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# HOW INFLATION VARIES ACROSS SPANISH HOUSEHOLDS

*Inflation has distributional effects. Leveraging data on consumption expenditure of goods across households provided in the Spanish Household Budget Survey we estimate household-specific inflation from 2006 to 2021 in Spain and analyse how it varies according to households' known characteristics. We show that households with lower income, more members and whose head is less educated, older, and male experience higher inflation. Finally, we also depict the effects of the most recent price increases across households.*

## Cómo varía la inflación entre los hogares españoles

*La inflación tiene efectos distributivos. Aprovechando los datos sobre el gasto de consumo de bienes en los hogares proporcionados por la Encuesta de Presupuestos Familiares de España, estimamos la inflación específica de los hogares de 2006 a 2021 en España y analizamos cómo varía según las características conocidas de los hogares. Mostramos que los hogares con menores ingresos, más miembros y cuya cabeza de familia tiene menos estudios, es mayor y varón, experimentan una mayor inflación. Finalmente, también describimos los efectos de los aumentos de precios más recientes en los hogares.*

## 1. Introduction

The recent surge in inflation in 2021 has revitalised the debate of which parts of the population are the most vulnerable and how the cost of high inflation should be shared (Bank of Spain, 2022; Sánchez Soliva, 2022). A big part of this debate has focused on whether most of the burden should fall on workers, with salaries not increasing to match inflation, or on corporations with profit margins falling as final prices do not adjust as much as the increases in costs (see, for instance, Pérez, 2022). However, even amongst workers, or more generally, households, the impact of increases in inflation might not be homogeneous. Do the rich and the poor suffer equally? Do households with older members face similar changes in the cost of living relative to households with younger members?

The purpose of this work is twofold. First, we evidence and analyse the heterogeneity of inflation from consumption across households using Spanish data. In particular, leveraging data on consumption expenditure of goods across households provided in the Spanish Household Budget Survey (Encuesta de Presupuestos Familiares, EPF henceforth) we estimate the household-specific inflation from 2006 to 2021 and analyse how it varies according to households' known characteristics. Second, we investigate the uneven impact of the increased inflation in 2021. Focusing on the marked increases in the prices of gas and electricity for that period, we also assess the effect of particular government policies and seek to answer whether quantities adjusted to price surges.

We show that inflation decreases with households' real income, thus poorer households are more exposed to surges in inflation. Moreover, we show that households with more members and whose main earner is less educated, older and male also experience higher inflation. The changes in the cost of living are sufficiently heterogeneous across households to warrant the attention of policymakers and other stakeholders taking decisions on how the burden of the recent inflation surge is shared amongst economic agents.

The Consumer Price Index (CPI) measures the cost of a market basket for an average consumer. CPI-based inflation is an aggregate economic indicator of changes in retail prices for a set of predetermined goods. CPI-based inflation or what is usually termed aggregate inflation, is universally used and is often assumed to affect all people equally. However, in the process of averaging across individuals, it mutes all the variability in the spending patterns across households. These differences in patterns added to variation in price increases across goods may lead to unequal levels of inflation for each household. Thus, while in its simplest form, aggregate inflation combines the shares of expenditure of different goods for an average consumer and their respective price change, household-specific inflation combines the shares of expenditure of different goods of each distinct household, together with the corresponding price changes. The Spanish EPF collects information on household expenditure across different categories of goods and the Institute of National Statistics (INE, by its acronym in Spanish) provides inflation for each of these goods, allowing us to estimate household-specific inflation. The EPF also provides information on a set of characteristics for each household and its members. We analyse whether these characteristics are systematically correlated to higher or lower levels of household-specific inflation.

First, we find that the level of income is negatively correlated to the household inflation rate. Poorer households experienced higher inflation during the period 2006-2021. Combining all 15 years, the increase in the cost of living for a household whose income is in the bottom decile of the distribution was about 1.8 percentage points greater than the increase observed for households whose income is in the top decile. The key driver of this result is that poorer households spend a greater share of their consumption on food and housing expenditures, which experienced higher price changes during the last 15 years. A similar pattern is observed when we compare households whose head (main earner) is young (less than 40 years old) and

old (more than 60 years old). Households headed by older individuals also faced higher inflation due to their greater share of expenditure on food and housing. We also find that relative to the respective reference group, households headed by a female, whose main occupation is managerial or white collar type of job, whose level of education is higher experienced lower inflation in the last decades. Households whose head is employed with a fixed-term contract experience higher inflation due to their exposure to price changes in transportation. Finally, renters face lower inflation rates during the period. Rents have not increased as much as other expenditures and the consumption basket of renters is skewed due to this expenditure type (note that INE does not include the changes in the imputed cost of owning a house as expenditure).

Aggregate inflation has increased substantially in the last 18 months. Focusing on expenditure data for 2021 we look more closely at the heterogeneity of inflation across households in 2021 and 2022 (due to the data available for this year we use inflation rates of 2022 and expenditure shares of 2021), uncovering which type of households experienced the highest increases in the cost of living. First, we find that the household inflation in 2021 has been particularly sensitive to their income level. The average inflation for households whose income is at the bottom quartile was 2 percentage points higher than for households whose income is in the top quartile; this implies an actual inflation rate almost 30 % higher for the poorest households. A similar pattern is observed when we consider the age of the head of the household. Households whose head is more than 60 years old experience inflation rates 1.2 percentage points higher compared to households whose head is less than 40 years old. Older and poorer households spend a larger share of consumption on housing services (including electricity and gas spending), which price increases have driven the high inflation rates in 2021. During the first half of 2022 inflation rates remained high, but the nature of the inflation process has

changed, with food and transportation prices increasing the most, while price changes on housing expenditure became subdued. As older and poorer households spend more on food but less on transportation, we no longer observe a strong disparity of inflation across age and across the income distribution during the first half of 2022.

Given the importance of the changes in prices of electricity and gas in driving inflation during 2021, we perform two additional exercises. First, we measure the impact of government policies on decreasing VAT taxation and excise duty on electricity. We show that both policy measures were potentially effective in mitigating the price increases suffered by households, particularly the ones whose income is at the bottom quartile of the distribution. Second, we exploit the panel dimension of the EPF to verify whether there is evidence that households adjusted the quantity consumed of electricity and gas as a response the observed price changes. We do not find a strong indication that households decreased the quantity (measured in kWh) of electricity consumed in 2021. However, this result comes with a set of caveats, not least the fact that is it not possible to separate the impact of price increases from the impact of the recovery from the pandemic and other potential disturbances households were exposed to during 2021.

This work relates to the long tradition on the uneven distribution of inflation across different population groups or the measurement of the cost of living of different people (for instance, Prais, 1959; Michael, 1979; Hagemann, 1982; Garner *et al.*, 1996; Deaton, 1998; Hobijn & Lagakos, 2003; Gürer & Weichenrieder, 2020 for more recent contributions). Although other weaknesses of CPI are well-explored, the focus of this tradition is on whether such an aggregate, single index is appropriate for a heterogeneous population and the implications of this for particular episodes of inflation surges or particular stages of the business cycle. In line with this literature, we verify the dispersion of household specific inflation rates, its negative relation to income levels, as well as the unequal impact due

to the 2021 price surges, which were mainly driven by energy and food price increases. Other contributions, like Argente and Lee (2021), also explore quality substitution differences across households. Due to the lack of data, we cannot exploit this additional source of heterogeneity, which may be particularly important for some good categories.

## 2.    Data and Methodology

We employ consumption and inflation data to measure household-specific inflation rates and their breakdown across good categories. Consumption and household characteristics data come from the Household Budget Survey (EPF) from INE. We use data from 2006 to 2021. From 2006 to 2015 the EPF provides household-level expenditure at the 4-digit good category level, based on the Classification of Individual Consumption by Purpose (COICOP). From 2015 onwards, the EPF provides expenditure on good categories based on the ECOICOP European classification. We employ the correspondence provided by INE to obtain a unique classification of expenditures for the entire sample period. Inflation data is also collected from INE. We use the year-on-year inflation rate at the 2-digit level from 2006 to 2021. For the analysis of the most recent inflation surge of 2021 and 2022, in Section 4, we use a 4-digit level annual year-on-year (January to December) inflation rate for 2021, the July 2021 - June 2022 year-on-year inflation rate and the year-to-date inflation of June 2022.

Denote the expenditure in good category $j$ (within the set of categories $J$) by household $i$ at year $t$, $s_{jit}$. Denote the inflation rate of good category $j$, $\pi_{jt}$. Then household $i$ specific inflation rate denoted $\pi_{it}$ is given by:

$$\pi_{it} = \sum_{j \in J} s_{jit} \pi_{jt} \qquad [1]$$

We use this formula to calculate the inflation rate of each household. As standard with the use of such Laspeyres-style indices, the prices (and the change

therein) faced by each household are the same for the corresponding goods in their consumption bundle.

When calculating household-specific inflation for a particular set of goods (for example, food inflation), we only aggregate goods within the category in question:

$$\pi_{it}^{J_1} = \sum_{j \in J_1} s_{jit} \pi_{jt} \qquad [2]$$

where $J_1 \subset J$.

We then look closely at how the household-specific inflation covaries with the set of characteristics of the household. These include total household income (that indicates purchasing power of the household), as well as education level, occupation and type of contract of the household head (as an indication of permanent level of income of the household). We also include other demographic characteristics of the households, such as age, sex and family size. Finally, we also include the housing tenure status of the household and the city size to control for potentially different spending patterns.

## 3.    Household Specific Inflation from 2006 to 2021

We start the analysis by checking how inflation of household $i$ during the period of 2006 to 2021, denoted $\pi_{ij}$, varies with a set of household characteristics after we control for time ($\alpha_t$) and region ($\gamma_h$, $h$ denotes the Autonomous Community the household resides). The explanatory variables included are the age and age squared of the household's head ($age_{it}$ and $age^2_{it}$), the log of total household real income ($y_{it}$) and $X_{i,t}$ a set of dummy variables that include the sex, education, occupation, type of contract of the household head, whether the household rents or owns a house and whether the household lives in a city of more than 100.000 habitants.[1] See Appendix A for a

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[1] Other household characteristics available in the data, such as whether household members are married, if they have a mortgage or not, which are found to be uncorrelated with total inflation were excluded from the benchmark model.

## TABLE 1

### INFLATION AND HOUSEHOLD CHARACTERISTICS

| | Inflation Total | Inflation Food | Inflation Housing | Inflation Transportation | Inflation Restaurants |
|---|---|---|---|---|---|
| Age | 0.0079*** | 0.0038*** | -0.0036** | 0.0044*** | 0.00061* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Age squared | -0.00006*** | 0.000002 | 0.00007*** | -0.00008*** | -0.00003*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Income | -0.075*** | -0.100*** | -0.11*** | 0.056*** | 0.064*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.00) |
| Household size | 0.014*** | 0.019*** | -0.027*** | 0.013*** | -0.0056*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Retiree | 0.17*** | 0.0054 | -0.017 | 0.089*** | 0.033*** |
| | (0.03) | (0.01) | (0.02) | (0.02) | (0.00) |
| Female | -0.034*** | -0.0053*** | 0.029*** | -0.041*** | -0.029*** |
| | (0.01) | (0.00) | (0.00) | (0.01) | (0.00) |
| College | -0.049*** | -0.017*** | -0.012 | 0.0041 | 0.0040* |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.00) |
| Manager | -0.035*** | -0.023*** | -0.00076 | -0.023*** | 0.0096*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Fixed-term contract | 0.050*** | 0.00068 | 0.013 | 0.022*** | 0.000049 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.00) |
| City size | 0.018*** | 0.0049*** | 0.00057 | 0.017*** | -0.0019*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Renters | -0.13*** | -0.059*** | 0.12*** | -0.050*** | -0.031*** |
| | (0.03) | (0.01) | (0.03) | (0.01) | (0.00) |
| Observations | 276715 | 276715 | 276715 | 276715 | 276715 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Age - Age of Head of the Household, Age Squared - Square of Age of Head of the Household, Income - Log of Real Income, Household size - Number of members in the household, Retiree - Household Head has retired, Female - Head of household is Female, College - Head of household obtained a college degree, Manager - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a fixed-term contract, City size - Takes values of 1 to 5, 1 denoting cities with more than 100000 habitants, increasing for smaller cities until 5 denoting cities with less than 10000 habitants and Renters - The main residence of the household is rented.
**SOURCE: INE and own calculations.**

detailed description of the data. Formally, the baseline econometric model is:

$$\pi_{it} = \alpha_t + \gamma_h + \beta_a age_{it} + \lambda_h + \beta_{a2} age_{it}^2 + \beta_y Y_{it} + \beta_x X_{i,t} + e_{ijt} \quad [3]$$

Given the composition of the consumption baskets of distinct households, we find that relatively older and poorer households experience higher inflation rates. Moreover, inflation tends to be higher for households with more members, and lower for households whose head is female, has completed a college degree, and is not a homeowner. Households who live in smaller cities experience a higher inflation rate. Households whose head has an indefinite employment contract or whose occupation is classified as managerial or white collar face lower inflation. Finally, households whose head is a retiree face higher inflation rates. Results are displayed in the first column of Table 1.

The average year-on-year inflation in Spain during the period 2006-2021 was around 1.7 %.[2] Almost half of this figure is attributed to the inflation on food and non-alcoholic beverages (21 % of total inflation, henceforth food expenditure category) and inflation on housing, water, electricity, gas and other fuel expenditures (28 % of total inflation, henceforth housing expenditure category). Inflation due to expenditure on transportation (17 % of total inflation) and expenditure on restaurants and hotels (11 % of total inflation, henceforth the restaurant expenditure category) were also relevant during this period. In order to highlight the key expenditure items that drive the relationship between inflation and household characteristics, we re-run the regression replacing the left-hand side variable $\pi_{it}$ with inflation for each of these four subcategories of goods (food, housing, transportation and restaurants), $\pi_{it}^{J_1}$.

The negative relationship between inflation and income is rooted in the expenditure on food and housing. Poorer households spend a higher share of income on food and housing and thus suffer a higher inflation rate when these prices increase (in the Appendix B, Table 6 we estimate explicitly the relationship between household characteristics and the share of expenditure in each subcategory). The correlation between inflation and income is reversed for transportation and restaurant expenditure; in this case, richer households spend a greater share on these goods and thus are more exposed to their price changes. Finally, more educated households experience lower inflation due to their relatively low share of food expenditure.

Households whose head has a fixed-term employment contract experience higher inflation since they are overly exposed to inflation on transportation. Households whose head has managerial and white collar occupation face lower inflation than other households across all four main good categories. Renters are relatively less exposed to inflation on food, transportation and restaurant expenditure but are particularly exposed to increases in prices of housing expenditures. Given that INE considers rent expenditure but does not input services on owned houses as implied expenditure to calculate inflation rates, the basket of consumption of renters is strongly skewed towards housing (which includes expenditure in rent), explaining their strong sensitivity to changes in rental costs. Households living in smaller cities experience higher inflation due to transportation expenses. Finally, we find that households whose head has retired face higher inflation. Surprisingly, this seems to be connected to the inflation of transportation and expenditure on restaurants and hotels.

Our measure of household-specific inflation uses observed consumption and actual price changes for good categories each year abstracting from any substitution effect in the consumption pattern of households due to price changes. It has also been suggested that richer households have a greater ability to substitute away from more expensive goods, relative to poorer households, particularly as the latter's bigger expenditure shares refer to necessity goods, as opposed to luxury ones. If that is the case, the heterogeneity in inflation measured here could be understated.
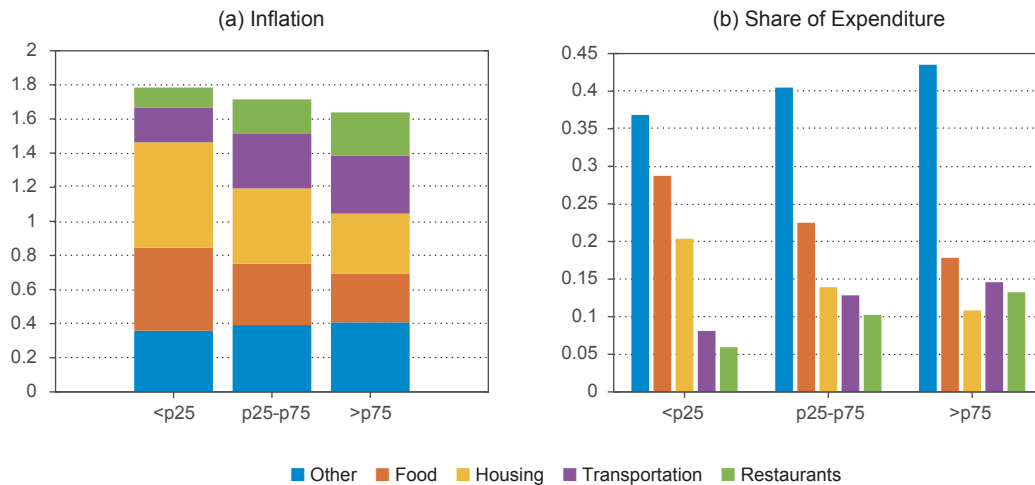
**Inflation and Income**

Next, we look more closely at the relationship between income and inflation. We start by splitting the sample into three groups, one with households whose income is at the bottom quartile, one with households whose income is at the top quartile and the third with the household whose income is between these quartiles.[3] We then estimate the same

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[2] We also analyze separately the period of disinflation in Spain between 2014 and 2016. Given the small values of inflation for most of the COICOP categories, we find differences across the income distribution, age, and other household characteristics to be small and in general statistically insignificant. As such, in what follows, we only report the results for the full time period available.

[3] We compute the quartiles for real income for the pooled sample for the whole time period. We verify that the households in the bottom quartile are not overrepresented in the years of recession.

FIGURE 1

INFLATION AND EXPENDITURE SHARES ACROSS THE INCOME DISTRIBUTION

(a) Inflation

(b) Share of Expenditure

■ Other  ■ Food  ■ Housing  ■ Transportation  ■ Restaurants

NOTE: The figures depicts average inflation (total and for the main four categories) and the average share of expenditure for the food, housing, transportation and restaurants from 2006 to 2021.
**SOURCE: INE and own calculations.**

empirical model for each group separately, as shown in Table 2. We observe that an additional unit of income is related to a bigger drop in inflation for households with low levels of income. Poorer households shift expenditure away from food and housing more quickly as income increases and thus become increasingly less exposed to price changes in these categories. With regard to other household characteristics, we observe that the relationship between inflation and households headed by a female and household size are stronger for poorer households, while the relationship between inflation and age and city size are weaker for poorer households.

In order to further gauge the relevance of income in determining the inflation exposure of each household, we show the average inflation (total and for the main four categories defined earlier) and the average share of expenditure for food, housing, transportation and restaurants from 2006 to 2021 across different income groups in Figure 1. Between 2006 and 2021, the average annual inflation rate for households in the bottom quartile of the income distribution stood at 1.8 %, almost

0.2 percentage points higher than for those in the top quartile. When this difference is accumulated over the 16 years analysed, and assuming that the households remain in the same income bracket throughout this period, the inflation gap increases to more than 2.75 percentage points. The key driver of the inflation difference observed is the higher relative shares of food and housing in the consumption basket of poorer households.

**Inflation and Age**

In the baseline model specification, we introduced controls for age, as well as included a variable to control for whether the head of the household is a retiree (which correlates with age). In order to analyse the robustness of our results with regards to the relationship between age and inflation we estimate an additional model where we exclude age, age squared and the retiree dummy and include instead two dummies, one for the head of households with age below 40 years old and one for the head of household with age between 40 and

## TABLE 2

### HOUSEHOLD INFLATION AND INCOME

| | All Households | Households Income < p25 | Households p25 < Income < p75 | Households Income > p75 |
|---|---|---|---|---|
| Age | 0.0079*** | 0.0033 | 0.0080*** | 0.0084*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Age squared | -0.00006*** | -0.00002 | -0.00007*** | -0.00005 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Income | -0.075*** | -0.11*** | -0.060*** | -0.044** |
| | (0.01) | (0.02) | (0.02) | (0.02) |
| Household size | 0.014*** | 0.029*** | 0.015*** | 0.0057 |
| | (0.01) | (0.01) | (0.00) | (0.01) |
| Retiree | 0.17*** | 0.17*** | 0.21*** | 0.095*** |
| | (0.03) | (0.04) | (0.03) | (0.03) |
| Female | -0.034*** | -0.063*** | -0.021* | -0.0063 |
| | (0.01) | (0.02) | (0.01) | (0.01) |
| College | -0.049*** | -0.10*** | -0.048*** | -0.029** |
| | (0.01) | (0.02) | (0.01) | (0.01) |
| Managers | -0.035*** | -0.028 | -0.035*** | -0.047*** |
| | (0.01) | (0.02) | (0.01) | (0.01) |
| Fixed-term contract | 0.050*** | 0.033* | 0.059*** | 0.039** |
| | (0.01) | (0.02) | (0.01) | (0.02) |
| City size | 0.018*** | 0.013 | 0.020*** | 0.018** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Renters | -0.13*** | -0.19*** | -0.12*** | -0.054 |
| | (0.03) | (0.04) | (0.04) | (0.03) |
| Observations | 276715 | 67172 | 140195 | 69340 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Age - Age of Head of the Household, Age squared - Square of Age of Head of the Household, Income - Log of Real Income, Household size - Number of members in the household, Retiree - Household Head has retired, Female - Head of household is Female, College - Head of household obtained college degree, Managers - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a temporary contract, City size - Takes values of 1 to 5, 1 denoting cities with more than 100000 habitants, increasing for smaller cities until 5 denoting cities with less than 10000 habitants and Renters - The main residence of the household is rented. Food denotes the category of Food and non-alcoholic beverages. Housing denotes the category of housing, water, electricity, gas and other fuels, Restaurants denote the category of Restaurants and hotels.
**SOURCE: INE and own calculations.**

60 years old. The reference group, therefore, consists of households whose head is more than 60 years old. Results are shown in Table 3. We confirm the finding that older households experience higher inflation and the effects of inflation across good categories indicate that inflation for food and housing are underpinning the correlation we observe at the aggregate level. The relationship between the other household characteristics and inflation is largely unchanged when we alter the controls for age.

To illustrate the link between age and inflation exposure of each household we show the average inflation (total and for the main four categories) and the average share of expenditure for food, housing, transportation and restaurants from 2006 to 2021 across different age groups in Figure 2. Between 2006 and 2021, the average annual inflation rate for young households stood at 1.6 %, almost 0.1 percentage points higher than for older households. When this difference is accumulated over the 16 years analysed,

### TABLE 3

### INFLATION AND AGE

| | Inflation Total | Inflation Food | Inflation Housing | Inflation Transportation | Inflation Restaurants |
|---|---|---|---|---|---|
| Young (age < 40) | -0.098*** | -0.15*** | -0.12*** | 0.12*** | 0.076*** |
| | (0.03) | (0.01) | (0.02) | (0.02) | (0.00) |
| Adult (40 ≤ age ≤ 60) | -0.046** | -0.099*** | -0.098*** | 0.100*** | 0.058*** |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.00) |
| Income | -0.071*** | -0.10*** | -0.11*** | 0.061*** | 0.066*** |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.00) |
| Household size | 0.012** | 0.018*** | -0.028*** | 0.014*** | -0.0055*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Female | -0.044*** | -0.0031** | 0.034*** | -0.050*** | -0.033*** |
| | (0.01) | (0.00) | (0.00) | (0.01) | (0.00) |
| College | -0.053*** | -0.021*** | -0.016** | 0.0073 | 0.0057** |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.00) |
| Managers | -0.032*** | -0.024*** | -0.0027 | -0.020*** | 0.011*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Fixed-term contract | 0.050*** | -0.0031 | 0.0086 | 0.027*** | 0.0026 |
| | (0.01) | (0.00) | (0.01) | (0.01) | (0.00) |
| City size | 0.018*** | 0.0048*** | 0.00042 | 0.017*** | -0.0018*** |
| | (0.01) | (0.00) | (0.00) | (0.00) | (0.00) |
| Renters | -0.13*** | -0.065*** | 0.12*** | -0.045*** | -0.028*** |
| | (0.03) | (0.01) | (0.03) | (0.01) | (0.00) |
| Observations | 276715 | 276715 | 276715 | 276715 | 276715 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Young - Age of Head of the Household is smaller than 40, Adult - Age of Head of the Household is between 40 and 60, Income - Log of Real Income, Household size - Number of members in the household, Female - Head of household is Female, College - Head of household obtained college degree, Managers - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a temporary contract, City size - Takes values of 1 to 5, 1 denoting cities with more than 100000 habitants, increasing for smaller cities until 5 denoting cities with less than 10000 habitants and Renters - The main residence of the household is rented. Food denotes the category of Food and non-alcoholic beverages. Housing denotes the category of housing, water, electricity, gas and other fuels, Restaurants denote the category of Restaurants and hotels.
**SOURCE: INE and own calculations.**

the inflation gap increases to more than 1.75 percentage points. The key driver of the inflation difference is the higher relative shares of food and housing on the consumption basket of older households.

## 4. The Unequal Nature of the Surge in Inflation

The post-COVID-19 period in most advanced economies has been characterised by high inflation rates, unprecedented in the last decades. In Spain, the year-on-year inflation rate reached 10 % in June 2022. In this section, we look more closely at the uneven consequences of inflation across households in 2021 and 2022, uncovering which type of households experienced the highest increases in the cost of living.

We employ the household-specific inflation for 2021 and project this household-specific inflation for the first semester of 2022 (to do so we use the expenditure shares of 2021 and the year-to-date inflation reported in June 2022, thus $\pi_{i,2002}=\Sigma_{j\in J}S_{j,i,2021}\pi_{j,2022}$). We then use the same empirical model that controls for age including dummies for young and adults. Results are reported in Table 4.

FIGURE 2

INFLATION AND EXPENDITURE SHARES ACROSS AGE GROUPS
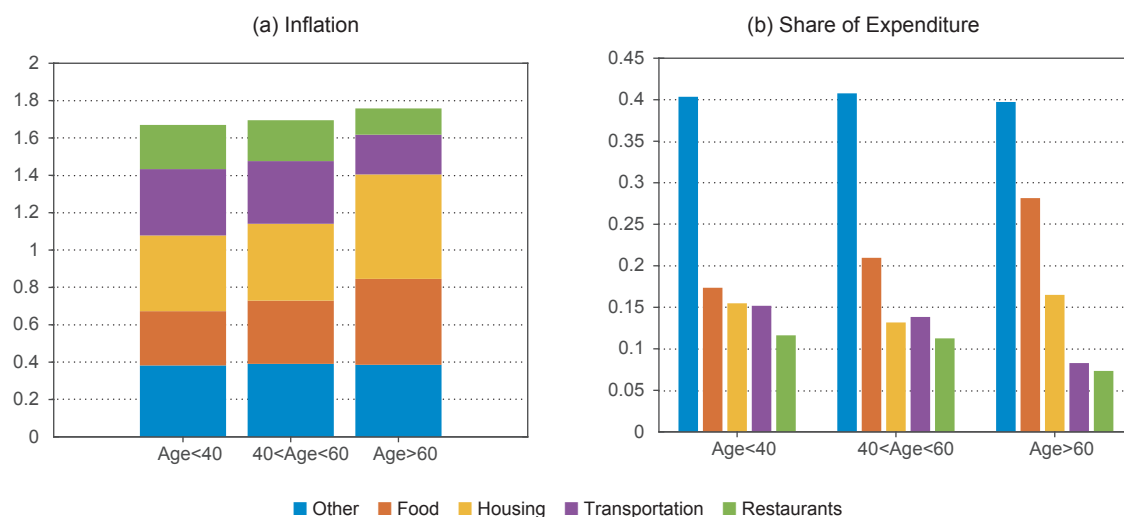


NOTE: The figures depicts average inflation (total and for the main four categories) and the average share of expenditure for the food, housing, transportation and restaurants from 2006 to 2021.
**SOURCE: INE and own calculations.**

The high rates of inflation in 2021 in Spain generated a higher dispersion of inflation across households. As a result, the co-variation between inflation rates and household characteristics, embedded in the parameter estimates displayed in Table 4, increases substantially in 2021 when compared to the average of the period 2006-2021. The key driver of the high inflation in 2021 was the price increases in electricity (incorporated within the housing expenses category). As the share of expenditure on electricity is particularly higher for poorer and older households, the relationship between household-specific inflation and their income and age increased tenfold. In Figures 3(a) and 4(a) we show the average inflation across income quartiles and age groups. In 2021, inflation for lower-income households (bottom quartile) was 2 percentage points higher than for higher-income households (top quartile) and for households whose head is above 60 years old, it was 1.5 percentage points higher than for younger

households. This difference is almost entirely driven by inflation in housing expenditures.

Inflation in the first semester of 2022 continues to be high, reaching almost the same level as inflation for the entire year of 2021. However, with the currently available data, inflation in other goods categories has increased while energy price increases seem to have been more moderate, indicating that inflationary pressures are becoming more widespread across goods. The two main categories where we observe high inflation are food and transportation categories. Poorer (richer) households suffer relatively more (less) from food inflation but less (more) from inflation on transportation. The same pattern is observed for older versus younger households. Hence, the composition of the household-specific inflation across income and age in 2022 has been very different but the overall inflation experience is similar —Figures 3(b) and 4(b)—. As a result, we no longer observe a correlation between income/age and inflation across households

TABLE 4

INFLATION AND HOUSEHOLD CHARACTERISTICS, 2021-2022

| | 2006-2021<br>Inflation - Total | 2021<br>Inflation - Total | Jan-Jun 2022<br>Inflation - Total |
|---|---|---|---|
| Young (below 40y) | -0.098***<br>(0.03) | -0.77***<br>(0.09) | 0.18**<br>(0.07) |
| Adult (between 40y and 60y) | -0.046**<br>(0.02) | -0.72***<br>(0.06) | -0.012<br>(0.04) |
| Income | -0.071***<br>(0.02) | -0.88***<br>(0.06) | 0.10<br>(0.07) |
| Household size | 0.012**<br>(0.01) | -0.16***<br>(0.04) | 0.073**<br>(0.03) |
| Female | -0.044***<br>(0.01) | -0.19***<br>(0.06) | -0.38***<br>(0.04) |
| College | -0.053***<br>(0.01) | -0.18***<br>(0.06) | 0.0063<br>(0.04) |
| Managers | -0.032***<br>(0.01) | -0.22***<br>(0.06) | -0.053<br>(0.05) |
| Fixed-term contract | 0.050***<br>(0.01) | 0.12<br>(0.09) | 0.086<br>(0.07) |
| City size | 0.018***<br>(0.01) | 0.34***<br>(0.04) | 0.32***<br>(0.04) |
| Renters | -0.13***<br>(0.03) | -1.84***<br>(0.05) | -1.40***<br>(0.05) |
| Observations | 276715 | 16220 | 16220 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Young - Age of Head of the Household is smaller than 40, Adult - Age of Head of the Household is between 40 and 60, Income - Log of Real Income, Household size - Number of members in the household, Female - Head of household is Female, College - Head of household obtained college degree, Managers - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a temporary contract, City size - Takes values of 1 to 5, 1 denoting cities with more than 100000 habitants, increasing for smaller cities until 5 denoting cities with less than 10000 habitants and Renters - The main residence of the household is rented.
**SOURCE: INE and own calculations.**

(Figure 4). Finally, renters spend relatively less in all good categories, as a large fraction of their expenditure is on rent, which have not experienced sharp price changes. As such, they face lower inflation rates throughout both 2021 and 2022.

**Inflation and Policy Interventions**

In the summer of 2021, the Spanish government approved a set of measures to mitigate the increase in electricity prices, reducing both the VAT and the excise duty.[4] Have these measures truly helped the most vulnerable households?

INE provides the price changes of categories of goods but also a series of price changes assuming taxes are constant. We collect data on year-on-year inflation from June 2021 to June 2022 for electricity (ECOICOP code 4510, within the housing category)

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[4] See Royal Decree-Law 12/2021 of 24 June 2021 and Royal Decree-Law 17/2021 of 14 September 2021 (both available in Spanish only), approving, respectively, the reduction in VAT on electricity from 21 % to 10 % and the reduction in the excise duty on electricity from 5.1 % to 0.5 %.
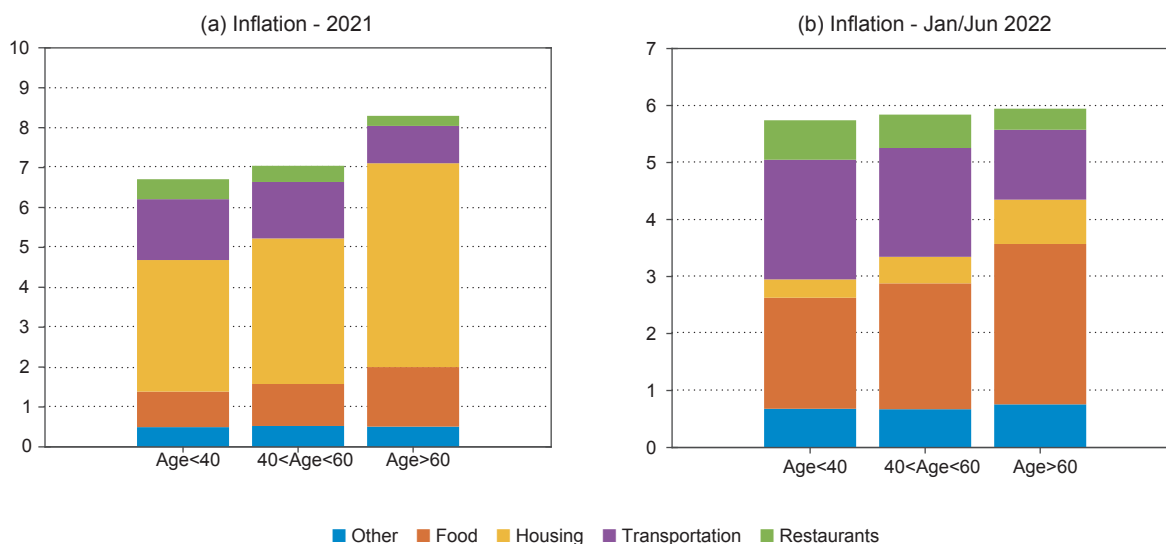
FIGURE 3

**INFLATION ACROSS THE INCOME DISTRIBUTION, 2021-2022**
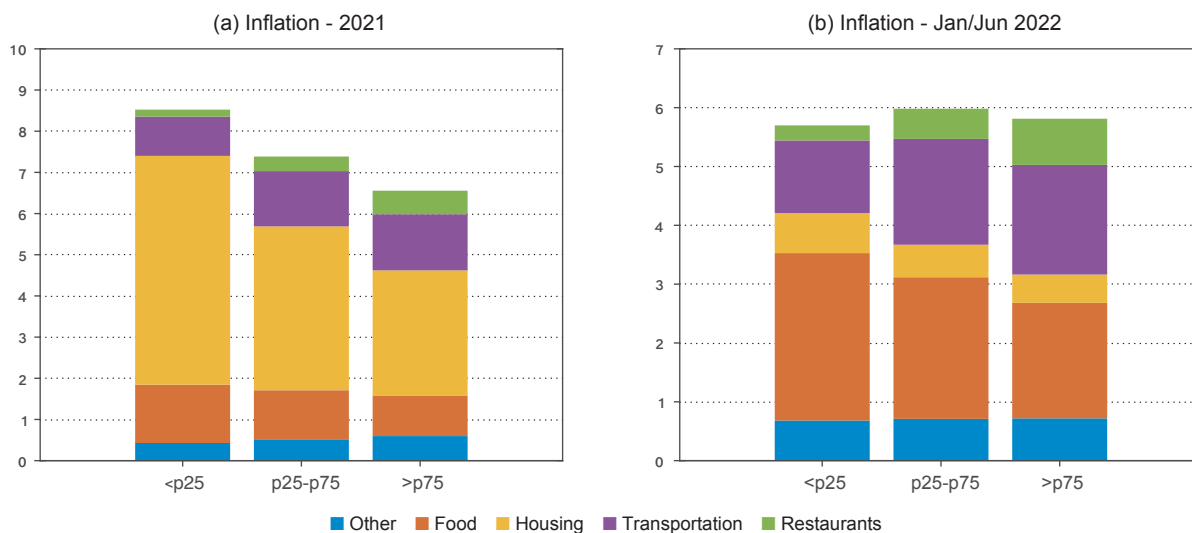
(a) Inflation - 2021

(b) Inflation - Jan/Jun 2022

Other  Food  Housing  Transportation  Restaurants

NOTE: The figures depicts average inflation (total and for the main four categories: food, housing, transportation and restaurants) for 2021 and first semester of 2022.
**SOURCE: INE and own calculations.**

FIGURE 4

**INFLATION ACROSS AGE GROUPS, 2021-2022**

(a) Inflation - 2021

(b) Inflation - Jan/Jun 2022

Other  Food  Housing  Transportation  Restaurants

NOTE: The figures depicts average inflation (total and for the main four categories: food, housing, transportation and restaurants) for 2021 and first semester of 2022.
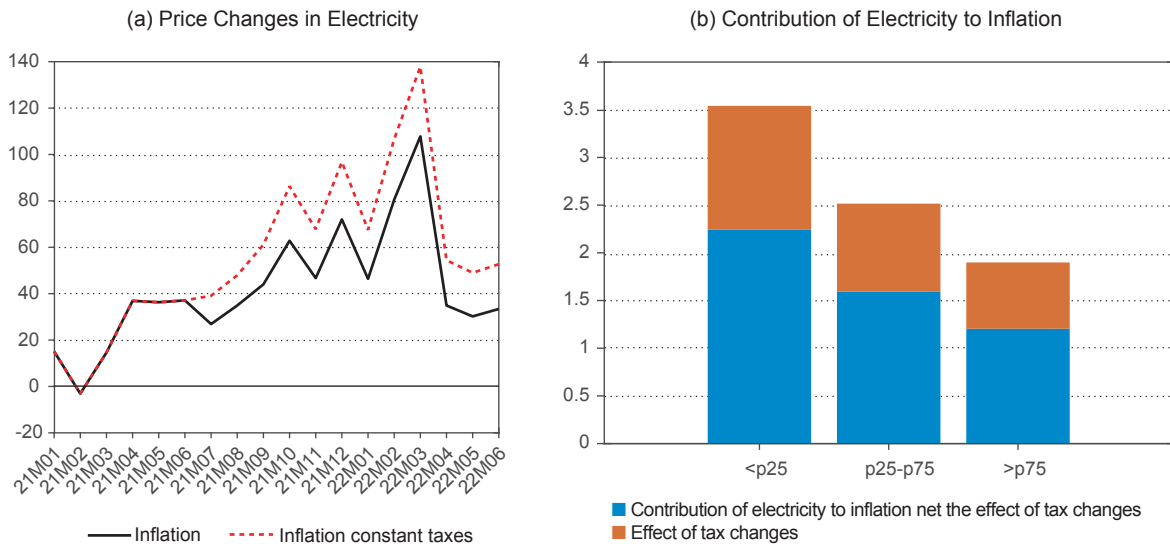**SOURCE: INE and own calculations.**

## FIGURE 5

### TAXES AND ELECTRICITY INFLATION ACROSS THE INCOME DISTRIBUTION



(a) Price Changes in Electricity

(b) Contribution of Electricity to Inflation

— Inflation    ····· Inflation constant taxes

■ Contribution of electricity to inflation net the effect of tax changes
■ Effect of tax changes

NOTE: The figures depicts the contribution of price changes in electricity to inflation from July 2021 to June 2022.
**SOURCE: INE and own calculations.**

for both series. The year-on-year change in electricity prices in June 2022 was 33 % and with constant taxes, it would have been 53 %, as shown in Figure 5(a). Given that households with lower incomes spend a greater share of their expenditure on electricity, these measures benefited them to a greater extent. Without the tax changes, inflation in June 2022 for households in the bottom quartile of the income distribution would have been 3.5 percentage points (pp), relative to the observed inflation of 2.2 pp (out of a total inflation of about 8.5 pp for this group). For households whose income was among the highest 25 %, these figures would be 1.9 pp and 1.2 pp, respectively —see Figure 5(b)—. If this exercise was done considering the peak of the electricity inflation in March 2022, taxes would have reduced the contribution of electricity to inflation for the poorest quartile from 9.2 to 7.2 pp. Therefore, although the measures helped all households, they were indeed more beneficial to the most vulnerable

who spend a greater part of their consumption on electricity.

**Household Consumption Responses to Inflation**

As documented above, price changes in electricity and gas (housing expenditures) were behind the surge in inflation in 2021. Did households attempt to reduce expenditure on these goods?

We analyse changes in household consumption exploiting the panel dimension of the EPF. In the EPF, some households interviewed in 2020 were also interviewed in 2021. We use both the data on expenditure and on quantities in electricity (ECOICOP code 4510, quantities are measured in kWh) and obtain their difference from 2020 to 2021 for each household and regress them on the household characteristics (results are displayed in Table 5). We also obtain the average change in quantity and expenditure across

different quartiles of the income distribution (see Figure 6). We do not find any significant correlation between household characteristics and the changes in quantities consumed or expenditure done on electricity. While looking at the average changes in consumption, we find that in general, it was positive, but less so, for households whose income is in the bottom quartile relative to households whose income is in the middle of the distribution, who adjusted the most. Hence, we do not find evidence of a significant drop in quantities consumed in 2021.[5]

Three caveats are in order. First, we are only observing changes in consumption, which could be the result of many different drivers apart from price changes, and due to data limitation, we cannot isolate the effect of price changes. Second, changes are measured from consumption in 2020 versus 2021. However, consumption patterns in 2020 might have been atypical due to the effects of the pandemic and thus the changes measured cannot be interpreted as due to the effect of shocks in 2021 only (in the Appendix B we show that both quantity and expenditure on electricity increased on average from 2019 to 2020, thus the average increase observed in 2021 does not seem to be a simple reversion of the effects of the shocks in 2020). Finally, although the prices of electricity and gas in the open market have changed considerably during 2021, a proportion of households might have signed electricity and gas provision contracts with fixed prices and as such did not suffer the direct increase in prices. Only after contracts are renewed, during 2022, the household will face high prices and may then adjust the quantities consumed (this seems to be the case since changes in total expenditure in electricity were not as significant in 2021 relative to the increase in prices observed in the open market, given that quantities consumed on average have also increased).

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[5] This is consistent with the overall increase in electricity consumption by households: according to the Institute of National Statistics, in 2021 the total amount of electricity consumed by households was 55.5 million of kWh, compared to 53.1 million in 2020.

## TABLE 5

### CHANGES IN THE CONSUMPTION AND EXPENDITURE OF ELECTRICITY AND GAS

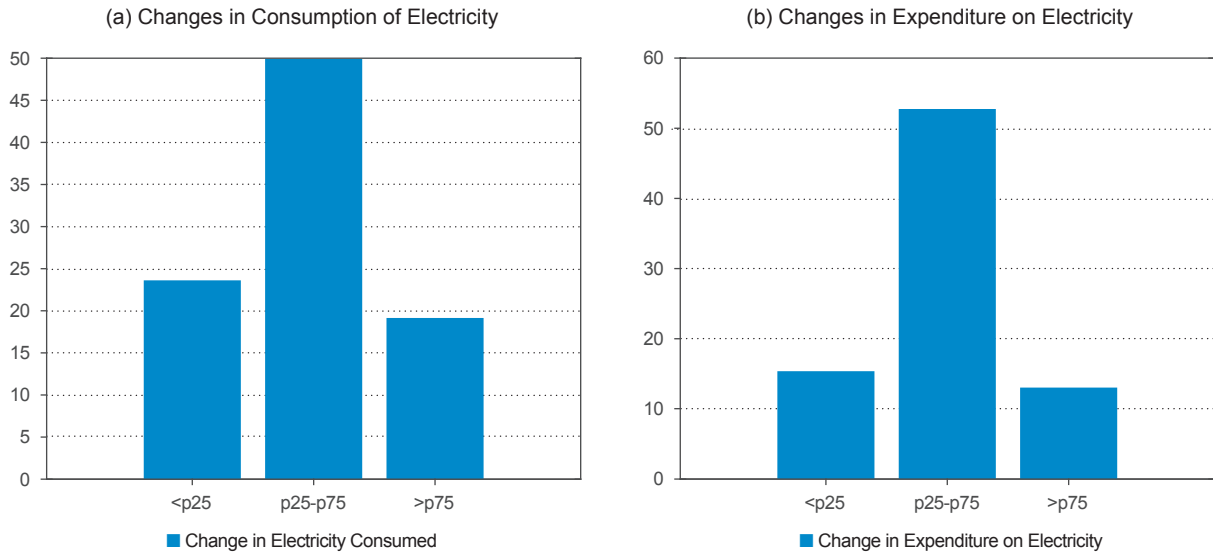|  | ΔElectricity Consumed | ΔExpenditure on Electricity |
|---|---|---|
| Young | 0.089 (0.07) | 0.091 (0.10) |
| Adult | 0.34 (0.30) | 0.46 (0.45) |
| Income | -0.27 (0.20) | -0.33 (0.31) |
| Household size | 0.12 (0.07) | 0.11 (0.09) |
| Female | -0.20 (0.22) | -0.31 (0.33) |
| College | -0.082 (0.10) | -0.023 (0.05) |
| Managers | 0.0015 (0.12) | -0.10 (0.08) |
| Fixed-term contract | -0.27 (0.17) | -0.32 (0.25) |
| City size | -0.048 (0.06) | -0.073 (0.08) |
| Renters | -0.20 (0.29) | -0.35 (0.43) |
| Observations | 5537 | 5779 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Young - Age of Head of the Household is smaller than 40, Adult - Age of Head of the Household is between 40 and 60, Income - Log of Real Income, Household size - Number of members in the household, Female - Head of household is Female, College - Head of household obtained college degree, Managers - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a temporary contract, City size - Takes values of 1 to 5, 1 for cities with more than 100000 habitants and 5 for cities with less than 10000 habitants and Renters - The main residence of the household is rented. Δ denotes percentage change. Change in Electricity Consumed - ΔQuantity in kWh consumed (item 4510), Change in Expenditure in Electricity ΔMonetary Spend (item 4510). **SOURCE: INE and own calculations.**

## 5. Conclusion

Using data provided by the Spanish Household Budget Survey we measure the distributional consequences of inflation from a consumption perspective. We estimate household-specific inflation

FIGURE 6

QUANTITY CONSUMED AND EXPENDITURE ON ELECTRICITY FROM 2020 TO 2021

(a) Changes in Consumption of Electricity

(b) Changes in Expenditure on Electricity

NOTE: The figures depicts the average change in consumption and expenditure on Electricity from 2020 to 2021 across the income distribution.
**SOURCE: INE and own calculations.**

from 2006 to 2021 in Spain and analyse how it varies according to households' known characteristics. We document inflation inequalities across income groups, size, age, education, and gender of distinct (heads of) households. We show that inflation decreases with households' real income, as poorer households spend a larger share of their total expenditures on food and housing expenses. A decrease in real income from the 90th percentile to the 10th is associated with an increase in annual inflation by 11 basis points, equivalent to 180 basis points for the whole period 2006-2021. Moreover, we evidence that households with more members and whose head is less educated, older and male experienced higher inflation.

Our work also concentrates on the 2021 post-pandemic inflation surge and records its heterogeneous effects across distinct Spanish households. The differences are substantial: in 2021, inflation for lower-income households (bottom quartile) was 2 percentage points higher than for higher-income households (top quartile) and for households whose head is above 60 years old it was 1.5 percentage points higher than for younger households. The shares of consumption expenditure on energy and food for poorer and older households are greater, explaining their higher exposure to the price surges of 2021.

Although our findings with regard to the uneven effects of inflation are robust and in line with the literature, a set of caveats are in order. First, we only look at the heterogeneous effects of inflation due to consumption, ignoring other sources of heterogeneity, namely how the household nominal income adjusts differently across households to changes in inflation and how their net asset position and its respective interest rate adjust to

changes in inflation.[6] Second, using a Laspeyres style index with fixed weights implies that we cannot analyse how the composition of consumers' consumption expenditure changes in response to changes in relative prices. A richer and perhaps more frequent panel would be needed to advance further in this regard. In addition, it is also assumed that the prices paid by each household are the same for each good subcategory, which need not be the case. That abstracts from any change in quality within categories. As Argente and Lee (2021) point out, quality substitution may also be an important source of heterogeneity.

With the above in mind, we nonetheless verify that "inflation is not the same for all". The statistically and economically significant differences in the inflation faced by distinct groups of the population have important policy implications. It first highlights that a single, aggregate inflation measure may not be appropriate for the evaluation of the cost of living under different stages of the business cycle or after different shocks. Second, it shows that many policy measures have distributional impacts and these can and perhaps should be assessed in policy evaluation exercises.

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[6] See Cardoso *et al.* (2022). Note that a caveat is needed to compare these effects since the effects on consumption and income are on flow variables while the effect on net asset positions is on a stock variable.

## APPENDIX A

### DATA

In this section, we give more details on the variables used in the regressions. We define age as the age of the head of the household. Dummy variables Young and Adult are for households with the age of head below 40 and between 40 and 60 years, respectively. Income is defined as the logarithm of real income. Household size is measured as the number of members in the household. Retiree indicates if the household head has retired. Female indicates if the head of household is female. Variable College is an indicator variable that takes a value 1 if the head of household obtained a college degree. Variable Manager indicates if the occupation of the head of the household is classified as managerial or while collar. Temporary Contract indicates if the head of the household works under a temporary contract. City size takes values of 1 to 5, 1 denoting cities with more than 100000 habitants, 2 for cities with 50000 to 100000 habitants, 3 for cities with 20000 to 50000 habitants, 4 for cities with 10000 to 20000 habitants and 5 denoting cities with less than 10000 habitants. Finally, Renter takes a value of 1 if the tenure status of the household is renters.

## APPENDIX B

## ADDITIONAL RESULTS

In this section, we present additional regression results (Table 6 and Figure 7).

### TABLE 6

### SHARE OF EXPENDITURE ON CONSUMPTION AND HOUSEHOLD CHARACTERISTICS

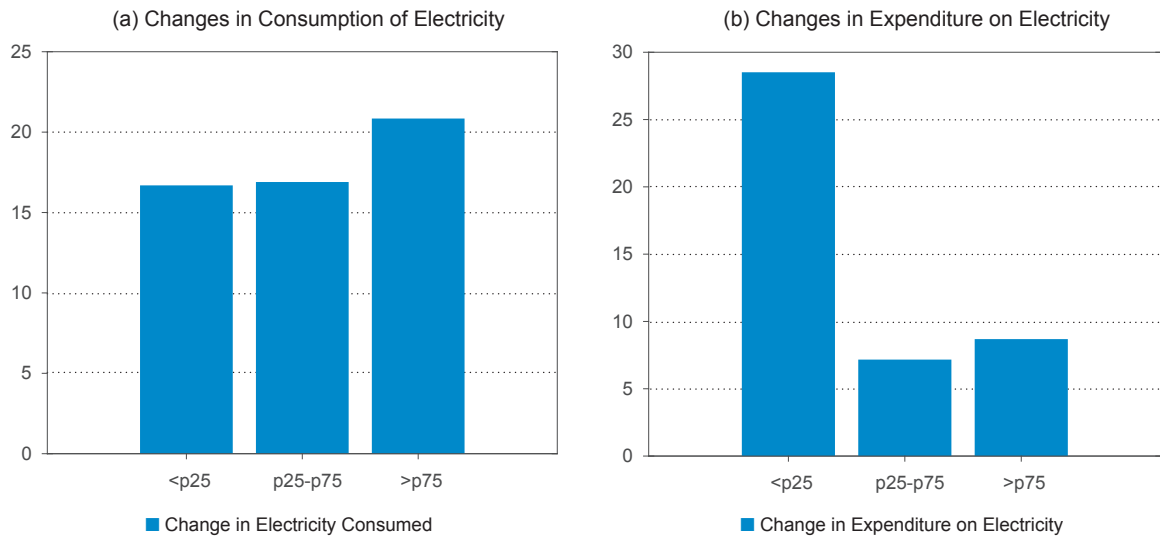|  | Share of Exp. Food | Share of Exp. Housing | Share of Exp. Transportation | Share of Exp. Restaurants |
|---|---|---|---|---|
| Age | 0.0015*** | -0.00085*** | 0.0012*** | 0.00053*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Age squared | 0.000008*** | 0.00002*** | -0.00003*** | -0.00002*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Income | -0.056*** | -0.036*** | 0.029*** | 0.033*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Household size | 0.013*** | -0.0093*** | 0.0025*** | -0.0043*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Retiree | 0.0056*** | -0.0035*** | -0.00094 | -0.0021*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Female | -0.0022*** | 0.010*** | -0.019*** | -0.017*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| College | -0.014*** | 0.0013** | 0.000092 | 0.0029*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Managers | -0.017*** | 0.0010** | -0.0046*** | 0.0067*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Fixed-term contract | 0.0056*** | 0.0032*** | 0.0027*** | -0.0026*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| City size | 0.0031*** | -0.0042*** | 0.0074*** | -0.00091*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Renters | -0.043*** | 0.19*** | -0.023*** | -0.017*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) |
| Observations | 276715 | 276715 | 276715 | 276715 |

NOTE: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Description of variables: Age - Age of Head of the Household, Age Squared - Square of Age of Head of the Household, Income - Log of Real Income, Household size - Number of members in the household, Retiree - Household Head has retired, Female - Head of household is Female, College - Head of household obtained a college degree, Managers - Occupation of the Head of the household classified as managerial or white collar, Fixed-term contract - Head of the household works under a temporary contract, City size - Takes values of 1 to 5, 1 for cities with more than 100000 habitants and 5 for cities with less than 10000 habitants and Renters - The main residence of the household is rented.
**SOURCE: INE and own calculations.**

**APPENDIX B**

## FIGURE 7

### QUANTITY CONSUMED AND EXPENDITURE ON ELECTRICITY AND GAS FROM 2019 TO 2020



(a) Changes in Consumption of Electricity

(b) Changes in Expenditure on Electricity

■ Change in Electricity Consumed

■ Change in Expenditure on Electricity

NOTE: The figures depicts the average change in consumption and expenditure on Electricity from 2020 to 2021 across the income distribution.
**SOURCE: INE and own calculations.**