Look Within: Demographic Grouping Masks Inflation Inequality

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A number of recent papers have tackled an important question: did the period of high inflation in 2021 and 2022 exacerbate inflation disparities across households? Answers vary depending on the dataset and methodology applied. This paper puts these literatures in conversation and argues that the question cannot be answered by comparing inflation experiences of demographic groups. One must look within demographic groups and compute inflation at a household level using data granular enough to capture the particular products they purchase. Using barcode-level data on household grocery spending, I show that such an approach is essential for capturing the extent of inflation heterogeneity and its rise in 2021-2022.

I. Literature

Careful efforts by Jaravel (2024), Klick and Stockburger (2024), and Gindelsky and Martin (2025) to construct distributional versions of the Consumer Price Index and Personal Consumption Expenditure price index yielded important insights on the extent to which inflation differs systematically across households of varying demographic groups. When these authors use the resulting datasets to examine inflation gaps, they find that these gaps did not increase—and perhaps shrank—after 2020.[1] These papers all apply the best-available data on households' full consumption baskets: the Consumer Expenditure (CE) survey. As Jaravel (2024, p. 3) notes, this data "cannot allow for inflation heterogeneity across socio-demographic groups *within* product category" and will tend to understate differences across demographic groups.

Looking within product categories where such detailed data is available reveals this understatement to be dramatic. In the first work applying barcode-level grocery purchases to compute inflation at a household level, Kaplan and Schulhofer-Wohl (2017) found that inflation differed far more across households than previous studies were able to recover using CE microdata. Recent applications of such data to examine the period of high inflation find a significant rise in heterogeneity for grocery inflation.[2]

Several factors drive the divergent findings between these strands of literature on how inflation inequality varies with aggregate inflation. One is the latter strand's focus on the grocery sector, where "cheapflation" did drive a larger gap than usual between the inflation rate of low- and high-income households (Cavallo and Kryvtsov, 2024). Another is the granularity of its data. Chen, Levell and O'Connell (2024, Fig. 4.2) show that within-category differences are crucial to recovering both the degree of heterogeneity and its relation to income. This paper highlights a third: the asystematic nature of inflation heterogeneity.

From the outset, papers examining inflation at a household level have emphasized how little demographics explain total heterogeneity (Kaplan and Schulhofer-Wohl, 2017, p. 20). I further contend that the continued focus on inflation across demographic groups leads us to miss not only the latent degree of inflation inequality, but also an important part of how that inequality evolves with aggregate inflation.

* Board of Governors of the Federal Reserve System (kelsey.j.oflaherty@frb.gov). Views expressed are those of the author and do not reflect the opinions of the Board of Governors of the Federal Reserve System. Researcher's own analyses and calculations based in part on NielsenIQ Consumer Panel Service data for the Total US. The conclusions drawn from the NielsenIQ data are those of the researcher and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the reports herein or in developing, reviewing, or confirming the research approaches used in connection with this report. This paper was developed under the RESET Project with the support of the Alfred P. Sloan Foundation (G-2016-7227, G-2021-16821). I am grateful to Louise Sheiner for helpful comments.

[1] Jaravel examines inflation not only by income group, but also by age, race and urbanity. Only age featured a significant long-run gap. The trend for older households to experience more rapid inflation reversed between May 2020 and May 2022.

[2] See Chen, Levell and O'Connell (2024) for an excellent example using data from the United Kingdom, as well as O'Flaherty (2026) for evidence from the United States and Kostyshyna and Ouellet (Forthcoming) for Canada.

II. Measuring Household Inflation

To examine inflation heterogeneity in the high-inflation period from 2021-2022—and how much of that evolution was captured by changes across demographic groups—this paper applies barcode-level data from the NielsenIQ Consumer Panel to compute grocery inflation at a household level.

Between two years $t-j$ and t, the relative price of groceries for household h is captured by its Tornqvist price index:

$$(1)\quad \Psi_{h,t-j,t} = \prod_{k \in \left\{\Omega_{h,t} \cup \Omega_{h,t-j}\right\}} \left(\frac{p_{k,t}}{p_{k,t-j}}\right)^{\omega^{TQ}_{h,k,t-j,t}}$$

a geometric average price change where each good k receives importance weight

$$\omega^{TQ}_{h,k,t-j,t} = \frac{s_{h,k,t} + s_{h,k,t-j}}{2}$$

an average of current and previous expenditure shares

$$s_{h,k,t} = \frac{p_{k,h,t} q_{k,h,t}}{\sum_{\Omega_{h,t}} p_{k,h,t} q_{k,h,t}}.$$

In these equations $\Omega_{h,t}$ denotes the basket of groceries household h purchases in period t. Like the Fisher index, Tornqvist indices capture households' substitution patterns by looking at goods purchased in either period $t-j$ or t. As in O'Flaherty (2026), equation 1 applies national average prices for every good k to overcome the difficulty of undefined household-level prices for goods not purchased in both periods.

III. Grocery Inflation Experiences

Figure 1 summarizes the grocery inflation experiences of households in the NielsenIQ consumer panel from 2019 to 2023. In particular, for about 33,500 households consistently in the panel for that period, it plots the distribution of inflation faced since 2019: $\Psi_{h,2019,t}$. Results among households aged 30-64 who have not changed family size, income bin, or state of residence are similar.[3]

The average grocery price index across households is given by the solid line. After modest inflation of 6.8% through 2021, households on average saw inflation of 9.9% in 2022 and 5.4% in 2023—rates close to the PCE Food price index. The dashed line in Figure 1 tracks the average inflation experience among households reporting annual incomes below \$25k. The dotted similarly tracks the average inflation experience for households with annual incomes above \$100k. Their price indices in 2023 are 124.9 and 122.9, respectively. The average annual inflation gap of 0.41 percentage points between low- and high-income households over this period is of similar magnitude to that documented by Jaravel (2019) and Argente and Lee (2021).

The shaded gray regions of Figure 1 convey the range of households' inflation experiences spanned by the 10th and 90th percentiles. This range runs from 118.9 to 128.5, a gap about five times wider than that captured by the average experiences of income groups. This feature of Figure 1 captures the first point of this paper: that income explains very little of the cross-sectional variation in household inflation rates.

As an illustration of its second and more novel point—how little demographic groups capture the *dynamics* of total inflation heterogeneity—note that the inflation rate gaps in 2022 and 2023 are 0.89 and 0.67 percentage points, respectively. Neither value is far above the 0.63 percentage point gap recorded by Argente and Lee (2021, Table 2, p. 927) between these same groups between 2008 and 2013. By contrast, the inflation gap separating the 90th and 10th percentiles grew by 3.2 percentage points in 2022, more than in any other year.[4]

To assess whether any other demographic groupings better capture household inflation experiences, consider that in every period t the variance of one-year household inflation rates summarizes the degree of heterogeneity:

$$(2)\qquad \sigma^2_t = \sum_h d_{h,t} \left(\Psi_{h,t-1,t} - \bar{\Psi}_{t-1,t}\right)^2$$

$$\text{where}\quad \bar{\Psi}_{t-1,t} = \sum_h d_{h,t} \Psi_{h,t-1,t}.$$

[3] I thank David Ratner for suggesting this check.

[4] This value has fewer external comparisons. Since it eliminates the price variation featured in Kaplan and Schulhofer-Wohl (2017), the scale of heterogeneity is much smaller. Estimates are closer methodologically to O'Flaherty (2026) though they do not make use of NielsenIQ Retail Scanner Data. Table III of that paper reports larger gaps due to a focus on Q4/Q4 inflation, but its longer time series strengthens the impression that heterogeneity in 2022 far exceeded that of previous years.

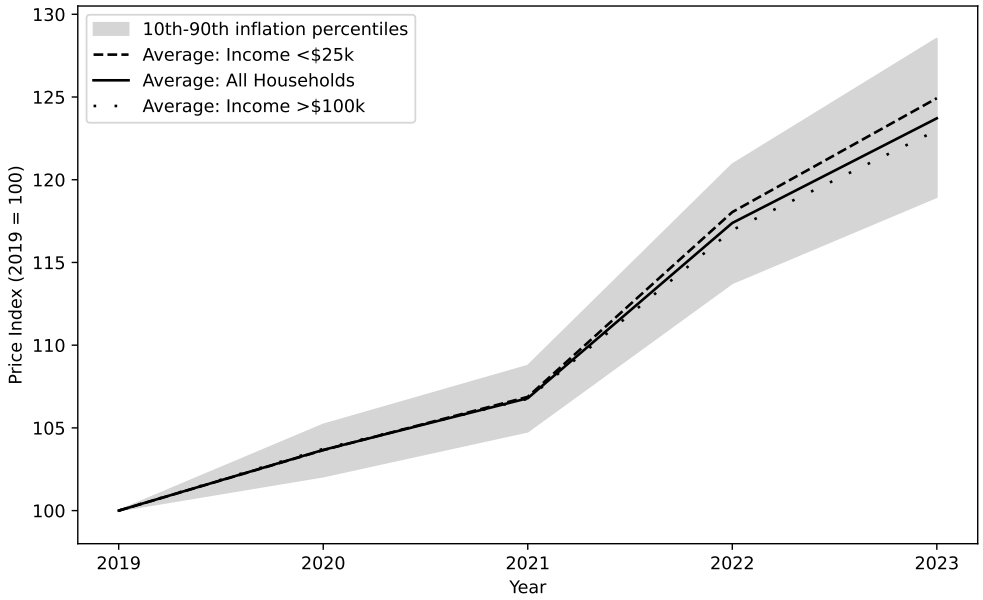

Figure 1. : Cumulative Grocery Inflation

Note: Price index reflects annual average Tornqvist inflation rates computed using a 2019 base year among all product categories except general merchandise. Average rates and percentiles of the inflation distribution apply NielsenIQ projection factors to produce nationally representative sample. *Source:* NielsenIQ Consumer Panel.

Households are weighted by $d_{h,t}$, the product of their spending and their NielsenIQ projection factors to make both the mean $\bar{\Psi}_{t-1,t}$ and deviations from it more representative of that in the U.S. One can also assess the residual variation remaining across households after allowing each group g of a demographic G to have different inflation rates. That residual variation is

$$\tilde{\sigma}^2_{G,t} = \sum_h d_{h,t}(\Psi_{h,t-1,t} - \bar{\Psi}^g_{t-1,t})^2 \tag{3}$$

$$\text{where} \quad \bar{\Psi}^g_{t-1,t} = \sum_{h\in g} d^g_{h,t}\Psi_{h,t-1,t}$$

$$\text{and} \quad d^g_{h,t} = \frac{d_{h,t}}{\sum_{h\in g} d_{h,t}}.$$

The percent of total variation captured by differences across demographic group G is then

$$100\left(1 - \frac{\tilde{\sigma}^2_{G,t}}{\sigma^2_t}\right).$$

The first row of Table 1 summarizes the average of this value over a decade of inflation rates between 2013 and 2023. Very little variation in household inflation rates is accounted for by these demographics.[5] Putting all of them in combination and allowing each of the resulting 1600 potential groups to have its own inflation rate still captures just over 10% of the variance.

Figure 1 shows the widening gap between inflation experiences at the 90th and 10th percentiles in 2022. That period of higher inflation and a widening distribution of outcomes contributes to a correlation of more than 0.8 between one-year average inflation rates $\bar{\Psi}_t$ and the cross-sectional variance of the same σ^2_t between 2013 and 2023. Do changing inflation gaps across demographic groups—such as the growing inflation gap between low- and high-income households also apparent in Figure 1—contribute meaningfully to that relationship?

To assess this, consider the relative strength of the correlation between average inflation and residual variation not attributable to demographic groups. The more differences across demographic groups contribute to fluctuations in the variance, the more the correlation between the residual variance and aggregate inflation should lessen. A second row of Table 1

[5]Results applying household-level price reports exhibit even less variation explained by any demographic.

Table 1—: Percent Explained by Demographics: 2013-2023

	Income	Age	Size	Race	ZIP Density	All
σ_t^2	0.9%	0.5%	0.9%	0.6%	1.6%	11.6%
$Corr(\sigma_t^2, \bar{\Psi}_t)$	0.7%	0.0%	0.0%	0.5%	0.1%	0.7%

Note: Variances σ_t^2 computed for each year t across household-level annual average Tornqvist inflation rates relative to $t-1$ using all product categories except general merchandise. Computations apply NielsenIQ projection factors to produce nationally representative sample and winsorize outliers beyond the 1st and 99th percentiles of the distribution. Values reflect averages across all years.
Source: NielsenIQ Consumer Panel; U.S. Census Bureau (2020).

summarizes the statistic

$$100\left(1-\frac{Corr(\tilde{\sigma}_{G,t},\bar{\Psi}_t)}{Corr(\sigma_t,\bar{\Psi}_t)}\right).$$

Results illustrate that the correlation is effectively unchanged. Nearly all of the relationship between average inflation and cross-sectional heterogeneity is due to the portion of variation which is unexplained by demographics.

IV. Implications

A full understanding of the costs of inflation cannot be achieved without understanding the distribution of budget shocks it creates. Initiatives to estimate how disparate those shocks can be, and who incurs them, are therefore of great importance. That these differences are generated less by systematic differences across households of differing demographic groups than by idiosyncratic price change variation across products within a category raises significant challenges for those efforts.

Firstly, it makes clear that group-specific inflation rates—while helpful for tracking the adequacy of indexed benefits for low-income or older households—should not be taken as comprehensive characterizations of inflation heterogeneity. To properly track the latter requires looking within demographic groups, tabulating inflation at a household level and examining its distribution.

Secondly, for such distributions to capture meaningful heterogeneity requires data granular enough to distinguish the major sources of variation. In the grocery sector, this turns out to depend comparatively little on geography, shopping outlet, or other systematic characteristics. To identify it also requires looking within product categories at not just a sample of goods informing the average price change, but at a rich distribution of price changes.

This research therefore highlights the potential value of expanding such detailed pictures of household purchases outside of the grocery sector. In sectors where such data is nowhere on the horizon, the field's practical understanding of how inflation varies across households can still be improved. As a first step, it would be helpful to expand knowledge of how pervasive price change dispersion is across close substitutes in non-grocery categories. Here, even though not matched to households, web-scraped data of the type gathered by Cavallo and Rigobon (2016) are informative, as the recent application in Cavallo and Kryvtsov (2024) shows.

Measurement aside, the degree of inflation heterogeneity which has recently been documented raises important interpretational questions. O'Flaherty (2026) contends that households' idiosyncratic inflation rates should be interpreted as meaningful, moderately persistent budget shocks. If these shocks originate from idiosyncratic differences in price changes across close substitutes, it implies households are unable or unwilling to take advantage of significant gains from switching products. A deeper understanding of why—and whether those same responses to price change dispersion might be expected in other categories—would be an important step to improving how we conceptualize households' inflation experiences.

V. Conclusion

Whether the recent rise in inflation drove increasing disparities across households is currently a difficult question to answer. Data comprehensive enough to provide a complete picture of household spending lacks enough detail to identify the major source of budget shock variation. Absent such a comprehensive picture, ev-

idence from the grocery sector and its detailed data provide valuable insights. That data reveals the inadequacy of common narratives to describe why inflation varies across households. To close gaps of understanding requires more research on the causes and costs of this heterogeneity, including in sectors where more detailed data must first be compiled.

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