix} P_X \\ P_E \\ P_M \end{pmatrix} + \begin{pmatrix} v_X \\ v_E \\ v_M \end{pmatrix} \tag{1.7}$$

Endogenous prices equation then becomes:

$$P_E = (I - A'_{EE})^{-1} A'_{XE} P_X + (I - A'_{EE})^{-1} A'_{ME} P_M + (I - A'_{EE})^{-1} v_E$$

Finally, imported products price chocs will spread throughout the production structure according to the following equation:

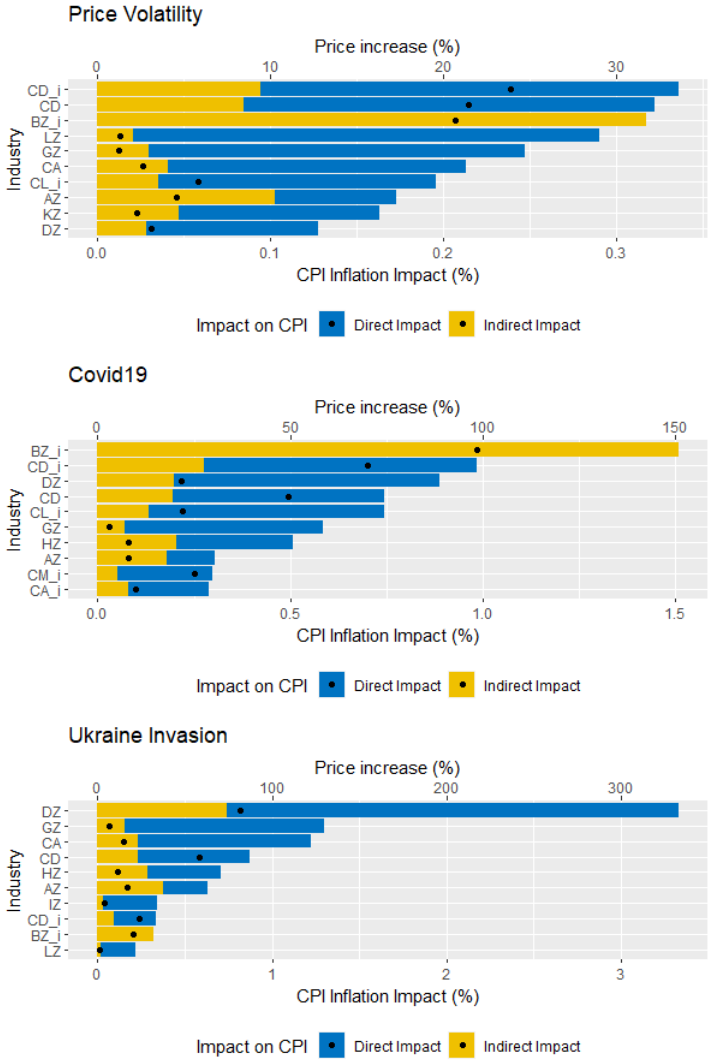
$$\Delta P_E = (I - A'_{EE})^{-1} A'_{ME} \Delta P_M$$

In this version of the model, we assume that prices in the 'Coking and refining' (CD) and 'Extractive industries' (BZ) sectors are endogenous, and that all prices of imported products are exogenous.

The results of this new model can be observed on figure 1.2 (in which domestic sectors keep the same notations as before, to which we add "_i" to refer to the external sectors providing the imported products).

Notes. Top chart: without adjustment or substitution mechanisms, a price increase in sector BZ_i (product of Extractive industries imported) of 21% (equal to the volatility of its price over 2000-2019) leads to an increase of the CPI of 0,32%, fully resulting from indirect impact, i.e via subsequent price increases in sectors using the products of sector BZ_i as Intermediate consumption for their production. Nomenclature. CD: Coking and refining. LZ: Real Estate Activities. GZ: Trade. CA: Manufacture of food, beverages and tobacco products. AZ: Agriculture, forestry and fisheries. KZ : Finance and Insurance Activities. DZ: Production and distribution of electricity, gas, steam and air conditioning. HZ: Transport and storage. CL: Transport equipment manufacture. BZ: Extractive industries.

Figure 1.2.: Leontief price model - extension with imported products



Source: *INSEE 2019 Symetric Input-Output Table and Production Price Index*

Adding external sectors modifies the hierarchy established in the previous section. Three sectors make their appearance in the 10 most important sectors for inflation in the three periods studied: Extractive industries (BZ_i), Coking and refining products (CD_i), and Transport equipment (MZ_i). Extractive industries (BZ_i) imports mainly concern the domestic Coking and refining (CD) sector, and their impact on inflation is entirely indirect (households do not consume them directly). Imported coking and refining products (CD_i) have an impact that is about one-third indirect, and imported products from the Transportation Equipment Manufacturing sector (CL_i) mainly have a direct impact on the CPI. The ranking of sectors varies according to the shock studied. If we consider price volatility between 2000 and 2019 (top in figure 1.2), imported products from the Extractive industries (BZ_i) and Coking and refining (CD_i) sectors rank 3rd and 1st (the impact of Extractive industries (BZ_i) imports on the domestic energy, Coking and refining (CD) and Electricity, gas, steam and air conditioning (DZ) sectors is significant, as it supplies them with inputs); and the Manufacture of transport equipment (CL_i) sector ranks 7th. In the post-Covid price shock, these same three sectors are all in the top five sectors for inflation, with a very strong impact for Extractive industries imports (BZ_i) of 1.5% CPI rise (compared with the 0.9% CPI rise caused by the shock to the Electricity and gas sector (DZ), which is the leading domestic sector in terms of CPI impact), and prices almost doubling; and an impact of imports of coking and refining products (CD_i) of almost 1% of CPI increase, with a price shock of 70%. The hierarchy of impact of the domestic sectors remains the same, once the external sectors are added.

Finally, for the shock following Russia's invasion of Ukraine, the situation is different. In this case, the external sectors in the top 10 (Extractive industries BZ_i and Coking and refining products CD_i) are down to 9th and 8th place respectively, just ahead of Real Estate (and the top seven sectors are the same as in the base model). What's more, their impact on the CPI is far lower than that of the first-ranked sectors.

This last exercise has highlighted the importance of imported products for domestic price stability. Products that are particularly likely to cause CPI rises, in some cases higher than domestic sectors, are energy products (mainly crude oil and refined petroleum here); but this is also the case for products from other sectors (transport equipment, for example). While it is of course more difficult to control import prices than domestic prices, it is nevertheless important to take these results into account when considering inflation policies.

1.3. Conclusions

The model developped in this first part allowed us to highlight sectors which are "systemically significant" for inflation. Those were identified based on: their importance for the productive structure, the magnitude of their price hikes, and their weight in household consumption budget. A high sector heterogeneity appears.

The domestic sectors identified as systemically significant for price stability are mainly those of Energy (Electricity, gas, steam and air conditioning DZ, and Coking and refining CD), Food (Agriculture, forestry and fisheries AZ, and Manufacture of foodstuffs, beverages, and tobacco products CA), Distribution (Trade GZ, and Transport HZ), and Housing (Real estate LZ). These results are close to those found for the USA by Weber et al (2024), and echo some aspects of those of Ipsen et al (2023) for "core" european countries. As regards imported products, it is once again Energy that stands out as being systemically significant for inflation, via products from the Extractive Industries (BZ_i) and Coking Refining (CD_i) sectors, suppliers to the domestic energy sectors and to households.

These results call for a new approach to the inflation policy toolbox, different from the current monetary policy framework. If inflationary pressures arise within the productive structure (via cost increases and their propagation), it seems relevant to give special attention to provisioning and to consider production planning, price controls (an issue addressed in Cucignatto et al (2023) for the cases of France, Spain and Italy, in a scenario of rising energy prices, based on a Leontief price model as well; which could be an interesting extension to the present work), as well as distribution and redistribution mechanisms able to satisfy essential needs in a context of limited supply. These considerations prove particularly relevant in the context of ecological transition, because of the various issues it raises: in terms of energy, raw materials and supply (Miller et al (2023)), but also of satisfying essential needs through the production and distribution of specific goods and services in a post-growth context (Doyal & Gough (1984), Briens (2015), Millward-Hopkins (2020), Durand et al (2024)).

In this first part, we studied the cost-push dimension of inflation dynamics, particularly via their propagation within the productive structure and to household budgets. However, inflationary pressures trigger distributional conflict (Marie (2022), Weber & Wasner (2023), Rowthorn (1977)), and this conflict exacerbates them, as illustrated by the models with adjustment presented above. We analyse, once again adopting a sectoral approach, the evolution of cost components and value sharing in France since 2020. We will also provide elements for the debate on the role of profits and markups in the recent inflation dynamics.

2. Conflict Inflation - Prices, value sharing and markups

2.1. The "Profit inflation" debate

The question of the role of profits in the inflationary surges of the period under consideration has opened up an important debate, which we will attempt to account for and to which we will provide empirical elements for France. To do so, we need to spell out a few conceptual and methodological elements.

Let's start with a few definitions from National Accounting:

- Value Added is computed by subtracting Intermediate Consumption (IC) from Total Production (noted Y); and is then shared between Labour income, production taxes, and Gross Operating Surplus (GOS): $Y = IC + VA$ et $VA = W + GOS + T$, with W the Labour income, and T the net production taxes.
- Gross Operating Surplus (GOS): is computed by subtracting Labour income and net production taxes from Value Added: $GOS = VA - W - T$
- Profit Share (PS): the ratio between GOS and VA; it reflects Value Added sharing between Labour income and Profits. It's formula is: $PS = \frac{GOS}{VA}$
- Profit margin (or unit profits, or markup over total costs): the ratio between GOS and total production $Pm = \frac{GOS}{Y}$
- Markup: under the *markup pricing* assumption, it is the rate τ applied to Unit Direct Costs UDC (or variable costs; which are the labour and input costs which are *directly engaged* in the production process, unlike the indirect (or "overhead") costs such as fixed costs) for post-Keynesian economists - or to the marginal cost MC for mainstream economists; $p = (1+\tau) \cdot UDC$

Several studies have recently analysed the recent inflation, notably in the US and in Europe; and the role of profits was particularly highlighted. It is notably the case in Bivens (2022) and Weber & Wasner (2023) for the US, and in Hansen et al (2023) for the Eurozone. However, as we shall see in detail below, a debate regarding the role of profit rises in inflation dynamics has emerged.

Firstly, several studies have highlighted the fact that an increase in the share of profits in value added (also known as the profit share) can occur without companies increasing the markup (which could, under market pricing assumption, indicate a pricing strategy aimed at increasing profits by raising prices); and this point has been defended both by orthodox (Colonna et al (2023)) and post-Keynesian economists (Lavoie (2023)), via different formalism but arguments converging on two points: the role of the wage share in costs, and the role of the business cycle.

Secondly, the relevance of the term "profit inflation" is the subject of controversy between those for whom it strictly applies to the dynamic described above, i. e. an increase in markups by companies (such as Hansen et al (2023) or Lavoie (2023)), and those who find it relevant to explain a broader dynamic, in which price rises are propagated due to companies' ability to maintain their margins, thus

shifting the burden of inflation onto labour incomes, and thereby modifying value sharing (Weber & Wasner (2023), Nikiforos et al (2024)).

Colonna et al (2023) criticise the relevance of Profit Share as a proxy for markup; starting from the definition of "profit share" (which is the share of profits in value added) and a markup pricing hypothesis applied to marginal cost, they show that the evolution of profit share depends, at constant markup, on the relative shares of different costs, and on the ratio between marginal cost and average cost. They also show analytically, using a markup pricing equation and standard production functions (Leontief, Cobb-Douglas, CES), that profit share can increase despite constant markup and constant cost shares. The authors then compute a markup proxy for Italy, Germany and the USA (for which they have the necessary data, i.e nominal and real production, as well as intermediate consumption costs and labour income) by dividing the output deflator by the sum of unit variable costs (intermediate consumption and labour). they conclude that trends vary from one sector to the next. Their markup proxy is computed as follows (noting Y_n nominal production, Y_r real production, IC_n nominal Intermediate Consumption, W_n nominal Labour income):

$$1 + \tau \sim \frac{\frac{Y_n}{Y_r}}{\frac{CI_n}{Y_r} + \frac{W_n}{Y_r}}$$

Hansen et al (2023), focusing on the Eurozone, break down the consumption deflator (to include import prices in the analysis of inflation dynamics). They argue that 40% of inflation between the first quarter of 2022 and the first quarter of 2023 comes from import prices, and 45% from domestic corporate profits. However, echoing the arguments of Colonna et al (2023), the authors insist that an increase in corporate profits ("profits" meaning Gross Operating Surplus, obtained after subtracting nominal Intermediate Consumption and nominal labour income from nominal production), or Profit Share (which, in national accounting terms, is the ratio between GOS and Value Added), does not necessarily imply an increase in markup (and price rises would not therefore be the result of a pricing strategy by companies aimed at increasing markup and therefore profits). According to the authors, while it is clear that profits have risen, there is insufficient evidence to claim that this is due to an increase in markup (and therefore to a pricing strategy).

As for post Keynesian scholars, Storm (2023) also underlines the complexity of the recent debate on the link between profits and inflation, because of methodological misunderstandings, conceptual controversies, and lack of data. His starting point is Marc Lavoie's intervention[1] (Lavoie (2023), explained in detail further in this section), who also highlighted that profit share is not always a relevant indicator for the current debate: profit share can increase at constant markup, only because of intermediate consumption cost hikes for example (as it was the case for energy recently). However, as explained by Storm (2023), several recent studies (by European Stability Mechanism, ECB blog[2]) seem to directly link profit share and profitability, without paying close attention to markup evolution; or they mention the difference between both but do not provide elements on markups (OECD Economic Outlook (2023)). Then, defining profit inflation as inflation resulting from markup increase, he shows that this actually happened in the US between 2020 and 2022, and explains that it does not only come from the struggle between workers and shareholders but also from the struggle between speculators and the real economy. In order to show this, Storm assumes a markup pricing equation in which the markup is applied to labour and energy costs:

$$p = (1 + \tau) \cdot (\beta \cdot w + \alpha \cdot p_M)$$

With p the price, τ the markup, β the unit number of hours of work, w the unit nominal hourly wage, α the unit energy input, and p_M the average energy input price.

To study markup evolution, he uses data on nominal and real production, value-added and intermediate consumption, for different sectors. However, this does not fully answer Lavoie (2023) arguments (detailed in the following paragraph), who questions "profit inflation".

Nikiforos et al (2024) explain in detail the “controversy” surrounding "profit inflation", and provide elements to it. First, they summarise the points made by Lavoie (2023). The first point is that variations in the profit share (ratio $\frac{GOS}{VA}$, i.e. the share of profits in Value Added) are cyclical, due to the presence of “overhead” costs. Overhead costs are costs, such as labour costs, which do not correspond to activities directly involved in the production process; as the level of activity (and capacity utilisation) rises, unit overhead costs fall. Then, if the markup applies only to direct costs (directly involved in production), then the profit share increases mechanically when activity rises. The second point deals with imports of raw materials: if the markup applies not only to direct wage costs but also to direct costs of imported raw materials, then the markup may also increase when direct unit costs of raw materials rise more than direct unit costs of labour. To assess markup variations, it would therefore be necessary to use data on direct costs (“Cost of goods sold”), in order to take these different points into account. Nikiforos et al (2024) then provide a theoretical and an empirical answer.

First of all, for the authors, it is legitimate to refer to recent dynamics as profit inflation, even if there have been no markup increases by companies. In support of this, the authors mention Weber

[1] https://medium.com/@monetarypolicyinstitute/some-controversies-in-the-causes-of-the-post-pandemic-inflation-1480a7a08eb7

[2] https://www.ecb.europa.eu/press/blog/date/2023/html/ecb.blog.230330 00e522ecb5.en.html

& Wasner (2023), who studied the inflationary process in the USA since the Covid-19 pandemic and describe a three-stage process of inflation development: a rise in prices in upstream sectors, due to raw material prices or bottlenecks; a phase of propagation of cost increases, in downstream sectors, in order to maintain margins or even increase them; and finally the emergence of a struggle for higher wages, aimed at opposing the decline in their real value. Indeed, for Nikiros et al (2024), when input price rises occur and propagate across sectors (via cross-sector relations), due to firms' efforts to maintain their margins (their unit profits, i.e. the $\frac{GOS}{Y}$ ratio), then it is real wages that bear the burden of these input price rises. Since this has a real distributional impact, the authors refer to this process as *cost-push-profit-led inflation.*

Secondly, the authors show that empirical data (even from direct costs), do indicate a rise in markups in several sectors. To show this, they use data on direct costs ("Cost of goods sold"); however, they point out that the measures obtained via what they call the "accounting method", which mobilises National Accounts data and therefore does not distinguish direct costs from "overhead" costs, is the one they prefer and gives similar results (similar in evolution, albeit different in level).

This literature shows that the study of inflation since 2021 gave rise to conceptual and methodological debates. It is clear from the above-mentioned studies that we need to be cautious in interpreting data when trying to shed light on the mechanisms at work. As pointed out in these studies, soaring profits do not prove that the *cause* of inflationary outbursts is to be found in companies' pricing strategies; as Vernengo & Caldentey (2023) also mention, in some sectors the opposite mechanism may be at work, i.e. that price increases, combined with stagnating wages, have caused profits to explode. However, as Storm (2023) points out, an increase in the price of intermediate consumption does not necessarily imply an increase in the markup, nor in the price of production; it happens only if markups remain constant (or if they do not decrease enough)- and the explosion in prices and profits is therefore neither mechanical nor inevitable. More, as underlined by Nikiforos et al (2024), if price hikes propagate via firm behaviour aiming at maintaining their unit profits or markups (over direct costs), therefore perpetuating inflationary dynamics and shifting the burden onto real wages, it may be legitimate to use the term "profit inflation", given the distributive impact it causes.

In order to contribute to this research, and to provide elements for the case of France, we examine the evolution of the components of producer price inflation, the evolution of the components of Value Added inflation, and we provide elements on the evolution of markups.

To study the evolution of cost and value-added components, we decompose the deflators with a method similar to Weber & Wasner (2023) (who adopted it from Bivens (2022), and which is also used by INSEE - as in a June 2023 economic outlook report[3]). They break down the evolution of the Value Added deflator into its components: profits and wages. To do this, they define "inflation capture by profits and wages" as the contributions of increases in unit profits and unit wage costs to the variation in the Value Added deflator. This variable, inflation capture, identifies the component (wages or profits) of the aggregate (Value Added) that has been remunerated by the increase in nominal flows enabled by inflation[4]. We will also apply it to the production deflator, whose components are Intermediate Consumption and Value Added. Moreover, as illustrated in the first part of this work (inspired by the methodology of Weber et al (2024)), sector dynamics are fundamental and highly heterogeneous. However, most of the studies mentioned in this second part provide analyses at an aggregate scale (but this is not the case, for example, with the very recent study by Nikiforos et al (2024) for markups). We demonstrate once again the importance of sector disaggregation for understanding inflationary dynamics, using National Accounts data. We will pay particular attention to the "systemically significant" sectors identified in the first part of this work.

We first analyse trends in the components of production prices, followed by those of value-added. Next, we study the evolution of sector-specific markup proxy. Finally, using more precise data available only up to 2021, we present markup proxies for certain sectors, based on more disaggregated data, as well as a number of indicators, notably profitability. We end this section with a conclusion.

[3] https://www.insee.fr/fr/statistiques/7634656?sommaire=7634660

[4] this breakdown is described in detail in the next section

2.2. Deflators and price components evolution

In what follows, we use national accounts quarterly[5] and annual[6] data, provided by INSEE. Data are valued at base price[7]. When using quarterly data, the economy is divided between 17 sectors (but data concerning "Coking and refining" sector are not available)[8].

To compute the contributions of the components of prices, we take the example of Value Added. As Weber & Wasner (2023) explain in the appendix to their article, one needs to compute the unit profits at two given time periods - which are obtained by dividing nominal profits by VA volume, and to divide their difference by the difference in the VA deflator between these two periods; this allows to obtain the share of the increase in the VA deflator that is "captured" by the increase in unit profits. This breakdown does not indicate what drives the dynamics observed (neither indicates whether component changes are nominal or in volume; it does not give, for example, for labour income, any indication of changes in productivity or hourly wages; neither, for profits, indications on changes in shareholder income, or investment, or interest on debt, for example), nor the sense of causality (i.e whether or not price inflation was caused by this increase in the component's remuneration), but only allows to identify the component that was "remunerated" by the phenomenon.

Noting $VA_{d,t} = \frac{VA_{n,t}}{VA_{vol,t}}$ the VA deflator at time t, $w_{d,t} = \frac{W_{n,t}}{VA_{vol,t}}$ the unit labour income, and $p_{d,t} = \frac{P_{n,t}}{VA_{vol,t}}$ the unit profits, we get:

$$\begin{aligned} VA_{n,t} &= W_{n,t} + P_{n,t} \\ VA_{d,t} &= w_{d,t} + p_{d,t} \\ VA_{d,t} - VA_{d,t-1} &= w_{d,t} - w_{d,t-1} + p_{d,t} - p_{d,t-1} \\ 1 &= \frac{w_{d,t} - w_{d,t-1}}{VA_{d,t} - VA_{d,t-1}} + \frac{p_{d,t} - p_{d,t-1}}{VA_{d,t} - VA_{d,t-1}} \end{aligned}$$

Which allows to define "profit capture":

$$ProfitsCapture = 100 \cdot \frac{p_{d,t} - p_{d,t-1}}{VA_{d,t} - VA_{d,t-1}}$$

[5] From Quarterly national accounts for the second quarter of 2023 https://www.insee.fr/fr/statistiques/7655731

[6] From National Accounts in 2022 https://www.insee.fr/fr/statistiques/6793580?sommaire=6793644

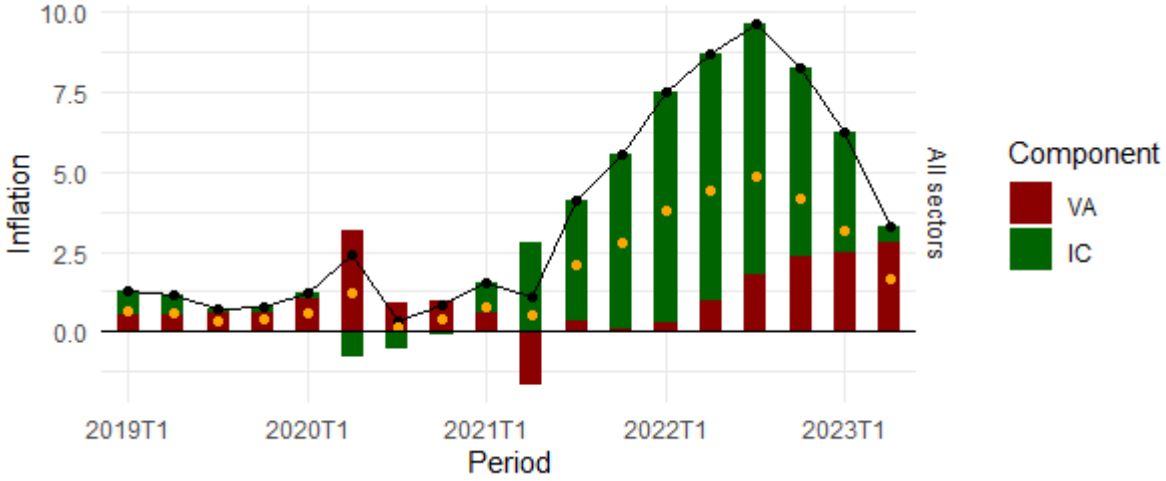
[7] As defined by INSEE: "The amount the producer receives from the buyer per unit of good or service produced, less taxes on products and plus subsidies on products. The base price excludes transport costs". https://www.insee.fr/fr/metadonnees/definition/c1901

[8] the "Energy" sector contains the sectors "Extractive industries", "Production and distribution of electricity, gas, steam and air conditioning" and "Production et distribution d'eau; assainissement, gestion des déchets et dépollution".

Production deflator

All sectors

Figure 2.1.: Production price inflation (year-on-year change) - All sectors



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

Production price inflation for all sectors (black line on figure 2.1) exceeds the 4% mark in the third quarter of 2021, reaches its peak of nearly 10% in the third quarter of 2022, then declines to 6% in the first quarter of 2023, and falls below 3% in the second quarter of 2023.

Figure 2.1 also represents the production deflator breakdown (based on the evolution of the Index of Producer Prices and that of its components - nominal Intermediate Consumption and nominal Value Added), for all sectors. As explained previously (by Weber & Wasner (2023)), this graph represents the component of the aggregate that was remunerated by the nominal inflow created by price inflation. The colour point in each bar of the graph represents the level that the VA component should reach in order for the sharing of these nominal flows between IC and VA to be "uniform", in the sense that each component would increase by the same percentage; there would then be no distortion of the cost distribution between CI and VA relative to the reference level, which is set at the average distribution over the period 2010T1 - 2019T4.

The breakdown of overall production inflation (between Intermediate Consumption (IC) and Value Added (VA)), reveals that inflation has remunerated almost exclusively IC from 2021Q2 until 2022Q2, and then remunerated more and more VA. Inflation was thus mainly captured by ICs between mid-2021 and mid-2022, and then also by VA; except for 2023Q2, the distribution of costs shifted in favour of ICs throughout the period.

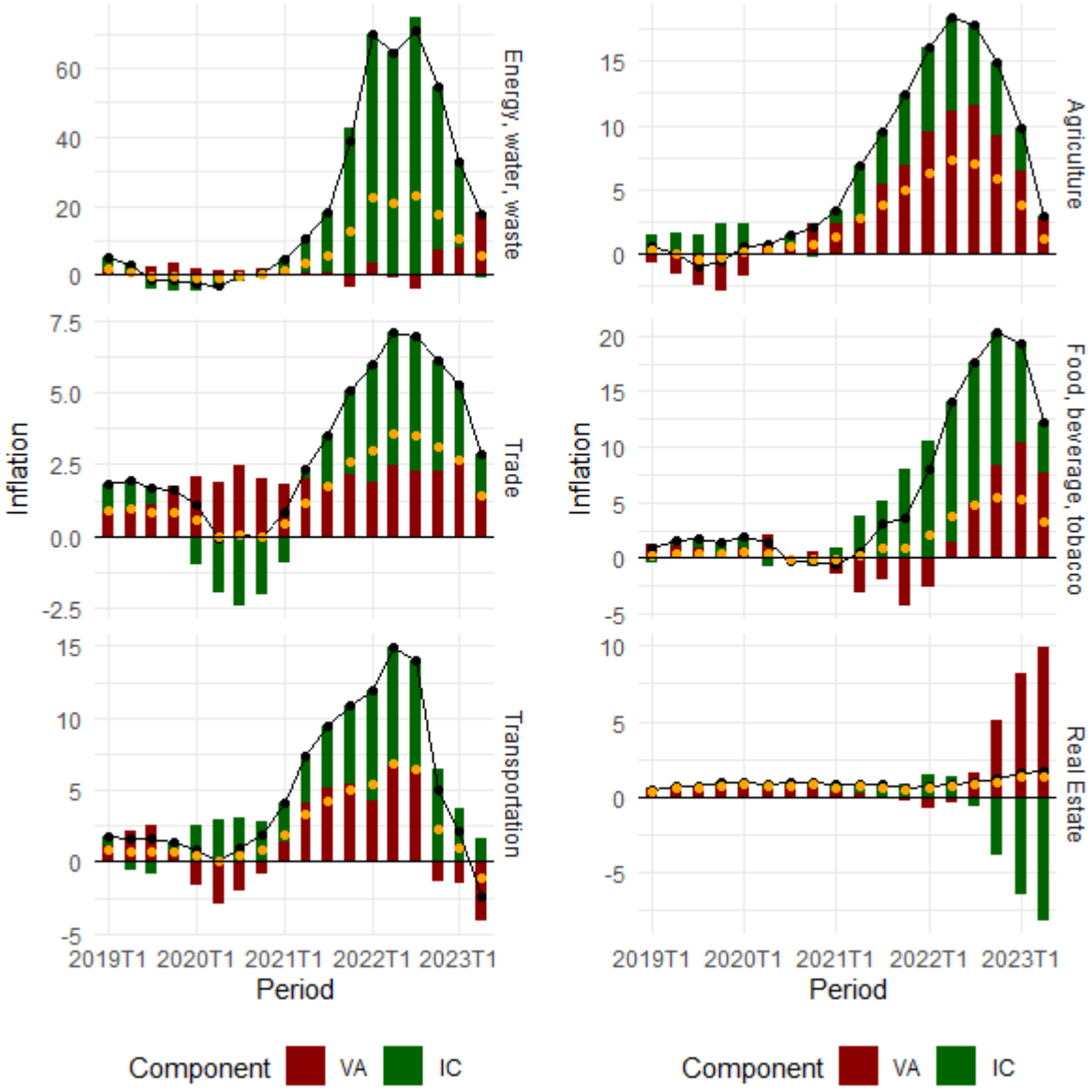
However, this dynamics masks sector heterogeneity.

Sector evolution

Figure 2.2 represents the breakdown of output price inflation in the Energy, Trade, Transport, Agriculture, AFI and Real Estate sectors; sectors identified as systemically significant in the first part. In the case of Energy, output price inflation is very high from the first quarter of 2022 onwards (almost 70% increase between 2021Q1 and 2022Q1), and these price increases correspond almost entirely to increases in the cost of Intermediate Consumption; from 2023 onwards, output price inflation remains high, and is associated with a uniform increase in CI and VA costs in the first quarter, and entirely with an increase in the cost of Value Added in the second quarter. Inflation in the case of Agriculture, which reaches 10% in 2021Q3, exceeds 17% in 2022Q2, and then falls back, is mainly captured by VA.

Production price inflation in the AFI sector rises in 2021 due to a rise in the cost of ICs, then amplifies in 2022 and 2023, a period during which the cost of Value Added grows until it contributes more than ICs to production price inflation. In Transport and Trade, inflation rises mainly from 2021 and 2022, with levels reaching 15% in early 2022 for Transport, and is linked to quite uniform increases in IC and VA unit costs. Finally, in the Real Estate Services sector, a slight inflation appears from 2022Q2, entirely captured by the cost of VA (which more than offsets a decrease in the cost of IC). The dynamics of other industrial sectors and of the construction sector are close to the overall dynamic (similar to that of the AFI, albeit with lower inflation and less inflation captured by VA), as is the case for the business services sector; the rest of the market sectors experience inflation mainly captured by IC (graphs for sectors not represented here are in Appendix A, figure 2.8).

Figure 2.2.: Production price inflation (year-on-year change)



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

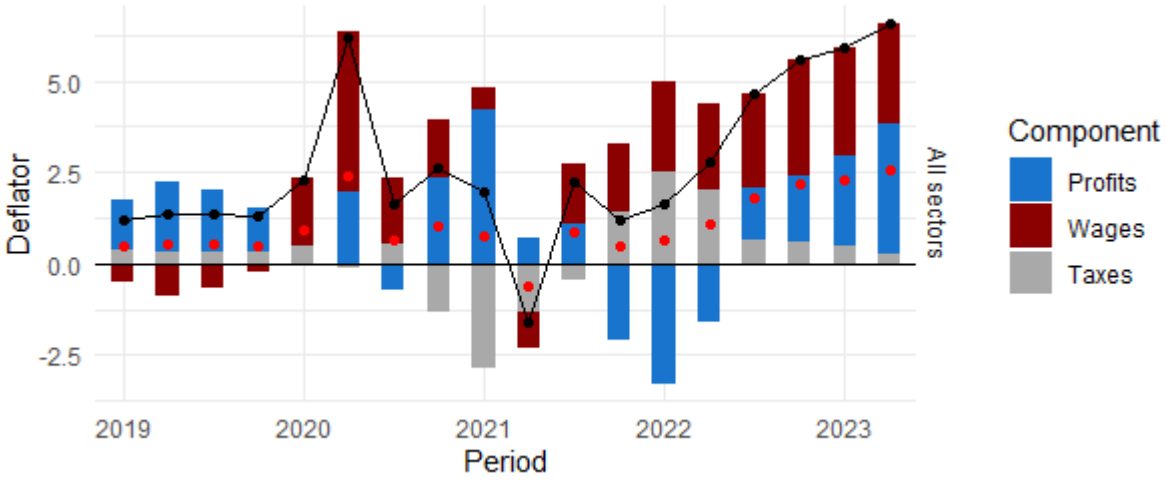
Therefore, it seems that despite an overall dynamic of output price inflation associated mainly with rising IC costs until the second quarter of 2023 (during which it is captured more by VA), in several of the "systemically significant" sectors the evolution of the components of price rises has been different: in some of these sectors, inflation has been associated with increases in the cost of VA as much as in the cost of IC (Trade and Transport, Agriculture), while in others, from the end of 2022, inflation has been higher, and/or captured more by VA, than in the rest of the sectors (case of the AFI, Energy, Real Estate Services sectors). To better understand these dynamics, we propose a similar breakdown of value added to its components: labour income, profits, and taxes.

Value Added deflator

All sectors

The overall evolution of the VA deflator (black line on figure 2.3) peaks in the second quarter of 2020 - a period in which the country faces a national lockdown for the first time, falls in the second quarter of 2021 and then increases throughout 2022 to exceed 7% in early 2023. If wages and taxes capture changes in the VA deflator between the end of 2021 and mid-2022, unit profits seem to play a role at the end of 2020 and from 2022T3. However, we will see that sector-specific dynamics are considerably heterogeneous, particularly in systemically significant sectors.

Figure 2.3.: VA inflation (year-on-year change) - All sectors



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

Sector evolution

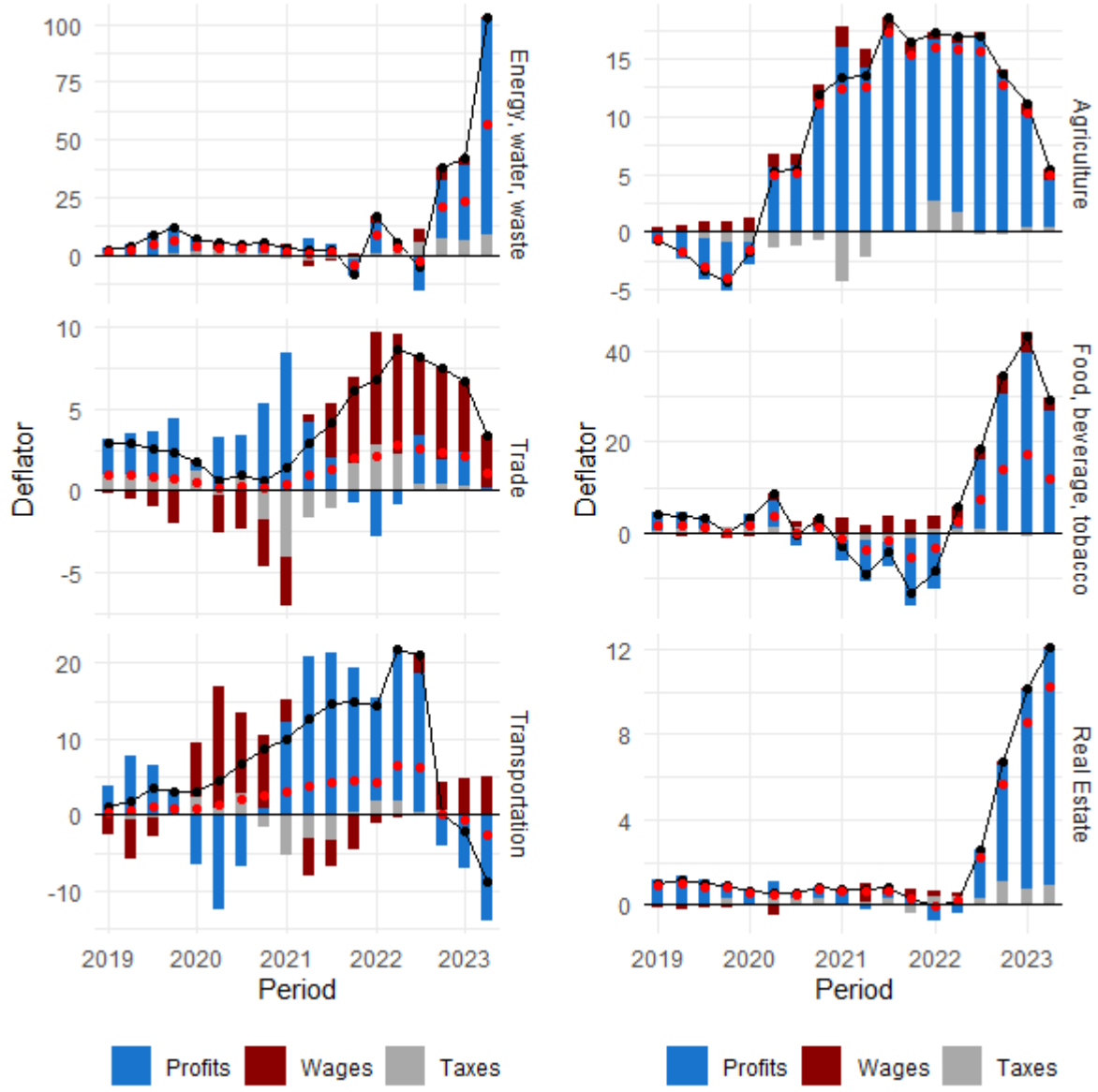
VA inflation in the Energy sector, shown in figure 2.4, reaches very high levels (around 40%) from the fourth quarter of 2022, and extremely high levels (100% inflation) in the second quarter of 2023. This VA inflation is used almost entirely to remunerate the sector's profits, and the reference wage-profits split (average split over the period 2021Q1-2019-Q4), is completely distorted in favour of profits over these periods (red dot on the figure). As for AFI (same figure), after a decline in the price of VA in

2021, we observe an explosion in 2022, again captured almost entirely by profits - and with a significant deviation from the reference sharing. Inflation reaches considerable levels: almost 20% in 2022Q3, and over 30% for the last quarter of 2022 and the first two quarters of 2023. The case of the Transportation sector is also remarkable: from the beginning of 2021 to the end of 2022, unit profits rise very sharply, and VA inflation over the corresponding quarters is between 15 and 20% throughout the period (year-on-year change). It then declines from the end of 2022. In the Real Estate Services sector, VA price rises also remunerate profits more than in reference sharing (even though the majority of VA in this sector is made up of Profits).

For Trade, increases (reaching lower levels) appear to be fairly close to the historical VA sharing, slightly to the advantage of wages. In the case of Agriculture, the VA deflator experiences significant increases from the end of 2020 until the beginning of 2023, mainly captured by profits, but without considerably distorting the sharing of value (the case of the agricultural sector is indeed particular since salaried labour is scarce, and the analysis of the remuneration of profits, therefore, requires more detailed analysis). In the industrial and construction sectors, we first observe trends in favour of wages up to 2022, and then higher inflation throughout 2022 and in the first two quarters of 2023, with profits taking the most important part (or even the whole part, for some sectors). For the rest of the sectors, we see a distortion of the reference split in favour of wages, with lower levels and negative trends for some sectors (graphs for sectors not represented here are in Appendix B, figure 2.9).

Changes in the price of Value Added have therefore been highly heterogeneous among sectors; and the cases of the Energy, AFI and Transport sectors are particularly striking over certain periods: violent increases almost entirely captured by profits, to the detriment of labour (according to the historical sharing of value in these sectors). However, the fact that inflation in the VA deflator is used to remunerate mainly profits in certain sectors - i.e. that nominal flows have been captured by profits, and not by wages - does not necessarily indicate a pricing strategy of markup increases by companies in those sectors. These considerations call for a closer look at the evolution of sector-specific markups (proxied using National Accounts data). The next section deals with it.

Figure 2.4.: VA inflation (year-on-year change)



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

2.3. Evolution of markup proxy

In this section, we study markup evolution in the different sectors. To do so, we use the same proxy as Colonna et al (2023); similar to the one used by Storm (2023) (which however only includes energy IC); and close to the one obtained with the "Accounting Method" by Nikiforos et al (2024).

With this methodology, we assume that the price is set by accounting for unit costs in IC and Labour, to which a markup rate is applied to build up profits. Noting Y_n and Y_{vol} the nominal production and production in volume, $w_n = \frac{W_n}{Y_{vol}}$ the unit labour costs, $ic_n = \frac{IC_n}{Y_{vol}}$ the unit IC costs, and τ the markup ; and asuming the markup pricing equation $p = (1+\tau) \cdot (w_n + ci_n)$, we get the following approximations:

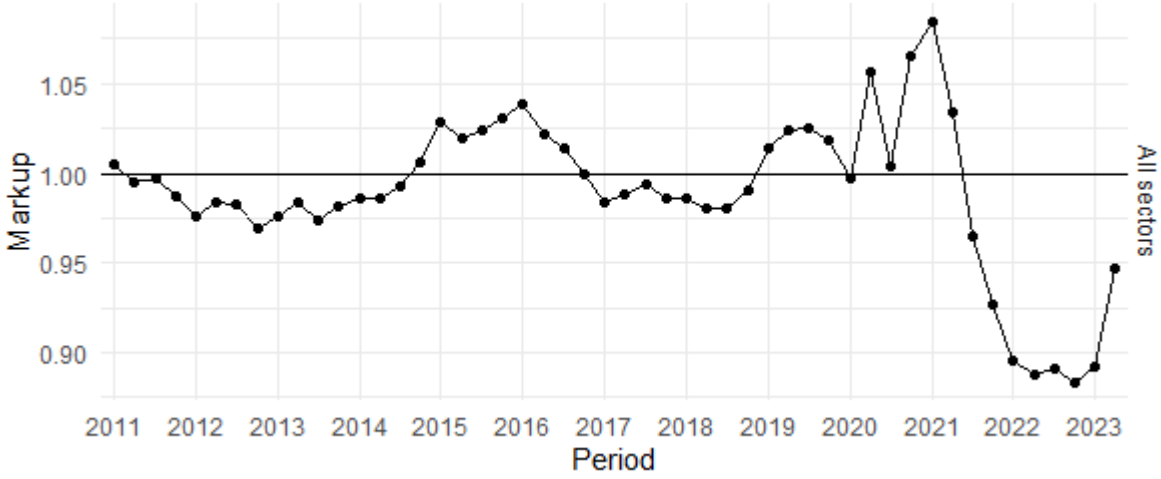
$$\begin{aligned} p &= (1+\tau) \cdot (w_n + ic_n) \\ &= (1+\tau) \cdot (\frac{W_n}{Y_{vol}} + \frac{IC_n}{Y_{vol}}) \\ \frac{Y_n}{Y_{vol}} &\sim (1+\tau) \cdot (\frac{W_n}{Y_{vol}} + \frac{IC_n}{Y_{vol}}) \\ \tau &\sim \frac{\frac{Y_n}{Y_{vol}}}{(\frac{W_n}{Y_{vol}} + \frac{IC_n}{Y_{vol}})} - 1 \end{aligned}$$

Of course, this pricing hypothesis does not apply equally well to all sectors. What's more, the aim is only to get a proxy to have an intuition about price dynamics; the approach is to ask: if companies set their prices by accounting for unit labour and IC costs, to which they add a unit profit that is proportional (via the markup) to these costs; then how would this markup have evolved over the period 2020-2023?

quarterly data - 17 sectors

Figure 2.5 highlights the unusualness of the relations between profits, IC and wages over 2020-2023: indeed, this relationship varies little over 2010Q1-2019Q4, but it strongly fluctuates from 2020Q1. It is interesting to note that, while markup rises in 2020 and early 2021, its level drops from 2021Q2 until 2023. However, as expected, this overall evolution masks, one more time, a considerable sector heterogeneity.

Figure 2.5.: Evolution of the markup proxy - All sectors



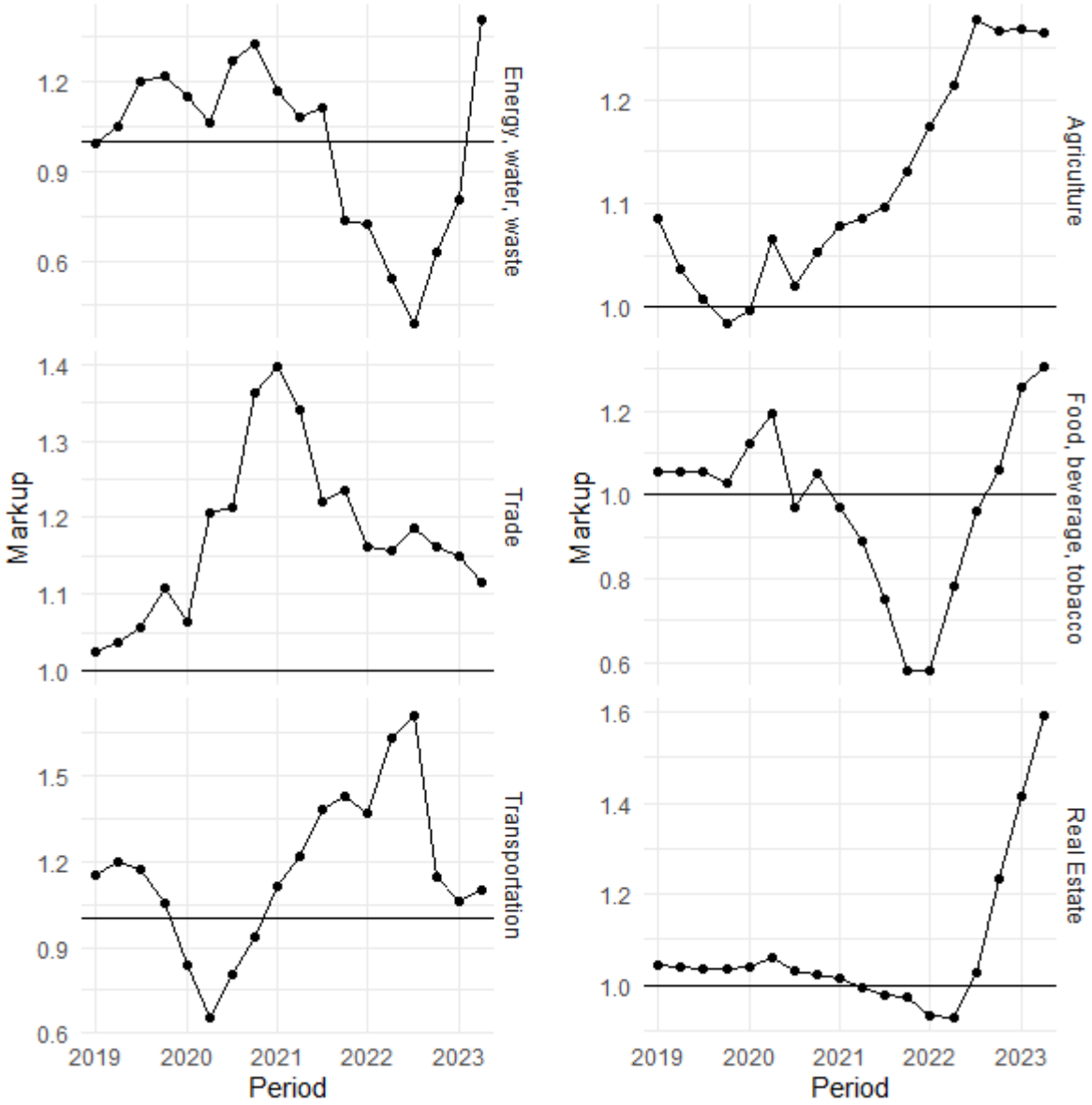
Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

In the case of AFI, observable in figure 2.6, the proxy suggests that markups have been significantly reduced between 2021 and the end of 2022; then violently increased from the end of 2022. The period of decrease of the markup, from 2021, corresponds to that of significant increase of the IC of the sector, which almost entirely captures the inflation of the production price (cf the section on the deflator of the production price); this decrease likely limited the transmission of IC price increases to the final price. However, markup rises sharply from 2022T3; which, as seen previously, is the point at which VA (profits, for the vast majority) starts capturing more and more inflation. The case of Energy is similar: the drastic drop in the markup, which started at the end of 2021 and accentuated in 2022, did not prevent the surge in production price due to the explosion in the cost of ICs but limited it. However, the markup rise at the end of 2022, and its explosion in early 2023 (more than 30% above the reference level) coincides with the explosion of the price of the VA in the sector, an explosion almost entirely captured by profits (as seen in the previous section).

In the Trade, Transport, Agriculture and Real Estate sectors, markups increase considerably, and reach levels which strongly contrast with the ones of the reference period. In the other sectors (other industries and market services), the evolution of the markup is almost always downwards from 2021 and leads to levels inferior to the ones of the reference period (graphs for sectors not represented here are in Appendix C, figure 2.10).

It is interesting to note that markup evolution in the sectors identified as "systemically significant" for inflation in the first part, particularly strong and upwards, clearly stand out from the ones of the other sectors.

Figure 2.6.: Evolution of the markup proxy



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2*

It is important to emphasize it once again: if we assume that the price is set by companies via

markup pricing, then markup changes result from pricing strategies; their increase (aiming to increase profits) but also their maintenance (allowing for example the complete transmission of increases in raw materials to final prices) or their decrease (as in the case of AFI in 2021). However, as pointed out in the literature section, the increase in markup does not necessarily indicate that the *cause* of price increases is the pricing strategy of companies. On the contrary, it may be the rise in prices that has caused the increase in profits (and markup), at least in certain sectors such as energy, in which prices are not necessarily fixed at the firm level (or even at the national sector level) and can be very directly correlated to international prices.

However, studying markup proxy has allowed us to complete deflator components analysis by linking the evolution of the components (CI and VA, Capital and Labour) remunerated by inflation to their relative levels (indeed, markup proxy links profit level to cost level). It confirms that in several sectors, particularly in the systemically significant sectors, profits have reached historical levels (relative to costs). This raises questions regarding *the use* of these considerable nominal flows captured by Capital. In the last section, we will indicate relevant data to try and clarify this question. In the next one, we will improve the previous analyses using data at a finer disaggregation level but covering a less recent period.

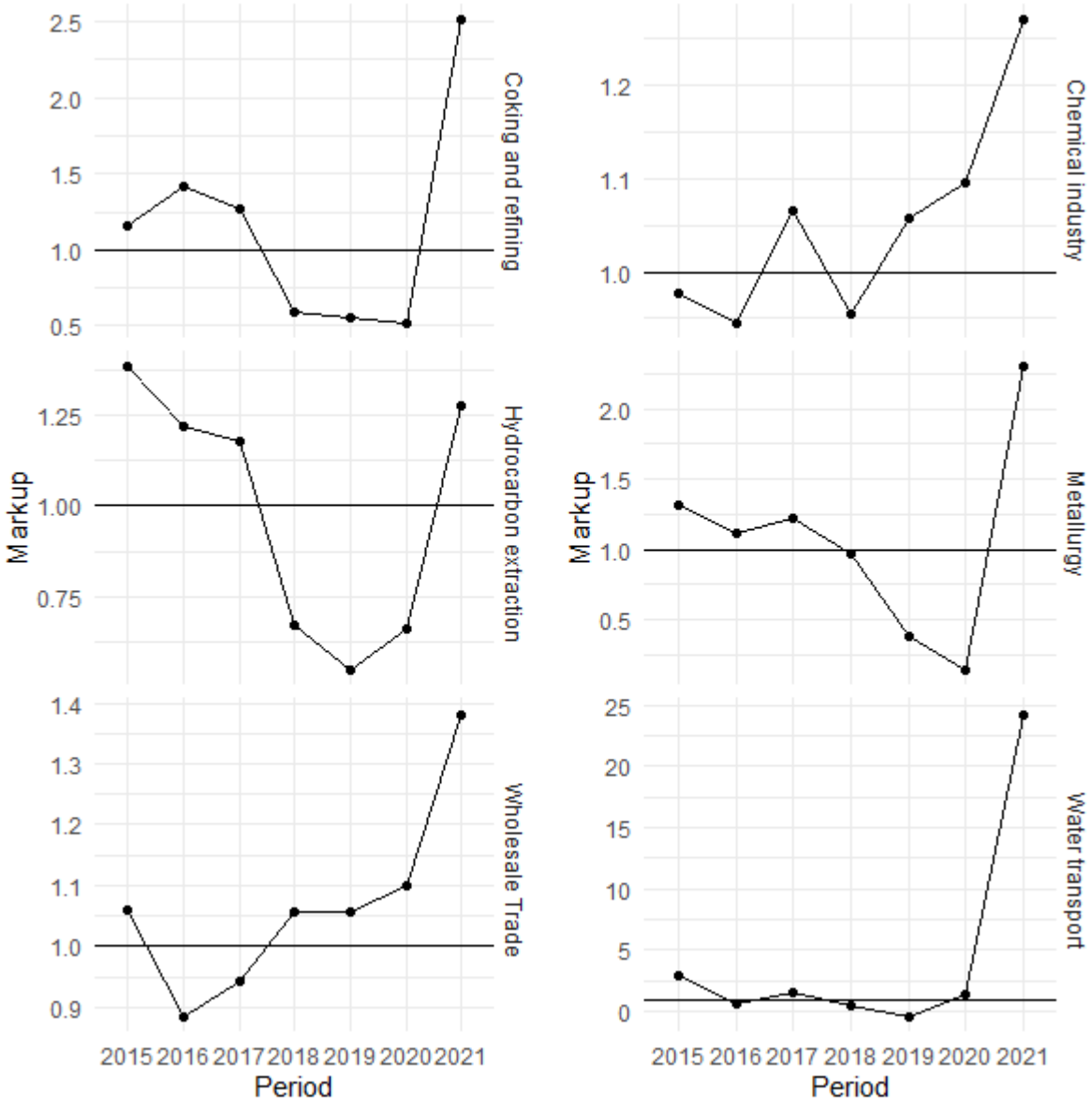
Annual data - 88 sectors

This subsection presents more disaggregated data (88 sectors) which however are available up to 2021 only. We show markup proxy evolution for sub-sectors experiencing particularly large variations. The sectors selected are Coking and refining (whose data were not available in the previous sections with 17 sectors); Hydrocarbon extraction (which was part of Extractive industries, included in the Energy sector); Water transport (the only sub-sector of Transport with considerable variations); Wholesale trade; Chemicals; and Metallurgy (the latter two sectors being the only sub-sectors of the Other Industries sector showing substantial variations). Markup proxies, for those sectors, are shown in figure 2.7.

The case of water transport is particularly striking. The production price index in this sector rose by almost 80%; nominal output doubled, while in volume it increased by 5.6% only; IC and Labour income rose slightly, but the nominal GOS was multiplied by 20. This amounts to having raised the markup level to 25 times the reference level (computed over the period 2015-2019). It is important to recall, once more, one thing about the markup pricing hypothesis and causality; the price increase (largely captured by profits) is probably not the result of the markup increase *by* companies, the opposite phenomenon can be at work; this is particularly true for certain sectors, whose prices depend directly on international prices. Another interesting case is the Wholesale Trade sector, where markup increased considerably in 2021. This is also the case in Coking and refining, and Hydrocarbon Extraction. Finally, there are explosions of markups in the chemical and metallurgical sectors (which are the sub-sectors of the Other Industries sector that have experienced strong changes in their deflators, unit profits, and proxy markup). It is necessary to question the mechanisms at work in these sectors.

The next section mentions some indicators regarding the use of profits.

Figure 2.7.: Evolution of the markup proxy - finer disaggregation



Source: *Author's estimates - INSEE Annual data - National Accounts 2022*

Further research

The previous subsection allowed us to look more closely at a few sectors in which deflators and profit hikes were particularly large. We go on by presenting, when data are available, some accounting ratios[9] provided by INSEE statistical survey Esane 2021 (Elaboration des Statistiques Annuelles d'Entreprises[10]): economic and financial profitability; investment rate, indebtedness rate and financial levy rate; their definitions are available in Appendix D.

We represent them for Wholesale trade, Transport and storage (data for water transport specifically are not available), Chemical industry, and Metallurgy. Economic profitability ratios of Wholesale Trade and Transport and storage, Figure 2.11 (also in appendix D), increase between 2020 and 2021; as for financial profitability ratios, they explode in both cases (after, for Transport and storage, a continuous decline between 2017 and 2020). However, indebtedness, financial levy and investment rates do not increase in 2021. Chemicals and Metallurgy ratios are different. While profitability ratios increase significantly in 2021, after a relatively stable phase between 2017 and 2020, indebtedness and financial levy rates rise between 2015 and 2018, and maintain or diminish a bit in 2021; Investment rates are quite stable.

[9] definitions can be found in the document "Liste et définition des variables Esane", available at: https://www.insee.fr/fr/statistiques/7651449?sommaire=7651565#documentation-sommaire

[10] https://www.insee.fr/fr/statistiques/7651451

2.4. Conclusions

In this part, we focused on the evolution of the components of production prices, which experienced very strong growth from mid-2021. While inflation was generally accompanied by a significant rise in unit costs in intermediate consumption, the analysis of sector-specific dynamics showed considerable heterogeneity between sectors: for trends in output and value added deflators, and for the components of these aggregates. It is interesting to note that the sectors identified as "systemically significant" during the first part have experienced particular changes: the sectors of Energy, AFI, Trade, Transport, Agriculture and Real Estate, saw their production prices, profits and markup (as measured by the proxy used) explode over the period 2020-2023. In these sectors, profits clearly captured the considerably inflated nominal income. More disaggregated data, available until 2021, allowed to shed light more specifically on the following sub-sectors: Water transportation, Wholesale trade, Food industries, Chemicals, Metallurgy and, for energy, Coking and refining and Hydrocarbon extraction.

These results are consistent with those of several studies that have also highlighted this phenomenon of considerable profit growth in various countries; but at a more aggregated level, and rarely concerning France. This work allows us to better understand the French case, accounting for sector heterogeneity.

This study also attempts to contribute to the complex methodological debate surrounding the controversies over the recent inflation. As mentioned several times in this work, the study of profits, margin rates, and even markup proxies, alone is not sufficient to deduce causal relationships between capital income, pricing and price inflation (of output or of VA). It is necessary to complete the analysis of these dynamics with studies concerning the use of these profits: some avenues have been mentioned, and for some sectors identified in this study, the surge in profits seems to have gone along with an improvement in profitability (including financial) but no increases in investment or financial charges.

However, even if the *causes* of price evolution can not be directly deduced from it, those analyses do identify changes in the split of costs which compose prices, and in the sharing of Added Value between Capital and Labour; and this study highlights the points of the productive system on which it is necessary to focus to improve our understanding of the inflationary phenomenon, and to rethink policies adequate to its control.

To conclude, these considerations (to be deepened) raise, in some particularly important sectors (for inflation, but also for social or environmental considerations for example), the question of the legitimacy and effectiveness of uncontrolled allocation of resources and income by prices, of which inflation is a symptom of dysfunction.

Conclusion

This research work analysed the recent inflation in France, between 2021 and 2023, focusing on its dynamics within the productive structure via cost hikes and cross-sector relationships (*cost-push inflation*), as well as on the conflict over value sharing it embodies because of its distributive impact (*conflict inflation*).

First, following the methodology of Weber et al (2024) for the USA, we built a Leontief price model to simulate the impact on the CPI of sector-specific price increases to identify "systemically significant" sectors for inflation, in the case of France. This significance was characterized in this study by the importance of sectors in the productive structure, their weight in the household budget, and the magnitude of their price increases. The sectors highlighted are energy (oil, electricity, gas), distribution (trade and transport), and food (agriculture, agri-food industries), as well as real estate. Introducing wage and profit adjustment mechanisms, aimed at maintaining the real wage in one case and the unit profits in the second, confirmed the sector hierarchy initially identified, and illustrated the increased inflationary pressures caused by these adjustments, particularly in the case of maintaining real wages. Then, the analyses of this model were extended (compared to Weber et al (2024)) to imported products from external sectors; this second exercise highlighted the importance of imports of oil (crude and refined) and transport equipment.

Secondly, we studied price components and value-sharing evolutions in the different sectors. First of all, the study of the components of the output and value-added deflators showed that if, overall, nominal increases mainly corresponded to intermediate consumption expenditure increases, this was not the case for all sectors or the entire period. In particular, the Energy, Agri-Food Industries, Transport, Trade, Agriculture and Real Estate sectors experienced significant increases in nominal income, most of which were captured by profits - significantly altering value sharing between Capital and Labour. Moreover, the empirical study of markup proxies allowed us to observe, in these sectors, the singular character of the recent period, during which they experienced particularly marked increases. These sectors correspond to the sectors identified as systemically significant in the first part.

More disaggregated data, available until 2021, highlighted particularly strong dynamics in some subsectors of those sectors: Water transportation, Wholesale trade, Food industries, Chemicals, Metallurgy and, for energy, Coking and refining and Hydrocarbon extraction. Finally, the analysis of more precise indicators of profitability, investment and financial expenditures can provide relevant elements regarding the uses of the income generated by those high profit rises, and should be deepened.

The identification of essential sectors for inflation and the study of value sharing in those sectors suggest that the term "cost-push-profit-led inflation" (Nikiforos et al (2024)) adequately describes the

dynamics observed in France over the period.

These results call for a rethinking and renewing of the policy toolbox against inflation. When inflationary pressures arise within the productive structure (via cost hikes and their propagation), it seems relevant to think about production planning, provisioning, and price controls, as well as distributive and redistributive mechanisms. Moreover, the value-sharing changes, the distributive consequences of inflation, and the uses of profits generated by the inflation period call for questioning, in some particularly important sectors (for inflation, but also social or environmental considerations for example), the legitimacy and effectiveness of uncontrolled allocation of resources and income by prices, of which inflation is a symptom of dysfunction. These considerations prove particularly relevant in the context of ecological transition, because of the various issues it raises: in terms of energy, raw materials and provisioning (Miller et al (2023)), but also of satisfying essential needs through the production and distribution of specific goods and services in a post-growth context (Doyal & Gough (1984), Briens (2015), Millward-Hopkins (2020), Durand et al (2024)).

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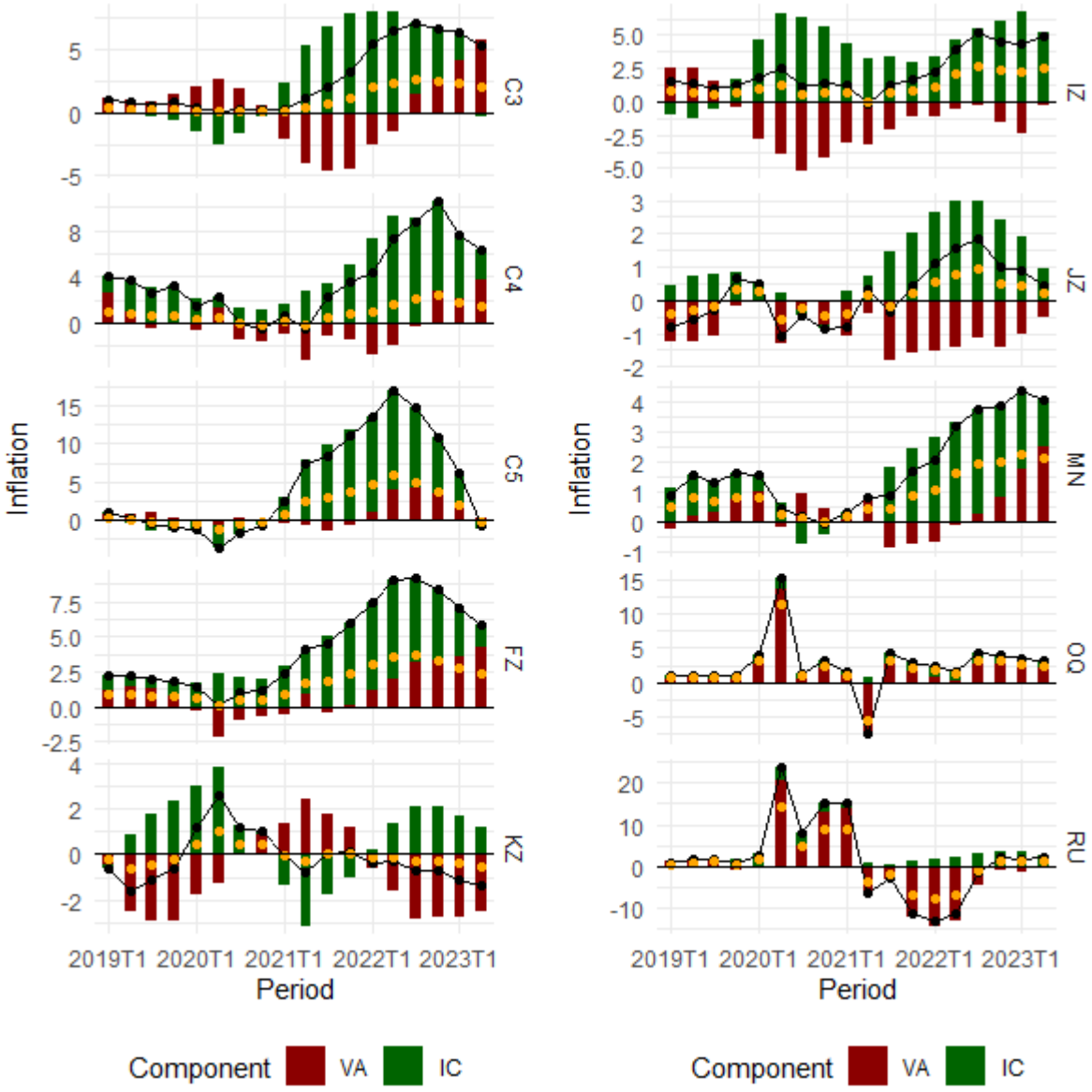
Appendix

Nomenclature for the graphs in the appendix

- *C3 : Capital goods*
- *C4 : Transport equipment*
- *C5 : Other industrial branches*
- *FZ : Construction*
- *KZ : Financial services*
- *IZ : Accomodation and catering*
- *JZ : Information-communication*
- *MN : Business services*
- *OQ : Non-market services*
- *RU : Household services*

A. Production prices - Other sectors

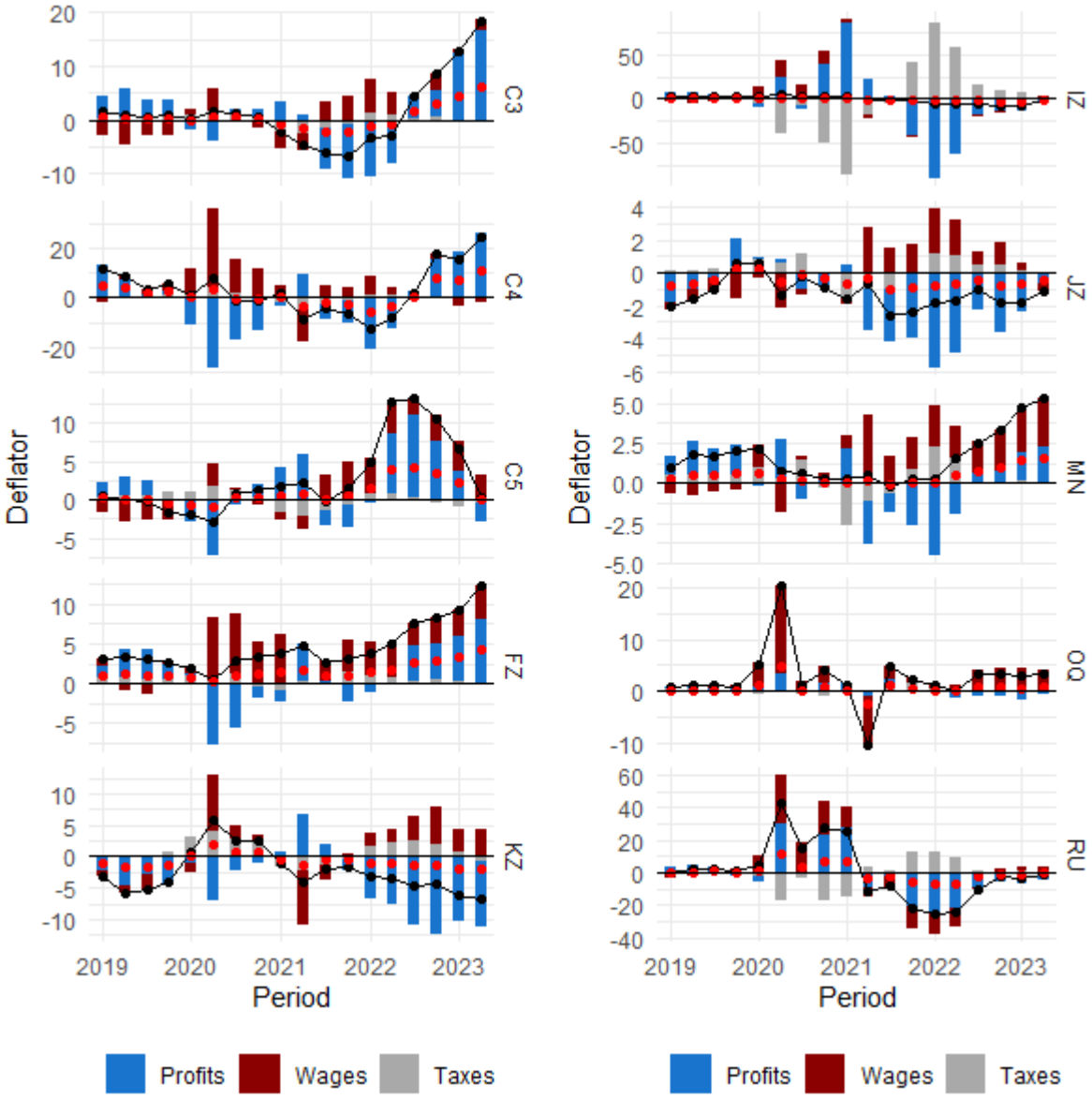
Figure 2.8.: Production price inflation (year-on-year change) - Other sectors



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2. Nomenclature in appendix's introduction.*

B. Value Added - Other sectors

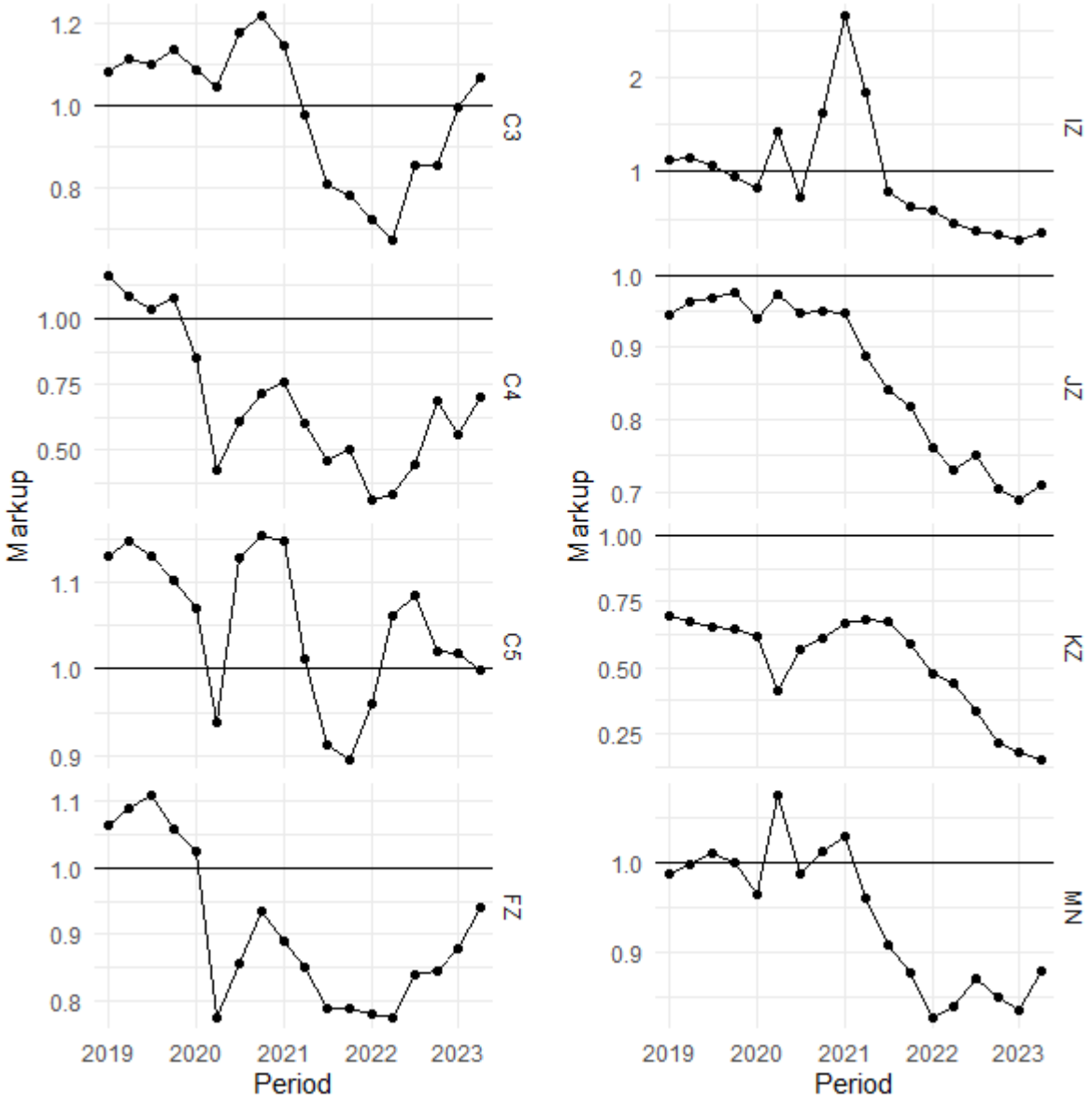
Figure 2.9.: VA inflation (year-on-year change) - Other sectors



Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2. Nomenclature in appendix's introduction.*

C. Markup proxy - Other sectors

Figure 2.10.: Evolution of the markup proxy - Other sectors



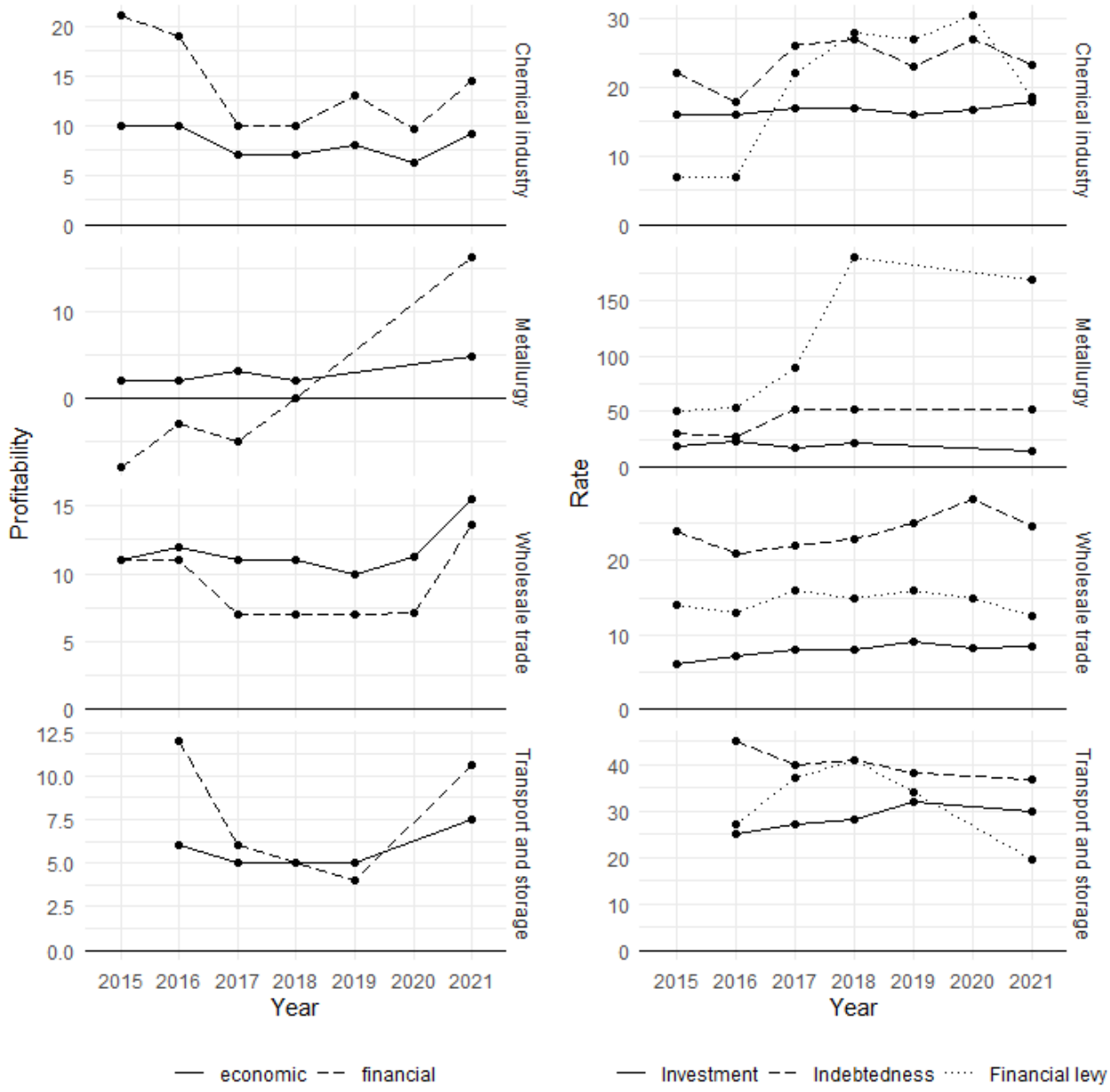
Source: *Author's estimates - INSEE quarterly data - National Accounts at 2023Q2. Nomenclature in appendix's introduction.*

D. Accounting ratios

- Economic profitability : "Gross Operating Surplus / (tangible and intangible assets + working capital requirement)"
- Financial profitability : "Net accounting income / Equity"
- Overall profitability : "Measure of the industrial and/or commercial and/or services and financial performance of a given company. "Extended" (operating + financial) economic profitability net of depreciation and provisions for depreciation of fixed assets - Formula: Gross Operating Surplus + [Financial products of participation + Products of other securities (...) + Other interest and similar income]/ Net assets (Total gross assets - Total assets amortisation and provisions for depreciation)"
- Investment rate : " Gross fixed capital formation / Gross Value Added"[11]
- Indebtedness rate : "Rate measuring the share of debts in total company resources - Formula : Borrowings and similar debt/Total liabilities."
- Financial levy rate : "rate measuring the weight of corporate debt - Formula : Interest and similar income/Gross Operating Surplus."

[11]For this definition only : https://www.insee.fr/fr/statistiques/2830260

Figure 2.11.: Accounting ratios



Source: *INSEE Esane 2021*

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