The Redistributive Effects of Inflation on Spanish Households

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ABSTRACT

This paper examines the heterogeneous impact of inflation on Spanish households between 2021 and 2023, focusing on differences by age and income. The aim is to evaluate how price increases unequally burden households and redistribute welfare across different population segments. The analysis is conducted through the "consumption channel," which considers the effects of inflation based on the different consumption patterns of individuals.

I use publicly available microdata to calculate household-specific inflation and to examine its composition. Then I run a linear regression analysis to explore the relationship between inflation and several other household characteristics. The results reveal how the main burden of inflation shifted from younger and lower-income households in 2021 and 2022, to older and wealthier households during the disinflationary period in 2023. Additionally, the study identifies consistent patterns that associate certain demographic characteristics with housing and food inflation over time.

The findings contribute to the literature on inflation heterogeneity, demonstrating that the "inflation tax" does not affect all households equally and generates redistributional effects that merit consideration.

Keywords: Inflation, Redistribution, Inflation Heterogeneity, Household-Specific Inflation, Consumption Channel, Microdata Analysis.

RESUMEN

Este documento examina el impacto heterogéneo de la inflación en los hogares españoles entre 2021 y 2023, centrándose en las diferencias por edad e ingresos. El objetivo es evaluar cómo el aumento de los precios afecta de manera desigual a los hogares y redistribuye el bienestar entre diferentes segmentos de la población. El análisis se lleva a cabo a través del "canal de consumo", que considera los efectos de la inflación según los distintos patrones de consumo de los individuos.

Utilizo microdatos de acceso público para calcular la inflación específica de cada hogar y examinar su composición. Luego, realizo un análisis de regresión lineal para explorar la relación entre la inflación y varias características de los hogares. Los resultados revelan cómo el principal peso de la inflación pasó de los hogares más jóvenes y con menores ingresos en 2021 y 2022, a los hogares de mayor edad y con más recursos durante el período desinflacionario de 2023. Además, el estudio identifica patrones consistentes que asocian ciertas características demográficas con la inflación en vivienda y alimentos a lo largo del tiempo.

Los hallazgos contribuyen a la literatura sobre la heterogeneidad de la inflación, demostrando que el "impuesto inflacionario" no afecta a todos los hogares por igual y genera efectos redistributivos que merecen consideración.

Palabras clave: Inflación, Redistribución, Heterogeneidad de la Inflación, Inflación Específica de los Hogares, Canal de Consumo, Análisis de Microdatos.

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1. Introduction

Since the beginning of this century, the euro area has undergone a series of structural changes, like an ageing population and slower productivity growth, which led to a declining growth trend (Masuch, Aderton, Setzer, & Benalal, 2018). This situation, together with the legacy of the global financial crisis, pushed down inflation in a period, from 2013 to 2020, where euro area inflation has mostly been below the monetary policy authority target. In addition to this, the world has been changing, with several major shocks, including the recent coronavirus pandemic, slower globalization trend, higher digitalization and climate change challenges. In this challenging environment, in July 2021 the European Central Bank (ECB) reviewed its monetary policy strategy (European Central Bank, 2021) modifying the interpretation of its inflation target from "below, but close to, two per cent" to a symmetric "two per cent inflation target over the medium term", which considers both negative and positive deviations of inflation from the target to be equally undesirable.

However, since 2021 it begun a very intense inflationary period that was mainly driven by external shocks such as the reopening of economies after the COVID-19 pandemic, the subsequent supply chain disruptions, and (since February 2022 by) the serious energy shortages caused by Russia's invasion of Ukraine - a particularly significant issue for a net energy importer area like the European Union.

These shocks triggered a huge fiscal response from the EU, primarily through the Next Generation EU (NGEU) program, along with an unprecedented monetary policy response from the ECB. Among the other measures, the ECB launched the Pandemic Emergency Purchase Programme (PEPP) and raised the cost of money (interest rates) to a record-high 4% (deposit facility rate) in September 2023, in an effort to control inflation and keep long-term inflation expectations anchored to the target. The sharp rise in inflation also led the ECB to shift from a *forward guidance* communication strategy to a less certain approach, based on data dependency and decisions taken on a meeting-by-meeting basis.

The unprecedented increase of price levels reached its peak in October 2022 when the euro area headline inflation rate reached the figure of 10,6% (Figure 1). This situation was the same for all euro area countries even if with some timing differences. Spain for example reached the peak of 10,7% in July 2022, slightly before the euro area. Since then, inflation started a decreasing path, mainly thanks to the drop in energy prices, the easing of supply chain disruptions, and the effects of tighter monetary policy (Hernández de Cos, 2024).
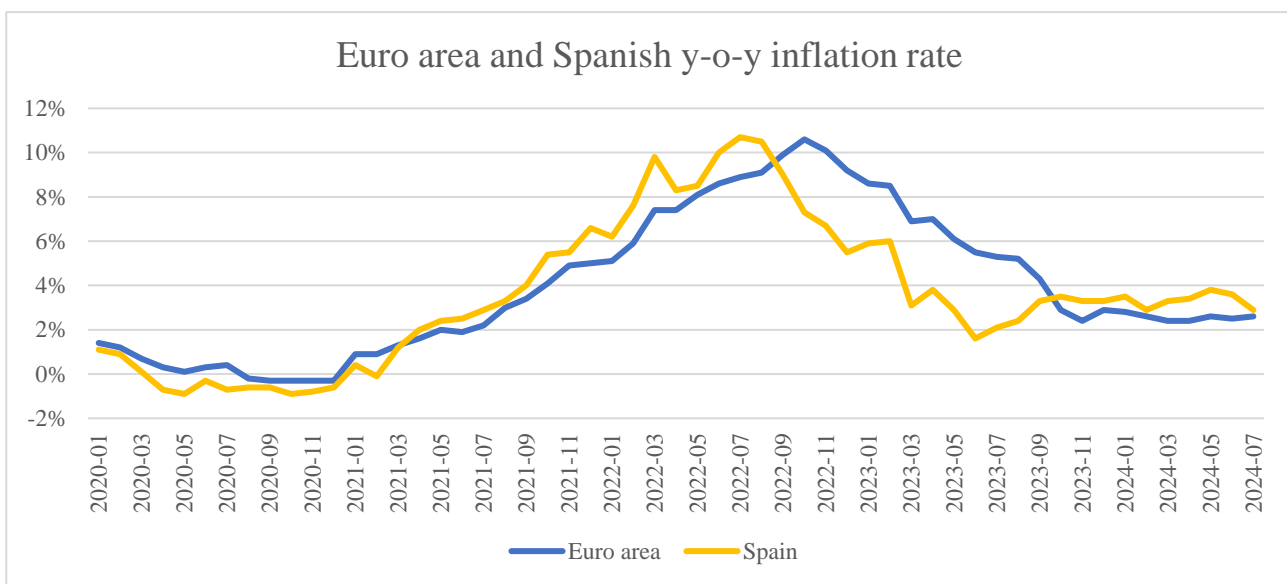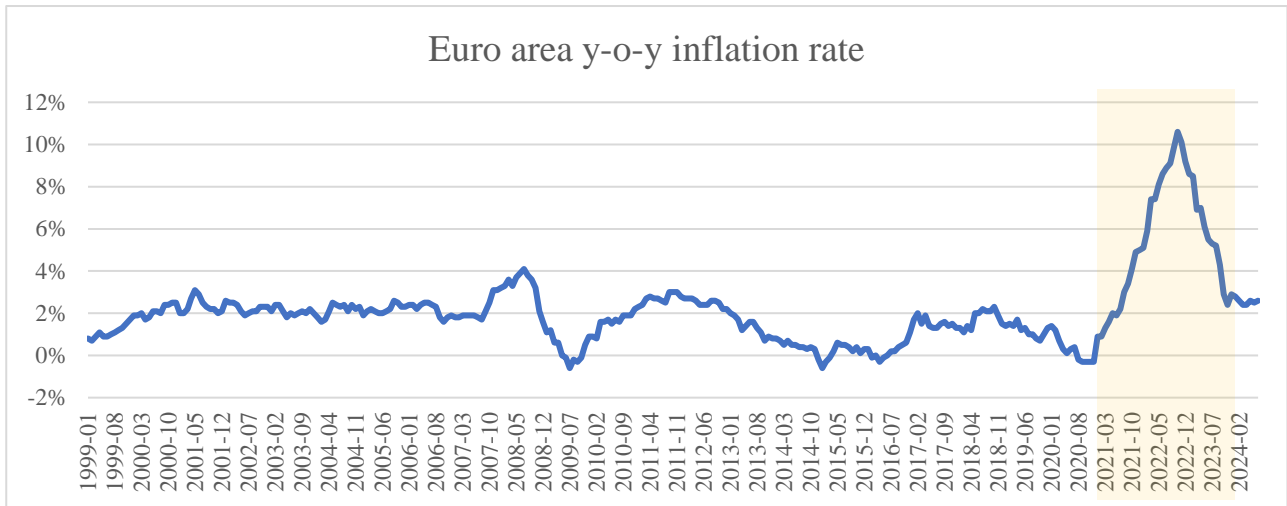
Figure 1: Inflation rate (HICP), year-on-year percentage change, monthly. On the top panel euro area inflation since the creation of the Euro (highlighted the period 2021-2023); on the bottom panel a comparison between euro area and Spanish inflation since January 2020. Source: Eurostat

Inflation is often described as an "invisible tax" because it erodes the purchasing power of money, thereby reducing the real value of income and savings. Indeed, as prices increase due to inflation, the same amount of money can buy fewer goods and services. This means that people effectively have less purchasing power, similar to how a tax reduces disposable income. This erosion in the purchasing power of money generates redistributional effects because it impacts different individuals and groups in varying ways. Therefore, while inflation may affect everybody, it does not affect everybody in the same way. Individual inflation rates can vary significantly depending on factors like income levels, wealth composition, and consumption patterns. In this sense, some recent studies like (Ferreira, et al., 2024), (Basso, Dimakou, & Pidkuyko, 2023) or (Pallotti, Paz-Pardo, Slacalek, Tristani, & Violante, 2023), have tried to address the impact of the recent inflation shock across euro area or Spanish households. In particular, they consider the impact of inflation based on three main channels: (i) the "wealth channel", which captures how inflation redistributes real wealth from lenders to borrowers by changing the value of nominal assets and liabilities, (ii) the "income channel", which reflects how inflation reduces the real value of nominal income (that is often sticky), and (iii) the "consumption

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channel", which analyse the impact of inflation based on the fact that prices of some goods or services rise more than others.

In this paper, I analyse the impact of inflation on different individuals through the "consumption channel". This channel stems from the fact that people consume different baskets of goods and services, and therefore a heterogeneous increase in price across these items will affect individuals differently. Specifically, those who consume more of the goods and services that experience the largest price increases will experience higher individual inflation rates. This leads to a higher reduction in their wealth as they need to devote a larger share of resources to pay for their consumption basket.

The year-on-year increase in the Consumer Price Index (CPI), the most widely used economic indicator of inflation, measures the increase in the cost of a predetermined market basket for an average consumer and is often assumed to affect all people equally. But in reality, in averaging across individuals, it ignores the differences in the spending patterns across households which often result in different inflation levels for each person.

The focus is placed on the "consumption channel" since analysing the first two channels becomes challenging during a prolonged period of volatile inflation. Indeed, if it is true that the inflation surge in 2021 was largely unexpected (thus making it a favourable year to study the effect of temporary inflation shocks), this is not the case for the following years when inflation becomes larger and more persistent. In such a context, economic agents constantly tend to adjust their inflation expectations about the future, which implies that nominal contracts (such as loans) or income sources (like wages and pensions) may be renegotiated or indexed to inflation more frequently. This reduces the redistributive effect between debtors and creditors, as interest rates on new contracts are adjusted to account for expected inflation. Moreover, there are often lags in the adjustment of wages and pensions to inflation, which further complicates the analysis of inflation's impact on real incomes. In this sense, wage growth in the euro area reached a 5,2% increase in 2023 (the highest annual rate since the start of the euro), and remained at 4,7% in the first quarter of 2024, in a context of low growth and inflation closer to the target, making it one of the most important issue for possible further inflationary pressure (Bing, Holton, Koester, & Roca, 2024).

On the other hand, focusing on the "consumption channel" has the advantage of directly showing how price changes impact the cost of living for households, based on their specific consumption patterns. This implies that their purchasing power is reduced when all other variables (such as income) remain constant and is therefore more effective in addressing the immediate effects of inflation.

This approach is consistent with the fact that an individual cares about how the prices of the goods that he/she consumes change, and not those of the average consumer. Despite the potential for a "substitution effect" (where consumers replace more expensive goods with cheaper alternatives), this channel still offers a more straightforward approach to understanding the impact of inflation in such a volatile environment.

The purpose of this paper is therefore to analyse how inflation affects different individuals and try to understand who benefited and who suffered the most from it during the recent shock. To do this, I use Spanish publicly available microdata on household consumption expenditures and calculate household-specific inflation for the years 2021, 2022 and 2023. Then I examine how it varies

according to specific household characteristics, with a particular focus on age and income, is examined. The aim is to understand if the individuals with higher income and those with lower income suffer equally or not, and whether households with older members are more or less exposed to inflation compared to those with younger members.

The results suggest that for 2021 and 2022 the most affected groups have been the youngest and the poorest, which experienced higher personal inflation rates compared to the rest of the population. On the other hand, the disinflationary period of 2023, reversed this situation partially compensating for the wealth loss in the previous years.

The paper proceeds as follows: Chapter 2 explains the data and methodology used. Chapter 3 illustrates the stylized facts for 2021, 2022, and 2023. Chapter 4 provides an econometric analysis to empirically test the aforementioned hypothesis. Chapter 5 summarizes the main conclusions.

2. Data and Methodology

The basis of my analysis is the Spanish Household Budget Survey (*Encuesta de Presupuestos Familiares*, EPF henceforth), a comprehensive household expenditure survey carried out with annual frequency by the Spanish National Statistical Institute (*Instituto Nacional de Estadística*, INE henceforth) since 1958, with a sample size of around 20.000 Spanish households. Its main goal is to collect detailed information on household consumption expenditures and their evolution over time. I use the "expenditure table" and the "household table" provided by the EPF to extract households' characteristics and data that I need for the analysis.

For each household and expenditure category, I use the following variables: "Age", "Income" and "Monetary Expenditure"; "Age" refers to the age of the head of the household, "Income" refers to the amount of the total net monthly household income, and "Monetary Expenditure" represents the actual monetary expenditures of the household excluding all non-monetary expenditures such as those for self-consumption and imputed rents for housing owned.

I also use the 2-digit expenditure classification from INE, which classifies households' expenditures based on 12 ECOICOP groups[1], and I calculate the total expenditure of each household for each category. This means that the prices (and the changes) faced by each household are the same for all goods in the same consumption category.

Then I take the annual average inflation rate based on the Consumer Price Index (CPI) for these 12 categories (Table 1) in order to calculate the household-specific inflation rate for the years 2021, 2022 and 2023.

	2021	2022	2023
01 Food and non-alcoholic beverages	1,8	11,6	11,7
02 Alcoholic beverages and tobacco	0,3	3,9	7,6
03 Clothing and footwear	1,0	2,7	2,2
04 Housing, water, electricity, gas and other fuels	11,1	15,5	-11,0
05 Furnishings, household equipment and routine household maintenance	0,9	6,3	5,0
06 Health	0,7	1,1	1,9
07 Transport	7,3	12,1	-0,4
08 Communication	-3,0	-1,3	3,1
09 Recreation and culture	0,2	2,8	4,4
10 Education	0,2	1,2	2,0
11 Restaurants and hotels	0,9	6,4	6,8
12 Miscellaneous goods and services	1,0	3,5	4,7
Overall Index	3,1	8,4	3,5

Table 1: Annual average of Consumer Price Index (CPI). National indices: overall and by ECOICOP group. Units: Annual growth rates. Source: INE

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[1] European Classification of Individual Consumption according to Purpose (ECOICOP)

As observed in Table 1, the increase in consumer prices in 2021 is mainly concentrated in *Housing, water, electricity, gas and other fuels* (category 4), and *Transport* (category 7). This is consistent with the increase in the price of energy, which more than doubled in 2021, driven by both the increase in the price of oil and base effects linked to the collapse in oil prices at the beginning of 2020 (Rubene & Koester, 2021) (European Council, 2024). This trend continues and even intensifies in 2022 as prices for *Housing, water, electricity, gas and other fuels* and *Transportation* rise further due to the effects of the Russia-Ukraine war. Additionally, *Food and non-alcoholic beverages* (category 01) surged, reaching 11,6%. The rise in food inflation was primarily driven by increasing global energy and food commodity prices since the second half of 2021 (Bodnár & Schuler, 2022), which led to higher input costs. In 2023 we assisted in a decline in the energy price, which translated into a fall in prices for *Housing, electricity and gas*, and *Transportation*, while *Food and non-alcoholic beverages* inflation remained quite high, significantly contributing to the annual average inflation.

Food, Housing (which includes water, electricity, gas and other fuels) and Transportation (which includes motor fuel) were the three main drivers of inflation during the period 2021-2023, therefore I will focus on them in analysing the evolution of individual inflation for those years. "Food inflation" will be represented by category 01, "Housing inflation" by category 04 and "Transportation inflation" by category 07 of Table 1.

Household i specific inflation rate, denoted π_{it}, is calculated as:

$$\pi_{it} = \sum_{j \in J} \frac{s_{jit-1}}{S_{it-1}} \pi_{jt}$$

Where s_{jit-1} is the expenditure in good category j (within a set of categories J) by household i at year $t-1$, S_{it-1} is the total expenditure of household i at year $t-1$, and π_{jt} the average inflation rate of good category j at year t.

As can be seen, in order to calculate individual inflation rates, I use the consumption basket of the previous year and the inflation rate of the current year. For example, to calculate individual inflation for 2021, I use the EPF 2020 and the annual average inflation rate for each ECOICOP category for 2021, assuming that the consumption basket doesn't change from one year to the other. Moreover, in the EPF each surveyed household (of the 20.000) is weighted with a "population factor" (to represent a different part of the total population) which is taken into account for all the calculations in this paper.

Using this method to calculate individual inflation is simpler and more straightforward, but the main disadvantage is that the aggregate inflation will not match exactly with INE official inflation data. This is due to the different and more complex methodology used by INE[2]. Nevertheless, this

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[2] To calculate the aggregate inflation rate, INE uses a "chained index that establishes comparisons between the current period (t) and the base period (0) but considering intermediate situations (k), … which correspond to the months of December of all years". "The main drawback of chained indices is the lack of additivity. This means that it is not possible to obtain the index of any aggregate as a weighted average of the indices of its component aggregates. Thus,

discrepancy is not a major concern as aligning with official data is not the primary objective of this exercise. Instead, the advantage of my methodology is that I can use "personalized" weights when calculating individual inflation since they are based on the actual expenditure of each household. For the sake of accuracy, it does not exist a standard or *correct* method to calculate individual inflation between using "personalized" weights for each household based on their consumption basket or using the aggregate basket for the average consumer.

In the following paragraph (3) individual inflation is calculated and households are grouped by age and income groups. For age, I group the households into four categories:

1) Young Households: Households where the head is 34 years or younger, that are in the early stages of their career and are establishing their financial independence or starting a family.
2) Middle-Age Households: Households where the head is between 35 and 49 years old, generally more financially stable with established careers that may be focused on raising children and managing mortgages.
3) Mature Households: Households where the head is between 50 and 64 years old. These households are usually at the peak of their earning potential and may be preparing for retirement, with their children transitioning to leave home.
4) Old Households: Households where the head is 65 years or older, mostly retired and focused on leisure and health management.

On the other side, households are grouped by quartiles of income[3], as follows:

- First Quartile (q1): Includes the population from 0% to 25% (lowest incomes). These represent the poorest share of the population.
- Second Quartile (q2): Includes the population from 25% to 50%.
- Third Quartile (q3): Includes the population from 50% to 75%.
- Fourth Quartile (q4): Includes the population from 75% to 100% (highest incomes). These are the richest share of the population.

In paragraph 4, I conduct a linear regression analysis using Ordinary Least Squares (OLS) to examine the relationship between the variables and to identify any potential trends or patterns. The primary objective of this analysis is to gain a deeper understanding of how inflation is related to different household characteristics. To this end, I extract the following variables from the EPF, which are then used for the regression analysis:

- *Income*: exact amount of the total net monthly household income
- *Age*: age of the household's head
- *Household Size*: number of people composing the household.
- *Occupation*: Categorical variable for the occupation held by the head of the households, that classifies the population according to the following categories:
    - *1 Directors and managers*

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for example, the overall index cannot be calculated as a weighted average of the indices of the twelve groups." (INE, 2017)

[3] For informational purposes, in 2021 (2023) the first quartile includes households whose net monthly income is below 1217€ (1282€), q2 includes those from 1218€ to 1830€ (1283€ to 2195€), q3 from 1831€ to 2792€ (2196€ to 2850€), and q4 above 2793€ (2851€).

- *2 Technicians and professionals*
- *3 Clerical and administrative workers and service and trade workers*
- *4 Craftsmen and skilled workers in other sectors, operators and assemblers*
- *5 Workers in elementary occupations*

- *Education*: Categorial variable for the level of studies completed by the head of the household that classifies the population according to the following categories:
    - *1 Lower than the first stage of Secondary Education.*
    - *2 First stage of Secondary Education*
    - *3 Second stage of Secondary Education*
    - *4 Higher Education*

- *City Size*: categorical variable to represent the size of the city where the household lives. It is classified as follows:
    - *1 Municipality with 100.000 inhabitants or more*
    - *2 Municipality with 50.000 or more and less than 100.000 inhabitants*
    - *3 Municipality with 20.000 or more and less than 50.000 inhabitants*
    - *4 Municipality with 10.000 or more and less than 20.000 inhabitants*
    - *5 Municipality with less than 10.000 inhabitants*

Finally, in order to highlight the key expenditure items that drive the relationship between inflation and household characteristics, I re-run the regression analysis replacing the Total Inflation rate with the inflation rate of each one of the three main categories.

3. Household-Specific Inflation Analysis

3.1 Household-specific inflation in 2021 by age and income

In 2021, the average inflation calculated as the weighted average of the inflation rates of the twelve groups is 3,4%. Figure 2 shows that inflation is higher for the Young Households which experience a personal inflation of slightly over 4%, while Mature Households are the ones which experience lower inflation at 3,28%. Regarding income levels, the poorest individuals in the first quartile (q1) experience higher inflation at 3,89%, while it decreases constantly as income increases, with the richest in q4 experiencing the lowest inflation rate at 3,11%.
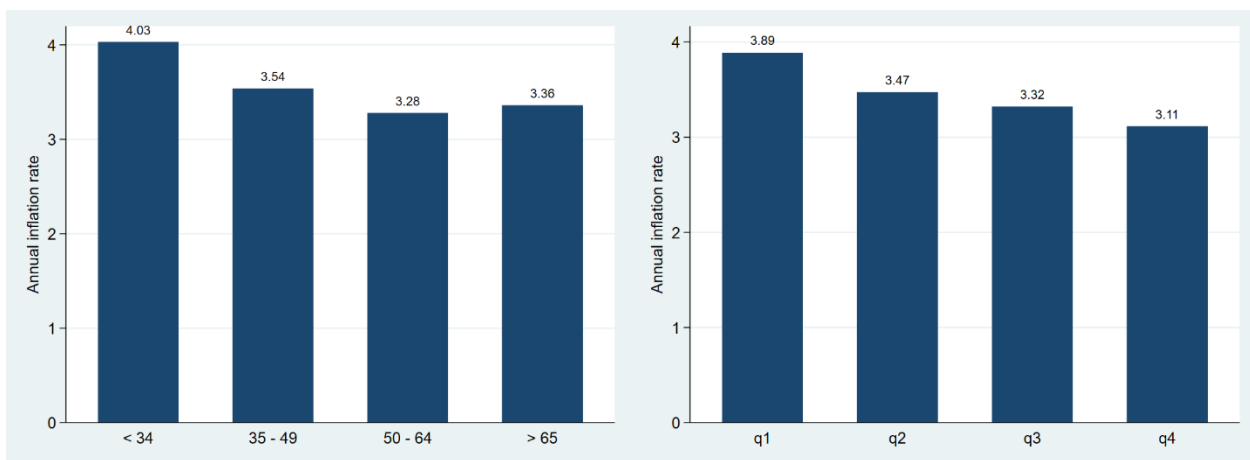

Figure 2: On the left side, mean of household-specific inflation by age; on the right side, mean of household-specific inflation grouped by income in 2021. Source: Own elaboration.

When analysing the composition of inflation (Figure 3), we observe that more than 95% is concentrated on the three main categories. In particular, "Housing" represents the most significant contributor to inflation, which is consistent with the high energy inflation in 2021 (since the housing category includes high energy-dependent items like electricity and gas). Housing inflation is higher for younger and older households (2,64% and 2,24% respectively), and lower for Mature Households (1,88%). On the other hand, transportation inflation is higher the younger the household, probably because households with older heads tend to make less use of personal vehicles. Analysing inflation by income reveals that the poorest households are more affected by inflation in the "Food" and "Housing" categories, likely because they spend a larger proportion of their income on basic necessities compared to wealthier households, while they are less affected by transportation inflation when compared to the richest (0,5% against 0,84% respectively).
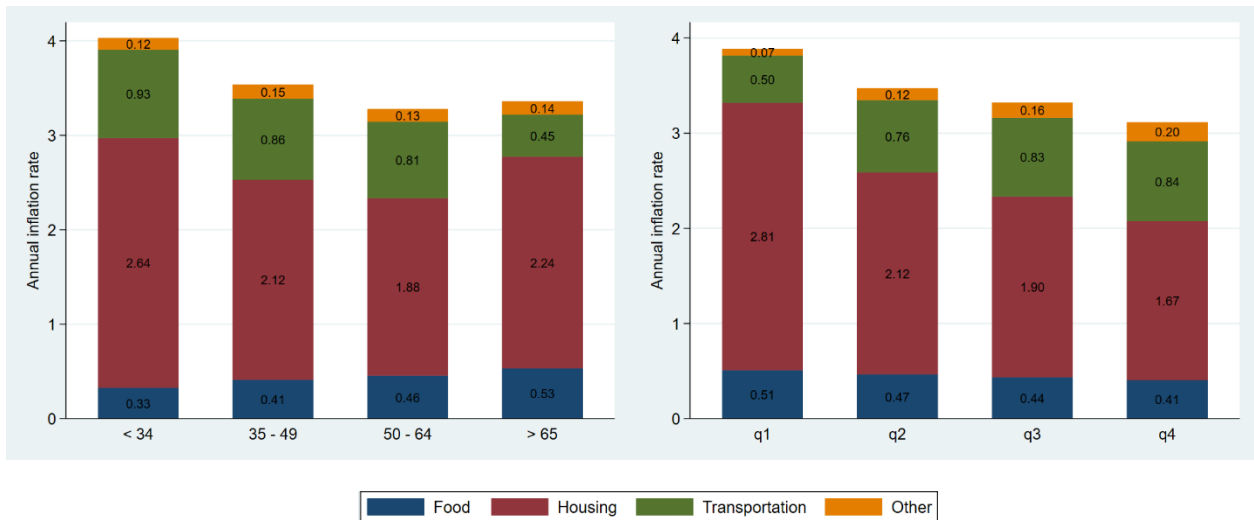
Figure 3: Mean of household-specific inflation in 2021 by main categories for age group (left panel) and income group (right panel). Source: Own elaboration

When grouping together (Figure 4), it is evident that the most affected by inflation are the Young Households in the second quartile, followed by the poorest (q1) Middle-Age Households and the poorest Young Households. On the other hand, those who suffer the less are the richest Mature Households (2,97%) and the richest Old Households (3,05%). Regarding the main categories, it is clear that food inflation is generally higher the older the household's head, while housing inflation has a bigger impact on poorer households in every age category, with the ones between 35-49 years old as the most affected (3,04%). Transportation inflation is more heterogeneously distributed and had a more significant impact on younger households, with the Young Households in the second quartile as the most affected (1,05%) and the Old Households in the first quartile as the less affected (0,26%).
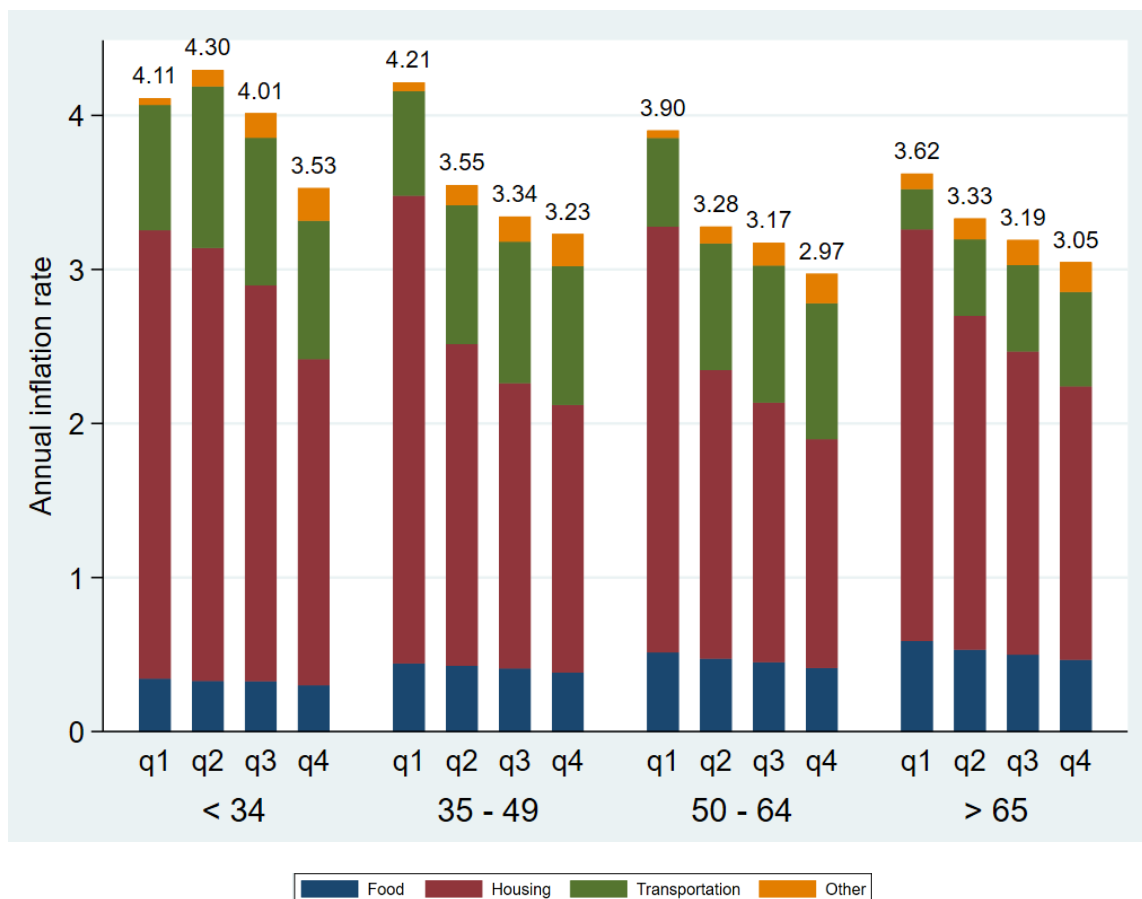
Figure 4: Mean of household-specific inflation in 2021 by main categories for combined age and income groups. Source: Own elaboration.

3.2 Household-specific inflation in 2022 by age and income

In 2022, the average inflation calculated as the weighted average of the inflation rates of the twelve groups is 8,4%, which in this case matches exactly with INE general inflation. Looking at the inflation distribution by age groups (Figure 5) we see that the most affected are the Young Households (8,77%) and the least affected are the Mature Households (8,32%). Contrary to 2021, the inflation here is more homogeneously distributed along age groups, with a difference between the most affected and the least affected of just 0,45 percentage points. On the other hand, when looking at the distribution of inflation by income quartiles, we assist to the same pattern as 2021, with the poorest in the q1 as the most affected (9,1%) and the richest in the q4 as the least affected (7,95%).
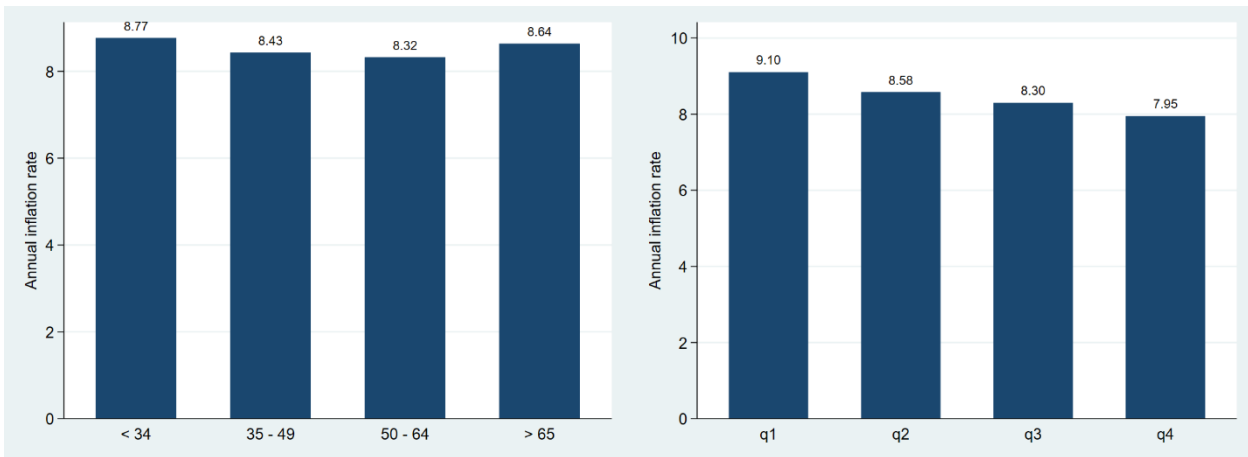
Figure 5: On the left side, average household-specific inflation by age; on the right side, average household-specific inflation grouped by income in 2022. Source: Own elaboration.

Analysing the composition of inflation by main categories individually (Figure 6), we observe a pattern similar to 2021. Specifically, food inflation increases with age and decreases with income, while transportation inflation decreases with age and increases with income. Meanwhile, housing inflation decreases up until the Mature Households category, before rising again for Old Households. However, the main difference with the previous year is that, even if housing inflation is still the main contributor to personal inflation for people younger than 50 years old (even if in a small relative term when compared to 2021), it is replaced by food inflation as the main inflation contributor for households older than 50 and for the richest half of the population (q3 and q4). This is consistent with the data in Table 1, where inflation for *Food and Non-Alcoholic Beverages* increased from 1.8% in 2021 to 11.6% in 2022. However, as previously discussed, this inflation impacts different segments of the population in different ways.
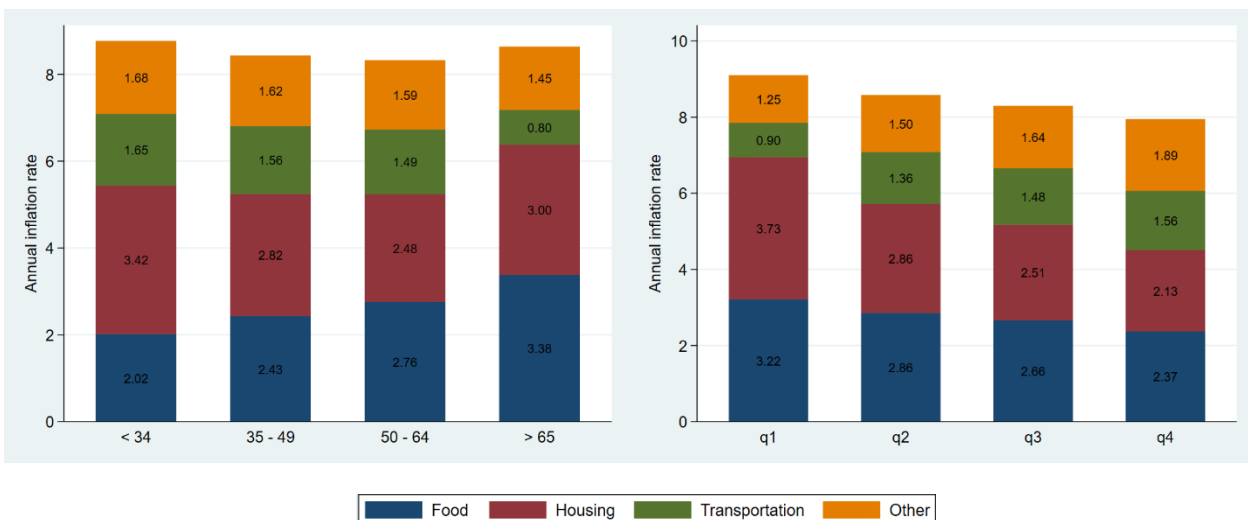

Figure 6: Mean of household-specific inflation in 2022 by main categories for age group (left panel) and income group (right panel). Source: Own elaboration

When looking at the combined age-income graph in Figure 7, we see again that the poorest (q1) are the ones that experience higher inflation in all age groups, always above 9%, and that inflation

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decreases as income increases for all age groups. Both food inflation and housing inflation reach the highest level for poor Old Households, respectively 3,77% and 3,61%, while transportation inflation is larger for the poorest Young and Middle-Age Households at 4,03%. The heterogeneity in food inflation is such that even the highest value among Young Households is still lower than the lowest value for Old Households, while the opposite happens for transportation inflation.
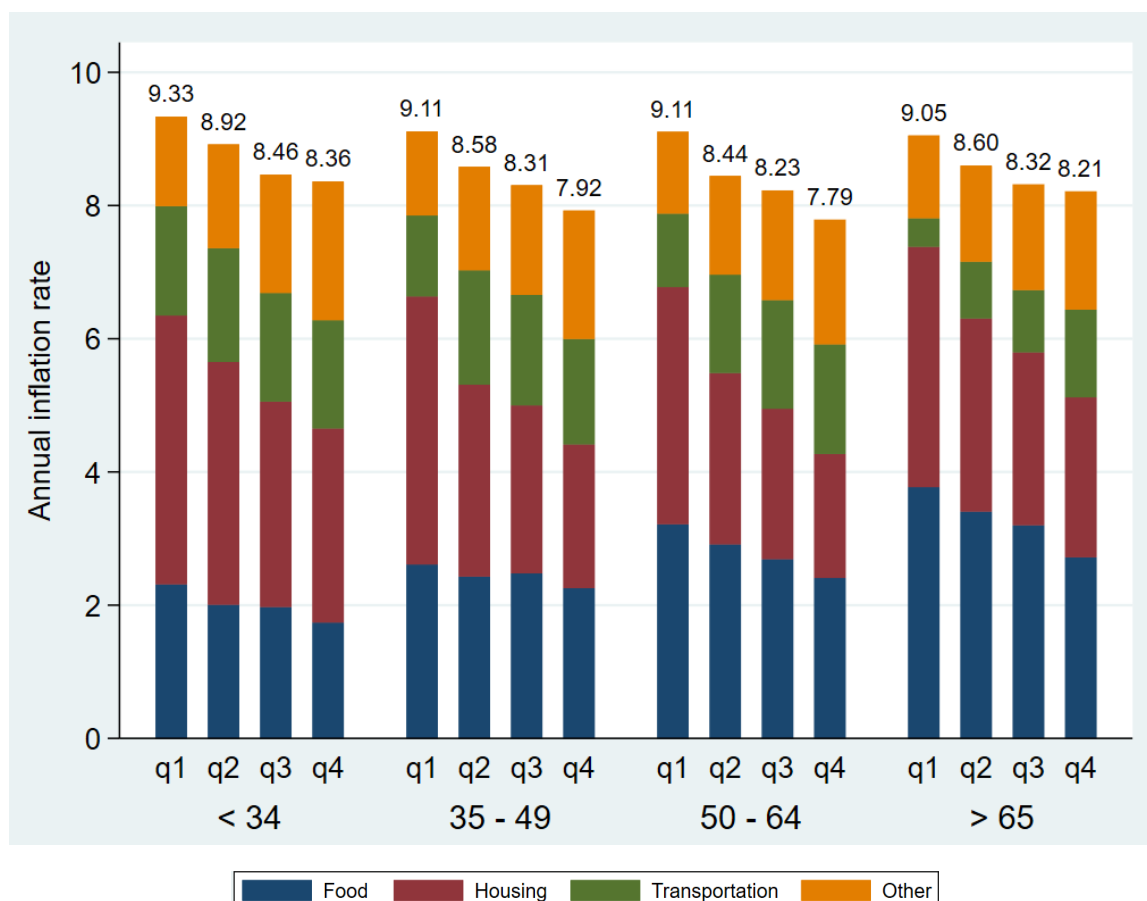

Figure 7: Mean of household-specific inflation by main categories for each age-income group in 2022. Source: Own elaboration.

3.3 Household-specific inflation in 2023 by age and income

In 2023, the weighted average of the inflation rates of the twelve ECOICOP groups is 2,7%, with the specificity that both housing inflation and transportation inflation have negative values. Particularly the former shows a year-on-year drop in prices of – 11%, thus having a huge impact on personal inflation.

For this reason, as can be seen from Figure 8, the households that were most affected by housing inflation in the previous years (that is, the ones with heads younger than 34 and in q1) enjoy lower personal inflation, with values much below the average, at 1,35% for Young Households and 2,18% for the poorest households. On the other hand, Old Households and the richest households are the most affected with average personal inflation of 3,11% and 3,16% respectively. Looking at the income

groups, the situation is completely the opposite of the previous years, with personal inflation that rises as income increases. This may be once again explained by the big drop in housing inflation.
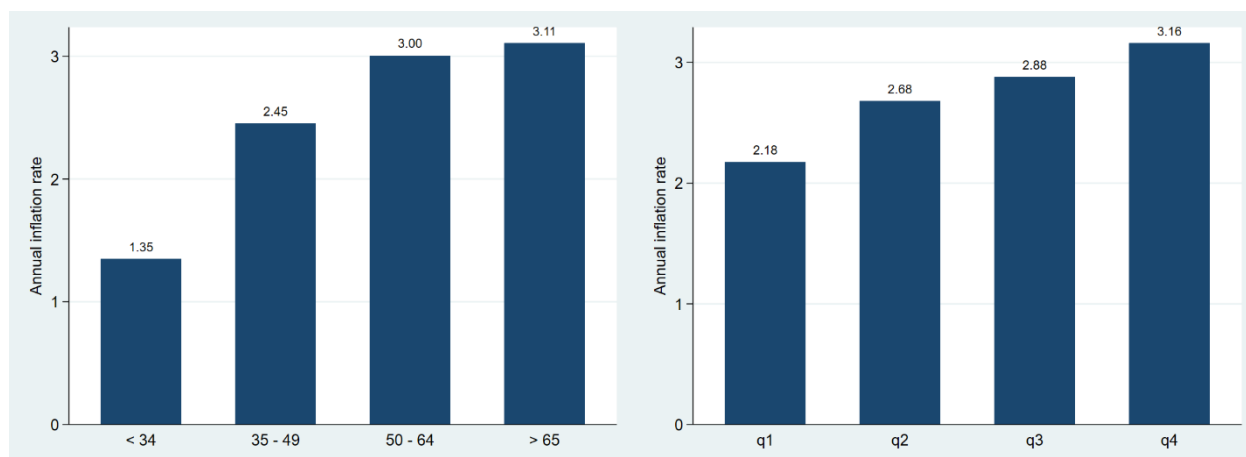

Figure 8: On the left side, average household-specific inflation by age; on the right side, average household-specific inflation grouped by income in 2023. Source: Own elaboration.

This condition is confirmed by the detailed inflation rate by categories shown in Figure 9, where it is evident the negative impact of housing inflation on the youngest and the poorest. Moreover, it is evident how this is the main cause of the reversed pattern for income groups. The decrease in housing inflation is higher for poorer households and it lowers as income increases. On the other hand, food inflation keeps following the same pattern as the previous years, increasing as age increases and decreasing as income increases, with the oldest and the poorest as the most affected.
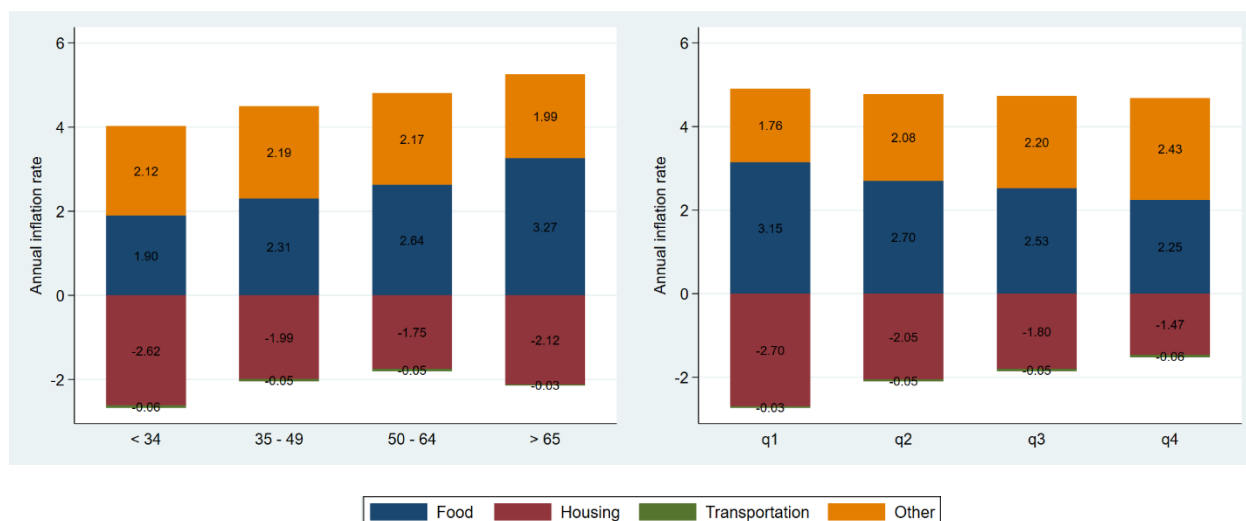

Figure 9: Mean of household-specific inflation in 2023 by main categories for age group (left panel) and income group (right panel). Source: Own elaboration

When looking at the combined effect on age and income (Figure 10), we see that the most affected by food inflation are the poorest Old Households (3,72%), while the ones that benefit the most from the decrease in housing inflation are the poorest Young Households (-3,09%).
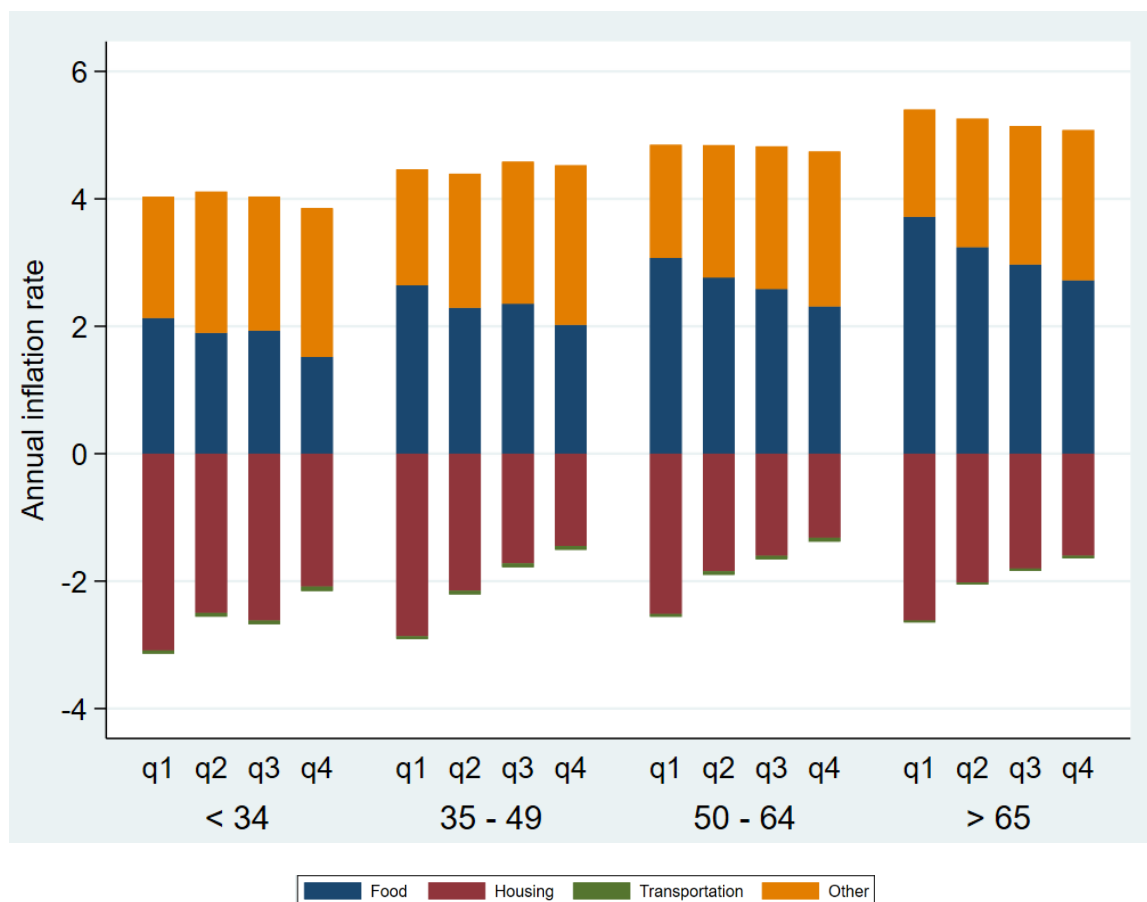

Figure 10: Mean of household-specific inflation by main categories for each age-income group in 2023. Source: Own elaboration.

3.4 Inflation rate gap

As we have seen, the impact of inflation is uneven among different segments of the population. To better understand this situation, the "inflation rate gap" is calculated, representing the difference in the average inflation rate experienced by the youngest and the oldest, as well as by the poorest and the richest. The disparity in the impact of inflation is clearly illustrated in Figure 11. The inflation gap between the poorest and the richest is 0,78 % in 2021 and increase to 1,15 % in 2022, before turning negative to -0,98 percentage points in 2023. This means that the poorest segment of the population (q1) was more affected by inflation than the richest segment (q4) in 2021 and 2022, while the opposite happens in 2023 when the richest suffer from higher inflation of almost 1% compared to the poorest. Regarding the inflation rate gap by age, the difference is pronounced in 2021, when the youngest faced an inflation rate 0,67% higher than the oldest; almost negligible in 2022, and becomes very significant in 2023 with the oldest individuals being hit much harder (1,76%) than the youngest.
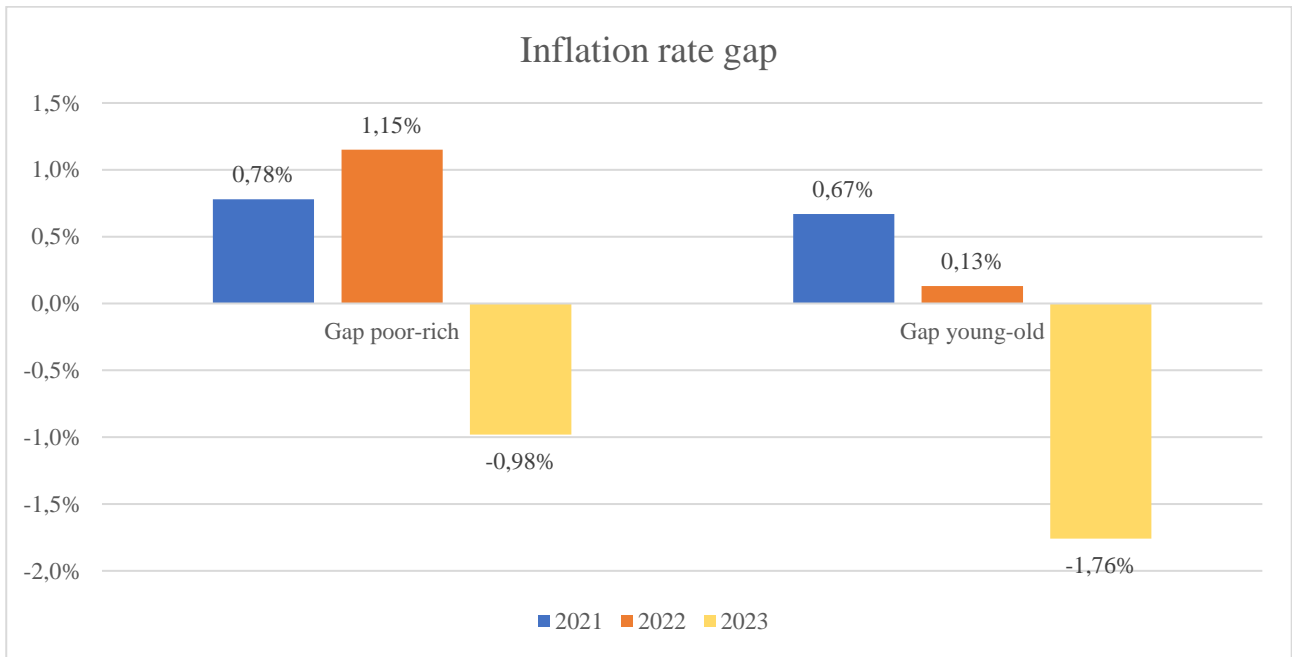
Figure 11: Inflation rate gap between Young Households – Old Households and households in q1-q4. Source: Own elaboration

4. Regression Analysis

To empirically confirm my previous stylized facts, I run a linear cross-section regression analysis for each year—2021, 2022, and 2023—using the variables detailed in paragraph 2. This approach allows for a deeper examination of how these socioeconomic factors (income, age, household size, occupation, education, and city size) interacted with inflation across different years. I isolate each year – meaning that the cross-section regressions are sequentially estimated - but I show them all in Table 2, with the twofold aim: (i) to identify potential shifts or consistencies in these relationships over time, and (ii) to offer statistical micro-foundation for interpreting the observed trends.

	Inflation 2021	Inflation 2022	Inflation 2023
Income	-0.203***	-0.297***	0.388***
	(0.013)	(0.016)	(0.024)
Age	-0.011***	-0.002	0.031***
	(0.001)	(0.001)	(0.001)
Household Size	-0.149***	-0.112***	0.283***
	(0.009)	(0.011)	(0.016)
Occupation	0.038***	0.098***	0.044**
	(0.011)	(0.013)	(0.019)
Education	-0.046***	-0.146***	0.016
	(0.012)	(0.014)	(0.020)
City Size	-0.040***	-0.016***	0.117***
	(0.006)	(0.007)	(0.011)
Observations	18446	18719	19882
R-squared	0,05	0,07	0,06

Income = log(income). Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2: Inflation and households characteristics. Source: Own elaboration.

In 2021 and 2022, **income** is negatively associated with inflation, which suggests that during these years higher income households were associated with a lower personal inflation rate. However, in 2023, this relationship reversed, with the income coefficient turning positive, indicating that higher income levels were now associated with higher inflation. A similar situation occurs with **age**, with older households that are associated with lower inflation in 2021, while the opposite happens in 2023 when age becomes a positive predictor of inflation.

Regarding **household size,** it consistently showed a significant relationship with inflation throughout the period, but its direction and magnitude varied. In 2021 and 2022, larger households were associated with lower inflation. However, this trend reversed dramatically in 2023 (coefficient of

0.295, with a p-value < 0.01), indicating that larger households were now experiencing higher inflation.

City size and education follow a similar trend, with larger cities and individuals with higher levels of education experiencing lower inflation during the first two years of the analysis, and the opposite in 2023 (even if for education the coefficient becomes statistically insignificant).

Finally, **occupation** emerges as a significant predictor of high inflation across all three years, indicating that individuals with lower professional status (a higher value of the variable) are regularly associated with greater exposure to inflation.

Then I re-run the regression with the three main categories, in order to understand which expenditure item, drives the relationship between inflation and household characteristics (Table 3).

	Inflation Cat.	Income	Age	HH Size	Occupation	Education	City Size
	Food	-0.028***	0.004***	0.022***	0.016***	-0.017***	0.007***
2021	Housing	-0.312***	-0.005***	-0.201***	0.027**	-0.047***	-0.116***
	Transp	0.097***	-0.011***	0.025***	0.010	0.011	0.070***
	Food	-0.212***	0.027***	0.112***	0.091***	-0.153***	0.051***
2022	Housing	-0.449***	-0.007***	-0.275***	0.069***	-0.085***	-0.159***
	Transp	0.168***	-0.018***	0.054***	0.002	0.033**	0.099***
	Food	-0.201***	0.028***	0.129***	0.152***	-0.122***	0.031***
2023	Housing	0.397***	0.006***	0.180***	-0.036***	0.065***	0.101***
	Transp	-0.008***	0.001***	-0.002***	0.000	0.000	-0.004***

Income = log(income); *** p<0.01, ** p<0.05, * p<0.1

Table 3: Main inflation categories with household's characteristics. Source: Own elaboration

For 2021 and 2022, we see that the negative relationship between **income** and inflation is rooted in the expenditure on food and housing. Moreover, income consistently shows a significant negative relationship with food inflation throughout all three years, indicating that higher incomes are always associated with lower food inflation. This can be caused by the fact that poorer households spend a higher share of their income on food and housing and thus suffer a higher inflation rate when these prices increase.

Age constantly shows a positive relationship with food inflation across all three years, suggesting that older households are more exposed to rising food prices. Conversely, it shows a negative relation with transportation inflation in the first two years, indicating that older individuals face lower transportation cost inflation, possibly due to reduced mobility or less dependence on transportation as people age.

The negative relationship between inflation and **household size** in 2021 and 2022 is rooted in housing inflation, indicating that larger households benefited from relatively lower housing costs. Larger households are also strongly associated with higher food inflation in all three years, which suggests that as household size increases, food costs rise more, likely due to the higher demand for food in larger households.

The relationship of **occupation** with food inflation increases over time, (with the coefficient rising from 0,013 in 2021 to 0,124 in 2023), suggesting that "low-level" occupations become more vulnerable to food price changes, possibly due to variations in income stability.

Education consistently shows a significant negative relationship with food inflation, suggesting that higher education levels are associated with lower food price inflation.

Finally, the relationship between inflation and **city size** seems to be rooted in housing inflation, as it shows significant negative values for 2021 and 2022 but positive ones in 2023. City size has a consistently positive relation with food inflation across all three years, indicating that living in larger cities is associated with higher food price inflation, likely due to higher living costs in urban areas. It is also positively associated with transportation inflation in 2021 and 2022, implying that residents of larger cities faced higher transportation costs. However, this effect turns negative in 2023, suggesting a possible reduction in transportation cost pressures in urban areas, possibly due to public policy support. (European Central Bank, 2021).

5. Conclusions

I measure the distributional consequences of inflation during the recent peak of inflation from a consumption perspective by exploiting data provided by the EPF and INE. For this sake, I estimate household-specific inflation for 2021, 2022 and 2023 in Spain and then analyse how it varies according to households' characteristics, particularly across income and age groups.

A set of assumptions are imposed. Let me mention a couple. First, I only look at the heterogenous effects of inflation due to consumption, ignoring other sources of heterogeneity, and I consider that the prices faced by each household are the same for all goods in the same consumption category. Second, I only indirectly take into account the various specific fiscal policies deployed by the Spanish government during this period to help citizens facing inflation, such as energy price caps, energy subsidies and reductions in taxes on fuels, even though these measures certainly contributed to the reduction of the actual prices faced by consumers in certain categories in 2023.

The study reveals a shifting pattern in the impact of inflation across different demographic groups. Initially, the poorest and youngest segments were the most affected by inflation, particularly in 2021 and 2022. However, by 2023, this trend reversed, with the wealthiest and oldest segments experiencing higher inflation rates.

During the first two years, housing inflation and food inflation are the main contributors to inflation, while transportation inflation has a lower but still significant impact. These results are in line with what was found by (Basso, Dimakou, & Pidkuyko, 2023) who also highlight the significance of housing and food price pressures in driving inflation trends during this period. Therefore, during these years, the "inflation tax" redistributed wealth from the poorest to the richest and from the youngest to the oldest segments of the population. This situation probably occurred because the poorest and youngest households, who were initially the most affected by inflation, spend a larger portion of their income on essential items such as food and energy. As the prices of these goods increase, these households face a higher relative cost of living, and with less margin to adjust their consumption patterns, they bear a greater burden from inflation.

However, the welfare situation reverses in 2023, when the disinflationary process favours those households who spend the most in housing inflation, partially offsetting the welfare loss of the previous two years. This year those who suffer the most from inflation are the oldest and the richest households.

The empirical analysis also indicates that across all three years, higher incomes are always associated with lower food inflation and that age constantly shows a positive relationship with it, suggesting that older and poorer households are more exposed to rising food prices.

The findings partially align with some empirical evidence from related US literature on inflation heterogeneity (Hobijn & Lagakos, 2005), which highlights that, on average, over time there is no systematic gap between the inflation experienced by lower- and higher-income households. Indeed, as shown in this paper, the groups that were most affected during the inflationary process of 2021 and 2022, become the ones that benefit the most during the disinflationary year of 2023. Moreover, these findings also support the possible existence of a "pro-rich" inflation in the euro area (Gürer &

Weichenrieder, 2020) and confirm that when energy and food prices rise relative to average inflation, the impact of higher inflation tends to be stronger on the welfare of lower-income households.

In conclusion, this analysis has demonstrated that the effects of inflation are not the same for all households, but rather vary significantly over time and among different population segments. Certain groups are more severely impacted than others, leading to a redistribution effect that can have significant implications for economic policy.

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