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Markups, Profit Shares, and Cost-Push-Profit-Led Inflation

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ABSTRACT

The post-pandemic surge in inflation was accompanied by a surge in the corporate share of profits. As a result, several economists and policy makers have given to it names such as "profit-led inflation" or "sellers' inflation." The present paper discusses the extent to which profit-led inflation, as an explanation for the recent surge in inflation, is compatible with what we know about the price-setting behavior of firms, income distribution, and inflation. We do that in juxtaposition to two recent critiques: that the increase in the profit share is the result of cyclical factors, and that the increase in import prices leads to higher profit shares even under constant markups. We show that there is little evidence that the recent surge in profitability is cyclical in nature. Moreover, after outlining the Structuralist/Kaleckian theories of prices and inflation we argue that profit-led inflation does not require an increase in the markup of the firms and is consistent with these theories. In the face of large import and other price shocks even under constant markups, firms are able to pass the burden of adjustment to real wages. Thus, the term profit-led emphasizes the distributional source and consequences of inflation. We also provide an empirical examination of the markups in the post-pandemic period using data from the Compustat database. We show that, on average, firms were able to increase or maintain their markups, although there is significant heterogeneity across sectors or the position of the firms in the distribution of markups.

KEYWORDS: Inflation, Markup, Distribution, Profit-led Inflation

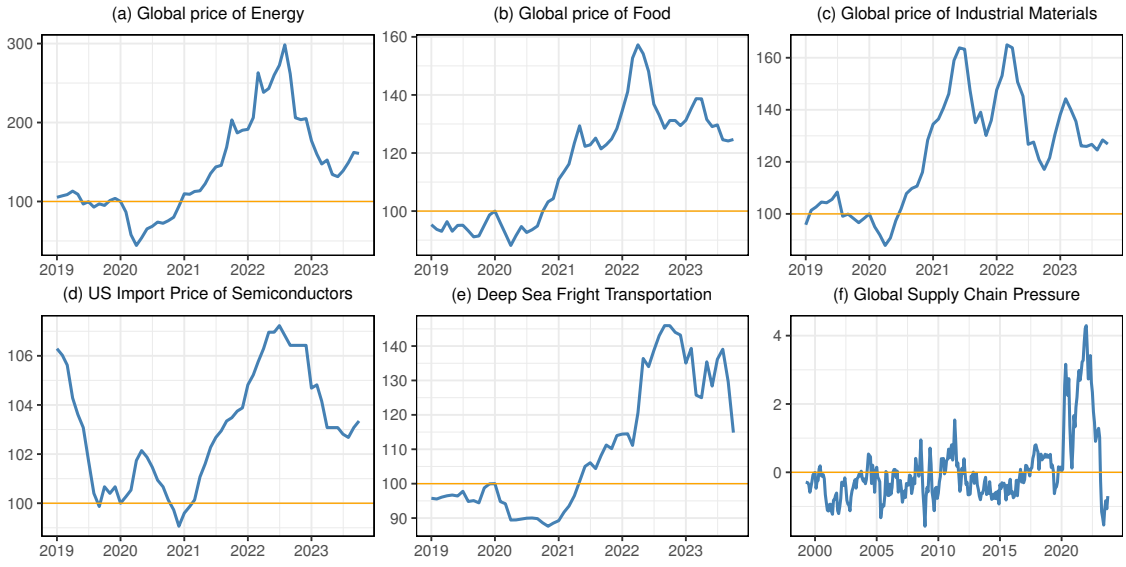
JEL CLASSIFICATIONS: E11, E12, E31, C67

1 INTRODUCTION

The post-pandemic period saw a sharp increase in inflation all over the world, which reached, at least in developed economies, levels not seen since the 1970s. The inflation rate started increasing in the first months of 2021, peaked towards the end of 2022, and has been decelerating since. Interestingly, for the different theories of inflation, as of early December 2023, this deceleration has not been accompanied by a decrease in the rate of employment or capacity utilization.

An important role in this inflationary episode was played by prices determined in international markets. Figure 1 summarizes these kinds of price pressures. Panel (a) shows that the energy prices increased by 300 percent between January 2020 and August 2022. Over the same period, the global price of food and industrial materials rose by around 60 percent (panels b and c), the price of semiconductors—an essential good for any electronic device nowadays—by 11 percent (panel d), and the cost of transportation by 45 percent (panel e). Panel (f) presents an index on Global Supply Chain Pressure (constructed by the New York FED), which shows that there was an unprecedented increase in these pressures in the post-pandemic period. Overall, these price developments implied a sharp increase in import prices for most economies, or an increase in the prices of goods determined in international markets (e.g., the domestic price indices for oil or commodities in economies that produce these goods experienced changes of similar magnitude).

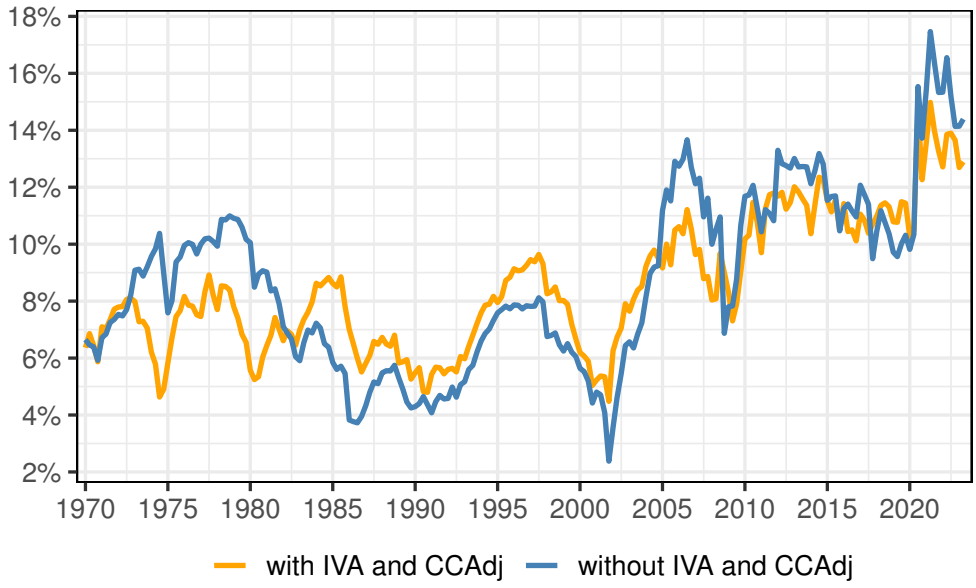
Figure 1: The Post-Pandemic Global Price Shock: Indices for Selected Categories of Goods and Services.



Note: For panels (a)-(e): 2020=100
Sources: IMF, BLS, Federal Reserve Bank of New York

At the same time, there is a growing consensus that the contribution of profits to price increases in the last three years is exceptional from a historical perspective. This consensus includes a heterogeneous group of agents such as the major central banks (Lagarde 2023; Schnabel 2023) , the OECD (2023), the IMF (Hansen, Toscani, and Zhou 2023), major banks (Donovan 2023), and academic economists (with the most well-known piece being the paper by Weber and Wasner [2023]). The result of this outsized role of profits has been that the share of profits in national income has increased. For example, Figure 2 shows that the corporate profit share in the United States spiked in the post-pandemic period.[1] This type of inflation has been given different names such as "profit-led inflation" or as Weber and Wasner called it—following Lerner (1958)—"sellers' inflation."

Figure 2: Corporate Profit Share



Note: Calculated as after-tax corporate profits over gross value added of the corporate sector with and without capital consumption adjustment (CCAdj) and inventory valuation adjustment (IVA)
Source: BEA

An interesting question that follows is to what extent this situation (inflation stemming from profits and increase in the profit share) is compatible with what we know about the price-setting behavior of firms and income distribution. We can discuss this question with reference to two recent critiques of the profit-led inflation story:

[i] A critique put forward by Lavoie (2023) suggests that, because of the existence of overhead (fixed) costs, as an economy recovers—and capacity utilization increases—unit total cost tends to

[1] Seen from the opposite side, Karabarbounis (2023) finds that the US labor share is at its lowest value since Great Depression.

decrease. If firms set their price as a markup over unit normal cost, the profit share tends to increase; it also follows that the markup over unit total cost will also increase. Thus, the observed increase in the share of profits is, to a large extent, simply due to cyclical factors.

[ii] Another critique—raised in the same piece of Lavoie (2023) but also by others such as Colonna, Torrini, and Viviano (2023)— is that markups (and profit margins) are not equivalent to profit shares. A usual assumption about the price-setting behavior of the firms—which can be found in Structuralist/Kaleckian but also in new-Keynesian models—is that firms set their price as a constant markup over the unit normal cost of production. If this is the case, when the unit material cost (e.g., imported intermediate inputs) increases relative to the unit labor cost, the profit share will increase even if the markup remains constant.

As we explain in the rest of this paper, both points are technically correct, but they do not negate the profit-led-inflation framework. Regarding the first point, profit shares do increase in the early periods of the business cycle due to the existence of fixed costs. Thus, part of the increase in the profit share and the markup over unit total costs in the last three years could have been due to this effect. However, it is unlikely that much of the observed spike in the profit share can be explained in cyclical terms. The recovery of the last three years has been extraordinary (especially in the US), but the increases in the profit share and the markups took place when different measures of the cycle (utilization, E–P ratio, employment rate) were much below their pre-pandemic levels. Moreover, unlike previous cycles, the recession of 2020 did not see a meaningful drop in the profit share (the increase in the share of wages was mostly due to the increase of government transfers to workers). Finally, the increase in the profit shares in a recovery due to fixed costs is not inflationary—if anything it is the opposite.

Regarding the second point, the criticism is based on the premise that profit-led inflation requires an increase in markups. However, this is not the case and therefore profit-led inflation is less "controversial" than what is suggested (the title of Lavoie's [2023] column is "Some controversies in the causes of the post-pandemic inflation"). Firms being able to maintain their markup implies that any cost of foreign-determined-price shocks is borne by real wages. After an extraordinary, synchronized price shock such as is depicted in Figure 1, even maintenance of corporate markups implies a very significant redistribution of income against wages. As such, the advantage of the term profit-led is that it emphasizes the distributional source and consequences of inflation.

The paper proceeds as follows. In the next section we discuss how firms set their markup, the implications of this price setting behavior for the distribution of income between wages and

profits, and the factors that determine the markup (and thus distribution). We pay special attention to the difference between Structuralist/Kaleckian theories where markup and distribution are primarily determined by institutions and social norms, and the neoclassical theory where the markup is determined by market concentration (captured by the elasticity of demand). We also highlight the imports, and input-output relations among sectors, which tend to propagate price shocks. Section 3 discusses how the theory of markup pricing can be connected with the theory of conflict inflation. Again, we distinguish between the ways conflict inflation is conceptualized in Structuralist/Kaleckian theory and the neoclassical/new-Keynesian theory. In Section 4, and based on the discussion of the previous two sections, we outline the argument that a cost-push-profit-led inflation is compatible with the theories of markup pricing and conflict inflation as envisaged in Structuralist/Kaleckian theory. Section 5 provides some empirical evidence on the markups in the post-pandemic period using data from the Compustat database. We find that, on average, firms were able to increase or maintain their markups, despite—as expected—significant heterogeneity across sectors or the position of the firms in the distribution of markups. Section 6 concludes.

2 PRICE SETTING, MARKUPS, AND PROFIT SHARES

Within Structuralist and Kaleckian macroeconomics, a common assumption about the prices is that they are set as a markup over the unit cost of production (Taylor 2004, ch.2; Lavoie 2014, ch. 2; Lee 1999). [2] At the macro level, and assuming a closed economy, we can then write a price equation

$$p = (1+z) \cdot a_L w \tag{1}$$

where p is the price level, a_L is the input coefficient for labor (the inverse of some measure of *average* labor productivity), w is the nominal wage rate (so that $a_L w$ is the unit labor cost) and z is the markup factor. Under these assumptions, we can solve for the profit share (π)

$$\pi = \frac{z}{1+z} \tag{2}$$

In equation (2), there is a strict positive correspondence between the profit share and the markup: when the one increases the other increases as well. Equations (1) and (2) also imply that, in a monetary economy, given the technology of production (expressed here with a_L), the distributional conflict between labor and capital manifests itself through the prices of goods and labor (p and w), which is mediated by the markup.

[2] Lee (1999) provides a detailed discussion of the origins of this approach to pricing and the theoretical and empirical research that underlines it.

In turn, Structuralist/Kaleckian analysis, following classical political economy, emphasizes institutions and social norms, the class struggle, and the structural characteristics of the economy as the main determinants of the distribution of income. According to this point of view, distribution (and thus the markups and the prices of output and labor) is influenced by several factors some of which are economic while others are to be found outside of the economic sphere—while even the economic ones are often shaped by the latter. Thus, in order to understand distribution, we need to examine things such as politics, the power of trade unions and firms' associations, fiscal and monetary policy, the economy's openness to trade and capital flows, the degree of monopoly in the markets, the sectoral composition of economic activity, and technical change, etc. (we will come back to some of these factors below).[3]

This is a very different approach compared to the neoclassical, where distribution of income is determined solely within markets based on the demand and supply in the markets of goods and factors of production. Institutions can play a role only through supply and demand. In the case of the markup, standard neoclassical theory suggests that it is determined by the elasticity of demand for output (and thus the monopoly power of firms); the lower the elasticity of demand is, the further away we are from the ideal situation of perfect competition (where elasticity is infinite and the markup is zero) and the higher is the markup. Another (related) difference is that the neoclassical approach is marginalist. The demand and supply curves that lead to price formation are microfounded based on the assumption of optimizing agents that equate marginal benefits with marginal costs. In terms of equation (2) this implies that a_L is the inverse of the *marginal* productivity of labor, and $a_L w$ is the marginal unit labor cost. Although, it is obvious that demand and supply factors play a role in the determination of markups and distribution, it is difficult to understand the trajectory of income distribution in the decades before the pandemic, but also in the period since, without reference to the aforementioned institutional factors and social norms.

A last point of interest here is that, according to the Structuralist/Kaleckian pricing theory, firms set their prices as a markup on top of an average expected-over-a-period-of-time, "normal" cost (Lee 1999; Lavoie 2014, sec. 3.6.2). This explains why prices do not usually change much over the business cycle (or they change much less compared to what changes in marginal or average costs would suggest). It also implies that cyclical fluctuations in the unit labor cost will lead to endogenous changes in the markup. An important source of such cyclical fluctuation is related to the presence of overhead labor (and other fixed costs of production). As a result, labor productivity will tend to be pro-cyclical: the increase in output during the recovery will be

[3] For a related methodological discussion of the classical approach to distribution in relation to other approaches see Nikiforos (2021).

proportionally larger than the increase in employment. In terms of equations (1) and (2), that means that $a_L$will decline as an economy recovers from a recession, and therefore the markup and the profit share will increase.[4]

It is this mechanism that underlines the first critical point of Lavoie (2023), mentioned in the introduction, namely that part of the observed increase in profitability is cyclical in nature. Although this is certainly the case in some sectors, it is unlikely to explain much of the aggregate increase in profitability. If this mechanism was at play, we would expect to see a significant decrease in the share of profits in 2020 during the pandemic and a recovery to their pre-pandemic level afterwards. As Figure 2 shows, this was not the case. Overall, the profit share did not decrease much in the depth of the pandemic, and increased far above its pre-pandemic level afterwards.

2.1 The Role of Imports

The baseline aggregate model can be extended to include imports. Under the simplifying assumption that all imports are used as intermediate inputs for production, the price equation becomes

$$p = (1+z)\cdot(a_L w + a_M P_M) \tag{3}$$

where a_M is the input coefficient for imported inputs and P_M is the price level of imports (in domestic currency). The idea is the same as before: firms set their prices as a markup on unit cost of production with the important difference being that this now includes the imported intermediate input. If we define as j the ratio of the unit import cost to unit labor cost ($j = \frac{a_M P_M}{a_L w}$), equation (3) implies that the profit share is

$$\pi = \frac{z(1+j)}{1+z(1+j)} \tag{4}$$

We can now see that the strict correspondence between the profit share and the markup disappears. An increase in the markup leads to an increase in the profit share, but the profit share can increase even without an increase in the markup (or even with a decrease in the markup), as long as j increases. Castro-Vincenzi and Kleinman (2022) find empirical evidence in favor of these effects of imported material prices on distribution for the US economy.[5]

[4] Kalecki (1971, ch. 6) emphasizes the distinction between overhead and variable labor and its role in the cyclical behavior of distribution. Lavoie and Nah (2020, sec. 1) provide a review of the Kaleckian literature which has taken explicitly into account the role of overhead cost.

[5] This distributional effect is one of the main mechanisms that bring about the "contractionary effects of devaluation" in the model by Krugman and Taylor (1978)—one of the first models in the contemporary Structuralist/Kaleckian

This is the second point made by Lavoie (2023), but also by Colonna, Torrini, and Viviano (2023). They claim that the observed increase in domestic prices and the profit share stems, to a large extent, from the increase in import prices. Since markups are constant, this is not profit-led inflation.

We discuss in more detail below whether such a name is appropriate for the recent spurt in inflation. At this point it suffices to mention that equations (3) and (4) highlight another dimension of distributional conflict mediated through price setting: distribution between the domestic economy and the rest of world. *Ceteris paribus*, an increase in import prices decreases domestic income (and increases foreign income). In turn, under the pricing rule of equation (3), and to the extent that wages do not react much, the decrease in domestic income is passed through to real wages, while the level of real profits remains constant and thus the profit share increases. To put it differently, if we rearrange equation (3), we get

$$\frac{z(a_L w + a_M P_M)}{p} + \frac{a_L w}{p} + \frac{a_M P_M}{p} = \frac{z}{1+z} + \frac{a_L w}{p} + \frac{a_M P_M}{p} = 1 \tag{5}$$

In this form the pricing equation reveals that firms are able to maintain their real profits, which are equal to the—constant—share of profits in gross output ($z/[1+z]$). As a result, increases in import prices (which increase the ratio $a_M P_M/p$) are accommodated by decreases in the real wage. This is obviously not a distributionally neutral process.

2.2 Sectoral Decomposition

We can gain some further insight by moving beyond the macro level and examining the sectoral linkages of an economy with different types of labor and imports. Assume an economy with n sectors, λ types of labor and μ types of imported products. Following the conventional notation, we can define P as the n-dimensional column vector of prices, ω as the λ-dimensional column vector of nominal wages and P_M as μ-dimensional column vector of import prices. A is the $n \times n$ matrix of domestic input coefficients, L the $\lambda \times n$ matrix of labor coefficients, and M the $\mu \times n$ matrix of imported inputs coefficients. Finally, ζ is the $n \times n$ diagonal matrix of markup factors.

literature. A currency devaluation leads to an increase in import prices in domestic currency which—with constant markups—leads to an increase in the profit share; given that the propensity to consume out of wages is higher than out of profits this redistribution tends to decrease consumption and output. For the same reasons, the increase in the import prices shown in Figure 1 can also have contractionary effects (Nikiforos and Grothe 2023).

This system can be written as

$$\begin{bmatrix} P_1 \\ P_2 \\ .. \\ P_n \end{bmatrix} = \begin{bmatrix} 1+z_1 & 0 & .. & 0 \\ 0 & 1+z_2 & .. & 0 \\ .. & .. & .. & .. \\ 0 & 0 & .. & 1+z_n \end{bmatrix} \left(\begin{bmatrix} a_{11} & a_{21} & .. & a_{n1} \\ a_{12} & a_{22} & .. & a_{n2} \\ .. & .. & .. & .. \\ a_{1n} & a_{2n} & .. & a_{nn} \end{bmatrix} \begin{bmatrix} P_1 \\ P_2 \\ .. \\ P_n \end{bmatrix} + \begin{bmatrix} a_{L,11} & a_{L,21} & .. & a_{L,\lambda 1} \\ a_{L,12} & a_{L,22} & .. & a_{L,\lambda 2} \\ .. & .. & .. & .. \\ a_{L,1n} & a_{L,2n} & .. & a_{L,\lambda n} \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \\ .. \\ w_\lambda \end{bmatrix} + \begin{bmatrix} a_{M,11} & a_{M,21} & .. & a_{M,\mu 1} \\ a_{M,12} & a_{M,22} & .. & a_{M,\mu 2} \\ .. & .. & .. & .. \\ a_{M,1n} & a_{M,2n} & .. & a_{M,\mu n} \end{bmatrix} \begin{bmatrix} P_{M,1} \\ P_{M,2} \\ .. \\ P_{M,\mu} \end{bmatrix} \right) \quad (6)$$

or, in a compact form,

$$P = (I + \zeta) \cdot (A'P + L'\omega + M'P_M) \quad (7)$$

with ($'$) denoting the transpose of a matrix. These equations suggest that the firms of each sector set their price level as a markup over the unit cost of production. Solving for prices, we get

$$P = (I - A' - \zeta A')^{-1}(I + \zeta)(L'\omega + M'P_M) = \Gamma(L'\omega + M'P_M) \quad (8)$$

where $\Gamma = (I - A' - \zeta A')^{-1}(I + \zeta)$. Assuming that $(I - A' - \zeta A')^{-1}$ exists, equation (8) suggests two more dimensions of distributional conflict mediated through price setting, conflict between different sectors of an economy and conflict between different types of labor.[6]

Importantly, equation (8) also implies a multiplier process. An increase in a certain type of import prices will have an immediate effect on the cost, and the price level of the sectors that use thes types of imports. Subsequently, and given that the goods of each sector are used as intermediate inputs in other sectors, there will be further rounds of price increases until eventually the system reaches a new equilibrium price level. This means that, in the presence of shocks to import prices, like those described in Figure 1, the intersectoral linkages imply a period of adjustment with increasing price levels. The exact way this process plays out depends on the structural features of the economy: the specific linkages among the various sectors, the importance of different types of imports for each sector, and also the markup level that the firms in each sector are able to set (factors captured by A, M, and ζ).

In order to derive the profit share, we can denote X an n-dimensional row vector of gross output per sector. This implies that the total value added of the economy is $XL'\omega + X\zeta(A'P + L'\omega + M'P_M)$. We can also assume an $n \times n$ diagonal matrix J, whose main diagonal elements denote the ratio of import to labor costs for each sector. In other words, $M'P_M = JL'\omega$. Given these definitions the profit share of this system can be written as

$$\pi = \frac{X\zeta(I + A'\Gamma)(I + J)L'\omega}{X[I + \zeta(I + A'\Gamma)(I + J)]L'\omega} \quad (9)$$

[6] The role of relative wages has some important macroeconomic implications, which were famously discussed by Keynes in *The General Theory* Keynes ([1936] 2013), but are beyond the scope of this paper and will not be further pursued here.

This equation, albeit more complicated, is analogous to equation (4). As before, the profit share increases as the markup of each sector (z_i) increases and as the import to labor cost of each sector increases as well (j_i). In other words, an increase in the prices of some imported goods will increase the import-to-wage cost—at least in some sectors—and will lead to an increase in the profit share even if the markups remain constant. As it was already mentioned the magnitude of the increase will be determined by the structural features of the economy (as captured by A, L, M, and ζ).

2.3 Endogenous and Exogenous Prices

A last interesting and relevant step is to distinguish between sectors whose prices are set endogenously, as a markup over unit costs of productions, and sectors whose prices are exogenously given in international markets. For example, an increase in the international prices of oil or commodities will lead to an increase in the import prices of these goods (if they are imported) but will also lead to an increase in the price of oil and commodities for domestic producers of these goods. Thus, these producers face prices given exogenously—determined in international markets—and thus their markups becomes endogenous.[7]

Following the notation in Valadkhani and Mitchell (2002) and Weber et al. (2022), we can assume that the economy of the previous section has x such exogenous-price sectors, and e endogenous-price sectors, with $x+e=n$. If we denote the "exogenous" sectors with the subscript X and the endogenous with E, equation (6) can be rewritten as

$$\begin{bmatrix} P_X \\ P_E \end{bmatrix} = \begin{bmatrix} I+\zeta_X & 0 \\ 0 & I+\zeta_E \end{bmatrix} \left(\begin{bmatrix} A'_{\mathrm{XX}} & A'_{\mathrm{EX}} \\ A'_{\mathrm{XE}} & A'_{\mathrm{EE}} \end{bmatrix} \begin{bmatrix} P_X \\ P_E \end{bmatrix} + \begin{bmatrix} L'_X \\ L'_E \end{bmatrix} \omega + \begin{bmatrix} M'_X \\ M'_E \end{bmatrix} P_M \right) \quad (10)$$

In this case, A'_{XX} is the $x \times x$ submatrix of the input coefficients of exogenous sectors from exogenous sectors; A'_{EX} is the $x \times e$ submatrix of the input coefficients of exogenous sectors from endogenous sectors; A'_{XE} is the $e \times x$ submatrix of the input coefficients of endogenous sectors from exogenous sectors; and A'_{EE} is the $e \times e$ submatrix of the input coefficients of endogenous sectors from endogenous sectors. On the other hand, L'_X and L'_E are the submatrices of the labor coefficients for the exogenous and endogenous sectors, with dimensions $x \times \lambda$ and $e \times \lambda$, respectively. Similarly, M'_X and M'_E are the submatrices of the imported inputs coefficients for the exogenous and endogenous sectors, with dimensions $x \times \mu$ and $e \times \mu$, respectively.

[7] Kalecki distinguished between cost-plus-markup-determined prices for finished goods and demand-determined prices with endogenous markups for goods such as commodities (Kalecki 1971, ch. 5).

Starting from the endogenous sectors, we can solve for the prices as in the previous subsection

$$P_E = (I - A'_{EE} - \zeta_E A'_{EE})^{-1}(I + \zeta_E)(A'_{XE}P_X + L'_E\omega + M'_E P_M) = \Gamma_E(A'_{XE}P_X + L'_E\omega + M'_E P_M) \quad (11)$$

where $\Gamma_E = (I - A'_{EE} - \zeta_E A'_{EE})^{-1}(I + \zeta_E)$. Assuming that $(I - A'_{EE} - \zeta_E A'_{EE})^{-1}$ exists, it is easy to see that the role of the inputs of the exogenous sectors is similar to that of imports: an increase in their prices leads to an increase in the endogenous prices. To solve for the profit share, we can denote X_E an e-dimensional row vector of gross output per sector for the endogenous sectors and also, assume two $e \times e$ diagonal matrices J_M and J_X, whose main diagonal elements denote the ratio of cost of imports and the inputs of the exogenous sector respectively to the labor cost of the endogenous sector: $M'_E P_M = J_M L'_E \omega$ and $A'_{XE}P_X = J_X L'_E \omega$.

The profit share of the endogenous sectors is thus

$$\pi_E = \frac{X_E \zeta_E (I + A'_{EE}\Gamma_E)(I + J_M + J_X)L'_E\omega}{X_E[I + \zeta_E(I + A'_{EE}\Gamma_E)(I + J_M + J_X)]L'_E\omega} \quad (12)$$

The result is similar to equation (9) of the previous subsection: increases in each of the markups and import prices increase the profit share. The only difference is the role of the exogenous sectors. Not surprisingly, an increase in their prices relative to the labor cost (increase in J_X) will lead to an increase in the profit share in a similar way to that of import prices.

When it comes to the exogenous sectors, the fact that the price level is exogenously determined implies that the markup is endogenous

$$I + \zeta_X = P_X \cdot (A'_{XX}P_X + A'_{EX}P_E + L'_X\omega + M'_X P_M)^{-1} \quad (13)$$

Assuming that the inverse matrix exists, it is intuitive that the markup is a positive function of the exogenous prices of these sectors (adjusted for the own-inputs used in production) and a negative function of the other costs of production (inputs from the endogenous sectors, labor and imports).

To derive the profit share of the exogenous sectors, we can denote X_X an x-dimensional row vector of gross output per sector for the exogenous sectors, and $M'_X P_M = J_{XX} L'_X \omega$, the ratio of imports to labor cost of the exogenous sectors. With some rearrangement, we get

$$\pi_X = \frac{X_X\left[(I - A'_{XX} - A'_{EX}\Gamma_E A'_{XE})P_X - A'_{EX}\Gamma_E(I + J_M)L'_E\omega - (I + J_{XX})L'_X\omega)\right]}{X_X\left[(I - A'_{XX} - A'_{EX}\Gamma_E A'_{XE})P_X - A'_{EX}\Gamma_E(I + J_M)L'_E\omega - J_{XX}L'_X\omega)\right]} \quad (14)$$

The first term in the square brackets of the numerator shows the effects of the exogenous prices on the profits of the exogenous sector (including their effect through the endogenous prices). Thus, the profit share of the exogenous sectors is increasing in each of the exogenous prices.[8] On the other hand, increases in import prices (and wages) affect negatively the profit share of exogenous sectors directly $[(I+J_{XX})L'_X\omega)]$ and via their impact on the prices of endogenous sectors which are used as input for the exogenous production $[A'_{EX}\Gamma_E(I+J_M)L'_E\omega]$. Overall then, at a theoretical level a situation with increases in import and exogenous prices has uncertain effects on the profit share of the exogenous sectors, which will depend on their relative magnitude and the structure of the economy (captured with the various matrices). Practically, the experience of the last three years, with these sectors having record profitability, suggests that the effect is positive.

3 INFLATION

The discussion of the previous section referred to the determination of the *level* of prices. This is different from inflation, which refers to the *rate of change* of prices. An increase in the import prices or what, in Section 2.3, we called exogenous prices will lead to an increase in the price level, and thus an increase in the rate of inflation only for one period or for a few periods if the input-output propagation mechanisms are taken into account. However, prices will eventually settle at a higher new level. On the other hand, inflation is a cumulative process. In order to have a permanent increase in the rate of inflation one needs to specify the mechanism that will propagate such a permanent increase in the rate of change in price level.

According to Structuralist/Kaleckian theory, inflation is the result of the conflict among different agents or sectors of the economy in their effort to maintain or increase their claims on real income. In the previous section, we highlighted several potential dimensions of this conflict. For example, an increase in inflation might be the result of conflict among firms of different sectors (price-price inflation) or different groups of workers (wage-wage inflation). However, a purely price-price (or wage-wage) inflation cannot continue *ad infinitum*, as that would imply a convergence of the wage (profit) share to zero. As a result, the main dimension of conflict inflation is that of the capital–labor conflict. The main idea is simple. As we explained above, an increase in import prices will increase prices and decrease real wages even with constant markups. If workers are able to push for an increase in nominal wages in order to preserve their

[8] The sufficient condition for this is that $X_X(I-A'_{XX}-A'_{EX}\Gamma_E A'_{XE})P_X>0$. This condition is always satisfied as long as profitablity is positive. In fact, positive profits require that $X_X(I-A'_{XX}-A'_{EX}\Gamma_E A'_{XE})P_X > X_X[A'_{EX}\Gamma_E(I+J_M)L'_E\omega+(I+J_{XX})L'_X\omega)]$.

real wage, and firms respond to that increase with a further increase in prices to maintain their markup, the economy can enter a phase with cumulative price and wage increase that leads to a permanently higher inflation rate.

As with many things in Structuralist/Kaleckian theory, these ideas go back to Robinson (1938), who highlighted the role of capital–labor conflict for the hyperinflation of the Weimar Germany, and Kalecki (1971, ch.14) who discussed the role of conflict over the markup and income distribution. The idea was then clarified and systematized by Rowthorn (1977).[9] Lerner (1958) seems to have a similar process in mind when he defines "sellers' inflation." After describing a process akin to the one discussed here in the previous paragraph he adds, "[s]ellers' inflation takes place whenever wage earners and profit takers together attempt to get shares that amount to more than 100 percent of the selling price" (259).

This process of conflict is conditioned by the same institutional factors, social norms, structural characteristics, or economic forces that also determine the distribution of income and were discussed in Section 2. For example, if the position of labor is strong, unions are able to achieve higher nominal wages in order to maintain their real wage in the face of, say, an import price shock. If firms are also able to maintain their markups, this can lead to an extended period of high inflation. On the other hand, if the position of labor is weak, the probability of such a cumulative process is smaller.[10] The state of the conflict among capital and labor is the most important reason why, in the face of import price shocks, inflation persisted in the 1970s but has been recently subsiding.

Among the economic forces that can determine the state of the conflict can be demand and the rate of (un)employment. As was recognized by Marx in *The Capital* and more recently formalized by Goodwin (1967) a decrease in the rate of unemployment tends to increase the power of workers, who are able to claim higher nominal—but also real—wages.[11] Indeed, until recently, most post-war cycles in the US and most European countries exhibited a cyclical profit squeeze at

[9] Textbook expositions with references to the related literature are provided by Taylor (2004) and Lavoie (2014, ch. 8). Vernengo (2007) and Taylor and Barbosa-Filho (2021) provide an interesting exposition juxtaposed other theories of inflation.

[10] This does not mean to say that the latter situation with low inflation is necessarily preferable to the former. As Lerner (1958, 259) writes "The 'who started it first' debate is a complete waste of time because there is no original situation in which there was a 'just' or 'normal' distribution of the product between wages and profits. Any increase can be seen either as the disturbance which bears the full responsibility for the inflation, or as nothing but the correction of an inequity per- petrated in previous history-all depending on the point of view." In fact, under certain circumstances, maintanance of the real wage can be better from a normative but also economic point of view (Nikiforos and Grothe 2023).

[11] The original Phillips curve proposed by Phillips (1958) examined "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957." It was not until the related study for the

high levels of employment, with the overall result being an inverse U-shaped profit margin and share over the cycle: the profit share was increasing as utilization and employment increased at low levels of employment/utilization—due to the producitivty gains we refered to in the previous section—but decreased at higher levels (Nikiforos and Foley 2012). However, the effect of demand and (un)employment on inflation is also conditioned by the aforementioned institutional characteristics of the economy. For example, in the US, the same forces that have led to the increase in the markup rates and the profit share over the last decades, have also led to the disappearance of the cyclical profit squeeze.[12] The secular decline in the position of labor also manifests itself in the inability of labor to increase its share along the cycle when unemployment decreases (Nikiforos 2017). In other words, although demand and unemployment might play a role, they are not the sole or most important factors in the emergence of inflation.

Conflict inflation has also been incorporated in relatively recent incarnations of new-Keynesian and neoclassical models. An important difference compared to the Structuralist/Kaleckian view though, is that conflict emerges as the economy deviates from a supply-side determined Non-Accelarating Inflation Rate of Unemployment (the famous NAIRU). If demand increases and unemployment falls below the NAIRU, inflation not only increases along a conventional Phillips curve, but also eventually accelerates as agents adjust their expecations about future inflation, making the long-run Phillips curve vertical at the NAIRU.[13] The result of the central role of the NAIRU is that this theory of inflation becomes the latest incarnation of monetarist theories of inflation—that go back to the quantity theory of money—and where inflation emerges as the result of excess aggregate demand and loose monetary and fiscal policy (Taylor and Barbosa-Filho 2021). It was this type of model that led many leading economists (Domash and Summers 2022; Blanchard 2022; Ball, Leigh, and Mishra 2022) to blame the recent increase in inflation on the excessive fiscal stimulus during the pandemic and to call for aggressive monetary tightening. Despite strong evidence to the contrary (e.g., Stiglitz and Regmi 2023), the tightening took place but the fact that inflation decelerated without any increase in unemployment casts doubt on this approach to inflation.[14]

US economy by Samuelson and Solow (1960) that the curve depicted the relation between unemployment and price inflation.

[12] This is what some economists have been calling the flattening of the Phillips curve (see for example Ratner and Sim 2022).

[13] For textbook expositions of this model see Carlin and Soskice (2015) and Galí (2015).

[14] Another explanation that has been put forward is that the NAIRU itself has decreased (see for example the latest—2023Q3—Survey of the Professional Forecasters by the Philadelphia FED [2023]). This brings in mind Galbraith's (1997, 101) comment: "In general, the estimated NAIRU in a variety of studies has tracked the actual unemployment rate sluggishly. When unemployment rises, analysts tend to discover that the demographic characteristics of workers are deteriorating, or that the jobwage and wage-price dynamic has become unstable ... And then the unemployment rate drifts down again, those flaws mysteriously begin to disappear, and a lower NAIRU is estimated."

Another point relevant for our discussion is that, as explained by Bilbiie and Känzig (2023), in the baseline new-Keynesian model profits are negatively related to inflation. Thus, for the model to produce high inflation *and* an increase in the profit share, it has to be assumed that wages react more slowly than prices to inflationary shocks—which is an almost tautological argument.

4 COST-PUSH-PROFIT-LED INFLATION

The discussion in the previous sections allows us to move to the main question of the paper, that is, whether profit-led inflation is compatible with the theories of markup pricing and conflict inflation. The criticism of profit-led inflation (e.g., by Lavoie [2023] or Colonna et al. [2023]) is based on the premise that profit-led inflation requires an increase in markups. We suggest that this is not the case—profit-led inflation can emerge under constant markups as well—and therefore profit-led inflation is consistent with the markup story and the conflict theory of inflation. To understand that we can retrace and rephrase the first two steps in Weber and Wasner (2023, 187):

[1] There is an initial cost push. For example, an increase in the price of oil, in commodity prices or in the cost of transportation, as we have witnessed in the wake of the pandemic and the war in Ukraine (Figure 1). This cost push has two dimensions: the increase in import prices but also the increase in the prices of domestic goods whose prices are determined in global markets, and whose markups are endogenous and increase (these are what we called in Section 2.3, the goods with "exogenous prices"). In other words, the increases in international prices lead both to an increase in import prices of related goods, but also to the increase in the price of domestically produced goods in these sectors. Moreover, market mechanisms can lead to higher prices—and therefore an endogenous markup—in other sectors that face bottlenecks.

Note however, that we should not interpret the totality of this type of price increases in the post-pandemic period in terms of demand and supply. As a result of the outsized role that finance has in oil, gas, and commodity markets the price increases were exacerbated by financial speculation. For example, Breman and Storm (2023) find that "speculation in the crude oil market has been responsible for 24%–48% of the increase in the WTI crude oil price during October 2020–June 2022." Therefore, the magnitude of the initial cost push was not determined only by market "fundamentals" (demand-supply mismatches) but was itself, to a large extent, profit-led.

[2] Given the importance of these sectors for the rest of the economy the cost-push is propagated by firms in an effort to protect their profit margins along the lines of the usual markup pricing

equation. There may be some firms that try to take advantage of the situation and increase their markups, but this is not a necessary condition for this type of inflation.

Since prices do not adjust instantaneously and simultaneously in all sectors, and there are input-output connections between different sectors (discussed in detail in sections 2.2 and 2.3), if the initial cost push is large and persistent (as it has been recently) it can lead to persistent price increases. Thus, there are two forces that have led to inflation: i) the initial cost-push and ii) the pricing behavior of the firms that protect their profit margins. This is consistent with the Structuralist/Kaleckian markup story but also with the narrative of profit-led inflation: a cost-push-profit-led inflation.

One can quibble with the onomastics: Is the term profit-led right? One advantage of the term is that it emphasizes the distributional source of inflation; it emphasizes that in the face of an extraordinary increase in import and "exogenous" prices, profit margins were maintained while all the burden of the adjustment was born by real wages. Ignoring this distributional aspect naturalizes the claim of corporations on output.

Of course, as was discussed in the previous section, profit-led inflation cannot go on forever. This would mean that the wage share would converge to zero, which is absurd from a logical and theoretical, but also practical point of view: labor will, at some point, react against price increases. Absent further import- and exogenous-price shocks, either the rate of inflation will subside or there will be a push to increase wages which might push prices up and further propagate inflation further. This is the conflict-inflation scenario discussed above, which again is consistent with the Structuralist/Kaleckian theory of inflation and is also mentioned as a potential third step in Weber's and Wasner's story (2023).

At the same time, the fact that the wage share cannot converge to zero does not mean that it should be treated as stable over the long run. Over the last decades, profit shares have increased in most developed economies and this increase has been accompanied by a secular increase in the markup of the firms.[15]

As was explained in Section 2, in terms of the Structuralist/Kaleckian analysis, the exogenous markup does not mean that markups and profit shares are overall constant, but rather that they are

[15] There is a voluminous recent literature on the increase in the profit share (or the decrease in the labor share) of income in most developed countries over the last decades (see for example Stockhammer 2013; Piketty 2014; Grossman and Oberfield 2022; Karabarbounis 2023). The increase in the markups have been documented by De Loecker, Eeckhout, and Unger (2020). We provide our own estimates in the next section.

determined by institutions and social norms outside of the economy along the lines of classical political economy. The increase in the markup and the profit share has been the result of a change in these institutions and social norms against labor.

These secular trends (increase in the profit share and markups) are important to consider in the current context for several reasons. First, firms being able to pass through the increase in material cost without much reaction of wages is another manifestation of the weakening position of labor. Second, the weak position of labor also casts doubt on the possibility of conflict inflation with wage and price increases compensating for each other; these doubts have been confirmed by the recent decline of inflation without any decrease in employment or the output gap. Finally, an increase in the markups that would amplify price shocks (on top of the protection of the markups) would be consistent with these trends.

What has happened to markups over the last three years? This is an empirical question, which we examine in the following and last section of this paper.

5 SOME EMPIRICAL EVIDENCE

The debate about the role of profits in the post-pandemic inflation has generated a rich literature. A small set of studies has used information from national and industry accounts data to estimate the markup. Colonna, Torrini, and Viviano (2023) find that firms in most sectors of the Italian economy managed to maintain the pre-pandemic markups in the period 2020–22, while in Germany, markups remained stationary in industry and manufacturing but increased considerably in construction and retail, accommodation, and transports. They also show that in the US economy, markups increased in most sectors. Matamoros (2023), using data from several industrialized economies, concludes that there is evidence in favor of markup inflation.

These studies aside, most empirical work—including our empirical exercise below—has utilized firm-level data. In the case of the US economy, Konczal and Lusiani (2022), Glover, Mustre-del-Rio, and Ende-Becker (2023), and Conlon et al. (2023) found a strong increase in the sales-weighted markup for 2021, above the increasing trend estimated by De Loecker, Eeckhout, and Unger (2020). Konczal and Lusiani (2022) find that the stronger the market power (proxied by previous years average markups), the stronger the markup increase in 2021, in line with the findings of Bräuning, Fillat, and Joaquim (2022).

Franzoni, Mariassunta, and Tubaldi (2023) construct a global dataset with firms in 83 countries from the Worldscope database and find a significant increase in the market share and markup of large firms after supply chain shortages. They also find that the higher the intensity of the supply shock and the higher the pre-pandemic market concentration of a sector, the higher the post-pandemic inflation rate. Acharya et al. (2023) find similar results for Eurozone firms. Lafrogne-Joussier, Martin, and Isabelle (2023) and Arquié and Thie (2023) using French data find excess pass-through of the energy cost shock on the firm and sectoral levels. Finally, Faryaar, Leung, and Fortier-Labonte (2023) find an increase in sales-weighted markups from 2018 to 2022 by 2.6 percentage points for the Canadian economy. On the other hand, Bijnens, Duprez, and Jonckheere (2023) find decreasing markups for Belgian firms which they attribute to wage indexation.

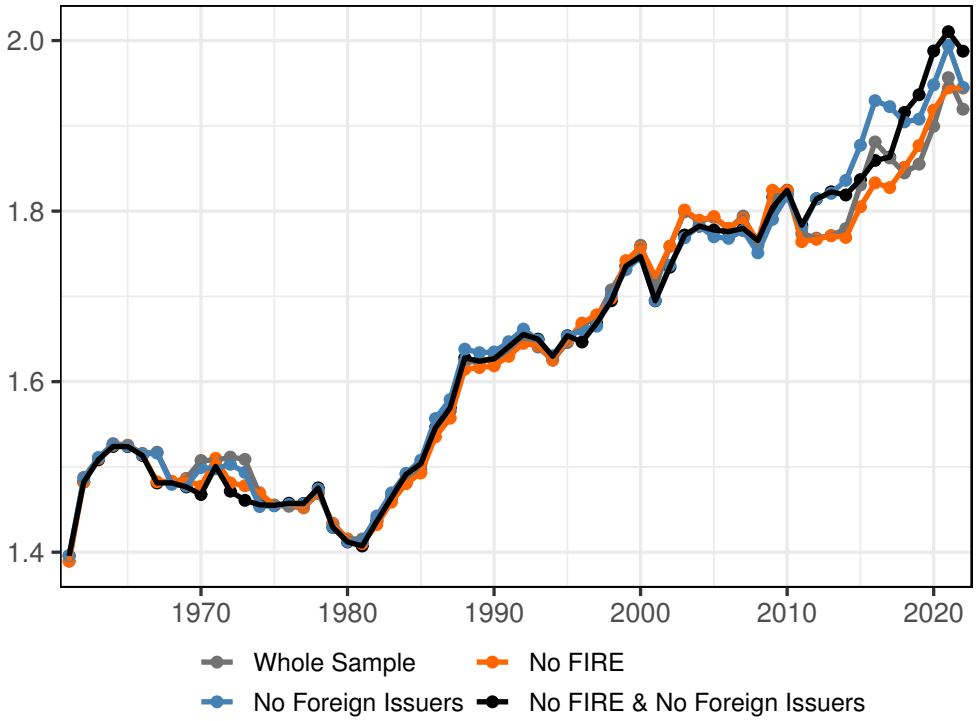
As we explained in Section 2, there are two different approaches to markups, which are also reflected in how markups are estimated. On the one hand, according to Structuralist and Kaleckian theory firms set their prices as a markup on some measure of average cost, while neoclassical theory suggests that firms apply their markups on a measure of marginal cost. In a recent seminal study, De Loecker, Eeckhout, and Unger (2020)—following earlier work by Hall (1988) and De Loecker and Warzynski (2012)—adopt the marginalist approach and find a very significant increase in the markup of US firms starting in the early 1980s. However, as we explained in Section 2, there is little evidence that firms set their prices this way. Instead, empirical evidence points toward a markup over average cost. For that reason, we opted to estimate accounting markups along the lines of equation (3).

More precisely, we use data from Compustat database, and we estimate markups as the ratio of "sales" over "cost of goods sold" which comprises direct labor cost and the cost of intermediate goods (e.g., energy and materials) and is used in the literature as a measure of variable cost. We should emphasize however that the results of our preferred "accounting" method are highly correlated with those produced using the "marginalist" method, a finding that is also highlighted by De Loecker, Eeckhout, and Unger (2020, 576–7). In other words, aside from a level difference, the trend and the fluctuations of our estimates (pre- and post-pandemic) are very similar to those following the method by De Loecker, Eeckhout, and Unger (2020). We provide such a comparison in the appendix.

For our analysis, we use the annual dataset of Compustat for the period 1962–2022. For ease of comparison, we estimate a benchmark series using the same sample—by specifying the same filters as De Loecker, Eeckhout, and Unger (2020). We construct three additional estimates. First,

we exclude the financial sector firms. The financial sector has different accounting and reporting standards, which are generally not comparable to non-financial firms.[16] Second, following Davis (2023), we construct an estimate which excludes foreign private issuers, which are large international companies that operate in the US but have their headquarters in different countries and use different reporting standards (Francis 2010). As Davis explains, many of these firms do not conduct any business in the US. Finally, the fourth estimate excludes both financial firms and foreign issuers. We consider this estimate to be the most appropriate for the measurement of the markup (although, in any case, the conclusions are not affected significantly one way or another).

Figure 3: The Sales-Weighted, Aggregate Markup



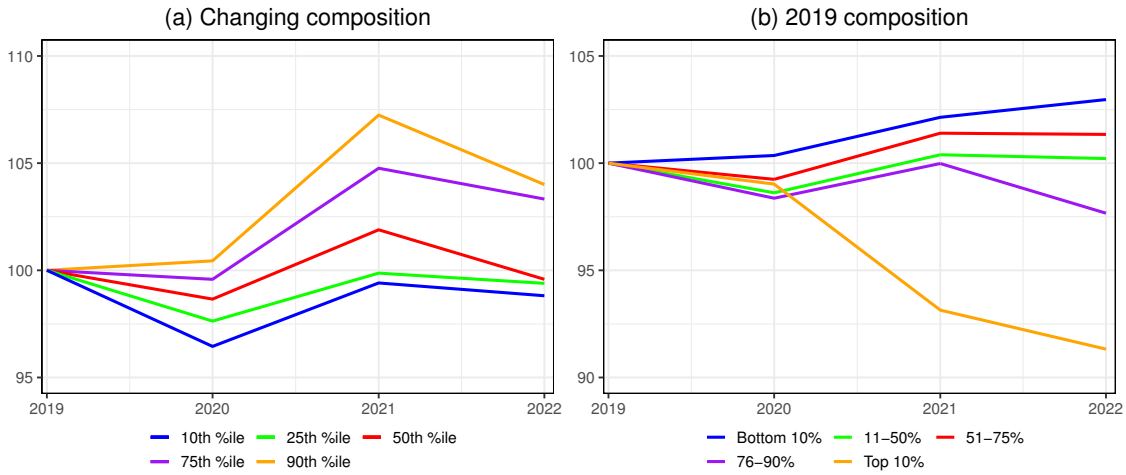
Source: Authors' calculations with Compustat data

Our estimates are presented in Figure 3. What we observe is that markups (under any of the four variations) increased significantly in the post-pandemic period. In the fiscal year of 2022 (which ranges into the first quarter of 2023 for some firms) they declined slightly—with the exception of the estimate without financial firms, which remained constant. Overall, and despite the decrease in 2022 the average markup is—under any measure—above its pre-pandemic level. This implies that, on average, during the pandemic and the high-inflation period, firms were able to increase their markups.

[16] Konczal and Lusiani (2022) and Conlon et al. (2023) include firms of the financial sector in their estimates.

In Figure 4, we go one step further and examine what happened to the distribution of the markups. Both panels present indices normalized to 100 for 2019. Panel (a) presents different percentiles of the distribution of the markups (so that the 10th percentile presents the threshold point below which are 10 percent of the firms, the 25th percentile the threshold point below which are 25 percent of the firms, etc.). Note that each specific firm, as its markups change, might move from one part of the distribution to another, hence, each year, a different firm can determine the median or, for example, the 90th percentile.

Figure 4: Markup Evolution by Markup Brackets

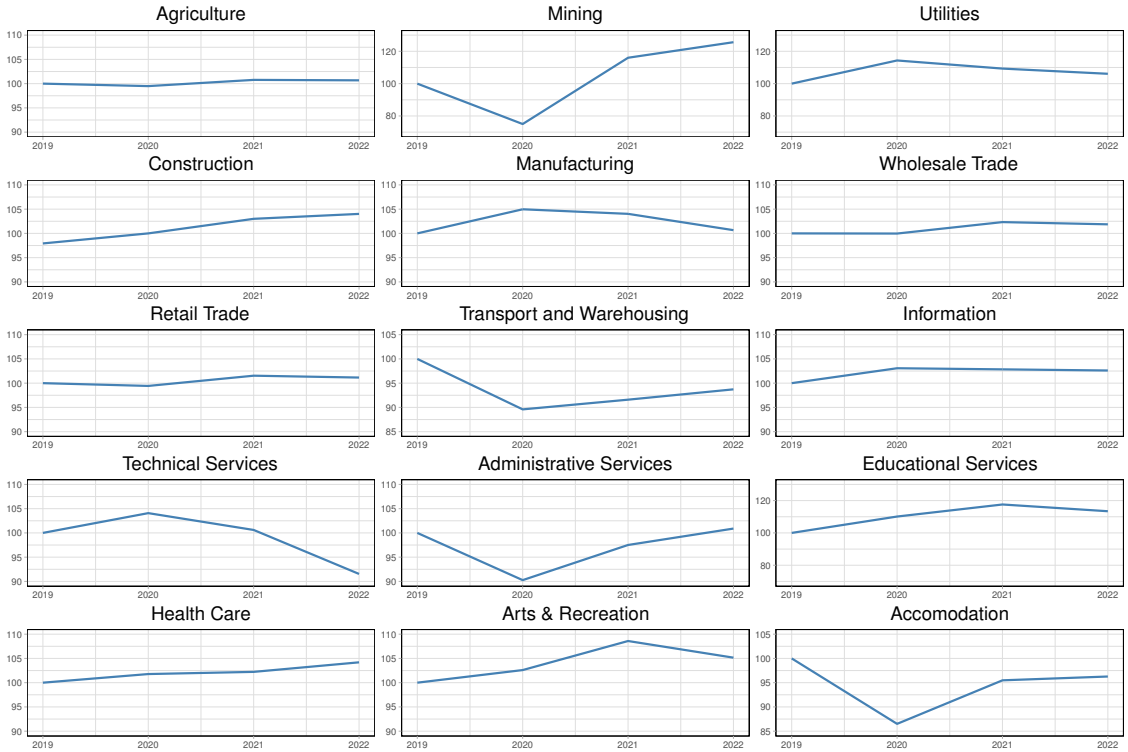


Source: Authors' calculations with Compustat data

Figure 4a shows that the 75th and the 90th percentiles increased significantly in 2021 and slightly decreased in 2022. The lower percentiles show a decrease in 2020 and a recovery to their pre-pandemic levels by 2022. This part of the distribution presents the cyclical behavior suggested by Lavoie (2023). These trajectories taken together indicate an increase in the variance of (unweighted) markups in the post-pandemic period.

Figure 4b tracks the firms that belonged to certain brackets of the markup distribution in 2019 in the following years. In other words, if a firm charged a relatively high markup in 2019 and belonged to the top 10 percent of the distribution, this firm is still counted in this bracket in the following years, even if its markup decreased in the following years and therefore in these years belonged to lower brackets. More specifically, we calculated the sales-weighted average markup of firms belonging to each bracket in 2019. Our figure shows that firms with lower markups in 2019 experienced, on average, higher increases in their markups, while firms with high markups saw their markups decrease on average. These estimates are in line with similar calculations by Davis (2023).

Figure 5: The Sales-Weighted Sectoral Markup for Selected Sectors (2019=100)



Source: Authors' calculations with Compustat data

The sectoral aggregation of markups reveals further heterogeneity. Figure 5 plots indices of the sales-weighted markups of the NAICS sectors at the two-digit level (with 2019=100). Not surprisingly, the mining sector, which contains most upstream oil and gas companies, saw the largest increase in their markups, being 25 percent above their 2019 level in the 2022 fiscal year. Manufacturing increased its markups in 2020 and 2021 but returned almost to its pre-pandemic level in 2022, whereas the markup in the construction sector increased steadily over recent years. Some services (such as healthcare) saw an increase in their markups while others (such as technical services) saw a sharp decline. The different sectoral trajectories can also shed some light on the results of Figure 4b. For example, construction and healthcare, which experienced a significant increase in their markups, are the two sectors with the lowest average markup in 2019, while technical services are close to the top. Finally, in some sectors the markups are cyclical, decreasing in 2020 and recovering afterward.

If we move to an even lower level of disaggregation, we can observe further heterogeneity. We provide a detailed table with the average markup for each sector at a 2-digit and 3-digit level in the appendix. An interesting question for future research would be a deeper examination of the

portion of the developments in the average markup and the distribution of markups due to different sectoral trajectories and what due to intra-sectoral changes.

6 CONCLUSION

The paper discussed to what extent profit-led inflation (inflation resulting from increases in the profit share) can be understood through the lenses of existing theories of how firms set their prices, inflation, and distribution. In particular we examine how profit-led inflation fares in comparison to the Structuralist/Kaleckian theory of markup pricing, distribution, and conflict inflation.

Recent critiques of the explanation of profit-led inflation have pointed out that that the increase in the profit share observed in the last years can be the result of cyclical factors: due to the existence of fixed costs, as utilization increases, average productivity increases as well leading to an increase in the share of profits. They have also pointed out that the observed increase in the share of profits is due to the increase in import prices, which leads to higher profit shares even under constant markups.

We show that, on average, there is not much evidence that the surge in profitability is cyclical, as the share of profits and markups did not decline during the pandemic. We also discuss the Structuralist/Kaleckian theories of markup pricing, distribution and inflation and argue that profit-led-inflation is consistent with these theories. To a large extent the criticism of profit-led inflation is based on the premise that profit-led inflation requires an increase in markups. We argue that this is not the case. In the face of large price shocks, firms are able to pass the burden of adjustment to real wages—even if markups are constant. As such, the advantage of the term profit-led is that it emphasizes the distributional source and consequences of inflation.

The paper also provided an empirical examination of the markups of the period 2019–22 using data from the Compustat database. We show that, on average, firms were able to increase their markups, although there is significant heterogeneity across sectors and the positions of the firms in the distribution of markups.

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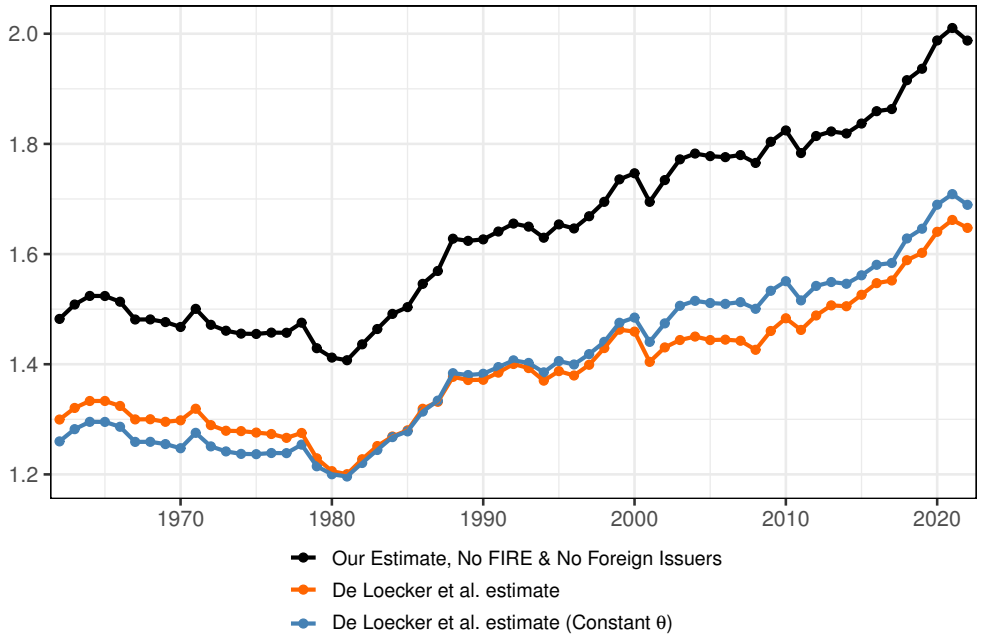
APPENDIX

A COMPARISON WITH DE LOECKER ET AL. (2020)

Figure 6 presents our estimates together with the esimates by De Loecker, Eeckhout, and Unger (2020). It is clear that aside from a level difference, the trend and the fluctuations of our estimates (pre- and post-pandemic) are very similar.

Figure 6: The Sales-Weighted, Aggregate Markup: Comparison of Our Estimates with Those of De Loecker et al. (2020)



Source: De Loecker et al. (2020) and authors' calculations with Compustat data

B SECTORAL MARKUPS

Table 1 shows the markups by sector according to the North American Industry Classification System (NAICS) at the 2-digit and 3-digit level for the years 2019-2022. The calculations were based on data from Compustat.

Table 1: Markup by Sector (NAICS Classification)

Sector	Definition	2019	2020	2021	2022	Change 2019-2022
11	Agriculture, Forestry, Fishing, Hunting	1.717	1.708	1.731	1.729	0.68%
111	Crop Production	1.771	1.756	1.778	1.738	-1.83%
112	Animal Production and Aquaculture	1.214	1.195	1.295	1.675	37.95%
21	Mining, Quarrying, Oil/Gas Extraction	1.893	1.42	2.197	2.379	25.63%
211	Oil and Gas Extraction	2.259	1.364	2.494	2.723	20.57%
212	Mining (except Oil and Gas)	1.487	1.647	1.914	1.735	16.67%
213	Support Activities for Mining	1.31	1.29	1.327	1.376	5.01%
22	Utilities	1.86	2.126	2.033	1.973	6.09%
221	Utilities	1.86	2.126	2.033	1.973	6.09%
23	Construction	1.249	1.275	1.314	1.326	6.22%
236	Construction of Buildings	1.272	1.3	1.356	1.383	8.75%
237	Heavy and Civil Engineering Construction	1.184	1.195	1.188	1.166	-1.52%
238	Specialty Trade Contractors	1.239	1.265	1.261	1.257	1.47%
31	Manufacturing	1.888	1.895	1.89	1.809	-4.16%
311	Food Manufacturing	1.419	1.437	1.399	1.357	-4.38%
312	Beverage and Tobacco Product Manufacturing	2.59	2.558	2.548	2.442	-5.72%
313	Textile Mills	1.476	1.533	1.539	1.458	-1.26%
314	Textile Product Mills	1.523	1.513	1.537	1.454	-4.53%
315	Apparel Manufacturing	2.131	2.139	2.27	2.186	2.62%
316	Leather and Allied Product Manufacturing	2.042	2.045	2.113	2.004	-1.87%
32	Manufacturing 2	2.377	2.649	2.521	2.391	0.58%
321	Wood Product Manufacturing	1.335	1.407	1.529	1.513	13.34%
322	Paper Manufacturing	1.542	1.568	1.535	1.501	-2.69%
323	Printing and Related Support Activities	1.443	1.553	1.539	1.69	17.14%

Sector	Definition	2019	2020	2021	2022	Change 2019-2022
324	Petroleum and Coal Products Manufacturing	1.194	1.077	1.225	1.296	8.52%
325	Chemical Manufacturing	3.698	3.993	3.607	3.508	-5.14%
326	Plastics and Rubber Products Manufacturing	1.488	1.497	1.474	1.423	-4.39%
327	Nonmetallic Mineral Product Manufacturing	1.389	1.393	1.426	1.438	3.53%
33	Manufacturing 3	1.755	1.785	1.819	1.776	1.18%
331	Primary Metal Manufacturing	1.189	1.18	1.367	1.316	10.69%
332	Fabricated Metal Product Manufacturing	1.47	1.488	1.495	1.482	0.80%
333	Machinery Manufacturing	1.589	1.608	1.616	1.597	0.52%
334	Computer and Electronic Product Manufacturing	2.108	2.119	2.149	2.111	0.18%
335	Electrical Equipment, Appliance, and Component Manufacturing	1.523	1.523	1.527	1.496	-1.75%
336	Transportation Equipment Manufacturing	1.302	1.272	1.31	1.297	-0.38%
337	Furniture and Related Product Manufacturing	1.701	1.709	1.639	1.629	-4.24%
339	Miscellaneous Manufacturing	2.799	2.689	2.739	2.688	-3.95%
42	Wholesale Trade	1.275	1.275	1.305	1.299	1.87%
423	Merchant Wholesalers, Durable Goods	1.306	1.307	1.336	1.346	3.05%
424	Merchant Wholesalers, Nondurable Goods	1.214	1.221	1.235	1.218	0.27%
425	Wholesale Electronic Markets and Agents and Brokers	1.89	1.968	2.157	1.97	4.26%
44	Retail Trade	1.439	1.443	1.433	1.428	-0.80%
441	Motor Vehicle and Parts Dealers	1.389	1.419	1.393	1.379	-0.76%
442	Furniture and Home Furnishings Stores	1.795	1.856	2.401	2.458	36.95%
444	Building Material and Garden Equipment and Supplies Dealers	1.496	1.51	1.509	1.508	0.83%
445	Food and Beverage Stores	1.358	1.365	1.362	1.348	-0.78%
446	Health and Personal Care Stores	1.524	1.491	1.566	2.167	42.15%
447	Gasoline Stations	1.359	1.445	1.271	1.256	-7.64%

Sector	Definition	2019	2020	2021	2022	Change 2019-2022
448	Clothing and Clothing Accessories Stores	2.02	1.742	1.696	1.632	-19.20%
449	Furniture, Home Furnishings, Electronics, and Appliance Retailers	1.445	1.44	1.451	1.51	4.53%
45	Retail Trade 2	1.479	1.465	1.513	1.507	1.89%
454	Nonstore Retailers	2.038	2.471	2.116	3.793	86.10%
455	General Merchandise Retailers	1.488	1.478	1.524	1.526	2.55%
456	Health and Personal Care Retailers	1.362	1.335	1.362	1.352	-0.73%
457	Gasoline Stations and Fuel Dealers	1.226	1.295	1.223	1.185	-3.31%
458	Clothing, Clothing Accessories, Shoe, and Jewelry Retailers	1.586	1.508	1.62	1.561	-1.59%
459	Sporting Goods, Hobby, Musical Instrument, Book, and Miscellaneous Retailers	1.505	1.527	1.58	1.548	2.84%
48	Transportation and Warehousing	1.422	1.238	1.279	1.317	-7.37%
481	Air Transportation	1.427	0.852	1.111	1.301	-8.82%
483	Water Transportation	1.327	1.365	1.486	1.495	12.63%
484	Truck Transportation	1.213	1.2	1.194	1.204	-0.71%
485	Transit and Ground Passenger Transportation	1.453	1.57	1.598	1.441	-0.84%
486	Pipeline Transportation	1.524	1.675	1.485	1.358	-10.89%
488	Support Activities for Transportation	1.257	1.225	1.223	1.262	0.42%
49	Transportation and Warehousing 2	1.324	1.349	1.348	1.349	1.87%
492	Couriers and Messengers	1.324	1.349	1.348	1.349	1.87%
51	Information	3.283	3.384	3.376	3.368	2.61%
511	Publishing Industries (except Internet)	4.657	4.547	4.59	5.268	13.12%
512	Motion Picture and Sound Recording Industries	1.467	1.587	1.571	1.541	5.04%
513	Publishing Industries	4.203	4.323	4.144	4.302	2.36%
515	Broadcasting (except Internet)	1.94	2.552	2.161	1.988	2.49%
516	Broadcasting and Content Providers	1.914	1.856	1.827	1.79	-6.48%
517	Telecommunications	2.25	2.313	2.24	2.341	4.04%

Sector	Definition	2019	2020	2021	2022	Change 2019-2022
518	Data Processing, Hosting, and Related Services	2.937	2.99	3.076	3.01	2.46%
519	Other Information Services	6.999	6.65	6.225	5.946	-15.04%
54	Professional, Scientific, Technical Services	2.078	2.163	2.091	1.902	-8.46%
541	Professional, Scientific, and Technical Services	2.078	2.163	2.091	1.902	-8.46%
56	Waste Management/Remediation Services	2.036	1.838	1.986	2.054	0.90%
561	Administrative and Support Services	2.175	1.91	2.088	2.183	0.37%
562	Waste Management and Remediation Services	1.582	1.608	1.619	1.597	0.93%
61	Educational Services	2.025	2.23	2.381	2.296	13.41%
611	Educational Services	2.025	2.23	2.381	2.296	13.41%
62	Health Care and Social Assistance	1.268	1.29	1.296	1.321	4.19%
621	Ambulatory Health Care Services	1.279	1.305	1.303	1.367	6.90%
622	Hospitals	1.235	1.237	1.271	1.242	0.58%
623	Nursing and Residential Care Facilities	1.126	1.133	1.155	1.163	3.27%
624	Social Assistance	1.408	1.289	1.369	1.308	-7.10%
71	Arts, Entertainment, and Recreation	1.678	1.721	1.822	1.764	5.16%
711	Performing Arts, Spectator Sports, and Related Industries	1.53	1.655	1.63	1.622	6.02%
713	Amusement, Gambling, and Recreation Industries	1.821	1.756	1.918	1.866	2.49%
72	Accommodation and Food Services	1.728	1.495	1.65	1.664	-3.73%
721	Accommodation	1.807	1.574	1.957	2.006	11.02%
722	Food Services and Drinking Places	1.675	1.473	1.547	1.528	-8.78%
81	Other Non-Public Services	1.814	1.996	2.013	1.977	9.00%
811	Repair and Maintenance	2.49	2.637	2.583	2.425	-2.59%
812	Personal and Laundry Services	1.752	1.929	1.929	1.889	7.81%