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# The inflationary spike in Spain between 2021 and 2023: evidence from micro data

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## Rationale

Analysis of the price micro data used to construct the consumer price index (CPI) allows us to understand how much of the inflationary spike observed in Spain between 2021 and 2023 was attributable to changes in the number of outlets adjusting prices (the "adjustment frequency"), rather than to changes in the size of such price adjustments.

## Takeaways

- The rise in the year-on-year growth rate of the CPI in 2021-2023 was marked by notable increases in the number of outlets that raised their prices from one month to the next, with the size of such price adjustments remaining practically constant.
- There is evidence of asymmetries in the upward and downward price adjustments made by outlets: given the same gap between a posted price and the estimated optimal price, the number of outlets making an upward price adjustment towards the optimal price exceeds those outlets making equivalent downward adjustments. This asymmetry has become more marked during the recent inflationary period.

## Keywords

Price rigidity, inflation, consumer prices, micro data, CPI.

## JEL classification

D40, E31.

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# THE INFLATIONARY SPIKE IN SPAIN BETWEEN 2021 AND 2023: EVIDENCE FROM MICRO DATA

## Introduction

The index that measures inflation in an economy captures changes in the price of the products included in the representative consumption basket of the average household. Analysis of how these prices move at individual product level can therefore help understand inflation developments at any given time.

In Spain, as in many other countries, the year-on-year inflation rate began to rise in 2021 from the moderate levels observed in previous years. The year-on-year rate of change in the consumer price index (CPI) rose from around 0% in early 2021 to 6.5% in December 2021, its highest value in decades.[1] Inflation continued to climb in 2022, holding at around 10% during the summer of that year, and then fell continuously to levels closer to the historical average.

This article documents the recent inflationary period by analysing price changes by product between January 2018 and December 2023, drawing on a sample of CPI micro data provided by the Instituto Nacional de Estadística (INE). Each data entry corresponds to an individual product (defined as per the European Classification of Individual Consumption according to Purpose) sold in a specific outlet, in a given province and month. The data used in this article cover a set of 144 non-energy products, representing 64% of the CPI and 74% of the non-energy CPI.[2] Using these data, this article seeks to understand the aggregate variation in inflation by analysing, at the microeconomic level, the individual prices underlying the CPI. Specifically, it shows the contribution of changes in the size of the price adjustments made by outlets that adjust prices vis-à-vis the contribution of changes in the number of outlets that adjust prices.

## Frequency and size of price changes

The inflation rate is calculated as a weighted average of the changes in price of the products included in the consumption basket. An increase in the aggregate inflation rate can therefore be disaggregated between the percentage of outlets that adjust their prices from one month to the next (the *frequency* of price changes) and the average size of such changes.[3]

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1 INE data, available at: https://www.ine.es/en/prensa/ipc_tabla_en.htm.

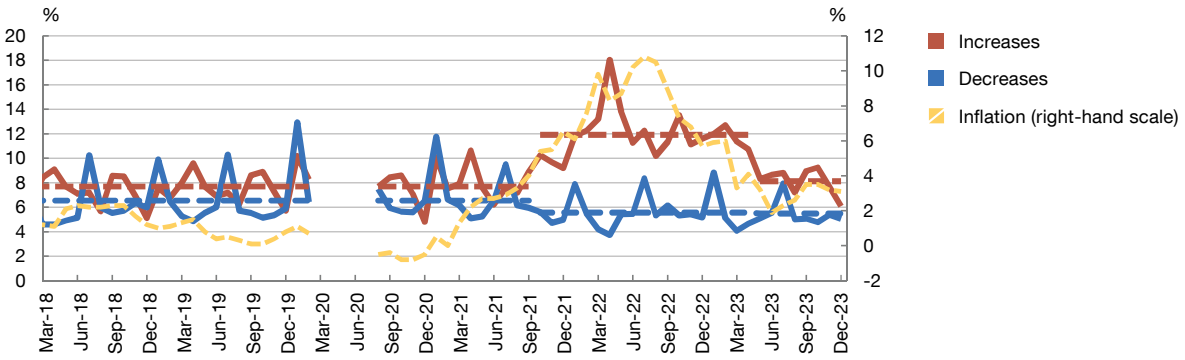
2 By sector, the products included in the dataset represent 91% of food CPI, 71% of non-energy industrial goods CPI and 65% of services CPI. For each product, year and month, the INE shares information at outlet-item-province level. The INE data refer to outlets in all provinces and cover 462 items belonging to 199 products, while the dataset provided contains information on a sample of outlets from 25 provinces and covers 203 items belonging to 144 products. As a result, of the roughly 210,000 prices processed each month by the INE, the monthly samples provided to the authors contain information on close to 20,000 price observations. The basket considered in the sample excludes energy products. The correlation between month-on-month inflation based on the data received and the inflation rate excluding energy is 88%.

3 As in common in the literature, we interpret the proportion of outlets that change the price of a given product from one month to the next as the probability of a specific outlet adjusting its price for that product. For example, if 25% of outlets adjust their price, an outlet will, on average, adjust its price once every four months. Consequently, an increase in the percentage of firms that adjust their price may be interpreted as a shortening of the average period of time that a firm's price remains constant.

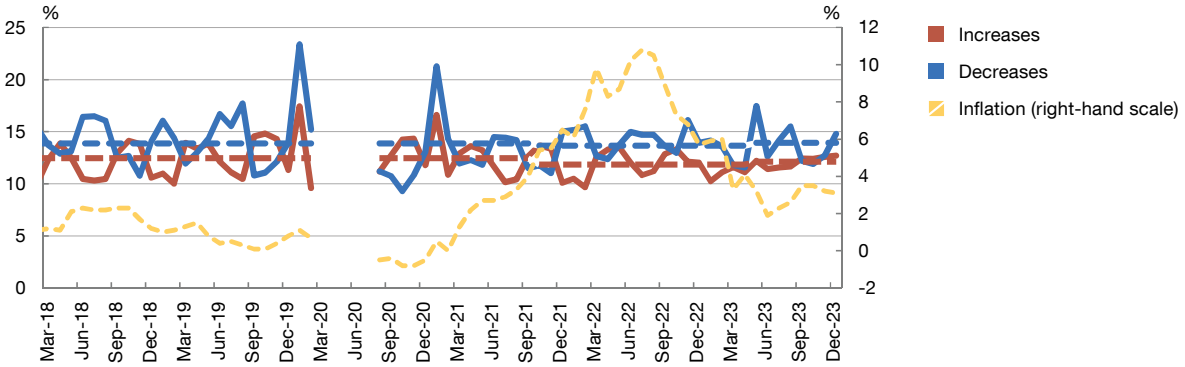
Chart 1

**Frequency and size of price changes**

1.a Monthly frequency of price changes




1.b Average size of monthly price changes

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**SOURCES:** INE and Banco de España.

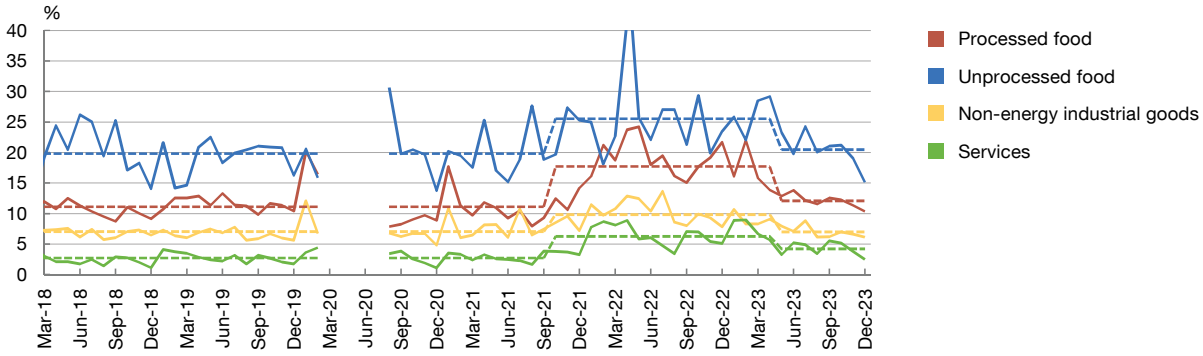
Chart 1.a shows the monthly frequency of price changes, while Chart 1.b presents their average size. Price increases between two consecutive months are presented in red, whereas price decreases are depicted in blue. The respective broken horizontal lines show the averages for specific sub-periods, and the broken yellow line depicts the year-on-year CPI rate of inflation (the scale for which is presented on the right-hand side of each panel). The period March-July 2020 is excluded from the analysis owing to the difficulties in compiling information on prices during the COVID-19 lockdown and the shifts in consumption patterns during these months.

As can be clearly seen in Chart 1.a, the start of the inflation spike was accompanied by a marked rise in the frequency of price increases. While only 6% of prices increased month-on-month in June 2021, 18% did so in April 2022, the highest value in the entire series. However, the frequency of price decreases remained essentially constant (if anything, dropping slightly) during this period. As shown by the broken red line, the frequency of price increases averaged around 12% between May 2022 and April 2023, and has since fallen to levels close to those of the period 2018-2020, standing at roughly 6% in December 2023.

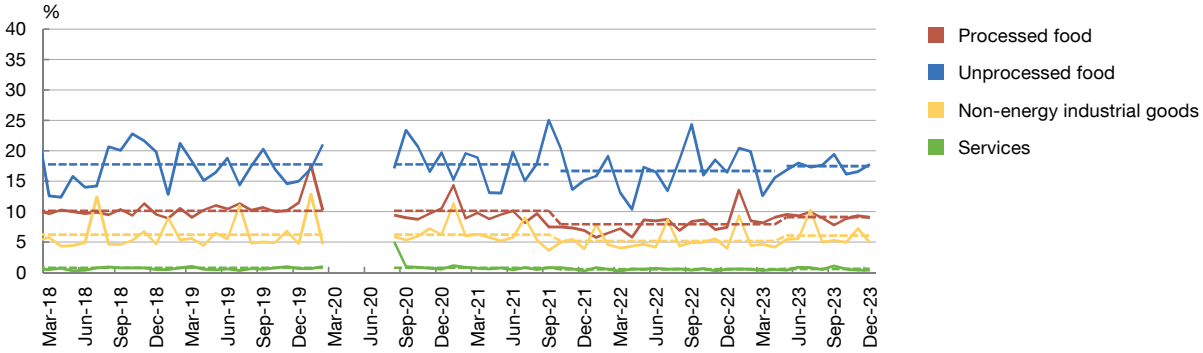
Chart 2

**Frequency of price changes by sector** (a)

2.a Monthly frequency of price increases




2.b Monthly frequency of price decreases




**SOURCES:** INE and Banco de España.

**a** Given the influence of sales in the textile sector, these products are not included in goods or services.

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Meanwhile, as shown in Chart 1.b, the average size of the month-on-month price changes did not vary significantly during this period, fluctuating for most of the time within a range of 10%-15% for increases (i.e. prices that rose month-on-month did so by between 10% and 15% on average) and within a slightly lower range in the case of decreases.

Consequently, the high inflation observed in 2021-2023 was attributable to a greater share of outlets raising the prices of their products, rather than to a larger size of these changes.[4]

By sector,[5] food (in particular processed food) saw the sharpest increase in the frequency of price increases (see Chart 2). This frequency also rose in the non-energy industrial goods sector, but it did so more moderately and more temporarily, as from 2022 Q3 onwards it returned to levels

4 These results contrast with those of the period of low inflation in the euro area (2010-2019), when the size of the price changes responded more forcefully to inflation than the frequency of such changes (Gautier et al., 2024).

5 The sectors analysed in this article are processed food, unprocessed food, non-energy industry goods and services. The products belonging to each sector can be found in: https://ec.europa.eu/eurostat/web/metadata/classifications.

similar to those before the inflation spike. Price increases also became more frequent in services, although much less so than in other sectors. As regards the size of the price changes, both increases and decreases remained largely unchanged across all the sectors analysed during the period 2018-2023. It should be noted that the sectoral results set out are purely descriptive and this article does not address the causes of the differences documented by type of product, which may be attributable to pre-existing asymmetries in the input costs for firms across the different sectors. For these reasons, the evidence relating to this sectoral breakdown should be interpreted with due caution.

## Asymmetries in price adjustments by outlets

The analysis in the previous section shows the share of outlets that adjusted the prices of their products – and to what extent – in response to the different aggregate shocks that occurred between 2021 and 2023. This section presents a more detailed analysis of the price adjustment at the microeconomic level, which can isolate asymmetries in outlets' pricing behaviour.

To this end, we first calculate the gap between each outlet's posted price and the average price of those of its competitors that have adjusted their prices.[6] This "competitor price" is used in the economic literature as a proxy for an outlet's "optimal price", as it is considered to be the price that the outlet would set if there were no price-setting frictions (for example, nominal price rigidities). This approximation is based on the fulfilment of the following theoretical assumptions: (i) the competitor price measures how supply and demand change for a homogeneous product and (ii) the local supply and demand conditions for the outlet in question do not affect the product's optimal price.[7] Once the gap between the posted price and the optimal price has been obtained, we measure whether or not the outlet adjusts its prices in the following period on the basis of this gap.

The vertical axis in Chart 3.a shows the average frequency of price changes during the period 2018-2023, while the horizontal axis depicts the percentage difference between the outlet's price and the optimal price, i.e. the price gap.[8] Month-on-month price increases are shown in red and decreases in blue. For example, on average, 20% of outlets whose price is 15% below the optimal price will raise it.

The frequency of adjustment grows with the size of the gap: the greater the difference between a price and its optimal price, the more likely it is that the outlet will adjust it. However, there is a clear asymmetry in the frequency of adjustment, depending on whether the gap is positive or negative. For negative price gaps (i.e. when the price is below the optimal price, which usually occurs when

6 This is done by measuring the change in prices between month t-1 and month t for all outlets and taking the average price in month t for the outlets that have adjusted prices between the two periods.

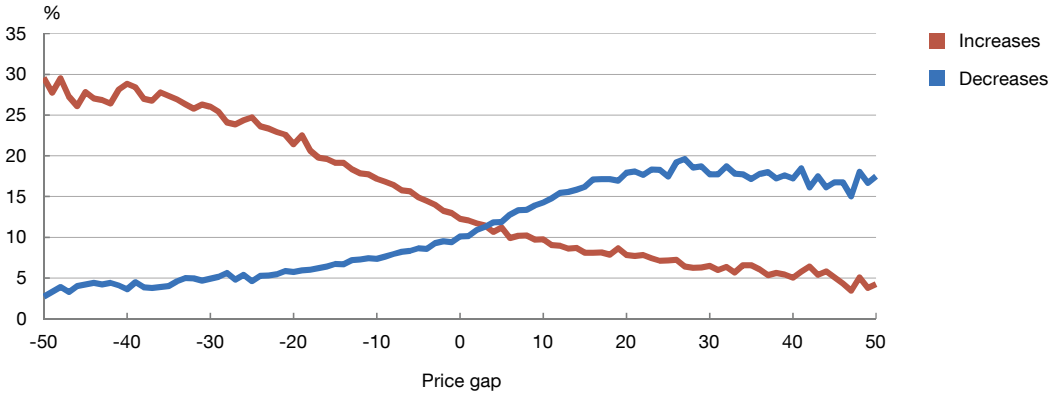
7 This interpretation and the methodology to calculate the price gap are based on Karadi, Amann, Bachiller, Seiler and Wursten (2023).

8 The horizontal axis is divided into 101 values, obtained by discretising the price gap (a continuous variable) into one-percentage point intervals, starting at -50.5% and ending at 50.5%. Thus, for example, any price gap between -0.5% and 0.5% is assigned the value of 0 on the horizontal axis.

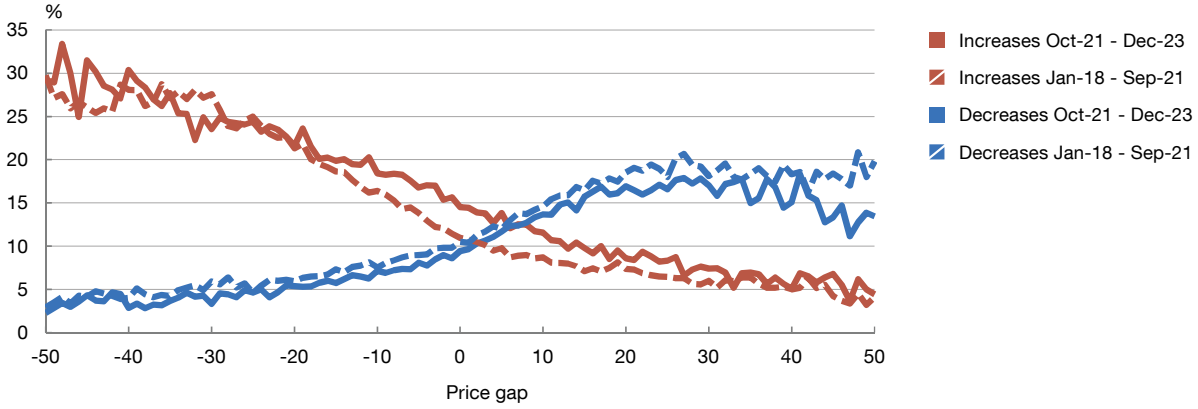
Chart 3

**Asymmetries in price changes**

3.a Monthly frequency of price changes according to the price gap (a)




3.b Monthly frequency of price changes according to the price gap, by period (a)




**SOURCES:** INE and Banco de España.

**a** The price gap refers to the percentage difference between each outlet's price and the price of competitors that have adjusted their prices in a given month. This is calculated by measuring the change in prices between month t-1 and month t for all outlets and taking the average price in month t of all the outlets that have adjusted prices between the two periods. For more details, see Karadi, Amann, Bachiller, Seiler and Wursten (2023).

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a firm's production costs increase), the likelihood that prices will be adjusted upwards is much higher than the likelihood of downward adjustments for positive gaps *of the same size.* For example, if the price of a product is 50% *below* its optimal price, the average outlet will adjust it upwards with a probability of around 30%. However, if the price is 50% *above* its optimal price, the outlet will adjust it downwards with a probability of just over 15%. Therefore, the percentage of outlets that adjust prices in response to rising costs that trigger a given negative price gap is higher than that of outlets that adjust prices in response to declining costs that prompt a positive price gap of the same size.

Lastly, Chart 3.b shows how these price adjustment asymmetries have changed in the inflationary period (October 2021-December 2023) compared with the previous period (January 2018-September 2021). The asymmetries have become somewhat more marked in the recent inflationary period, especially for relatively small price gaps. For example, while on average in 2018-2021

outlets with a negative gap of 5% raised prices with a probability of 14%, in 2021-2023 this probability rose to 17%. However, the probability of a downward adjustment for a positive gap of 5% remained practically unchanged. This increase in the frequency of upward adjustments between the two periods can be seen in gaps of up to 20%. Conversely, for price gaps in excess of 20% the percentage of upward adjustments in 2021-2023 is similar to that in the previous period and that of downward adjustments is lower.

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