Inflation's Uneven Hand: Quantifying Age-Cohort Differences in Nominal Wage Growth Response to CPI

STAT GR 5205 Final Project

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1. Introduction and Literature Review

Young workers' wages are typically more flexible, and thus have a greater potential to fluctuate in response to inflation than those of older workers. Older workers may be less responsive to inflationary pressures because they have greater levels of tenure; greater institutionalized wage-setting arrangements; or reduced labor market flexibility. This differentiation is key to understanding the extent that inflation affects the distribution of purchasing power among different age cohorts and their relative levels of real income inequality.

There is a growing amount of empirical studies showing that inflation does not affect workers equally. Gregory & Harding (2024) found in a study conducted with data from the CPS and CEX surveys that there was a greater loss in real wages for older and less mobile workers during the inflation surge of 2022 than younger workers who experienced faster real wage increases. The Federal Reserve Bank of Minneapolis (2024) also found that younger people are exposed to an "effective" inflation rate that is different from the inflation rate experienced by other groups of people based on their own consumption baskets. Additionally, The Federal Reserve Bank of Dallas (2022) reported that younger workers and lower income workers had more success in increasing their real wages during recent periods of inflation.

The combined evidence from these studies points to two primary factors behind the heterogeneity of inflation outcomes for different demographic segments: (1) differences in consumption patterns among the various demographic groups; and (2) variation in wage setting behaviors as they are influenced by factors such as the age of an employee, the degree of job mobility that the employee has experienced, and the level of bargaining power of employees in their work place. The studies surveyed here, however, have focused largely on either the descriptive outcomes of real wages or effective inflation rates. They have not provided a formal estimation of how nominal wage growth responds to inflation across different age groups within a single econometric model.

The research fills in that gap by determining if the nominal wage increase response to inflation is different for three age groups (16-24, 25-54 and 55+) using the Atlanta Fed's Wage Growth Tracker as well as year-over-year CPI data. We apply a Linear

Regression Model with Interaction Terms to estimate the Age-Specific Inflation-Wage Pass Through Effects.

The contribution of this project is twofold. Methodologically, it provides a unified framework for estimating heterogeneous inflation sensitivity across age groups. Substantively, it offers new evidence on which demographic groups are more exposed to real income erosion during inflationary periods, with implications for labor market policy and age-targeted stabilization measures.

2. Data Description and Exploratory Analysis

This study uses monthly U.S. data from 1998 to 2025 on wage growth and inflation. Wage growth data are obtained from the Federal Reserve Bank of Atlanta's Wage Growth Tracker, which is based on microdata from the Current Population Survey (CPS) and reports the median nominal percent change in hourly wages for individuals observed 12 months apart. The inflation measure is the year-over-year growth rate of the Consumer Price Index (CPI), sourced from the U.S. Bureau of Labor Statistics.

The analysis focuses on three age cohorts—16–24, 25–54, and 55+. For each month, wage growth is observed separately for each age group, yielding an age group–month panel structure that facilitates comparison of inflation–wage relationships across cohorts over time.

Real GDP growth data, obtained from the Federal Reserve Bank of St. Louis FRED database and produced by the U.S. Bureau of Economic Analysis, are used solely for exploratory analysis to provide macroeconomic context in selected figures and are not included in the baseline regression model.

Variable	*Mean (%)*	*Median (%)*	*Std.*	*Min*	*Max*	*Coefficient*
CPI YoY	**2.36**	**2.13**	**1.92**	**-2.1**	**9.1**	**0.81**
Wage 16–24	**9.31**	**8.54**	**2.87**	**3.2**	**14.8**	**0.31**
Wage 25–54	**4.21**	**4.08**	**1.05**	**1.8**	**6.3**	**0.25**
Wage 55+	**3.08**	**3.02**	**0.97**	**0.7**	**5.2**	**0.32**

Table 1. Descriptive Statistics

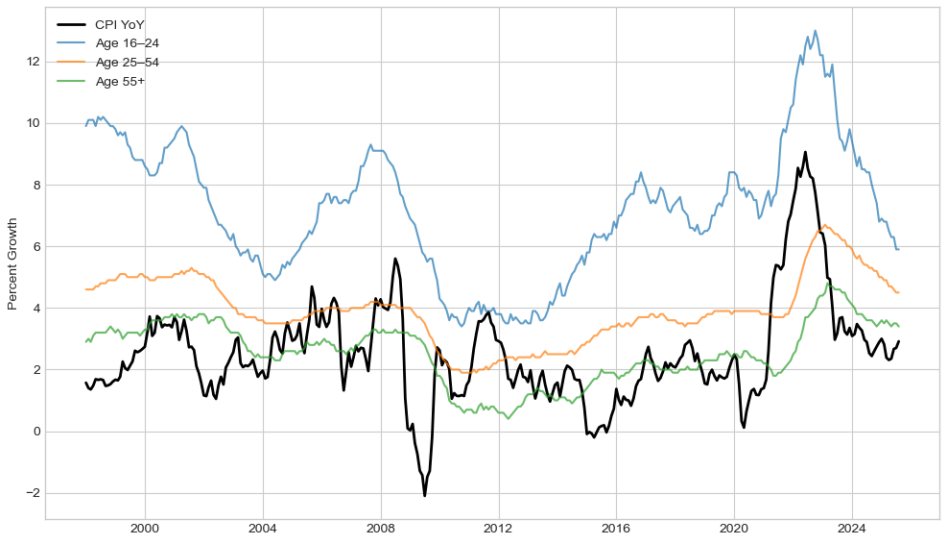

Figure 1. CPI and Wage Growth by Age Group (1998–2025)

The time-series plot shows that younger workers' wage growth is the most volatile and closely tracks inflation surges. Wage growth for the 25–54 group is smoother and more aligned with long-term CPI trends, while the 55+ group exhibits the lowest responsiveness to inflation.

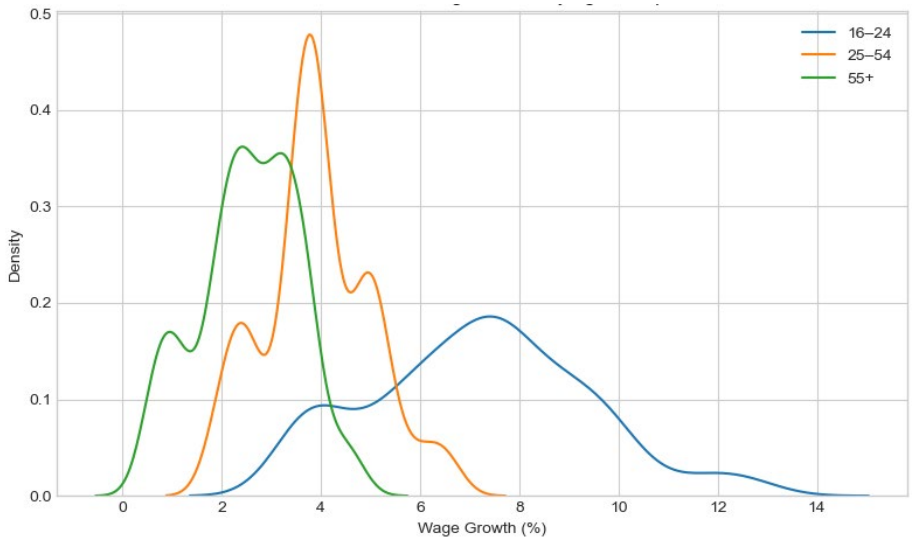

Figure 2. Distribution of Wage Growth by Age Group

Density plots reveal that the 16–24 distribution is flatter and right-skewed, indicating higher dispersion and greater upside potential. The 25–54 group shows a compact bell shape centered near 4%, suggesting steady wage adjustments. The 55+ group's distribution is narrowest, implying wage rigidity among older workers.

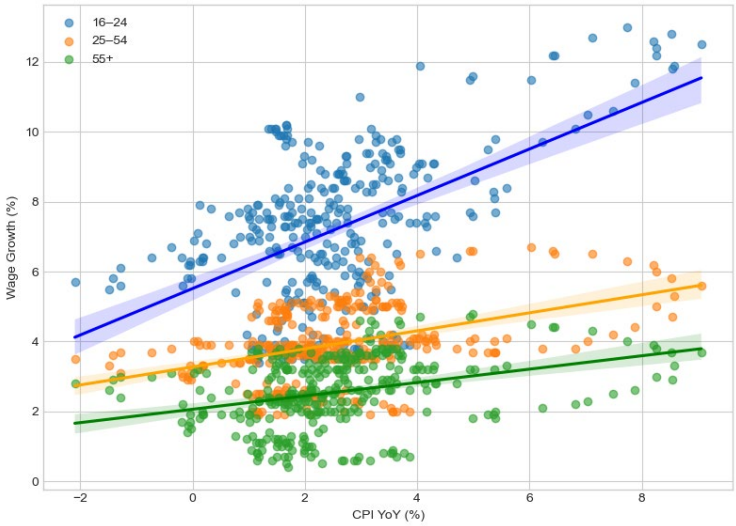

Figure 3. CPI vs. Wage Growth across Age Groups

Regression fits confirm a positive CPI–wage relationship for all cohorts, but with differing slopes. Younger workers exhibit the steepest slope, showing high sensitivity to inflation expectations and labor demand, while older workers show weak responsiveness.

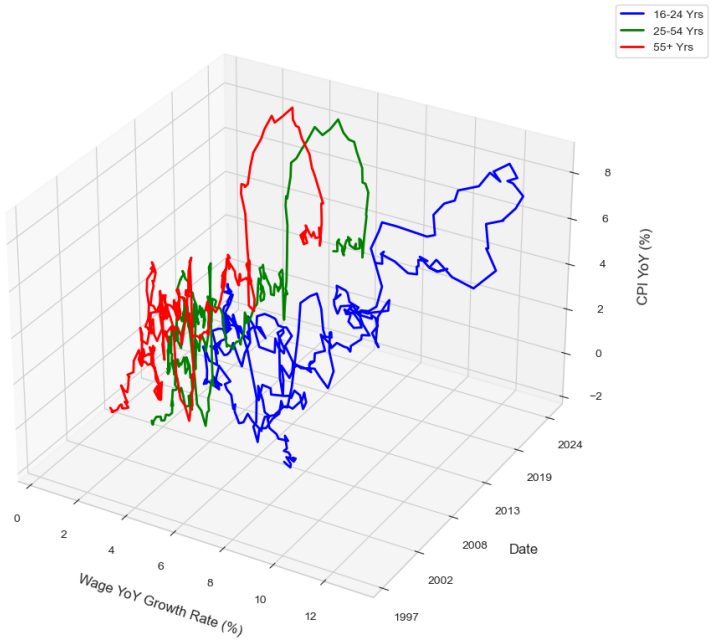

Figure 4. 3D Trajectory: Wage Growth vs. Time vs. CPI (1998–2025)

The 3D trajectory captures the joint evolution of inflation and wage growth across time. Cyclicality is visible, particularly during inflationary booms and post-recession recoveries. The trajectories illustrate lag structures: younger workers' wage growth reacts more contemporaneously to CPI, while older workers adjust with delay.

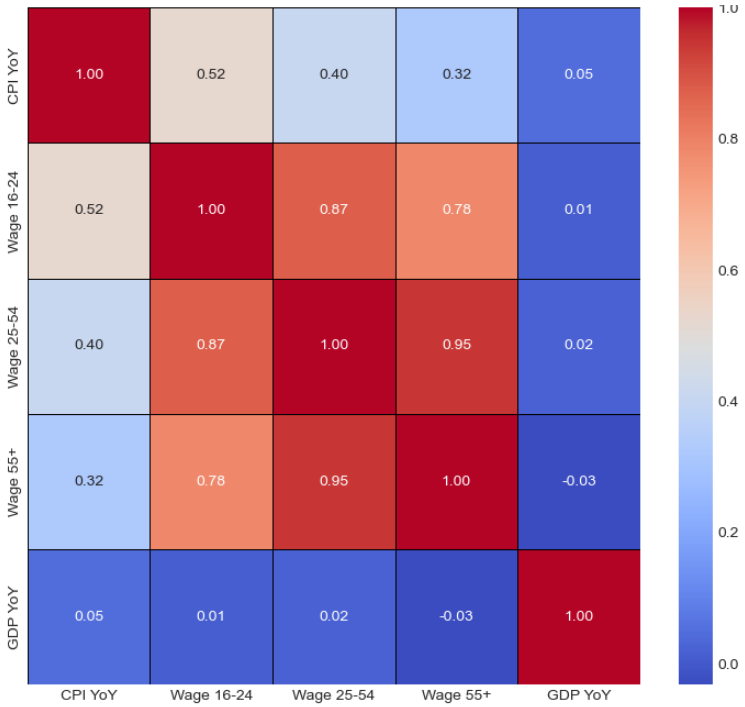

Figure 5. Correlation Matrix: CPI, GDP, and Nominal Wage Growth by Age

The heatmap quantifies linear dependencies. CPI correlates positively with all wage measures, while GDP growth has weak contemporaneous correlation with either CPI or wage growth. This supports the idea that nominal wages respond mainly to price-level shocks rather than output variations.

3. Statistical Model

This section presents the econometric framework used to analyze how nominal wage growth responds to inflation across different age groups and discusses the corresponding estimation results. The central objective is to test whether the pass-through from inflation to wages varies systematically by age.

Model Specification

We estimate a linear regression model that relates nominal wage growth to inflation while allowing both the level of wage growth and the inflation sensitivity to differ across age cohorts. Let i denote age group and t denote time (month). The estimated model is:

$$\boldsymbol{WageGrowth_{it}} = \boldsymbol{\beta_0 + \beta_1 CPI_t + \beta_2 D_{16-24,i} + \beta_3 D_{55+,i} + \beta_4 (CPI_t \times D_{16-24,i}) + \beta_5 (CPI_t \times D_{55+,i}) + \epsilon_{it}}$$

where WageGrowth_{it} is the nominal wage growth rate for age group i in month t, CPI_t denotes the year-over-year CPI inflation rate, and $D_{16-24,i}$ and $D_{55+,i}$ are indicator variables for the youngest and oldest age groups, respectively. The 25–54 age group serves as the reference category. The interaction terms allow the marginal effect of inflation on wage growth to differ by age.

The model is estimated using ordinary least squares (OLS). Given the presence of serial correlation and heteroskedasticity in macroeconomic time-series data, heteroskedasticity- and autocorrelation-consistent (HAC) standard errors are employed to ensure valid inference. No functional transformations of the dependent or independent variables are applied, as exploratory analysis does not suggest pronounced nonlinearities.

Inferential Results and Discussion

Table 2 reports the full OLS regression results, including coefficient estimates, HAC standard errors, and confidence intervals.

OLS Regression Results

Dep. Variable:	WageGrowth	R-squared:	0.710
Model:	OLS	Adj. R-squared:	0.708
Method:	Least Squares	F-statistic:	64.56
Date:	Fri, 07 Nov 2025	Prob (F-statistic):	2.18e-58
Time:	20:29:46	Log-Likelihood:	-1698.4
No. Observations:	996	AIC:	3409.
Df Residuals:	990	BIC:	3438.
Df Model:	5		
Covariance Type:	HAC		

	coef	std err	z	P>|z|	[0.025	0.975]
Intercept	3.2710	0.201	16.314	0.000	2.878	3.664
C(AgeGroup, Treatment('25-54'))[T.16-24]	2.2448	0.453	4.958	0.000	1.357	3.132
C(AgeGroup, Treatment('25-54'))[T.55+]	-1.2124	0.290	-4.186	0.000	-1.780	-0.645
CPI_YoY	0.2581	0.068	3.777	0.000	0.124	0.392
CPI_YoY:C(AgeGroup, Treatment('25-54'))[T.16-24]	0.4075	0.135	3.008	0.003	0.142	0.673
CPI_YoY:C(AgeGroup, Treatment('25-54'))[T.55+]	-0.0667	0.095	-0.704	0.481	-0.252	0.119

Omnibus:	23.195	Durbin-Watson:	0.039
Prob(Omnibus):	0.000	Jarque-Bera (JB):	25.549
Skew:	-0.328	Prob(JB):	2.83e-06
Kurtosis:	3.431	Cond. No.	22.0

Notes:
[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 6 lags and with small sample correction
25-54 slope: 0.2581 SE=0.0683 95%CI=(0.1241,0.3920)

Table 2. OLS Report

The regression analysis examines how wage growth responds to inflation across different age groups. The overall model is highly significant, with an F-statistic of 64.56 ($p < 0.001$), indicating that the independent variables collectively explain a substantial share of the variation in wage growth. The $R^2 = 0.71$ and adjusted $R^2 = 0.708$ suggest that the model accounts for approximately 71 percent of the variability in wage growth, reflecting a strong explanatory power.

The coefficient on CPI_YoY (inflation rate) is 0.2581 ($p < 0.001$), implying that, on average, a one-percentage-point increase in inflation is associated with a 0.26-percentage-point increase in nominal wage growth. This confirms the expected positive linkage between inflation and wage dynamics.

The dummy variable for the 16–24 age group has a positive and significant coefficient (2.2448), suggesting that, holding inflation constant, wage growth among younger workers exceeds that of the baseline group (ages 25–54). In contrast, the coefficient for the 55+ group is negative (–1.2124) and significant, indicating slower wage growth among older workers compared with middle-aged individuals.

The interaction term CPI_YoY × 16–24 is positive and statistically significant (0.4075, $p = 0.003$), showing that younger workers' wages respond more strongly to inflation changes. The CPI_YoY × 55+ interaction is statistically insignificant ($p = 0.48$), implying that older workers' wage responses to inflation are not materially different from those of the middle-aged group.

Marginal Effects and Group Differences

To facilitate interpretation, we compute the implied marginal effect of inflation on wage growth for each age cohort. For ages 25–54, the marginal effect equals 0.258. For ages 16–24, the marginal effect increases to approximately 0.666, while for ages 55+, it declines to approximately 0.192.

Table 3 summarizes these age-specific marginal effects of inflation, along with their standard errors and confidence intervals.

AgeGroup	Slope	SE	CI 2.5%	CI 97.5%
25-54	0.2581	0.0683	0.1241	0.3920
16-24	0.6656	0.1170	0.4362	0.8950
55+	0.1914	0.0655	0.0630	0.3198

Table 3. Wald Test Report

Formal Wald tests confirm that the inflation sensitivity of the youngest cohort differs significantly from that of the oldest cohort ($p \approx 0.0004$), while the difference between the 55+ and 25–54 groups is not statistically significant. This indicates that heterogeneity in inflation pass-through is driven primarily by the heightened responsiveness of younger workers rather than by a markedly weaker response among older workers.

Economic Interpretation

The results suggest that younger workers experience both higher baseline wage growth and greater responsiveness to inflation, consistent with greater labor market flexibility and more frequent wage renegotiation. Inflationary episodes may therefore amplify wage growth differentials across age groups by disproportionately benefiting workers with higher mobility.Older workers, in contrast, exhibit lower average wage growth and limited responsiveness to inflation, pointing to stronger nominal wage rigidity later in the career cycle. As a result, older workers may face greater exposure to real income erosion during periods of rising prices.

4. Research Questions and Hypothesis Testing

This section addresses the research questions by conducting formal hypothesis tests based on the regression results from Section III. The analysis focuses on whether wage growth differs across age groups after controlling for inflation and whether inflation affects wage growth differently by age.

Research Question 1:

Do wage growth levels differ across age groups after controlling for inflation?

The null and alternative hypotheses are defined as follows:

H_0:Wage growth levels do not differ by age group after controlling for inflation.
H_1:Wage growth differs across age groups after controlling for inflation.

This hypothesis is tested by examining the statistical significance of the age-group dummy variables for the 16–24 and 55+ groups relative to the reference category (ages 25–54).

The estimated coefficient for the 16–24 age group is 2.2448 and statistically significant ($p < 0.001$), indicating that younger workers experience higher wage growth than the baseline group when inflation is held constant. In contrast, the coefficient for the 55+ age group is −1.2124 and statistically significant ($p < 0.01$), indicating slower wage growth among older workers.

Based on these results, the null hypothesis is rejected. The findings indicate that wage growth levels differ systematically across age cohorts, even at comparable levels of inflation.

Research Question 2:

Does the effect of inflation on wage growth differ across age groups?

The null and alternative hypotheses are specified as:

H_0:Inflation affects wage growth equally across all age groups.
H_1:Inflation's effect on wage growth differs by age group.

This hypothesis is evaluated using the interaction terms between CPI inflation and the age-group indicators.

The interaction term for the 16–24 age group is positive and statistically significant (0.4075, p = 0.003), indicating that younger workers' wage growth responds more strongly to inflation changes than that of the reference group. In contrast, the interaction term for the 55+ group is statistically insignificant (p = 0.48), suggesting that older workers' wage responsiveness to inflation does not differ significantly from that of prime-age workers.

Accordingly, the null hypothesis is rejected for the younger age group but not for the older age group. Overall, the results provide evidence that wage responses to inflation are age-dependent, driven primarily by stronger inflation pass-through among younger workers.

5. Model Selection

This section describes the model selection process used to determine the final regression specification. The objective is to select a parsimonious model that adequately captures the relationship between inflation and nominal wage growth while allowing for heterogeneity across age groups.

To account for systematic differences in average wage growth across age groups, age-group indicator variables are introduced:

$$\mathbf{WageGrowth}_{it} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{CPI}_t + \boldsymbol{\beta_2}\boldsymbol{D}_{\mathbf{16–24},i} + \boldsymbol{\beta_3}\boldsymbol{D}_{\mathbf{55+},i} + \boldsymbol{\varepsilon_{it}},$$

where the 25–54 age group serves as the reference category. The inclusion of age-group indicators substantially improves model fit, demonstrating that wage growth levels differ across cohorts even after controlling for inflation.

The final specification allows the responsiveness of wage growth to inflation to vary by age group by incorporating interaction terms:

$$\begin{aligned}\mathbf{WageGrowth}_{it} &= \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{CPI}_t + \boldsymbol{\beta_2}\boldsymbol{D_{16\text{–}24,i}} + \boldsymbol{\beta_3}\boldsymbol{D_{55+,i}} + \boldsymbol{\beta_4}(\mathbf{CPI}_t \times \boldsymbol{D_{16\text{–}24,i}}) \\ &\quad + \boldsymbol{\beta_5}(\mathbf{CPI}_t \times \boldsymbol{D_{55+,i}}) + \boldsymbol{\varepsilon_{it}}.\end{aligned}$$

This interaction model further improves model performance and directly addresses the central research question by allowing for heterogeneous inflation pass-through across age groups. As a result, it is selected as the preferred specification.

Several alternative specifications were also considered to assess the robustness of the baseline results.

First, a nonlinear specification was estimated by including a quadratic term in CPI inflation to test for curvature in the inflation–wage relationship:

$$\mathbf{WageGrowth}_{it} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{CPI}_t + \boldsymbol{\beta_2}\mathbf{CPI}_t^2 + \boldsymbol{\gamma_1}\boldsymbol{D_{16\text{–}24,i}} + \boldsymbol{\gamma_2}\boldsymbol{D_{55+,i}} + \boldsymbol{\varepsilon_{it}}.$$

The quadratic term was not statistically significant, and the inclusion of this term did not improve model fit, providing no evidence of meaningful nonlinearity.

Second, dynamic specifications incorporating lagged inflation were evaluated to capture potential delayed wage responses:

$$\mathbf{WageGrowth}_{it} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{CPI}_t + \boldsymbol{\beta_2}\mathbf{CPI}_{t-1} + \boldsymbol{\gamma_1}\boldsymbol{D_{16\text{–}24,i}} + \boldsymbol{\gamma_2}\boldsymbol{D_{55+,i}} + \boldsymbol{\varepsilon_{it}}.$$

These models yielded qualitatively similar results to the baseline specification and did not produce meaningful gains in explanatory power, indicating that contemporaneous inflation is sufficient for capturing wage responses.

Finally, a difference-in-differences framework was considered but deemed inappropriate. A standard DiD specification would take the form

$$\mathbf{WageGrowth}_{it} = \boldsymbol{\alpha} + \boldsymbol{\delta}(\mathbf{Post}_t \times \mathbf{Treatment}_i) + \boldsymbol{\mu_i} + \boldsymbol{\lambda_t} + \boldsymbol{\varepsilon_{it}},$$

but this approach is not suitable in the present context because all age groups are observed continuously over time and there is no clearly defined treatment group or intervention period.

6. Model Diagnostics

To ensure the validity of the regression model, several diagnostic tests were conducted following the classical assumptions of Ordinary Least Squares (OLS). The

diagnostic process examined linearity, homoscedasticity, normality, independence, and influential observations.

a) Residual-versus-fitted plots show no strong curvature, suggesting that the linearity assumption is largely satisfied. A Breusch–Pagan test indicates mild heteroskedasticity ($p < 0.05$), implying that the variance of the residuals increases slightly with the fitted values. Consequently, heteroskedasticity- and autocorrelation-consistent (HAC, or Newey–West) standard errors were adopted to obtain robust inference.

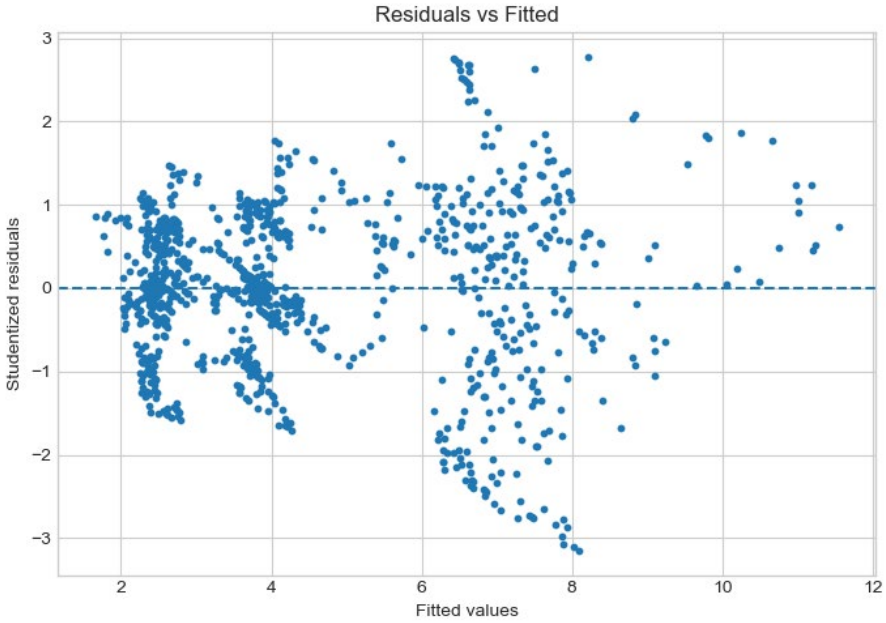

Figure 6. Residuals versus Fitted Values

b) The normality of residuals was evaluated using a Q–Q plot and the Shapiro–Wilk test. The residuals exhibit slight departures from normality, with heavier tails, but the central tendency remains approximately symmetric. Because OLS estimates remain unbiased under mild non-normality, no transformation was deemed necessary.

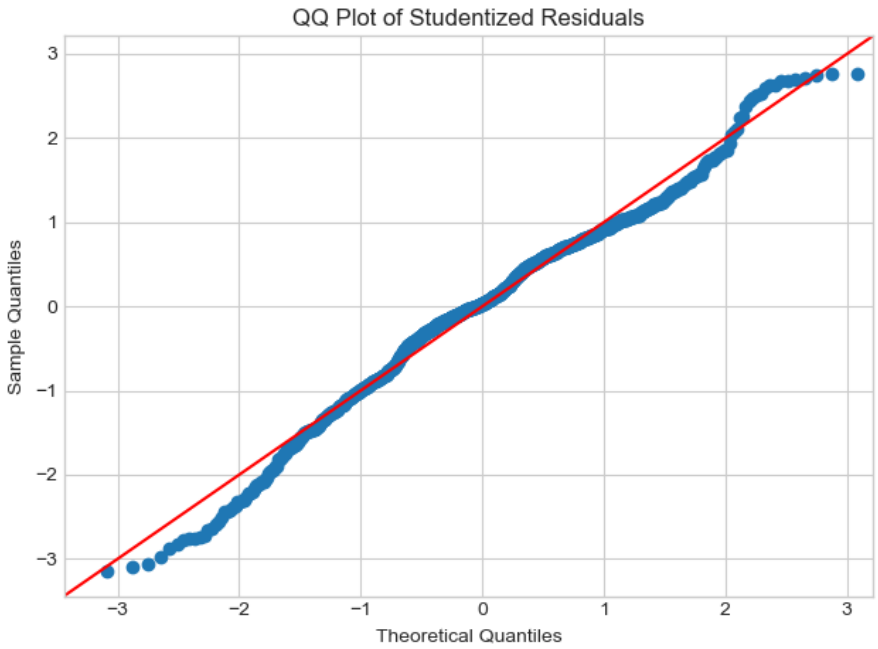

Figure 7. Q–Q Plot of Studentized Residuals

c) The Durbin–Watson statistic (~0.04) signals strong serial correlation in the residuals, which is expected in macroeconomic time series. The use of HAC standard errors corrects for both heteroskedasticity and serial correlation, ensuring valid standard errors and significance tests.

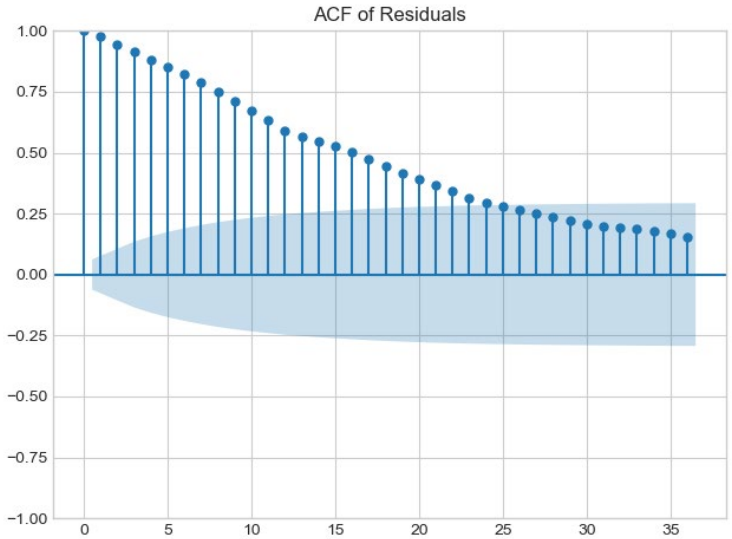

Figure 8. Autocorrelation Function (ACF) of Regression Residuals

d) A Cook's Distance plot was also examined to detect high-leverage or influential points. A few outliers were identified around the COVID-19 period (2020–2021), corresponding to extraordinary labor market fluctuations. These points were retained to preserve the economic interpretation, as they represent real shocks rather than data errors.

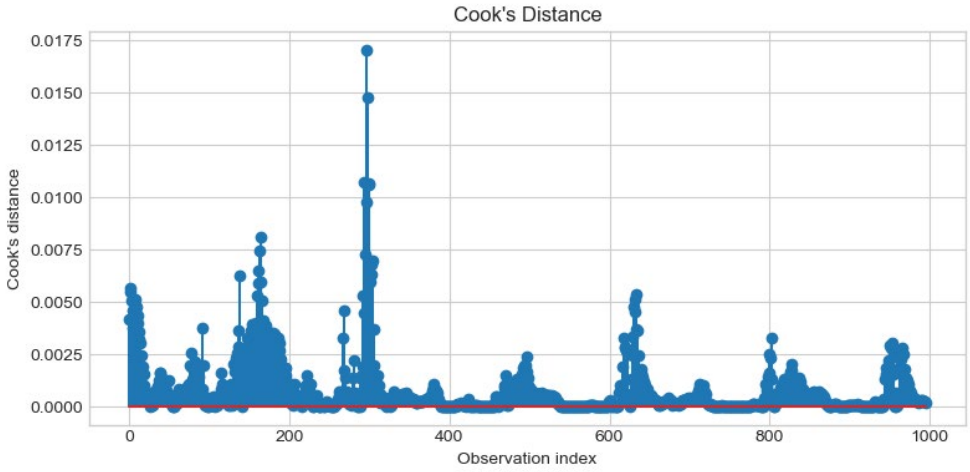

Figure 9. Cook's Distance for Influential Observations

e) Remedial measures considered include weighted least squares (WLS) and log transformation of wage growth, but neither materially altered the coefficient estimates. Thus, the final model maintains the original specification with HAC corrections as the preferred approach, balancing interpretability and robustness.

7. Conclusion

This study examines whether nominal wage growth responds differently to inflation across age groups in the United States. Using data from the Atlanta Fed's Wage Growth Tracker and CPI inflation, a linear regression model with age-group interaction terms is estimated to assess heterogeneity in inflation–wage pass-through. The results indicate that inflation has a positive but incomplete effect on nominal wage growth, consistent with the presence of wage rigidities. Wage growth levels differ significantly across age cohorts, with younger workers experiencing higher average wage growth and older workers experiencing lower growth.

In addition, the responsiveness of wage growth to inflation varies by age. Younger workers' wages respond more strongly to inflation, while older workers exhibit relatively rigid wage responses. These findings highlight the importance of demographic heterogeneity in understanding the distributional effects of inflation and suggest that older workers may face greater exposure to real income erosion during inflationary periods. Overall, the results underscore the value of incorporating age-specific labor market dynamics when evaluating inflationary pressures and related policy responses.

Reference

Gregory, V., & Harding, M. (2024). Real wage growth at the micro level. *Federal Reserve Bank of St. Louis Review, 106*(2), 87–105. https://doi.org/10.20955/r.106.87-105

Federal Reserve Bank of Atlanta. (n.d.). *Wage growth tracker*. https://www.atlantafed.org/chcs/wage-growth-tracker

Federal Reserve Bank of Dallas. (2022). *Whose wages are falling behind the least amid surging inflation?* https://www.dallasfed.org/research/economics/2022/1018

Federal Reserve Bank of Minneapolis. (2024). *Breaking down inflation by race, age, parenthood, and more*. https://www.minneapolisfed.org/article/2024/breaking-down-inflation-by-race-age-parenthood-and-more

U.S. Bureau of Labor Statistics. (n.d.). *Consumer Price Index (CPI) for all urban consumers*. https://www.bls.gov/cpi/

U.S. Bureau of Economic Analysis. (2024). *Real gross domestic product (A191RL1Q225SBEA)*. Federal Reserve Bank of St. Louis FRED. https://fred.stlouisfed.org/series/A191RL1Q225SBEA