Inflation and the distribution of real income

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Preliminary and incomplete

Abstract

We analyze how inflation affects the distribution of real income across households. We first show that, in the Unites States over the period 1967-2024, a 1% increase in inflation is associated with a 0.3% decline in labor income, with a 0.6% increase in asset income and with an insignificant change in transfer income. Combining these findings with the distribution of income types across the income distribution we show that inflation is beneficial for the very top of the distribution (which derive a large fraction of income from assets), detrimental for the middle (which derive most of their income from labor) and less detrimental for the bottom, where the decline in labor income is compensated by the more stable transfer income. Finally, using micro data from the CPS and PSID we analyze how inflation changes the distribution of labor income across different types. We show that low educated persons, experience the largest decline in labor labor income following increases in inflation. A 1% increase in inflation lowers the income of less educated persons by almost 2%. The larger decline for these types is due to a larger decline in their hours worked, suggesting a sizable impact of inflation on labor market outcomes of certain types.

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1 Introduction

The objective of this paper is characterize how, in the United States over the 1967-2024 period, inflation has affected the distribution of real income across households. In particular we are going to focus on two channels of transmission.

The first channel is due to the fact that different income categories respond differently to inflation. We are going to show that, after an inflationary burst, real labor income, possibly because of wage stickyness, declines substantially while asset income and transfer income decline much less (or even increase). Since different households have different shares of these types of income, inflation affects the distribution of real income across households. In particular, we first use Distributional National Accounting (Henceforth DNA, see Piketty et al. 2017 or Heathcote et al. 2023) to estimate accurately the share of each type of income accruing to different segments of the income distribution, and then we estimate the impact of inflation. We find that a 6% inflation burst increases the total real income of the top 5% of U.S. households (which have a significant fraction of asset income) by about 1%, while it reduces the total real income of the mid and bottom 10% (which have mostly labor and transfers income) by about 1%.

The second channel is due to the fact that the most important category of household income, labor income, has different sensitivity to inflation for different household categories. To assess this channel we use standard micro data from the Panel Study of Income Dynamics (PSID) and the Current Population Survey (CPS). In particular we focus on three educational groups: high school drop outs, high school graduates (with and without partial college) and college graduates. We find that an inflationary burst of 6% is associated with a decline in real hourly wage of about 3% for all the educational groups. However the three groups display a very different behavior of annual hours worked in response to inflation. The HS dropouts experience a decline in annual hours by almost 8% while college graduates hours are unchanged. As a result the total labor income of High School dropouts fall by around 11%, while college graduates only experience a 3% decline in their total labor income.

Taking these two set of results together we conclude that inflationary bursts have had, on average, a significant impact on the real income distribution, and thus on welfare, of the cross section of U.S. households. Moreover, the significant association we find between inflation and hours worked of certain groups, suggests that the effect of inflation goes beyond the mechanical reduction of real wages due to imperfect indexation, and that inflation can have significant impact on labor market outcomes.

1.1 Relevant literature

This paper is connected to the large, and fast growing, literature that explores the impact of monetary policy on inequality.[1] The focus of the literature is on the impact of interest rate shocks on the distribution of income (and wealth and consumption), but interest rate shocks do not always

[1] See, among others, Coibion et al. 2017, McKay and Wolf 2023, Andersen et al. 2023

correspond to inflation shocks. For this reason we focus directly on inflationary outcomes as drivers of changes in the distributions. The paper is also connected to the work on the distributional effect of inflation due to the fact that different households consume different basket of goods, or to the fact that different households hold different portfolio of nominal assets [2] Our work is different because we focus on impact of inflation on real income as opposed on real consumption or real wealth. More closely connected to our work are the recent papers by Afrouzi et al. (2024), Guerreiro et al. (2024) and Gregory and Harding (2024) which also focus on the impact of inflation of labor income in different part of the income distribution. Relative to those works we extend the analysis to other forms of income, and to data going back to 1967, to include older inflationary episodes.

2 Inflation and different categories of personal income

In this section we document how inflation and different categories of personal income have co-moved in the U.S. since 1967. We focus on the 3 largest categories of personal income (as reported in BEA table 2.1). The first is wages and salaries (line 3), the second is government transfers (line 17, which includes Social Security, Medicare, Medicaid and Unemployment Insurance) and the third is income from assets (line 13, which includes dividend and interest income). In 2024 these categories account for 50%, 18% and 16% of personal income, respectively. If inflation is neutral (that is these income categories are perfectly indexed) we should not observe any systematic co-movement between inflation and the percentage change in these categories. In the first pass of this analysis we simply regress the real growth of each of these income categories on CPI inflation. The result are reported in Figure 1 below

The graphs show that wage and salaries tend to co-move negatively with inflation, asset income co-moves positively with inflation while transfer income does not move systematically with inflation. Although these graph are suggestive that inflation comoves differently with different income categories, there are three issues with measuring this co-movement. The first is that some of the co-movement might arise not because the direct impact of inflation on these income categories but because real aggregate economic activity affects at the same time inflation (through a Philips curve relation) and these income categories (for example real wages and real asset income tend to be high when real economic activity is high). The second is that some of the inflation we observe in the data can be expected, and that expected and unexpected inflation can have a different impact on income. The final issue is that by regressing changes on inflation we just measure the co-movement of inflation in a year and income over the same year, while the association might be more dynamical, as, for example, an inflationary burst can drive a decline in real wages that persist for more than one year. To take care of these issues we then estimate a VAR specified as follows

[2] See, among others, Doepke and Schneider (2006), Kaplan and Schulhofer-Wohl (2017), Argente and Lee (2020), Jaravel (2024)

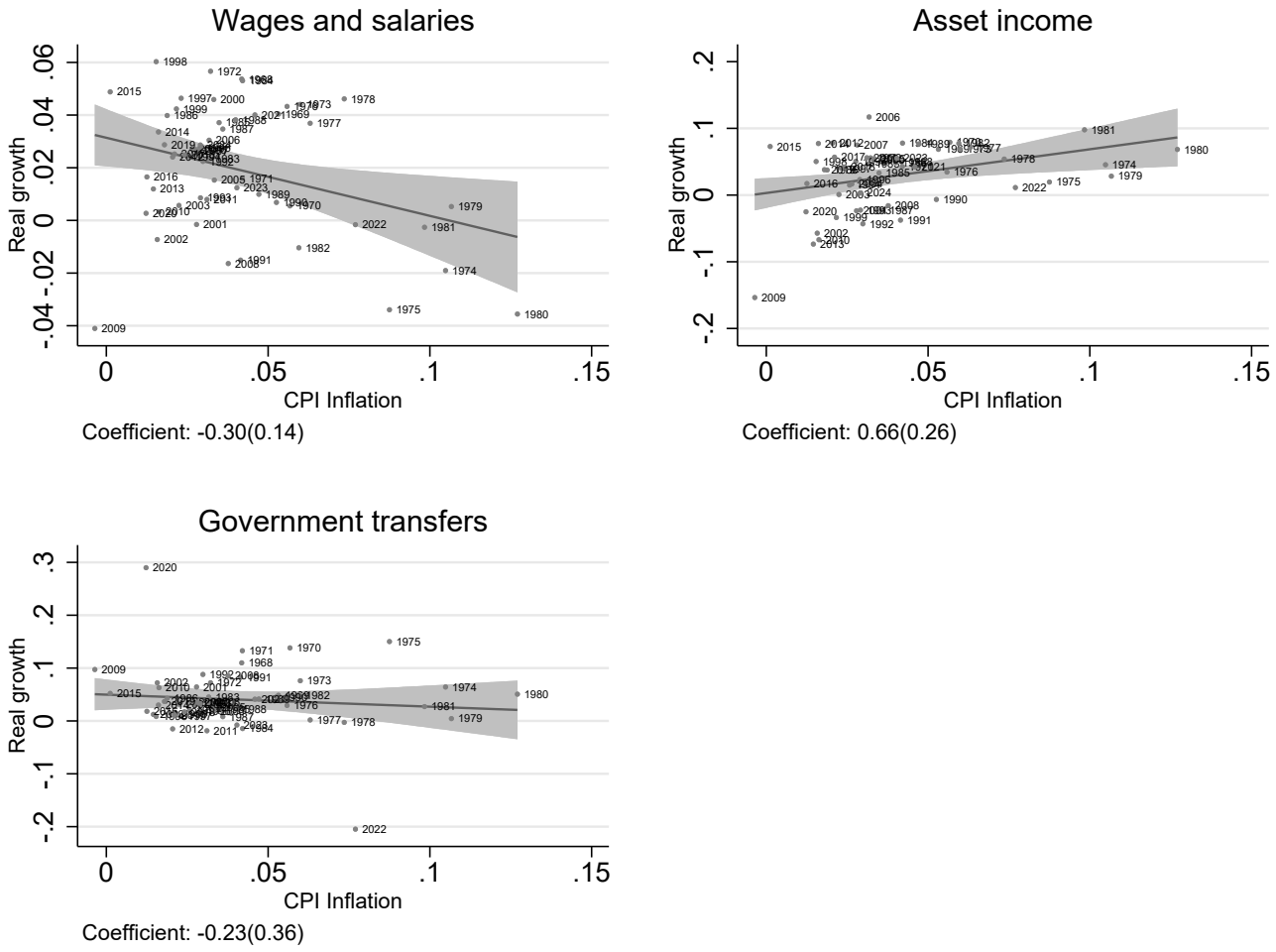


Figure 1: Income categories CPI Inflation, 1967-2024

$$\begin{bmatrix} \Delta ws_t \\ \Delta as_t \\ \pi_t \\ \Delta Y_t \end{bmatrix} = B_1 \begin{bmatrix} \Delta ws_{t-1} \\ \Delta as_{t-1} \\ \pi_{t-1} \\ \Delta Y_{t-1} \end{bmatrix} + B_2 \begin{bmatrix} \Delta ws_{t-2} \\ \Delta as_{t-2} \\ \pi_{t-2} \\ \Delta Y_{t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{wst} \\ \varepsilon_{ast} \\ \varepsilon_{\pi t} \\ \varepsilon_{Yt} \end{bmatrix}$$

where Δws_t and Δas_t represent the change in the share of wage income and asset income over total income (i.e. wages + asset income + transfers), π_t represents inflation and Y_t is a control for aggregate economic activity (Aggregate employment or Real GDP). Impulse responses from this VAR are plotted in Figure 2 below. The figure shows that an orthogonalized inflation shock increase consists in an increase in inflation of around 3% over the span of 6 years. This shock results in a increse in the share of asset income of about 0.5% and a decline in the share of wage and salaries of about 0.5%. The change in share of transfer is not reported as it is just the sum of the change

in share of the first two categories, but it is not significantly different from 0.

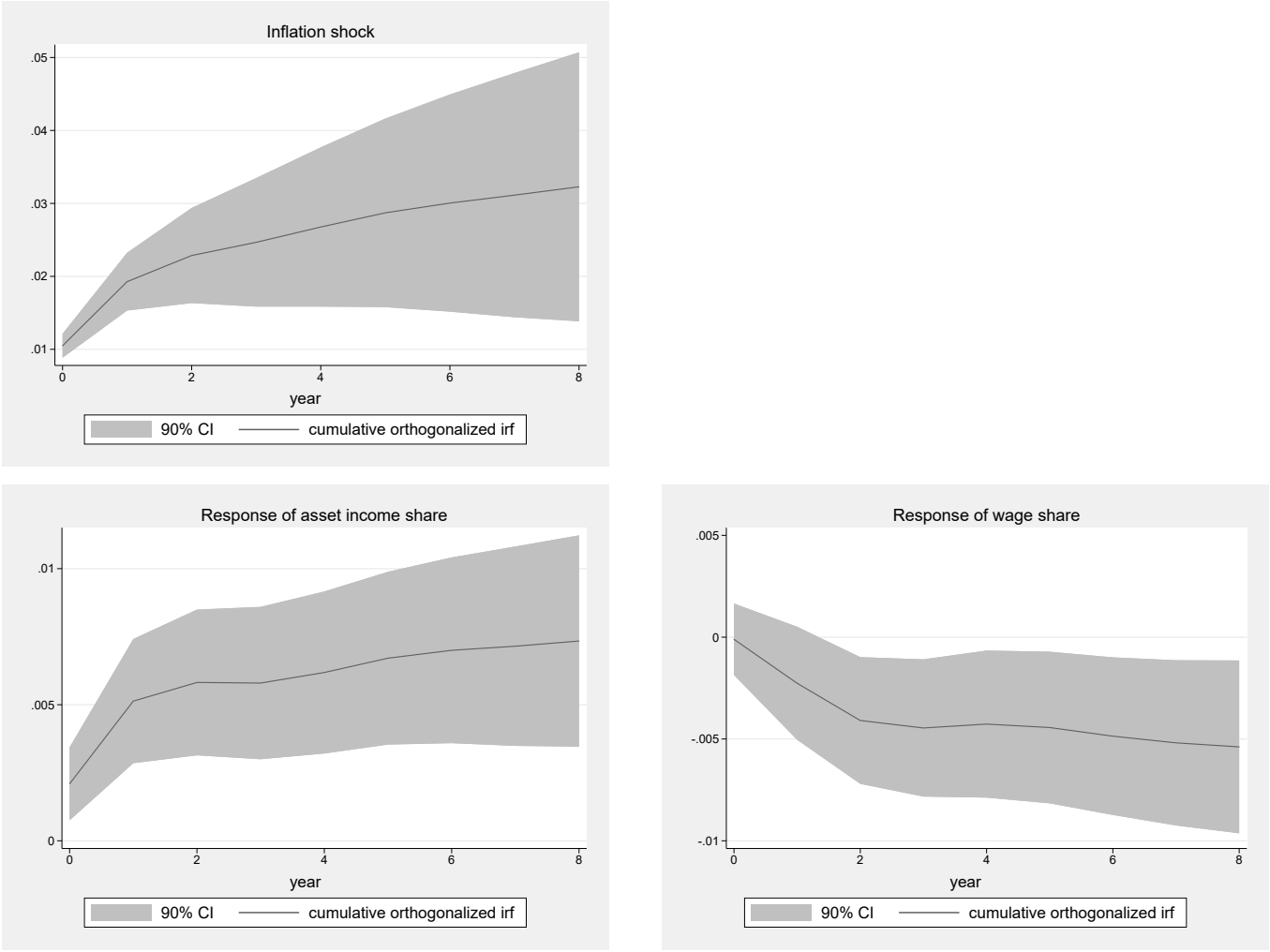


Figure 2: Impulse responses of shares of personal income to inflation

3 Impact on Inequality

Now that we have estimates of the impact of inflation on the income shares we can evaluate the impact of inflation on inequality, due to the fact that different households have different shares of these income categories. In particular we are going to use micro data from the CPS 2023 to estimate the shares of different income accrued to different segment of the houhold income distribution. One problem with this analysis is that it is well known (see, Piketty et al. (2017) that, although wage and salary income form the micro data matches well, asset income and transfer income from the CPS do not match the total reported in NIPA. This problem is displayed in table reft:NIPACPS which shows the per capita total of each income categories from NIPA data and from CPS. While wages and salaries are remarkable close in the two sources, both asset income and transfers and

underestimated by a factor of 3 in CPS, relative to NIPA. Some of this discrepancy is due to under-reporting in CPS, some of it is simply due the fact that households in CPS are not asked about some form of income (for example Medicare).

Table 1: Income categories: CPS and NIPA, 2023

	Wages and salaries		Asset income		Transfers	
	NIPA	CPS	NIPA	CPS	NIPA	CPS
Level	35k	34.5k	11.4k	2.9k	12.4k	4.4k
Share	59.5%	82.5%	19.5%	7%	20.5%	10.5%

In order to correct for this we are going to simply multiply each income categories in the CPS so that it is consistent wit NIPA per capita total. By doing so only households which receive a positive amount of a given income category get rescaled up, so the underlying assumption is that the zeros are "true" zeros, while the positive reports suffer from misreporting. Admittedly this is a very crude correction, however it yields figures for the fraction of each income held at the top that are similar to those reported by Piketty et al. (2017), which use a more sophisticated procedure to apportion the missing income. In table 3 we report the impact of this correction on shares of income and on income totals at different points of the distributions. The first result is that the rescaling of capital income dramatically increases both the level of income at the top and the share of capital income at the top (see the first two lines of the table), suggesting that the the missing capital is primarily located at the top. The missing transfers increase the level of income at the bottom and in the middle, however they reduce the share of transfers at the bottom (see the last line of table t:impact). The reason is that once the rescaling is done transfers become a very important sources of income both at the bottom and in the middle of the distribution, while before they were only relevant for the very bottom, which had no labor income. So after the rescaling the bottom of the distribution contains household which have low labor income and low transfers, so the share of the two is more even.

Table 2: Impact of correction: share and levels of income

	CPS, raw				CPS, rescaled			
	Shares				Shares			
	Wages	Asset	Transfers	Total	Wages	Asset	Transfers	Total
Top 1%	90%	9%	1%	675k	51%	44%	4%	963k
Top 5%	89%	9%	2%	442k	52%	42%	6%	637k
Mid 10%	75%	5%	19%	66k	62%	6%	32%	96k
Bottom 20%	26%	5%	68%	12k	59%	5%	36%	22k

We are now going to use the estimates from our impulse responses in Figure 2 together with the income portfolios at the different part of the distribution in Table 3 to estimate the impact of an inflation shocks on total income at different part of the distribution. To do that that let α_{Kt} α_{Lt} be the shares of labor and capital income at time t, before the inflation shock. The VAR estimates suggest that an inflation shock of size π^* approximately increases the the asset income share by

$\pi^*/6$, reduces the share of wage income by $\pi^*/6$ and leave the share of transfer income unchanged. It is easy to show that this implies that asset income will grow at a rate $\frac{\alpha_{Kt}+\pi^*/6}{\alpha_{Kt}}$ faster than the total, while wage income will growth at a rate $\frac{\alpha_{Lt}-\pi^*/6}{\alpha_{Lt}}$ slower than the total, while transfer income will grow a the same rate of the total. In Figure 3 we show the impact of an inflation shock of different sizes on the total income of the top 5% , the mid 10% and the bottom 10%. The figure shows that the top 5% gains from inflation. The reason is simple. As Table 3 the top 5% have almost 50% of their income coming from assets, and asset income increases with inflation. The figure also shows that the bottom and the mid of the distribution lose from inflation, and that a substantial part of their income is from wages and salaries. The bottom loses a bit less than the middle because it has a slightly large share of transfers (See the last two lines of Table 3). To recap a 6% inflation shock increases the income gap between the top and the bottom of the distribution by about 2%. The effect is not extremely large, however is of the same order of magnitude of the differential effect of inflation due to different changes in cost of living across households (see, for example, Jaravel (2024) or Gregory and Harding (2024))

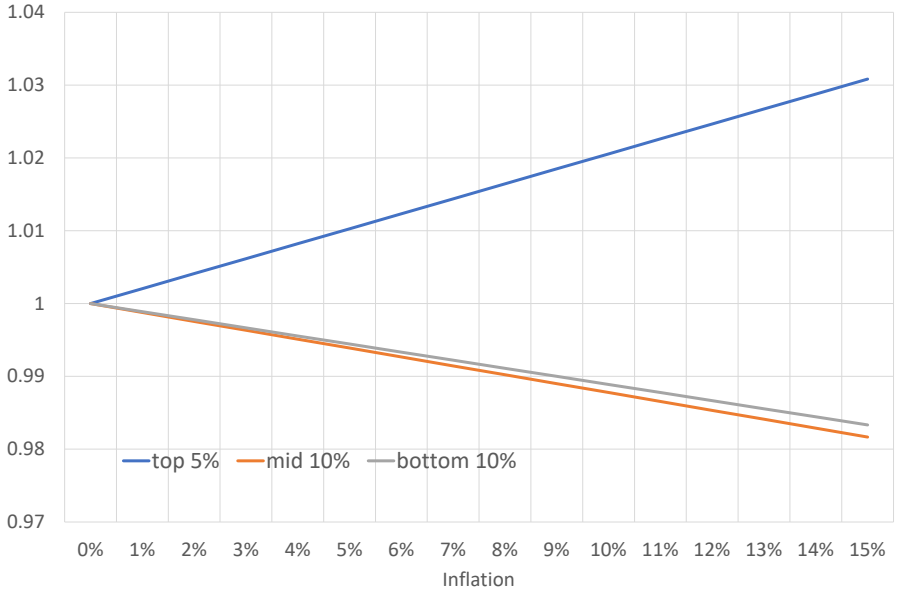


Figure 3: Impact of inflation shock on real income at different part of the distribution

4 Inflation and labor income

Having established that inflation have a differential impact across households because it affects differently different income categories, we now zoom in on wages and salaries income, which for the majority of U.S. households represent the main source of income. In particular we ask whether inflation income affect differently wages and salaries income for different households, and if so through which channels. Our main data comes from the Panel Study of Income Dynamics (PSID) which is a nationally representative panel of U.S. households, running annually from 1967 to 1996

and bi-annually from 1996 to 2020.[3] The main unit of analysis is the head of household, and we select heads which work at least 200 hours per year, have positive labor earnings and which are of age between 25 and 70.

For each individual, we construct three outcome measures capturing annualized growth in labor earnings, hourly wages, and hours worked from year t to $t+1$ (or $t+2$) .[4]

We consider two explanatory variables. The first one is an inflation shock, which represents the unanticipated inflation during the period; This variable is defined at the annual level: for each year t to $t+1$ we calculate the difference between actual inflation and expected inflation (from the Michigan survey of inflation expectation), which is defined as the "inflation shock." By focusing on shocks, we aim to isolate exogenous inflation surprises rather than predictable inflation that may already be priced into contracts. In the regressions, we treat inflation-shock as a continuous variable and allow its effect to differ by demographic group. Figure 4 plots our series for inflation shocks/surprises we use in the regression.

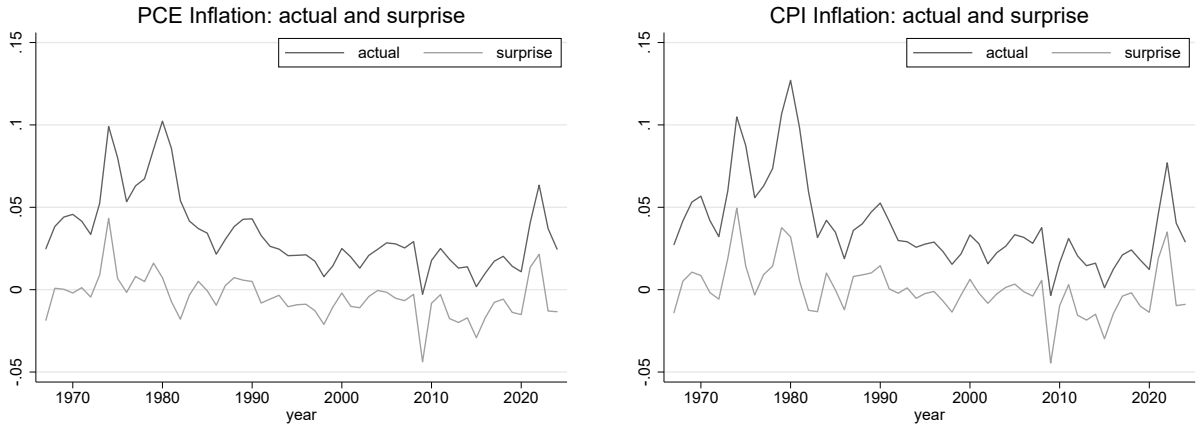


Figure 4: Inflation and Inflation shocks

The second explanatory variable we include is the an aggregate hours growth measure. This controls for year-specific labor market conditions. This serves as a control for any economy-wide shifts in aggregate labor that coincide with inflation. We consider three education groups: (1) High school dropouts, (2) High School Graduate +Some College and (3) College Graduate (bachelorâs or higher).

We estimate a series of linear regression models to quantify the effect of inflation shocks on the growth of individual labor income, hourly wages, and hours, and to test for heterogeneous responses across groups. In the baseline specification, we regress each outcome Y_i (where Y_i is one of the three growth measures for individual i) on the inflation shock and its interaction with group dummies:

[3] in the appendix we report the same analysis using the panel dimension of CPS date and we show that we obtain comparable results.

[4] Labor earnings growth is measured as the log change in annual wage and salary income from the first to the second period. Hours worked growth is the log change in total hours worked per year. Hourly wage growth is defined as the log change in the imputed hourly wage, where hourly wage is computed as annual wage income divided by total hours worked in the year.

$$Y_i = \beta_0 + \sum_g \gamma_g D_{ig} + \beta_1 \text{inflation_shock}_i + \beta_2 \text{agg_hours}_i$$
$$+ \sum_g \beta_{1g}(\text{inflation_shock}_i \times D_{ig}) + \sum_g \beta_{2g}(\text{agg_hours}_i \times D_{ig}) + \varepsilon_i$$

where D_{ig} are dummy indicators for the education or age categories (with one omitted reference group). The coefficients β_{1g} on the interaction terms are of primary interest, as they indicate how the effect of inflation differs for group g relative to the baseline group. We include the main effects of the group dummies D_{ig} to allow for level differences in average growth rates across groups (independent of inflation). All specifications are estimated by OLS.[5]

Table 3: Robust Regression Results

	(1) Earnings growth	(2) Wage growth	(3) Hours growth
Constant	-0.0321***	0.00738**	-0.0395***
	(0.004)	(0.003)	(0.003)
shock_PCE_infl	-1.856***	-0.515**	-1.341***
	(0.232)	(0.204)	(0.187)
HS+SC × shock_PCE_infl	0.827***	0.154	0.673***
	(0.275)	(0.245)	(0.218)
College × shock_PCE_infl	1.232***	0.144	1.087***
	(0.310)	(0.279)	(0.240)
aggregate emp. growth	1.674***	0.518***	1.156***
	(0.160)	(0.137)	(0.128)
HS+SC × aeg	-0.312*	-0.0747	-0.237
	(0.186)	(0.162)	(0.146)
College × aeg	-0.721***	-0.172	-0.549***
	(0.204)	(0.182)	(0.154)
HS+SC	0.0240***	0.00621	0.0178***
	(0.005)	(0.004)	(0.004)
College	0.0469***	0.0193***	0.0276***
	(0.005)	(0.005)	(0.004)
Observations	147033	147033	147033

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[5] We cluster standard errors at the individual level in all regressions. Clustering by person accounts for fact that the individuals in the sample appear several times in the sample.

Focusing on the second line of the first column, note that a 1% inflation shock reduces real earnings growth for the omitted growth (HS dropouts) by almost 2%. Education groups 2 and 3, experience much smaller declines. The pattern suggests that workers with at least a high school education reap a much higher nominal earnings growth from an inflation shock than workers without a diploma. This differential implies a widening gap in nominal incomes during positive-inflation environments.

Turning to the impact of an inflation shock on hourly wage consider the second column; It shows that real hourly wages tend to decline in response to inflation shocks at roughly similar proportional rates across the education spectrum. A 1% inflation shock lowers real wages by about 0.5% for everyone, on average, which implies real hourly wages fall for all groups.

Given that the hourly wage is reacting in the same way but total labor income react differently then it must therefore be that hours worked react differently across the education groups. This is depicted in the third column. High school dropouts see a fall in their work hours in response to inflation shocks. In contrast, all higher-educated groups experience a much smaller decline in their labor supply. The upshot of this table is that inflation can have a quantitatively significant impact on labor income of less educated workers. T primary margin of adjustment to inflation shocks occurs through hours worked (quantities) rather than hourly wages (prices). While real hourly wages decline in response to inflation shocks, they do so at similar rates across demographic groups, suggesting a relatively uniform price adjustment. In contrast, the variation in total labor earnings is almost entirely driven by differences in labor supply responses. This pattern suggests that theories aiming to understand the unequal impact of inflation should focus on differences in labor supply adjustments. The labor market, and in particular the ability (or inability) of workers to adjust their hours in response to inflation shocks, plays a crucial role in shaping distributional consequences.

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Appendix

A Results from CPS

We use microdata from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC), a nationally representative survey of U.S. households conducted each year, which contains detailed information on income and employment. To study year-to-year changes, we exploit the rotating panel structure of the CPS: a subset of individuals can be matched across two consecutive ASECs. For those individuals, we observe their labor outcomes in an initial year and one year later. We restrict the sample to adults between 25 and 70 years old (inclusive of 25â70 at the time of the first survey) to focus on prime-age and slightly older workers, excluding younger individuals who may still be in school and those past typical retirement age. We further require that individuals have positive wage and salary income in both the first and second survey year.

A.1 Heterogeneous Effects by Education

In the education-group results, the omitted category is high school dropouts, allowing us to assess differences relative to the least-educated workers. We present the regression results in Table 1, which summarizes the estimated impact of an inflation shock on the growth of individual labor income, hourly wages, and hours worked.

In the first column we find that an inflation shock raises nominal annual wage income growth for education groups 2 and 3, but not for the High school dropouts. The pattern suggests that workers with at least a high school education reap a much higher nominal earnings growth from an inflation shock than workers without a diploma. This differential implies a widening gap in nominal incomes during positive-inflation environments.

Turning to the impact of an inflation shock on hourly wage consider the second column; It shows that hourly wages tend to rise in response to inflation shocks at roughly similar proportional rates across the education spectrum. Since these increases are well below a one-for-one response to inflation it indicates partial adjustment: a 1% inflation shock raises nominal wages by about 0.5â0.7% for everyone, on average, which implies real hourly wages fall for all groups, with no strong evidence that more educated workers get disproportionately higher raises in percentage terms.

Given that the hourly wage is reacting in the same way but total labor income react differently then it must therefore be that hours worked react differently across the education groups. This is depicted in the third column. High school dropouts see a fall in their work hours in response to inflation shocks. In contrast, all higher-educated groups significantly increase their labor supply (hours). These differences are all statistically significant at the 1% level. Combining the baseline and interaction, the point estimates imply that an unexpected inflation triggers a substantial uptick in annual hours for the educated groups.

Hence, the general finding is that workers without a High school diploma decrease their work

VARIABLES	(1) Incwage growth	(2) hourly wage growth	(3) total hours growth
inflation_shock	0.00123	0.738***	-0.737***
	(0.230)	(0.178)	(0.174)
HS,SC	-0.00217	-0.00490	0.00273
	(0.00510)	(0.00402)	(0.00378)
Col	-0.00203	-0.00309	0.00106
	(0.00527)	(0.00422)	(0.00383)
HS,SC#c.inflation_shock	0.739***	-0.110	0.850***
	(0.246)	(0.192)	(0.184)
Col#c.inflation_shock	0.803***	-0.0741	0.877***
	(0.257)	(0.205)	(0.189)
mean_tothrs_agg_growth	2.099***	-0.646**	2.745***
	(0.357)	(0.275)	(0.269)
HS,SC#c.mean_tothrs_agg_growth	-0.903**	0.167	-1.070***
	(0.377)	(0.293)	(0.283)
Col#c.mean_tothrs_agg_growth	-1.216***	0.504	-1.720***
	(0.388)	(0.307)	(0.285)
Constant	0.0561***	0.0528***	0.00327
	(0.00483)	(0.00378)	(0.00360)
Observations	788,928	788,928	788,928
R-squared	0.001	0.000	0.001

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

hours in the face of inflation, whereas those with higher education significantly ramp up labor supply. This disparate adjustment in hours, combined with similar hourly nominal wage gains, explains why the differences in the growth in labor income.

A.2 Heterogeneous Effects by Age

We next examine differences across age groups, with the 60â70 year-olds as the reference category in Table 2.

The first column of the income growth regression by age reveals that younger and mid-career workers see a much higher nominal income growth than older workers; Older workersâ total labor nominal earnings are not responsive to inflation. Looking at hourly wage growth by age, as with the education groups, we find no significant differences across the age spectrum (second column). This suggests that when inflation rises, nominal hourly wage rates tend to increase at roughly the same proportional rate for young, middle-aged, and older workers alike, on average. Thus, as in the education dimension, the divergence in income outcomes by age is not because of differential hourly wage adjustments, but rather because of differences in hours worked responses. This is evident in the third column in Table 2 which shows that the hours worked adjustments differ markedly by age – the old reduce their hours worked while the the young age groups do not change their labor supply.

VARIABLES	(1) Incwage growth	(2) hourly wage growth	(3) total hours growth
inflation_shock	-0.0198	0.615***	-0.635***
	(0.235)	(0.195)	(0.176)
1.age_group	0.142***	0.0280***	0.114***
	(0.00505)	(0.00425)	(0.00368)
2.age_group	0.104***	0.00991**	0.0937***
	(0.00497)	(0.00422)	(0.00359)
1.age_group#c.inflation_shock	0.729***	0.0583	0.671***
	(0.258)	(0.213)	(0.191)
2.age_group#c.inflation_shock	0.641**	-0.0190	0.660***
	(0.252)	(0.210)	(0.185)
3b.age_group#co.inflation_shock	0	0	0
	(0)	(0)	(0)
mean_tothrs_agg_growth	1.298***	-0.323	1.620***
	(0.312)	(0.269)	(0.230)
1.age_group#c.mean_tothrs_agg_growth	-0.0690	-0.189	0.120
	(0.344)	(0.294)	(0.252)
2.age_group#c.mean_tothrs_agg_growth	-0.269	0.0198	-0.289
	(0.336)	(0.290)	(0.244)
3b.age_group#co.mean_tothrs_agg_growth	0	0	0
	(0)	(0)	(0)
Constant	-0.0559***	0.0326***	-0.0885***
	(0.00466)	(0.00394)	(0.00342)
Observations	788,928	788,928	788,928
R-squared	0.003	0.000	0.004

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1