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Real Wage Growth at the Micro Level

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Abstract

This article investigates patterns in real wage growth in 2022 to determine whether wages have kept up with rising price levels and how this differs among labor market participants. Using the consumer price index for wages and imputing expenditure data from the Consumer Expenditure Survey, we separately measure nominal wage growth and inflation rates at the micro level. We find that there is more heterogeneity in the former, meaning that when we combine them, an individual's real wage growth is primarily driven by their nominal wage growth. In 2022, 57 percent of individuals experienced negative real wage growth, with older and less-educated workers, as well as job stayers, being hit the hardest. Conversely, younger and highly educated workers, as well as job switchers, had higher real wage growth.

JEL codes: E24, E31, J31

Federal Reserve Bank of St. Louis *Review*, Second Quarter 2024, *106*(2), pp. 87-105.
https://doi.org/10.20955/r.106.87-105

1. INTRODUCTION

Until the beginning of 2021, the past decade saw consistent positive year-over-year real wage growth, showing that wage growth outpaced the rising cost of living. However, in the past two years, the U.S. has experienced high inflation combined with strong wage growth. With aggregate inflation reaching a high of 9 percent in June 2022 and average nominal wage growth soaring to 6.4 percent in 2022, most households experienced both rising wages and rising cost of living. The difference between these two values determines real wage growth. However, the contributions of these components may differ across individuals or households. The unequal impact of inflation across age, education, household size, and income is of great interest to policymakers.

To illustrate these trends, Figure 1 depicts median real wage growth in the United States over the past decade. The figure shows that while workers saw increases in real wage growth in 2015 and 2020, it typically ranged from 1 percent to 3 percent until 2021. However, more recently, median real wage growth has hovered around –2 percent, indicating a notable shift in economic conditions.

In this article, we explore the heterogeneity behind the negative values shown in Figure 1 by analyzing the distribution of real wage growth in 2022 across households. Specifically, we examine nominal wage growth and inflation rates at the individual level to determine the real wage growth rates for each worker in our sample. However, measuring real wage growth at the individual level presents a challenge. To calculate individual real wages, we must observe both wage and consumption for each individual, but there are no current microdata that cover both consumption and nominal wage growth.

We overcome this challenge by combining consumption data from the Consumer Expenditure Survey (CEX) and wage growth data from the Current Population Survey (CPS). We begin by pinpointing individuals in the CPS for whom we can observe wages 12 months apart. The CPS records wage information for individuals as they rotate out of the survey. We then follow the methodology of the Federal Reserve Bank

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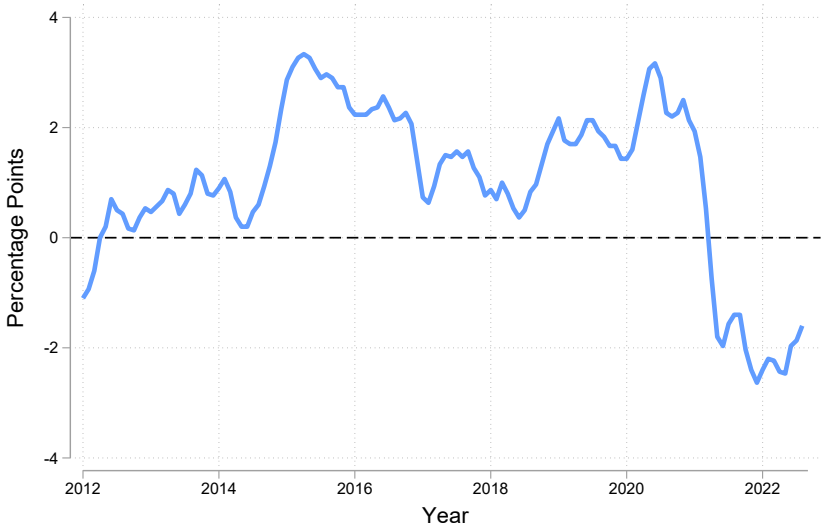
Figure 1
Aggregate Real Wage Growth



NOTE: The figure is constructed using the inflation estimates from the CPI as well as the Federal Reserve Bank of Atlanta's Wage Growth Tracker, which uses the CPS to calculate a three-month moving average of the median of overall unweighted year-over-year nominal wage growth.

of Atlanta's Wage Growth Tracker to measure median nominal wage growth, finding that the distribution of nominal wage growth has a wide range, with most values between –50 percent and 50 percent.

Rather than use the Bureau of Labor Statistics's (BLS) measure of average inflation, we calculate individual inflation rates that account for differences in consumption patterns of different demographic groups. We impute consumption information from the CEX to the CPS based on demographic characteristics: age, education, income, and household size. This imputation estimates consumption baskets for our sample of individuals in the CPS, thus providing us with a data set of observed wage and imputed consumption. To measure inflation, we match the consumer price index (CPI) inflation series to our 19 CEX expenditure categories to calculate individual inflation rates based on the estimated consumption baskets. Unlike that of nominal wage growth, the distribution of inflation rates has a narrow range, from 7 percent to 13 percent for most individuals.

Last, we calculate individual real wage growth as the difference between an individual's nominal wage growth and inflation rate and analyze real wage growth across demographic groups. Our results highlight three important features of real wage growth in 2022. First, 57 percent of individuals experienced negative real wage growth, 10 to 15 percentage points higher than in typical years. Second, real wage growth varies significantly across demographic groups. Younger workers as well as individuals who switched jobs experienced the highest real wage growth. The wage of workers older than 55 and individuals with children in the household were least likely to keep up with their rising cost of living. Third, the distributions of nominal wage growth and inflation suggest that variations in real wage growth are driven by variations in nominal wage growth. This observation stems from the fact that we find a lot more heterogeneity in nominal wage growth compared with inflation across households.

This article contributes to several aspects of existing literature. Similar to Argente and Lee (2021) and Kaplan and Schulhofer-Wohl (2017), we study differences in the cost of living across households. While these papers incorporate more sources of these differences that we cannot account for here (such as differences in shopping behavior and quality of items consumed), we explore the connection with wage growth. In addition, they also use the Nielsen Consumer Panel and Retail Scanner data sets, which focus primarily on grocery stores and drug stores. In contrast, we incorporate a much larger set of goods and services using the CEX.

Accordingly, we also borrow some techniques from other papers that use the CEX micro data to study household consumption baskets. For instance, Hobijn and Lagakos (2003) examine inflation inequality across the U.S. from 1987 to 2001 using consumption data from the CEX and aggregating expenditures into 19 categories to best match the CPI series, as we do here. Cravino, Lan, and Levchenko (2018) also use the CEX to document the relative prices of goods consumed across households, but they aggregate households

into income percentiles and examine the distributional effects of monetary policy shocks on those consumption baskets. Several other papers also perform related, but different, imputation techniques to link consumption data with other micro data sources, such as Blundell, Pistaferri, and Preston (2008) and Pretnar (2022).

Finally, our work relates to studies examining the characteristics of the income growth distribution, such as Guvenen et al. (2015). We find that the distributions we recover in this article exhibit similar properties.

The rest of the article proceeds as follows. Section 2 discusses the data, their structure, and how they are used in combination to estimate real wage growth. Section 3 presents estimates of individual nominal wage growth, inflation, and real wage growth and their distribution across households and demographic groups. Section 4 concludes.

2. DATA AND METHODOLOGY

We draw on two sources of microdata for our analysis. We use the CPS for nominal wage growth and the CEX for data on household expenditures of different item categories. We then impute the CEX data into the CPS to construct individual real wage growth rates. All of these steps are described below.

2.1 The CPS for Nominal Wage Growth

To measure year-over-year nominal wage growth for individuals from 2021 to 2022, we use the CPS conducted by the BLS. The CPS is a monthly survey that collects individual and household information, producing a broad body of data on demographic characteristics, employment, the labor force, and earnings. It covers a monthly sample of households across the 50 states and the District of Columbia. Individuals in the CPS are interviewed a total of eight times. They are first interviewed once per month for four consecutive months, and then eight months later, they are interviewed for another four consecutive months. The fourth and eighth interviews are considered the Outgoing Rotation Groups in which individuals are asked for additional information beyond what is asked in the other interviews. In particular, they are asked about their earnings, meaning that for each individual, we observe data on their earnings set 12 months apart. These data are pretax and focus on wage and salary earners, excluding those who are self-employed. For hourly and salaried workers, hourly and weekly earnings are collected, respectively.

Following the methodology of the Federal Reserve Bank of Atlanta's Wage Growth Tracker, we use the earnings data for wage and salary earnings to compute year-over-year nominal wage changes for each worker. We examine individuals who first are in the Outgoing Rotation Group in 2021 and appear in the Outgoing Rotation Group again in 2022, based on a match in their unique person ID number. We first confirm that these individuals match based on their age, gender, and race to avoid any coding errors in the ID number. We also restrict our sample to exclude agricultural workers. Weekly earnings for salaried workers are then converted to hourly by dividing weekly wage by usual hours worked per week (or actual hours worked if usual hours worked is not available). Finally, we calculate one-year log wage changes as follows:

$$\Delta y_i = \left[\log(y_{i,2022}) - \log(y_{i,2021})\right] \times 100,$$

where $y_{i,2021}$ and $y_{i,2022}$ are wages in 2021 and 2022, respectively, for individual i.

Our final sample includes about 1,400 observations per month.

2.2 The CEX for Individualized Consumption Baskets

The CEX is a nationwide household survey on expenditures and incomes collected by the BLS. Expenditures are split into about 600 categories, called Universal Classification Codes (UCCs), of goods and services. For our analysis, we use any data collected that pertain to spending during 2021. The CEX is composed of two different surveys, the Interview Survey and the Diary Survey. The Interview Survey asks consumers for expenditure information over a three-month period and typically covers large or recurring purchases, including vehicles, property, appliances, rent, and insurance. The consumer unit at the Interview Survey address is interviewed each quarter for up to four consecutive quarters and is asked about the previous three months of expenditures. For example, an address that enters the Interview Survey in March 2021 will be asked about purchases in December 2020, January 2021, and February 2021. They can then be interviewed again in June, September, and December 2021. The sample depends on address rather than on household, so if a consumer unit moves from the address, the new consumer unit at the address will be interviewed instead.

The Diary Survey collects weekly data on frequent expenditures, such as food, personal care, and medicine. Consumer units are interviewed for two consecutive weeks. While the Interview and Diary surveys both follow the same consumer units across multiple time periods, the CEX treats each interview as separate, independent observations in the data. To maintain a representative sample and account for the relocation of households, the

Table 1
Matching CEX Expenditure Categories to CPI Series

	CEX expenditure category	CPI series
1	**Food at Home**	Food at Home
2	**Food Away from Home**	Food Away from Home
3	**Alcoholic Beverages**	Alcoholic Beverages
4	**Owned Dwellings**	Owners' Equivalent Rent of Primary Residence
5	**Rented Dwellings**	Rent of Primary Residence
6	**Other Lodging**	Lodging Away from Home
7	**Utilities**	Fuels and Utilities
		Telephone Service
8	**Household Operations, Supplies, and Furnishing**	Household Equipment and Operations
		Information Processing Other Than Telephone
9	**Apparel**	Apparel
10	**Vehicles**	New and Used Motor Vehicles
11	**Gasoline**	Motor Fuel
12	**Other Vehicle Expenses**	Vehicle Parts and Equipment
		Vehicle Maintenance and Repair
		Motor Vehicle Insurance
		Motor Vehicle Fees
13	**Public Transportation**	Public Transportation
14	**Healthcare**	Medical Care
15	**Entertainment**	Recreation
16	**Personal Care**	Personal Care
17	**Reading**	Recreational Reading Materials
18	**Education**	Educational Books and Supplies
		Tuition, Fees, and Child Care
19	**Tobacco**	Tobacco

consumer unit is given a new ID number and weight each quarter or week in the Interview and Diary surveys, respectively. This yields about 35,000 households in the Interview Survey and 12,000 households in the Diary Survey in 2021.

Because the Diary and Interview surveys collect data on different households, we do not observe the complete consumption data of any household. For example, households in the Interview Survey are not asked about grocery purchases, and those in the Diary Survey are not asked about vehicle purchases. Further, households rarely report consumption in every UCC, and when these are aggregated to calculate population-wide expenditures by UCC, the BLS counts them as zeros.[1] We do the same before aggregating the UCCs into 19 more broad categories, as shown in the first column of Table 1.

After aggregating, we obtain for each household a value for its expenditures on 19 different categories (with many zeros). When averaged over the whole sample using the appropriate weights, our mean expenditures line up well with those of the published tables (see the first two columns of Table 2 for a comparison). We also have the following demographic categories for both the CPS and the CEX: household size; income; metropolitan status; geographic region; number of children under 18 years old in the household; and the reference person's age, race, ethnicity, marital status, and education. Table 3 compares our CEX and CPS samples along these

1. Based on our analysis, not doing so massively overstates the expenditure levels in their published tables.

Table 2
Average Consumer Expenditures

	CEX published tables	Author calculated	CPS imputation
Food at Home	5,259	4,901	6,961
Food Away from Home	3,030	2,948	3,785
Owned Dwellings	7,591	9,580	13,434
Rented Dwellings	4,684	4,259	5,959
Utilities	4,223	5,515	6,713
Household Equipment/Operations	5,142	4,999	5,397
Vehicle Purchases	4,828	4,868	5,951
Other Vehicle Expenses	3,534	3,364	4,348
Healthcare	5,452	6,250	5,311
Entertainment	3,568	3,598	3,847

dimensions. The two samples are very similar, with the most major difference being that the CEX has a much larger share of households over 65 years of age. We use these variables in our imputation method and in our analysis of the resulting real wage growth rates.

To create inflation rates for items in our estimated consumption baskets, we construct a concordance between CEX expenditures and CPI series by aggregating the UCCs into 19 expenditure categories and using nonseasonally adjusted indices for "All Urban Consumers" and "U.S. City Average," following the methodology of Hobijn and Lagakos (2003). For the CEX categories that do not match exactly to a CPI series, multiple CPI series are combined using the 2021 relative importance weights created by the BLS. For example, utilities in the CEX match to both fuels and utilities in the CPI series as well as telephone service in the CPI series. In this case,

$$W_u = \frac{w_f}{w_f + w_t} + \frac{w_t}{w_u + w_t},$$

where w_f is the CPI relative importance weight of fuels and utilities, w_t is the CPI relative importance weight of telephone service, and W_u is the constructed CPI series for utilities to match to the CEX.

Table 3
Shares of Demographic Categories in the CEX and CPS

Household size			Marital status		
	CEX share	CPS share		CEX share	CPS share
1 Person	32.06	19.70	Married	50.43	57.34
2 People	33.73	33.32	Widowed	9.33	2.68
3-4 People	25.59	35.23	Divorced	15.73	13.13
5-6 People	7.31	10.17	Separated	2.17	2.01
7+ People	1.32	1.58	Never married	22.35	24.84
Age			**Race**		
	CEX share	CPS share		CEX share	CPS share
Younger than 25	4.27	3.61	White	80.36	81.30
25-35	14.64	17.41	Black	10.80	9.76
35-45	16.56	23.76	Native American	0.58	0.93
45-55	16.16	23.61	Asian and Pacific Islander	6.20	6.37
55-65	18.84	22.65	Other	0.53	0.00
65 and Older	29.54	8.97	Two or more races	1.54	1.64
Education			**Region**		
	CEX share	CPS share		CEX share	CPS share
Less than HS	8.27	4.72	Northeast	17.27	16.15
HS degree	21.31	23.31	Midwest	20.69	21.07
Some college	28.69	26.79	South	33.91	36.35
At least bachelor's degree	41.72	45.18	West	28.13	26.43
Ethnicity			**Metro status**		
	CEX share	CPS share		CEX share	CPS share
Hispanic	13.88	12.77	Urban	94.14	82.52
Not Hispanic	86.12	87.23	Rural	5.86	17.48

2.3 Imputing CEX Expenditures into the CPS
2.3.1 Imputation Technique

A major challenge for researchers interested in individualized real wage growth is the absence of microdata containing both nominal wage growth and spending on a variety of items. We aim to overcome this by using the CEX data on expenditures to impute a consumption basket for each individual in the CPS. The idea is to estimate the relationship between spending and observable household characteristics in the CEX and apply these estimates to each individual in the CPS based on their own characteristics.

Because of the large number of zeros in our data, we model expenditures on UCC g with a hurdle model. This approach consists of two parts. The first models the probability of having a value of zero (the selection model). The second models the values of the nonzero observations (outcome model). Let c_{ig} be household i's expenditure on UCC g. In our model, for each g,

$$c_{ig} = s_{ig} h_{ig}.$$

s_{ig} is an indicator variable that determines selection:

$$s_{ig} = \begin{cases} 1 & \text{if } \boldsymbol{z}_i \boldsymbol{\beta}_g^s + \varepsilon_{ig}^s > 0 \\ 0 & \text{otherwise,} \end{cases}$$

where $\boldsymbol{z}_i$ is a set of explanatory variables that vary by household, $\boldsymbol{\beta}_g^s$ is a vector of coefficients, and ε_{ig}^s is a standard normal error term.

Table 4
Share of Expenditure by Income

	Less than $10,000	$10,000-25,000	$25,000-40,000	$40,000-60,000	$60,000-75,000	$75,000-100,000	$100,000-150,000	More than $150,000
Food	13.5	12.5	11.4	10.4	9.9	9.8	9.5	9.0
Food Away from Home	5.1	5.1	5.0	5.4	5.4	5.2	5.8	5.8
Owned Dwellings	8.0	6.7	8.6	11.7	13.5	15.3	18.5	20.7
Rented Dwellings	20.7	24.2	20.9	16.7	14.2	10.9	7.2	4.8
Utilities	11.7	11.5	11.3	11.4	11.0	10.8	10.1	8.4
Household Equipment/Operations	6.4	6.2	6.4	6.7	6.9	6.9	7.3	8.1
Vehicle Purchases	7.0	5.2	7.1	7.3	7.8	9.1	9.0	10.1
Other Vehicle Expenses	4.9	5.8	6.2	6.7	7.1	7.1	6.7	5.9
Healthcare	4.8	6.2	6.5	6.9	7.1	7.3	7.7	6.3
Entertainment	3.9	4.3	4.2	4.5	4.5	4.8	5.4	6.0

h_{ig} is continuous and only observed if $s_{ig} = 1$. The outcome model is the following:

$$\log h_{ig} = \boldsymbol{x}_i \boldsymbol{\beta}_g + \varepsilon_{ig},$$

where x_i is a set of explanatory variables, $\boldsymbol{\beta}_g$ is a vector of coefficients, and ε_{ig} is a standard normal error term.

We use the same set of explanatory variables in the selection and the outcome equations to remain agnostic as to what household features may be associated with expenditures (and the presence or lack of data in some cases). These variables include the following: family size (1 person, 2 people, 3–4 people, 5–6 people, 7+ people), education (less than high school, high school diploma, some college/associate's degree, and bachelor's degree and higher), and family income (< $10,000, $10,000–25,000, $25,000–40,000, $40,000–60,000, $60,000–75,000, $75,000–100,000, $100,000–150,000, $150,000+).[2]

We estimate 19 hurdle models, one for each UCC category g.[3] With the estimates $\boldsymbol{\beta}_g^s$ and $\boldsymbol{\beta}_g$ in hand, we use them to construct predicted values of expenditure on each UCC category for every CPS respondent in our sample. The explanatory variables we used in the CEX are also available in the CPS, and the binning of the categories is made consistent across the two data sets.[4]

2.3.2 Validation

In this section, we embark on a brief detour to show that our imputation approach yields sensible results for the CPS respondents' consumption. In the rightmost column of Table 2, we report the average consumption in each UCC category for our imputed CPS data. These line up very closely with both the CEX's published tables and our own calculations from the CEX microdata.

As another check, we look at the expenditure shares (an individual's share of imputed consumption spent on a given UCC category) of the most popular categories as a function of household income.[5] Table 4 displays these results. Our imputation results in expenditure shares that are qualitatively and quantitatively in line with those of the published tables of the CEX. For example, we reproduce the fact that poorer households use more of their budget on necessities such as food at home, rented dwellings, and utilities.

2.4 Individualized Inflation Rates and Real Wage Growth

Having established that we have credible estimates for expenditures for individuals in the CPS, we then use them as the basis for our individualized inflation rates. To do this, we apply the CPI series that correspond to

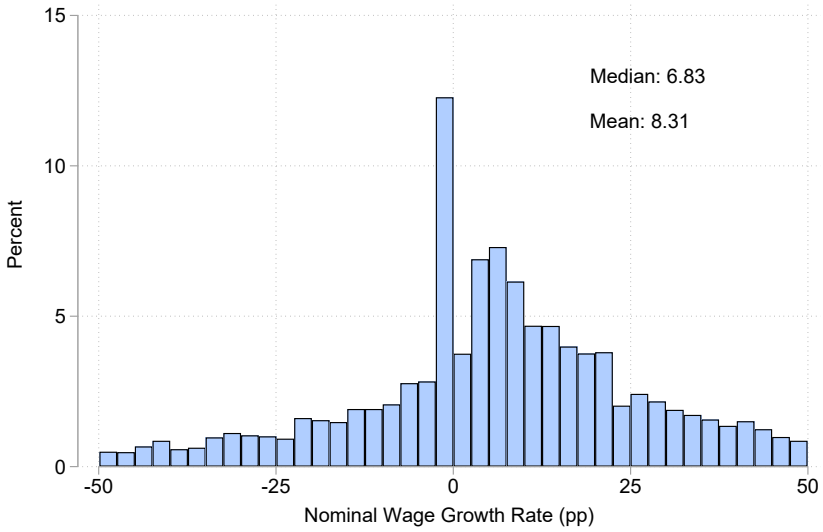
2. Household income and family size are only available in brackets from the CEX.

3. Although many categories are asked about both in the Diary and Interview surveys, some expenditures—including food at home, food away from home, and alcohol—are only collected in the Diary. In these cases, we only estimate the model on households in the Diary.

4. Note that although the CEX surveys households and the CPS surveys individuals, we have information on household characteristics in the CPS and thus use this information to generate the predicted expenditures.

5. In principle, we can do the same for other household characteristics, but the expenditure shares exhibit the most variation along the income dimension. The shares along other dimensions also match up well with the published tables.

Figure 2
Nominal Wage Growth Distribution



NOTE: This figure displays a percent histogram of the year-over-year nominal wage growth calculated for individuals in the CPS. Source: Authors' calculations.

the 19 expenditure categories that we estimated for each individual in our CPS sample. This matching exercise can be found in Table 1. For each individual, we calculate the share of total expenditure for each expenditure category, multiply by the expenditure's inflation rate, and sum across all expenditure groups. More precisely,

$$\pi_i = \sum_{g=1}^{19} \frac{c_{ig}}{C_i} \pi_g,$$

where π_i is household i's inflation rate in 2022, c_{ig} is an individual's expenditure on group g, C_i is an individual's total expenditure, and π_g is the inflation rate of group g from the CPI series. An individual's real wage growth is then calculated as the difference between their nominal wage growth and the inflation rate.

3. RESULTS

This section first reports our findings separately about the two components of real wage growth: nominal wage growth and inflation rates. Then we put them together and analyze real wage growth.

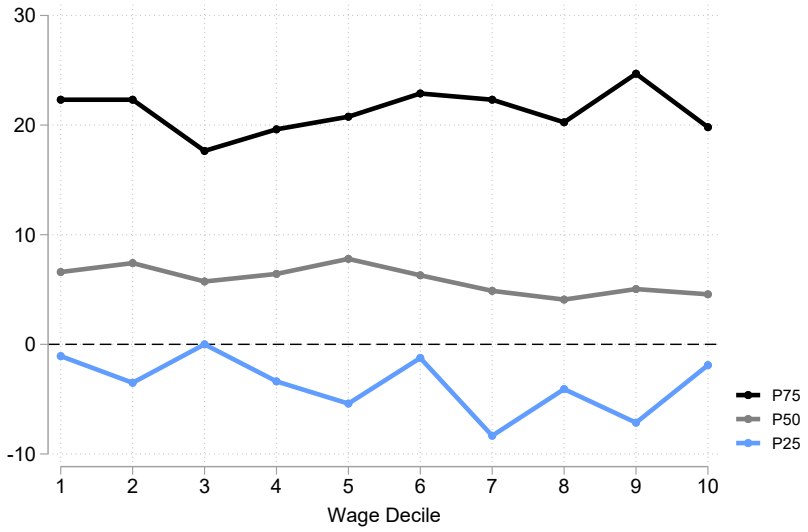
3.1 Nominal Wage Growth

Figure 2 depicts the distribution of nominal wage growth. The median nominal wage growth rate is 6.83 percent in 2022, and the mean is 8.31 percent. The distribution of nominal wage growth has two characteristics that stand out. First, the mass point around zero shows that many individuals, around 12 percent, experienced stable year-over-year wages: Their paychecks did not change at all in nominal terms. Second, the wide range in distribution shows that many workers experienced extreme wage changes. These features of the wage growth distribution—many small wage changes and very high kurtosis—are consistent with what has been documented by Guvenen et al. (2015) using U.S. administrative data.

Next, to see who is experiencing significant wage changes, we examine how nominal wage growth varies by wage decile, depicted in Figure 3. Overall, the median of the nominal wage growth distribution is still positive across all wage deciles, especially for lower-wage workers. In fact, among the lowest deciles, nearly 75 percent of them experienced positive wage growth. For the most part, the median and the 25th percentile of growth decline with movement up the wage distribution. Interestingly, the upper tail of the wage growth distribution is stable at all wage levels: The top quarter saw nominal wage growth of slightly more than 20 percent regardless of whether they were high- or low-wage workers.

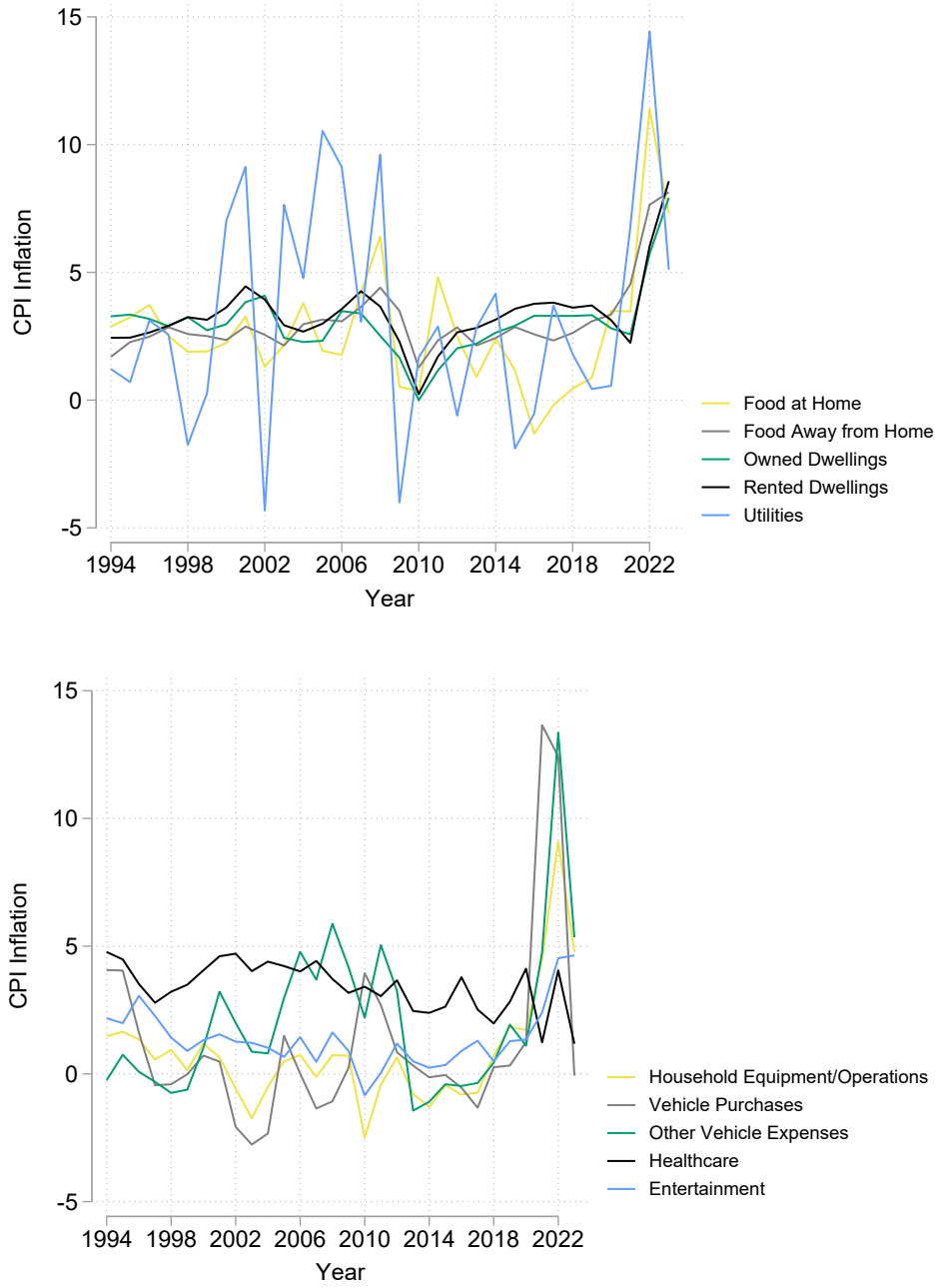
We have yet to consider how inflation cuts into these positive nominal wages. This will be addressed after we study the distribution of inflation rates for these workers.

Figure 3
Nominal Wage Growth by Wage Decile



NOTE: The figure plots nominal wage growth at the 25th percentile, median, and 75th percentile by wage decile. SOURCE: Authors' calculations.

Figure 4
Inflation over Time

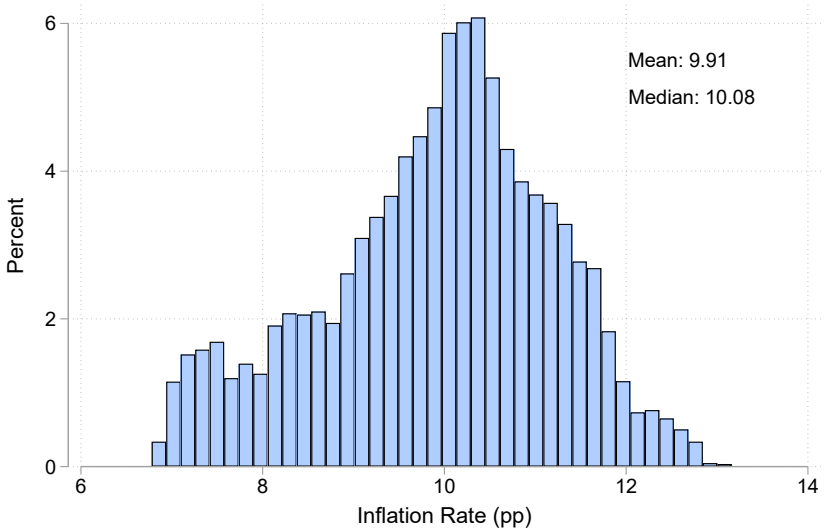


3.2 Inflation Rates

To get a sense of the raw inflation rates that went into our calculations (π_g) and the general context of inflation in 2022, we plot their time series in Figure 4. The spikes in 2022 are notable: Among the reasons are the fiscal policies enacted during the pandemic (such as the CARES Act and the American Rescue Plan Act) and the concurrent global supply chain crisis. The increase in the price level was particularly high among utilities (which includes fuel and gasoline), food at home, and vehicle purchases and expenses.

In Figure 5, we plot the distribution of inflation rates for the individuals in our CPS sample. The median household experienced a 10 percent increase in the price level of the goods basket it consumed from 2021 to 2022. Overall, individual inflation rates range from about 7 to 13 percent. By construction, the heterogeneity

Figure 5
Inflation Rate Distribution

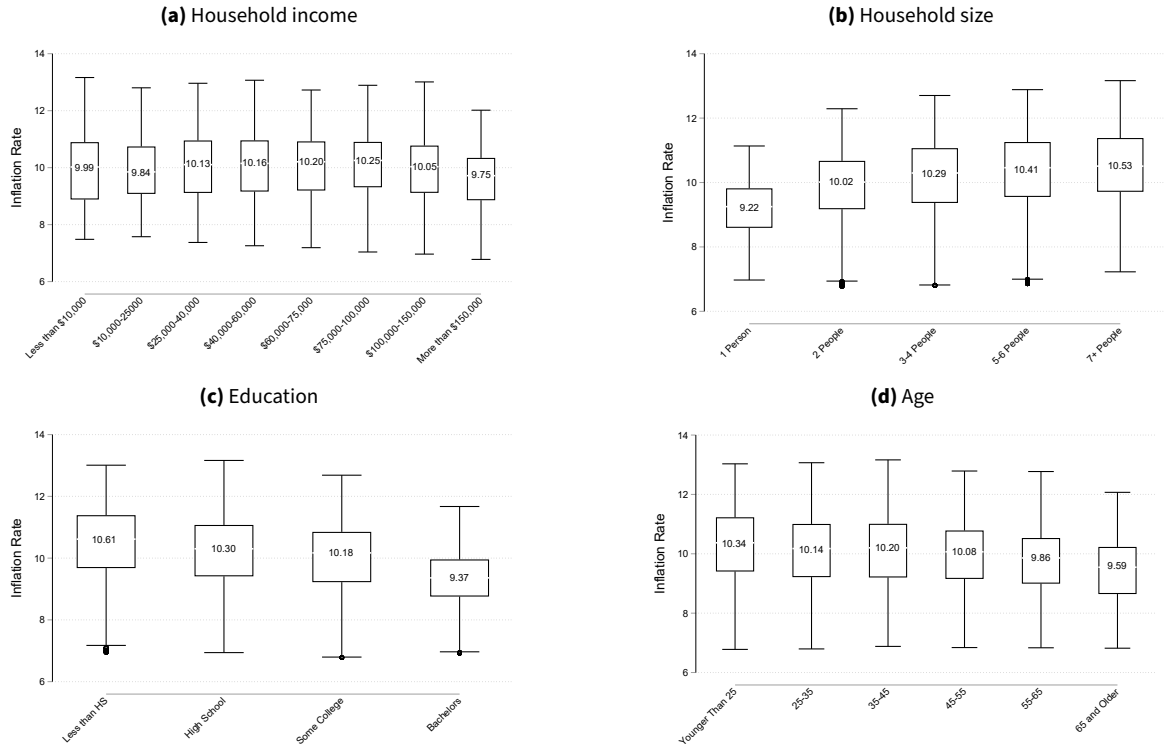


is due to individuals consuming different shares of each item category. Evidently, there is a lot less variation in terms of annual inflation rates compared with nominal income growth rates. This observation suggests that much of the variation in real growth rates will be driven by wages rather than by the prices of consumer goods.

Nevertheless, we can also use our imputation to examine which demographic groups experienced the highest inflation rates in 2021–22. Figure 6, panel (a) shows that we do not find a great deal of heterogeneity with respect to income: The highest income bracket has the lowest inflation rate, but below that there is no clear pattern.[6] We can discern the reasons for this by combining the inflation rates in Figure 4 with the expenditure shares in Table 4. Although low-income households spend more on high-inflation categories such as food at home and utilities, this is counteracted by high-income households' spending on different high-inflation categories such as vehicle purchases and expenses and household equipment/operations.

6. Other studies, such as Argente and Lee (2021), find that lower-income households experience much higher inflation rates, but that is due to differences in product quality and shopping behavior, which we cannot address here.

Figure 6
Distribution of Inflation by Demographic Group



NOTE: These box plots depict the distribution of inflation rates by demographic groups and report the median inflation rate in each category.

However, we do find more stark variations along the dimensions of household size, education, and age of the household head. Consumers who are in large households, have low education levels, or are young saw the highest inflation rates. At the same time, the household size, education, and age groups with the lowest inflation rates also had the least amount of heterogeneity within their groups. Appendix 1.2.1 reports the same statistics across other dimensions we can observe in the CPS, where we find little variation.

The key patterns in these findings can also be understood by combining the inflation rates with expenditure shares, reported in Appendix 1. For instance, older workers' lower inflation rates are primarily driven by more spending on healthcare, which had relatively low inflation. Less-educated workers' higher inflation rates are more attributable to their higher spending on food and utilities and lower spending on entertainment and healthcare.

3.3 Real Wage Growth

Finally, we subtract each individual's inflation rate off their nominal wage growth to arrive at their value for real wage growth. Figure 7 depicts this distribution. We find that the median worker experienced a 3.15 percent drop in their real wages between 2021 and 2022. In fact, for 57 percent of workers, their inflation rate was above their nominal wage growth rate, meaning their wages did not keep pace with inflation. This is unusual relative to previous decades: According to Rich, Tracy, and Krohn (2022), the share of workers whose wages fail to keep up with inflation has ranged from 42 to 48 percent over the past 25 years. The high proportion of negative real wage earners has only come close to that of 2022 twice in the past two decades: It was 54 percent in 2008 and 56 percent in 2011.

Turning to the heterogeneity, we find substantial variation in real wage growth rates. The majority range from –60 percent to 60 percent, with a large mass falling between 0 and –12.5 percent. This range encompasses many of the individuals who saw no change in nominal wages between 2021 and 2022. Because inflation rates have a much narrower spread than nominal wage growth rates, we can attribute much of these differences in real wage growth to variation in nominal growth rates rather than to inflation.

Figure 7
Real Wage Growth by Wage Decile

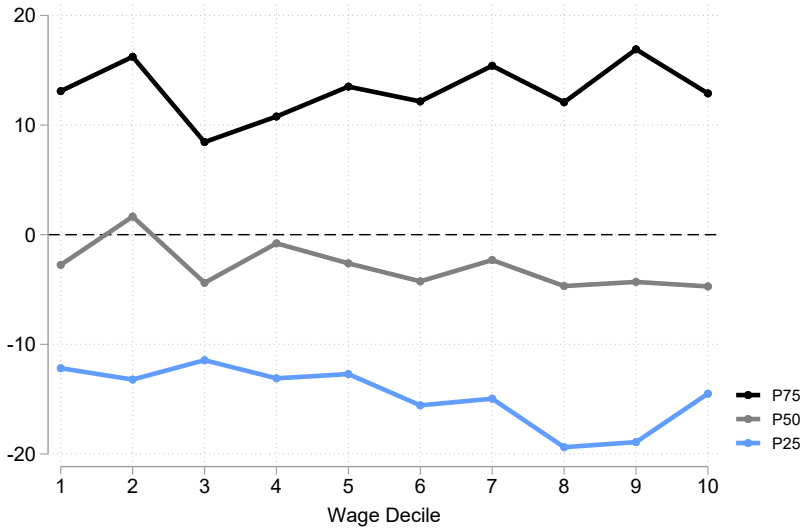


Figure 8
Real Wage Growth Distribution

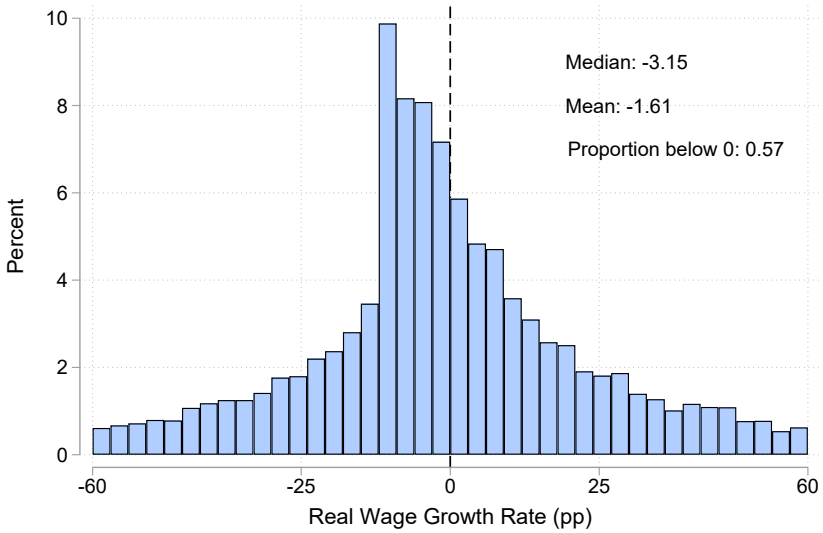
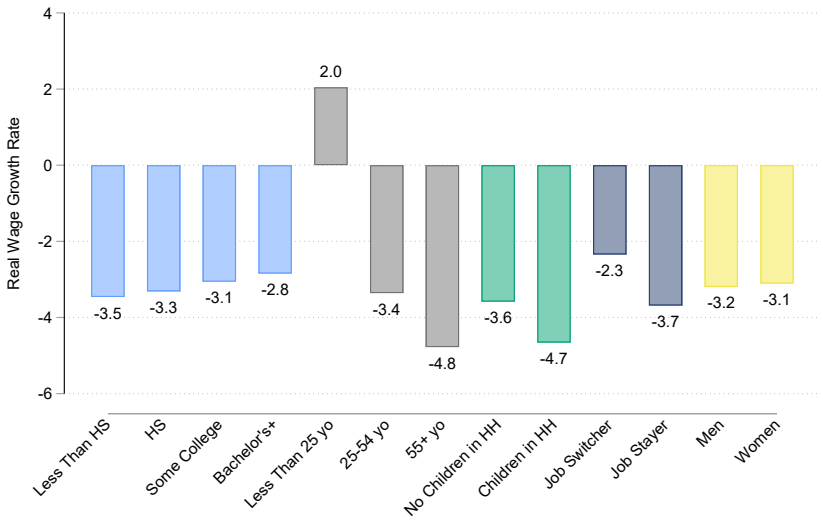


Figure 8 breaks this range down by decile of earnings, similar to how Figure 3 does for the nominal wage growth distribution. The general pattern remains the same: The values are just shifted downward after accounting for inflation. This finding indicates that the inflation rates within these deciles neither offset nor amplified the general patterns in wage growth.

A similar story emerges when analyzing the data by demographic group. Figure 9 highlights the median real wage growth for a few of the categories.[7] For example, real wage growth decreases as the worker's age increases. Despite the fact that workers younger than 25 years old saw the highest median inflation rate of any age group at 10.24 percent, they are the only demographic group that experienced a positive real wage growth

7. In Appendix 1.3.1, we present the same statistics for a broader set of characteristics.

Figure 9
Real Wage Growth by Demographic Group



rate, of 2 percent. This rate is 5.4 percentage points higher than workers between the ages of 25 and 54 and almost 7 percentage points higher than workers over the age of 54. Since young workers often experience the highest rates of wage growth across all stages of the business cycle, it is not surprising that we find that this held true in 2021–22. However, we do learn that even in this period of high inflation, the median worker under age 25 still came out ahead.

Figure 9 also shows that the real wage growth rates across the education distribution are more aligned than across age groups. Workers with less than a high school education experienced both the highest inflation rates and the lowest real wage growth rates, while workers with college degrees saw low inflation rates and high real wage growth rates. Households with children also saw a larger drop in real wages compared with households without children. We do not find any major difference in real wage growth between men and women, consistent with the observation that women had caught up to men at this point during the pandemic economic recovery.

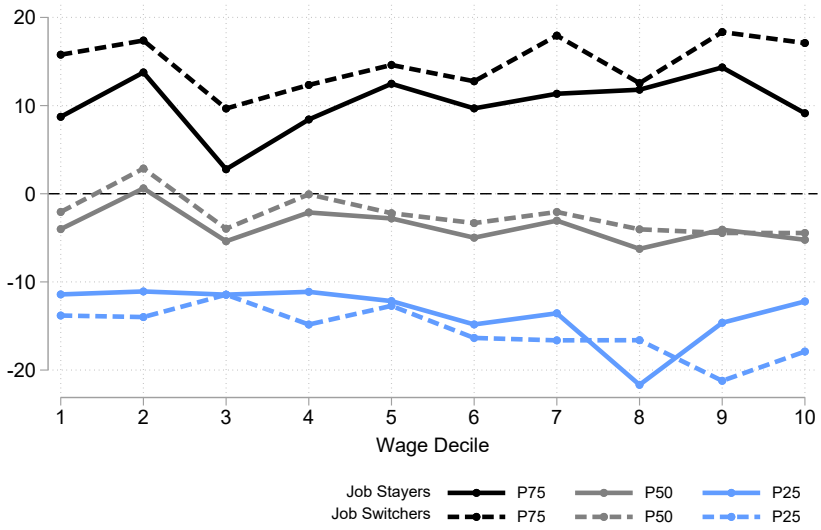
Finally, we note the important differences between job switchers and job stayers. Job switchers are those who are observed to have a change of employer between their 2021 and 2022 CPS interviews,[8] while job stayers encompass everyone else. Figure 9 shows that job switchers experienced higher real wage growth rates than job stayers, with a 1.4-percentage-point median real wage growth. This difference holds up even when controlling for the other demographic factors. This phenomenon is related to the historically tight labor market during this time frame. With soaring labor demand, the environment was favorable for job seekers. Workers took advantage of this, and those who switched jobs could secure higher wages compared with other periods.

Variations in real wage growth become more dramatic when zooming into smaller groups that combine these demographic characteristics. For example, workers who were younger than 25 years old, held a college degree, had no children in the household, and switched jobs in 2022 saw a positive real wage growth rate of 13.33 percent. On the other hand, workers who were at least 55 years old, did not hold a high school degree, had at least one child in the household, and stayed in their jobs in 2022 saw a negative real wage growth rate of –22.20 percent, 35.53 percentage points lower than someone with their "opposite" characteristics.

We view the job switcher versus job stayer distinction as important. Unlike the other dimensions that we study, this one is, to some extent, controllable by the worker: They have the option to search for new jobs in pursuit of wage increases. Therefore, we further explore the differences between job switchers and job stayers by breaking up the statistics in Figure 7. The results are shown in Figure 10, revealing that at all wage levels, the largest differences between switchers and stayers come mainly from the upper parts of the distribution. Although at all deciles, the median job switcher does better than the median job stayer, this is especially true

8. To identify individuals who switch jobs, we generate 12-month lags for industry, employer, and employment activity. We define job switchers as those whose industry, employer, or activity changes between their first and second reports of wages.

Figure 10
Real Wage Growth by Wage Decile for Job Stayers and Switchers



for at the 75th percentile of wage growth, where the gap between them is much greater. These large real wage changes also do not differ much across wage levels. Unlike the median among switchers, the highest percentage increases in real wages for the bottom earners are similar to those of the top earners.

4. CONCLUSION

In this article, we explore patterns in real wage growth in 2022 to pinpoint the individuals whose wages are the most and least likely to keep up with the rising cost of living. To overcome the lack of up-to-date data on wage and consumption, we use the CPS Outgoing Rotation Groups to track workers' wages 12 months apart and estimate their consumption by imputing expenditure information from the CEX. We find considerable variation in both nominal wage growth and inflation, with some coherent patterns across demographic groups. However, the distribution of nominal wages has a greater range than that of inflation, suggesting that a given individual's real wage growth is driven mainly by their nominal wage growth. We also find that 57 percent of individuals experienced negative real wage growth in 2022, which is 10 to 15 percentage points higher than the average year. The workers hit with the lowest real wage growth were generally older, were less educated, had children in the household, and did not switch jobs in 2022. On the other hand, the real wages of young, highly educated, job-switching workers and those without children fared relatively well in 2022.

More broadly, this analysis highlights the importance of considering how periods of high inflation affect different segments of the population. As monetary policy works to stabilize price levels going forward, it is clear that not all groups will have the same experiences throughout the recovery: How a given individual is impacted depends on the price levels of the goods they consume and how their job situation evolves. Moreover, this study has suggested how together, labor market conditions and expenditure patterns can impact real income inequality. It is clear that the evolution of inequality in the near future will depend on how this unique situation in 2022—a tight labor market combined with high inflation—plays out.

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APPENDIX 1.

Appendix 1.1 Expenditure Shares by Observables

Table Appendix 1.1
Share of Expenditure By Age Group

	Less than 25	25-54	55+
Food	9.3	10.3	10.6
Food Away from Home	6.6	5.5	4.4
Owned Dwellings	9.8	13.8	17.1
Rented Dwellings	19.9	14.2	7.7
Utilities	9.2	10.5	11.8
Household Equipment/Operations	6.6	7.0	7.1
Vehicle Purchases	9.4	8.3	7.2
Other Vehicle Expenses	6.5	6.6	6.6
Healthcare	3.1	6.0	11.5
Entertainment	4.4	4.7	5.3

Table Appendix 1.2
Share of Expenditure By Education Group

	Less than HS	HS	Some college	Bachelors+
Food	12.5	10.5	9.5	10.1
Food Away from Home	5.0	5.4	5.5	5.3
Owned Dwellings	9.0	12.0	14.3	19.5
Rented Dwellings	18.9	15.0	12.3	10.1
Utilities	11.8	11.6	10.5	8.7
Household Equipment/Operations	5.9	6.7	7.1	7.8
Vehicle Purchases	8.8	7.5	9.2	7.2
Other Vehicle Expenses	6.3	6.8	6.9	5.7
Healthcare	4.9	6.9	7.0	7.7
Entertainment	3.6	4.8	4.9	5.3

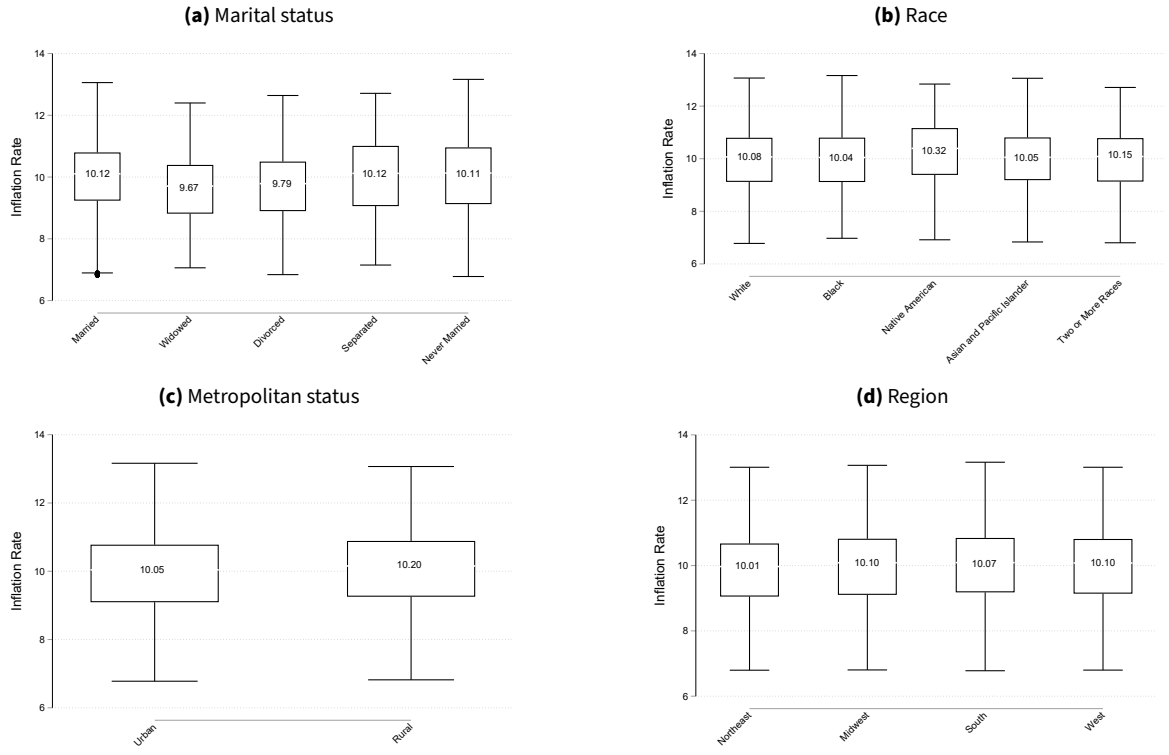
Table Appendix 1.3
Share of Expenditure For Job Switchers and Stayers

	Job stayer	Job switcher
Food	10.3	10.3
Food Away from Home	5.3	5.5
Owned Dwellings	14.6	13.7
Rented Dwellings	12.8	13.8
Utilities	10.7	10.6
Household Equipment/Operations	7.0	6.9
Vehicle Purchases	8.1	8.2
Other Vehicle Expenses	6.5	6.6
Healthcare	7.3	6.7
Entertainment	4.9	4.8

Appendix 1.2 Inflation Rate Distribution

While the following demographic groups were not used to impute consumption information from individuals in the CEX to individuals in the CPS, Figure Appendix 1.2.1 depicts their inflation rates for reference.

Figure Appendix 1.2.1
Distribution of Inflation by Demographic Group



Appendix 1.3 Real Wage Growth Distribution

While inflation typically varies only within 1 percentage point across demographic groups, real wage growth often varies to a greater degree across different characteristics. Figure Appendix 1.3.1 extends Figure 10.

Figure Appendix 1.3.1
Distribution of Inflation by Demographic Group