Inflation-Inequality Puzzle: Is it still apparent?

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Abstract

US economy is facing inflation jump, which is running at 30 year high. Using inequality and inflation data that are available at a high frequency, i.e. on a quarterly basis for over 30 years, we find evidence that inflation causes swings in income distribution rapidly. The dynamic response of inequality to changes in inflation alters over a four-quarter period. We show that the contemporaneous impact of inflation on inequality is negative; however, after three quarters the impact becomes positive and stronger in magnitude. From our results we learn that over a one year period, higher inflation would exacerbate income inequality in USA. The positive impact of inflation on income inequality is stronger when inflation rate, initially, is above the sample average.

Keywords: Inflation, Inequality, United States.

Journal of Economic Literature Classification Numbers: D60, O40, O50.

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1 Introduction

Recently US economy is facing inflation hurdle, which is running at 30 year high. A study by PEW Research Center asserts that U.S. had the eighth-highest inflation rate among the 46 countries examined in third quarter of 2021[1]. Federal Reserve Officials have raised concerns of latest intensification in prices. Particularly, they stated "*the longer inflation remains high, the more likely it is that businesses and workers begin to believe that inflation will not come back down. Then they begin to alter their habits.*[2]" Motivated by these recent developments in prices and with rising inequality, the real question we aim to address in this study is what the distributional consequence of this upsurge in so many prices is.

Even though there is a puzzle[3] in regards to the relationship between inflation and income distribution, several studies document a positive relationship between inflation and the income inequality (Scully (2002), Albanesi (2007), Beck et al. (2007), Erosa and Ventura (2002), and Cao et al. (2021)) The rationale is that inflation costs are likely to impact lower-income households relatively more as they hold a larger fraction of their assets in cash and most of their income comes from wage. On the other hand, more than 40% of income for the upper income earners is from non-wage sources i.e. capital gains and entrepreneurial activities, which are the best inflation hedges because their values tend to rise with general price level.

Our contribution is that we use inequality and inflation data that are available at a high frequency, i.e., on a quarterly basis for over 30 years (1990:Q1 to 2017:Q2). Prediction of the distributional consequences of higher inflation at a higher frequency should be more relevant to policymakers in designing appropriate policies to circumvent the wide-ranging negative impacts of inflation compared to when predictions are only available at the annual frequency. The higher frequency provides more degrees of freedom, which allows us to be more precise in understanding the relationship between inflation and income inequality in different macroeconomic environments and investigate how regional differences in the US may influence the relationship between inflation and income inequality. In addition, we are able to investigate whether the inflation-inequality puzzle is still apparent during the last three decades. Specifically, we have enough degrees of freedom to understand the relationship between inflation and income inequality when inflation is below-and-above Federal Reserve's target of 2 %. Note, U.S. states are characterized with similar institutions and face common monetary and fiscal policies, which provides us with an opportunity to separate the effects of inflation on income inequality without worrying about differences on quality of institutions or policy response. To ensure that there is no heterogeneity on the effects of inflation on income inequality across the states, we also explore a "Random Coefficient" model.

We show evidence that inflation causes swings in income distribution rapidly. Our results suggest that the dynamic

[1] https://www.pewresearch.org/fact-tank/2021/11/24/inflation-has-risen-around-the-world-but-the-u-s-has-seen-one-of-the-biggest-increases/
[2] https://www.washingtonpost.com/business/2021/10/15/us-economy-inflation-uncomfortable/
[3] Refer to Galli (2001) for more details about "inflation-inequality puzzle".

response of inequality to changes in inflation alters over a four-quarter period. Specifically, we show that the contemporaneous impact of inflation on inequality is negative; however, after three quarters the impact becomes positive and stronger in magnitude. From our results we learn that over a one year period, higher inflation would exacerbate income inequality in USA. It should be noted that the size of the impact on income inequality weakens over the period post 2008, which corresponds with years over which inflation rate in US was persistent below Federal Reserve's target rate (2%). We find evidence of the inflation-inequality puzzle existence. Specifically, for the entire sample period, increases in inflation correspond with contemporaneous decrease in inequality only during the high inflation regime. Over a one year period, higher inflation adds to upsurges on inequality during both high-and-low inflation regimes. However, the impact is stronger during the high inflation regime. We find no evidence of heterogeneous impact of inflation on inequality across U.S. states. The results are robust even when we extract the unanticipated part of inflation by using the inflation forecasts from the Survey of Professional Forecasts. Surprisingly, the distributional consequences of unanticipated inflation are found to be short lived. The remainder of the paper is organised as follows. In the next section, some stylised facts about the U.S. economy and Income Inequality are presented. Section 3 describes the data. Section 4 describes the panel model and presents the main results, and Section 5 concludes.

2 Inflation and Inequality Nexus

The impact of inflation on inequality still remains to be somewhat controversial. The link between inflation and inequality is mainly derived from empirical grounds. It is stated that inflation is likely to be borne by lower-income households because they hold a larger fraction of their assets in cash. Performing cross country analyses Bulir and Gulde (1995) show that inflation deteriorates income distribution in the short term. However, the disaggregated results are mixed. For the United States, Finland, and Italy they find inflation to actually lower income inequality. For Canada, Greece, Israel, and Russia they obtain the expected "deteriorating" impact of inflation. Romer and Romer (1998) indicate that higher unanticipated inflation corresponds with higher income share for the poor and a lower Gini coefficient in the United States. However, they find the estimated coefficients to be small. One percentage point increase in unanticipiated inflation rate contributes to 0.1 percent drop in Gini coefficient. The impact from anticipated inflation they found to be similar with the point estimates from unanticipated inflation. In addition, Romer and Romer (1998) perform across countries analyses and find that there is a negative association between poor's average income and inflation. The negative relationship is especially strong for industrial countries. Fischer and Easterly (2000) identify that poor are more likely than the rich to mention inflation as a top national concern. This suggests that low income households perceive inflation as being more costly. Bulíř (2001) show that past inflation affects current levels of income inequality. However, the relationship is nonlinear. Decreasing inflation, whenever countries experience hyperinflation, tends to drop income inequality. Afterwards, benefits of further drop in inflation towards a very low

level are found to be trivial. Galli (2001)assert that the nonlinear relationship between inflation and income inequality exists because the relationship depends on the initial level of inflation. Specifically, the authors state that reducing inflation might decrease inequality, when inflation is initially high. When initial inflation is low, reducing inflation might worsen inequality. Balcilar et al. (2018) present further evidence of nonlinear relationship between inflation and income inequality. They find that when inflation is above the threshold of 2.8 percent, it affects relative prices and increases income inequality.

In this paper we contribute to the literature by showing evidence that inflation causes swings in income distribution rapidly even after controlling for the state of the economy. In addition, we show that the strength of the relationship between inflation and income inequality depends whether the initial rate of inflation is below-or-above the Fed's target of 2%. To our knowledge, we are the first one to emphasize that the strength of the relationship between inflation and income inequality might be driven by the targets set by central banks. We show evidence that Great Recession weakened the link between inflation and income inequality.

Note, income distribution and inflation are relevant concerns for policy makers. Thus, policies by government and central banks can contaminate the relationship between income distribution and inflation, which makes it hard to isolate the impact of inflation on income inequality when performing cross-country analysis. The uniqueness of our study is that we use inequality and inflation data for USA that are available at a quarterly frequency. States within US are characterized with similar institutions and face common monetary and fiscal policies, which provides us with an opportunity to separate the effects of inflation on income inequality without worrying about differences on quality of institutions or policies through taxes, transfers, public sector employment, and other policy instruments. To ensure that our results are robust to various specifications of inflation, we follow Romer and Romer (1998) and estimate unanticipated inflation rate. We find the distributional consequences of unanticipated inflation, contemporaneously, to be similar to the point estimates from anticipated inflation.

3 Data and Model Specification

3.1 Data

We build a U.S. state-level quarterly data set at that includes information on inflation, income inequality, real per capita total personal income. The data set is complemented by a set of fiscal and monetary policy measures, such as total state and local current government expenditures and 3-month Treasury bills. The inequality measure for all states is obtained from Fischer et al. (2019). The measure is constructed using household income data from the Annual Social and Economic Supplement of the Current Population Survey (CPS). Fischer et al. (2019) provide extensive documentation of the construction of the inequality series. The authors use splines to interpolate annual measures of household income

inequality to quarterly frequency. Inflation rate data are from Hazell et al. (forthcoming). The measure is quarterly averages of 12-month inflation rates within a quarter year. For example, the inflation rate for 2004.Q1 is the average of 12-month inflation rates of January, February, and March of 2004, relative to the corresponding months of 2003. To compute inflation rate, they use non-shelter component of the CPI[4]. To ensure that our findings are robust across various measures of inflation, we follow Romer and Romer (1998) and extract the unanticipated part of inflation. Specifically, unanticipated inflation is the difference between actual inflation and forecast values from a year ago. For example, unanticipated inflation in Q1 1990 is equal to actual inflation in Q1 1990 and one-year-ahead expectations of inflation from Q1 1989. The remaining variables are obtained from the Federal Reserve Bank of St. Louis database.

Figure 1 shows the time series of inflation rate during the sample period 1990-Q1 to 2017-Q2. Overall, there is a downward trend on the inflation rate. At the early 1990s, inflation rate was at around 4%, followed with a decline to 2% until late 1999. With beginning of year 2000, inflation rate in U.S. began to raise again, and it reached the peak in late 2007, which is officially known as the year when U.S. economy began to slow down and enter the Great Recession. With the beginning of the crisis, inflation followed the decline and stayed below 2% until the end of the sample period. Exception are years 2011 and 2012, where inflation rate in U.S. was at around 3%.

Figure 2 shows the dynamics of Gini coefficient. Overall, there is an upward trend of income inequality in U.S. To a certain degree, we see upsurges in Gini coefficient to correspond with lower rates of inflation. However, there is some variation in this observed relationship. For instance, during the period 2000 to 2007, we see increases in both inflation rate and income inequality in U.S.

Figure 3 shows the time series of income per capita. We see an upward trend on U.S. income per capita. However, whenever U.S. economy contracts, we observe drops in inflation and income inequality. This suggest that income plays a role in driving the relationship between inflation and income inequality. In figure 4, we plot the relationship between inflation and income inequality incorporating the state of U.S. economy. On average, with lower level of income per capita, higher inflation contributes to higher income inequality. As income per capita increases, we see the relationship between inflation and income inequality to turn moderately negative.

We believe this observed heterogeneous relationship between inflation and income inequality allows for the use of panel estimation techniques, which, in turn, permits us to improve the accuracy of the analysis and provide evidence on how income inequality changes across and within states due to the changes in inflation rate. In addition, exploring the dynamics that link inflation to inequality at a higher frequency will help us understand social welfare costs and/or gains of inflation in short term vis-a-vis medium term.

[4]Hazell et al. (forthcoming) details the methodology used to construct the indexes starting from micro level price data.

3.2 Model Specification

We estimate a panel-data model with quarterly data over the period 1990:Q1 to 2017:Q2. In the Panel Data model for state $i \in 1, ..., I$ and for time $t \in 1, ..., T$ we have in generic terms:

$$y_{it} = \sum \rho_k \pi_{it-k} + X_{it}'\beta + \delta_t + \mu_i + \epsilon_{it} \tag{1}$$

and in our specific application:

$$ineq_{it} = \sum_{k=0}^{4} \rho_k \pi_{it-k} + \beta_1 inc_{it} + \beta_2 ffr_{it} + \beta_3 GTE_{it} + \delta_t + \mu_i + \epsilon_{it} \tag{2}$$

where we consider the growth of Inequality (ineq) in this set up to depend on the lagged value, or different combinations of the lagged values of inflation (π). The parameter ρ captures the effect of lagged values of inflation. Note that $\sum_0^4 \rho_k \pi_{it-k}$ is equivalent of $\rho_0\pi_{it} + \rho_1\pi_{it-1} + \rho_2\pi_{it-2} + \rho_3\pi_{it-3} + \rho_4\pi_{it-4}$, enabling us to consider, by design, at least no lag of inflation and at most 4 lags of inflation (we can only include first lagged inflation if we set $\rho_0, \rho_2, \rho_3, \rho_4$ equal to 0, and let ρ_1 capture the effect of immediate lag). X_{it} in Equation 1 is the set of predictors controlling for income per capita, the monetary policy changes and the state of the economy; ffr stands for federal fund rates and GTE stands for state and local government spending. Time and State fixed effects are captured by δ_t and μ_i respectively. Note that we employ growth of the control variables in our regressions.

We use the fixed effects (FE) method that has been suggested in literature for estimating heterogeneous aggregate panels that are large in time series. The FE method gives more efficient estimates because it reduces economic and statistical endogeneity by allowing for unobserved country and time differences through specific fixed effects. Now, to cancel out the unobserved states μ_is, a fixed effect model subtracts the average of each state:

$$\widetilde{ineq_{it}} = \sum_{0}^{4} \rho_k \widetilde{\pi_{it-k}} + \beta_1 \widetilde{inc_{it}} + \beta_2 \widetilde{fr_{it}} + \beta_3 \widetilde{GTE_{it}} + \widetilde{\delta_t} + \widetilde{\epsilon_{it}} \tag{3}$$

in which $\widetilde{ineq_{it}} = ineq_{it} - \frac{1}{T}(ineq_{i1} + ineq_{i2} + ... + ineq_{iT})$. [5]

In addition, we investigate if there is any heterogeneity in the coefficients across the states by exploring a "Random

[5] To be exact, we use a "highly Dimensional" Feasible estimator for linear models with multi-Way fixed effects. In our general model/equation 1, if we consider

$$y_{it} = \sum \rho_k \pi_{it-k} + X_{it}'\beta + D\alpha + \epsilon_{it} \tag{4}$$

then the dummy matrix D could represent states fixed effects across T dimensions, so it has a block representation $D = [D_1 D_2, ..., D_T]$. The number of levels (states) for the t-th dimension is g_f so $g = \sum_{t=1}^{T} g_f$. Note that this model allows for state fixed effects to vary over time (Correia, 2016). Note that assuming f=1 then this is **the regular FE model** mentioned above, but with the benefit of correcting for possible inconsistencies in the standard errors (for example in a standard panel with individual and time fixed effects, we require both the number of states and periods to grow asymptotically, which is not the case here.(Stock and Watson, 2008)). We provide a sensitivity analysis among the suggested method in the literature in Section 5.2.

Coefficient" model. We test if a model, as given below (in simple words):

$$y_{it} = (\beta_0 + \alpha_{0i}) + (\beta_1 + \alpha_{1i}) Z_{it} + \epsilon_{it} \tag{5}$$

improves upon a model which does not allow for the intercept and slope coefficients to vary across states.

We believe that exploring the dynamics that link inflation to inequality at a higher frequency and allowing for across states heterogeneity in the estimated coefficients will help us understand how social welfare costs and/or gains of inflation vary in short term vis-a-vis medium term and across states. Note, over the last ten years of our sample period, central-bank balance sheets became the main policy instrument in the U.S. and other advanced economies (Gambacorta et al., 2014). Thus, we are able to examine how the relationship between inflation and income inequality holds for the period when Federal Reserve initiated large-scale asset purchases (LSAPs), also known as quantitative easing (QE). Specifically, we investigate the relationship between inflation and income inequality over two sub-sample periods (prior-and-post 2008). We also investigate how the relationship holds by decomposing our analysis by our main variable of interest, inflation below and above the Federal Reserve's target of 2%.

4 Empirical Results

Table 1 summarizes the main result. Column 1 provides the result in which we include the same period values of inflation (π) and growth rate of income per capita. We observe that per one unit increase in inflation, income inequality is expected to to drop by 0.12 (0.118) percentage points. In column 2 through 6, we include lagged values of inflation from the first lag to the fourth lag. In the last specification we also control for monetary and fiscal policy changes (changes in federal funds rate and changes in state and local government spending). Although column 2 still depicts a negative effect of immediate lag of inflation (previous period values) on inequality growth (though smaller than the contemporaneous effect reported in column 1), with inclusion of more delayed lags, the direction of the prolonged effect changes. In column 5, the fourth lag of inflation, meaning the inflation of the same quarter of the previous year, shows the long term significant and positive effect of inflation on income inequality. One percentage point increase in inflation rate contributes to 0.12 percent increase in inequality over 4 quarters. Controlling for federal fund rates and state and local government spending, the effect of one percentage point rise in inflation is estimated to be an increase of 0.15 percentage point in inequality over a year.

The main finding is the change of magnitude and direction of the effect of inflation on inequality: although the immediate/contemporaneous effect of inflation on inequality is negative, we observe a significant large positive effect on annualized growth rate of income inequality over the span of four quarters. While the main variable of interest is inflation, the point estimates for added controls are in line with the inequality literature of the United States ((Saez,

2018), Berisha et al. (2018)). We observe growth in income per capita positively and significantly affects inequality during the period under study. The federal fund rates and changes in state and local government spending have negative and statistically significant affect on income inequality.

To ensure that there is no heterogeneity in the estimated inflation coefficient across the states, we explore a "Random Coefficient" model. The heterogeneity of the effect was ruled out from the Likelihood Ratio Test (with the p-value of 0.4075). However, we still provide the results of the Random Coefficient Model (refer to Equation 5), estimated by restricted maximum-likelihood, which allows for the overall level of the response, as well as the marginal effect of the independent variable, conditional on covariates, to vary across states. Findings summarized in Table 2 are similar to earlier results. We rule out the possible heterogeneity in the relationship between inflation and income inequality across the states.

As mentioned earlier, it should be noted that the period post 2008 corresponds with years over which inflation rate in US was persistently below Federal Reserve's target rate (2%). So consequently, we expect the size of the impact on income inequality to weaken over this period. To have a better inference, in Table 3 we divide the period under study to post-2008 and pre-2008. Column 1 and 6 report the result of the basic model (with contemporaneous values of inflation) for pre-2008 and post-2008 respectively, and column 5 and 10 report the effect for fourth lag of inflation. The contemporaneous effect of inflation is - 0.13 percent for pre-2008 period (column 1), and it becomes positive, larger and significant over the span of four quarters (0.35 percent in column 5). Note, the coefficients of all the lags are insignificant in the post-2008 result (column 6 through 10). Results reveal that Great Recession of 2008 and 2009 could have weaken the link between inflation and income inequality.

To better demonstrate the quarterly effects, Figure 5 and 6 below depict the response of the inequality to one percent rise in contemporaneous and different lagged values of inflation. Figure 5 provides this information for the entire period under study, driven from our result in Table 1, while Figure 6 shows this information for pre-2008 and post-2008 periods driven from our result provided in Table 3. Figure 5 aims to show better the swing in the response of inequality to different lags of inflation. Figure 6 depicts how the effect of inflation on income inequality changes direction depending on the initial inflation rate is below-or-above the Fed's target of 2% and how we can conclude that the Great Recession changed the connection between inflation and inequality. While the effect of inflation on inequality for post-2008 is not that substantial, it has a significant positive effect over the span of 4 quarters

On the same note but from another angle, in Table 4 below, we summarize the result of a similar analysis for "high inflation" versus "low inflation" times. Specifically, we decompose our data to the years in which the annual average inflation rate was above and below the overall average (of 2.21 percent). From our results we learn that in the presence of high inflation, higher inflation contemporaneously decreases inequality. However, the impact alters to positive over a four quarter period. In the presence of low inflation period, higher inflation, contemporaneously, has statistically no significant impact on income inequality. Over a 4 quarter period, we observe the impact to be positive, but not that

substantial.

Overall, our findings contribute to the existing literature in several ways. Initially, we show evidence of inflation causing swings in income income inequality even within one quarter period. Secondly, we are the first one to emphasize that the dynamic response of inequality to changes in inflation alternate over a four-quarter period. The contemporaneous impact of inflation on inequality is found to be negative. After three quarters the impact becomes positive and stronger in magnitude. Thirdly, we emphasize that the nonlinear relationship between inflation and income inequality might be driven by the targets set by central banks. Specifically, we find When inflation is above Fed's target, higher inflation initially leads to lower inequality and the impact alters to positive over a four quarter period. Lastly, we find that Great Recession might have weaken the link between inflation and income inequality in the US.

5 Sensitivity Analysis

5.1 Data Robustness Check

To assess the robustness of the findings, following Romer and Romer (1998), we extract the unanticipated part of inflation by using the inflation forecasts from the Survey of Professional Forecasts. Results presented in Table 5 indicate that, contemporaneously, distributional consequences of unanticipated inflation are similar with the point estimates of overall inflation rate. However, the impact is found to be short lived. Specifically, the impact from unanticipated inflation to inequality drops down to zero and becomes statistically insignificant.

We also replace income growth with unemployment, as another measure to control for business cycles. Results given in table 6 suggest that earlier findings are intact to this change of covariate

5.2 Method Robustness Check

A standard assumption for efficiency in panel-data models is that the error terms are independent across cross sections. We test for heteroscedasticity, and cross sectional dependence in our data. To test for heteroskedasticity, we perform a modified Wald test for group-wise heteroskedasticity in the residuals, and the null hypotheses of homoskedasticity is rejected (Baum, 2001; Greene, 2002). The result of Breusch-Pagan LM test (appropriate for our large T) for cross-sectional independence concludes in the rejection of null hypothesis (of no cross sectional dependence) (Breusch and Pagan, 1980; Baum, 2011). The errors exhibit both heteroskedasticity and contemporaneous correlation.

Although our original feasible estimator with multi-way fixed effects (an expanded form of a regular Fixed Effect model) allows correction for heteroskedasticity and cross correlations, we test the sensitivity of our result to different estimation method suggested and employed in the literature. In Table 7 below, we provide the coefficients of the main relationship of interest, estimated by potential alternative approaches. We estimate the relationship with a gen-

eral/regular Fixed Effect model (explained more in dept in Section 3.2) in which we are able to reduce endogeneity and inefficiencies by including level and time fixed effects, a panel-data linear models by using feasible generalized least squares that allows estimation in the presence of auto-correlation within panels and cross-sectional correlation and heteroskedasticity across panels (Greene, 2012), and a panel-corrected standard error (PCSE) estimates for linear cross-sectional time-series models which assumes by default, heteroskedastic and contemporaneously correlated errors across panels (Greene, 2012). For example, columns 1 through 3 show the results of the contemporaneous effect of inflation on inequality estimated from the Fixed Effect model, Panel FGLS, and Panel Corrected Standard Error model. We observe very robust estimation results across these methods for all the coefficients. Lastly, we examine for a non-linear relationship between inflation and income inequality by adding a square term of the inflation in our model specifications. We found no evidence of a significant non-linear effect of inflation on income inequality in the USA [6].

6 Conclusion

The impact of inflation on inequality still remains to be somewhat controversial. The puzzle exists because the relationship depends on the initial level of inflation. Whenever inflation is high, reducing inflation might decrease inequality. When initial inflation is low, reducing inflation might worsen inequality.

We contribute to the literature by showing evidence that inflation causes swings in income distribution rapidly even after controlling for the state of the economy. In addition, we show that the magnitude of the effect of inflation on income inequality changes direction depending on the initial inflation rate is below-or-above the Fed's target of 2%. To our knowledge, we are the first one to emphasize that the strength and the direction of the relationship between inflation and income inequality might be driven by the targets set by central banks. Specifically, we show that When inflation is above Fed's target, higher inflation initially leads to lower inequality; however, the impact alters to positive over a four quarter period. When inflation is below Fed's target, higher inflation initially has no impact on inequality. After four quarters, the impact become slightly positive. We show evidence that Great Recession might have weakened the link between inflation and income inequality. Finally, from our findings we can assert that recent observation of higher inflation should further exacerbate income inequality in the United States. Thus, policymakers should pay more attention to redistributive consequences of recent development in prices to avoid the growth-retarding effects of policies initiated by them to help the economy recover from the pandemic.

[6] These results are available upon request

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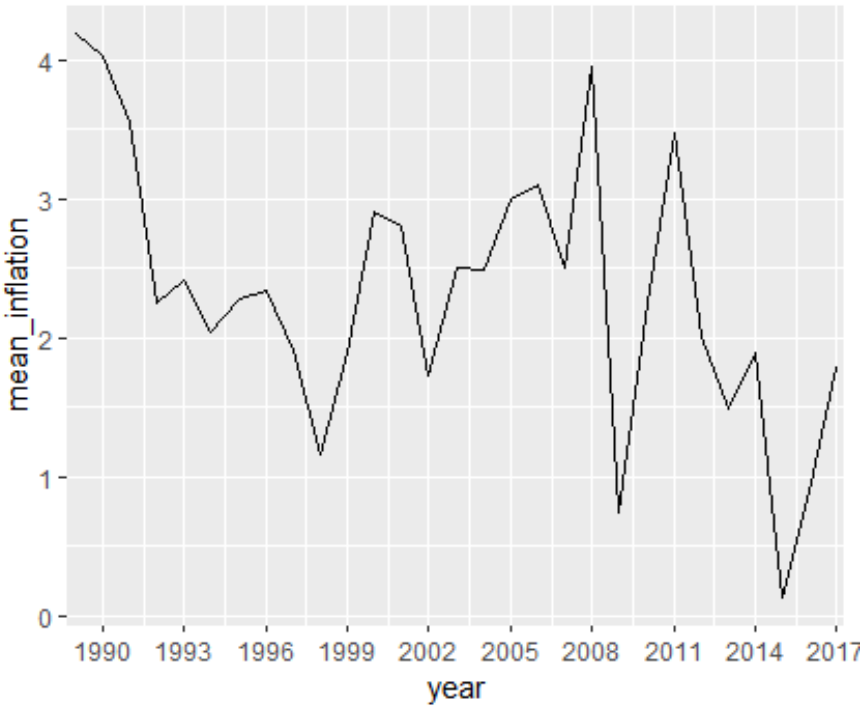

Figure 1: Time Series of Inflation

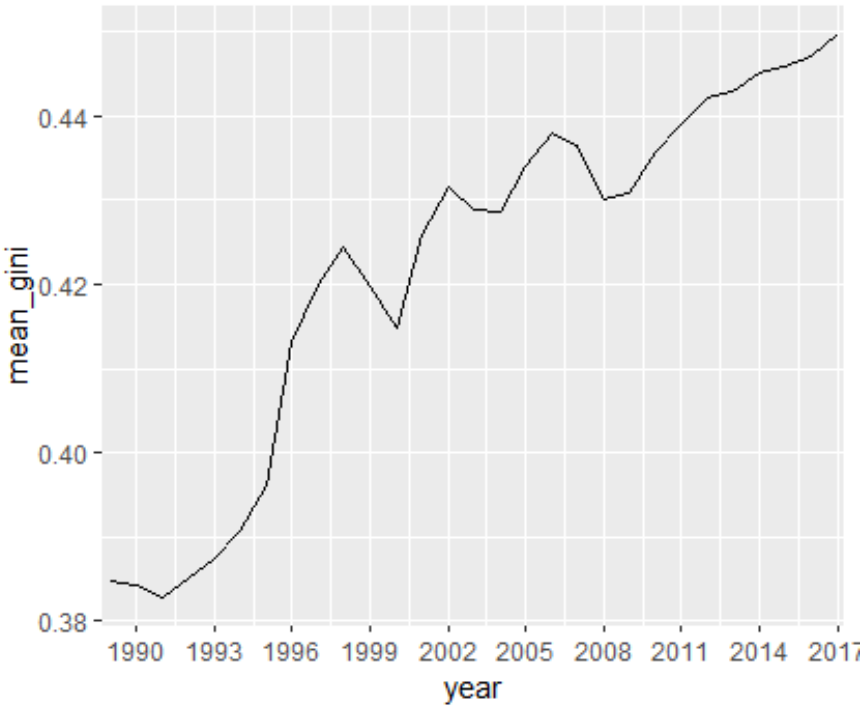

Figure 2: Time Series of Gini Coefficient

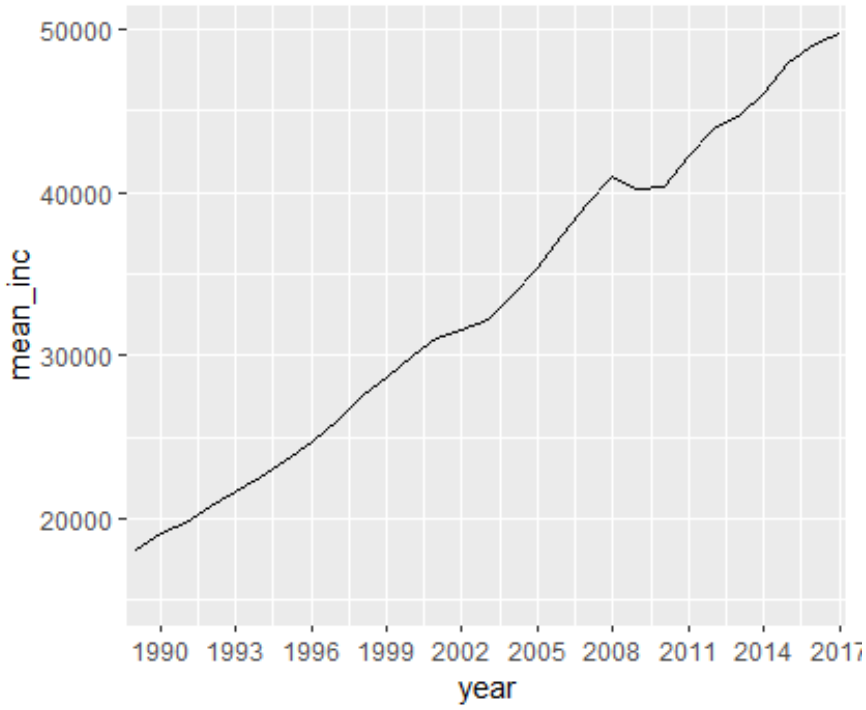

Figure 3: Time Series of Income per Capita

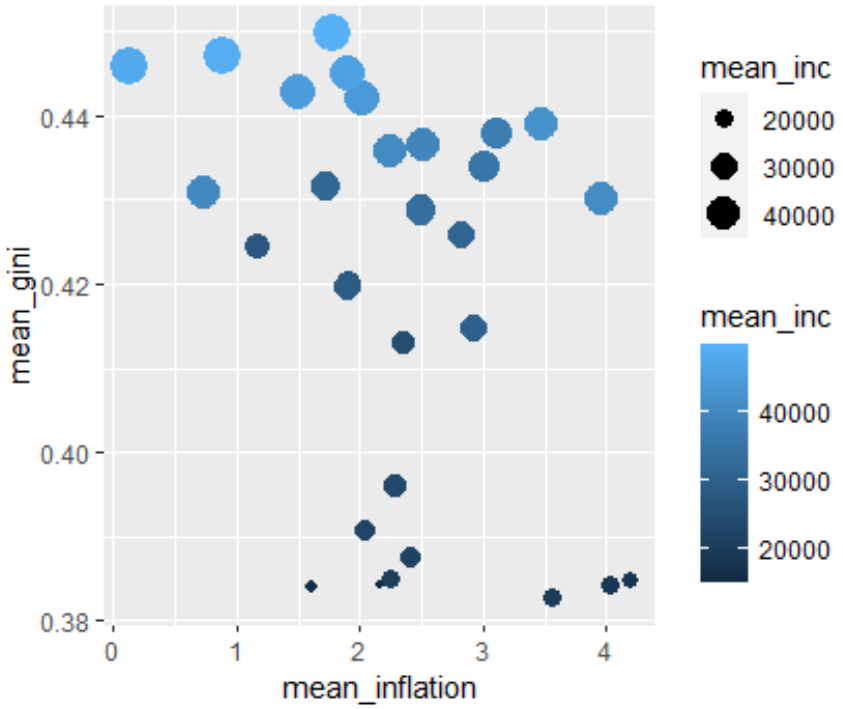

Figure 4: Inflation and Inequality by State

Table 1: Estimation Result, Different Lags of Inflation, With and Without Controls

	(1)	(2)	(3)	(4)	(5)	(6)
incgrowth	0.10***	0.09***	0.09***	0.08***	0.08***	0.09***
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
pi	-0.12***					
	(0.04)					
L.pi		-0.07*				
		(0.04)				
L2.pi			-0.00			
			(0.04)			
L3.pi				0.07		
				(0.04)		
L4.pi					0.12***	0.15***
					(0.04)	(0.04)
dffr						-0.10**
						(0.05)
dGTE						-0.13***
						(0.02)
FE	Yes	Yes	Yes	Yes	Yes	Yes
N	3604	3570	3536	3502	3468	3468

Dependent Variable is Inequality Growth.
Robust Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Estimation Result, Random Coefficient Model
Different Lags of Inflation, With and Without Controls

	(1)	(2)	(3)	(4)	(5)	(6)
incgrowth	0.10***	0.10***	0.09***	0.08***	0.08***	0.09***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
pi	-0.12***					
	(0.04)					
L.pi		-0.08*				
		(0.04)				
L2.pi			-0.01			
			(0.04)			
L3.pi				0.06		
				(0.04)		
L4.pi					0.11***	0.13***
					(0.04)	(0.04)
dffr						-0.10**
						(0.04)
dGTE						-0.13***
						(0.02)
N	3604	3570	3536	3502	3468	3468

Dependent Variable is Inequality Growth.
Independent Covariance Matrix is considered.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Estimation Result, Different Lags of Inflation, Post-2008 and Pre-2008

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
incgrowth	0.13***	0.13***	0.12***	0.11***	0.10**	0.01	0.01	0.01	0.01	0.02
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
pi	-0.13**					0.05				
	(0.06)					(0.06)				
L.pi		-0.01					0.04			
		(0.06)					(0.07)			
L2.pi			0.16**					0.03		
			(0.07)					(0.07)		
L3.pi				0.27***					0.06	
				(0.07)					(0.08)	
L4.pi					0.35***					0.10
					(0.07)					(0.07)
dffr	-0.13***	-0.16***	-0.17***	-0.17***	-0.18***	0.29	0.31	0.34	0.41*	0.48**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.19)	(0.20)	(0.23)	(0.25)	(0.23)
dGTE	-0.22***	-0.26***	-0.29***	-0.29***	-0.30***	0.02	0.02	0.02	0.04	0.05
	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Year<=2008	●	●	●	●	●					
Year>2008						●	●	●	●	●
N	2448	2414	2380	2346	2312	1156	1156	1156	1156	1156

Dependent Variable is Inequality Growth.
Robust Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

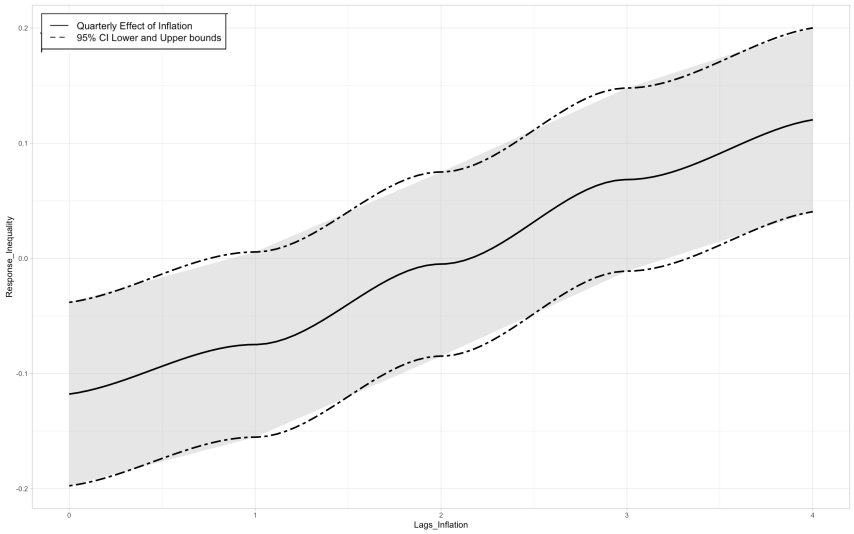

Figure 5: Quarterly Response of Inequality to Inflation, Over Entire Time Period

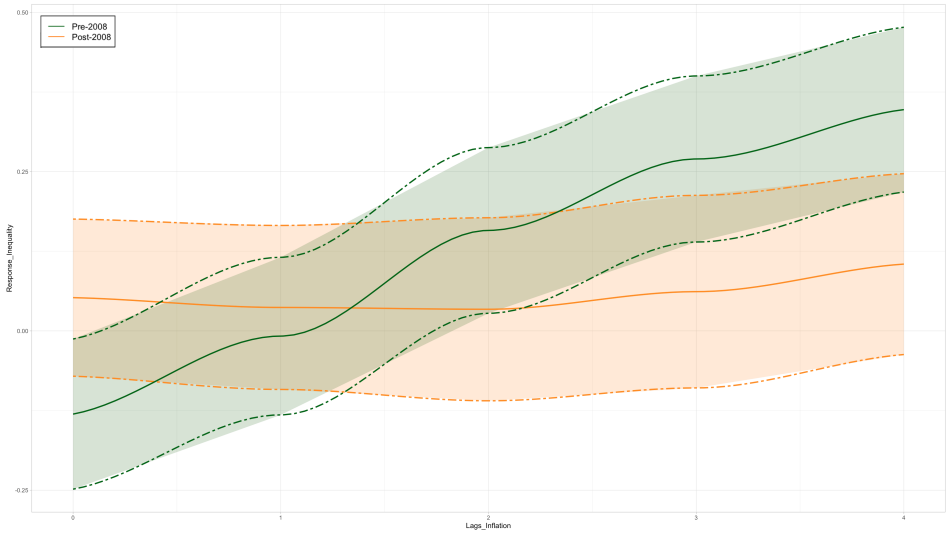

Figure 6: Quarterly Response of Inequality to Inflation, Post and Pre-2008 Period.

Table 4: Estimation Result, Different Lags of Inflation, High Inflation Vs. Low Inflation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
incgrowth	0.13***	0.13***	0.13***	0.10**	0.08*	0.09**	0.09**	0.09**	0.09**	0.10***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
pi	-0.26***					0.03				
	(0.06)					(0.07)				
L.pi		-0.21***					0.06			
		(0.07)					(0.07)			
L2.pi			-0.08					0.08		
			(0.07)					(0.06)		
L3.pi				0.05					0.10	
				(0.07)					(0.07)	
L4.pi					0.19***					0.13**
					(0.07)					(0.07)
dffr	-0.06	-0.09*	-0.09*	-0.09*	-0.10*	-0.30***	-0.29***	-0.26***	-0.24**	-0.23**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.09)	(0.09)	(0.09)	(0.10)	(0.10)
dGTE	-0.19***	-0.20***	-0.21***	-0.21***	-0.24***	-0.10**	-0.10**	-0.10**	-0.09**	-0.09**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Inflation>=Average	●	●	●	●	●					
Inflation<=average						●	●	●	●	●
N	2040	2006	1972	1938	1904	1564	1564	1564	1564	1564

Dependent Variable is Inequality Growth.
Robust Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Estimation Result, Different Lags of Unexpected Inflation

	(1)	(2)	(3)	(4)	(5)
incgrowth	0.09***	0.10***	0.10***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
unexpinfl	-0.14***				
	(0.04)				
L.unexpinfl		-0.12***			
		(0.04)			
L2.unexpinfl			-0.07*		
			(0.04)		
L3.unexpinfl				-0.01	
				(0.04)	
L4.unexpinfl					0.04
					(0.04)
dffr	-0.05	-0.08*	-0.10**	-0.11**	-0.12***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
dGTE	-0.10***	-0.11***	-0.11***	-0.11***	-0.12***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
FE	Yes	Yes	Yes	Yes	Yes
N	3604	3570	3536	3502	3468

Dependent Variable is Inequality Growth.
Robust Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Estimation Result, Robustness to Different Controls for Business Cycles

	(1)	(2)	(3)	(4)	(5)	(6)
dur	0.06	0.07	0.08	0.07	0.06	0.20***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
pi	-0.08*					
	(0.04)					
L.pi		-0.04				
		(0.04)				
L2.pi			0.02			
			(0.04)			
L3.pi				0.07*		
				(0.04)		
L4.pi					0.11***	0.14***
					(0.04)	(0.04)
dffr						-0.01
						(0.05)
dGTE						-0.15***
						(0.02)
FE	Yes	Yes	Yes	Yes	Yes	Yes
N	3604	3570	3536	3502	3468	3468

dur is Unemployment Rate Growth.
Dependent Variable is Inequality Growth.
Robust Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Method Sensitivity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
incgrowth	0.10***	0.10***	0.10***	0.09***	0.09***	0.10***	0.09***	0.08***	0.09***	0.08***	0.08***	0.08***	0.08***	0.08***	0.08***
	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)	(0.02)
pi	-0.12***	-0.10***	-0.12***												
	(0.04)	(0.00)	(0.04)												
L.pi				-0.07*	-0.07***	-0.08*									
				(0.04)	(0.00)	(0.04)									
L2.pi							-0.00	-0.01***	-0.01						
							(0.04)	(0.00)	(0.04)						
L3.pi										0.07*	0.05***	0.06			
										(0.04)	(0.00)	(0.04)			
L4.pi													0.12***	0.09***	0.11***
													(0.04)	(0.00)	(0.04)
FE	•			•			•			•			•		
XTGLS		•			•			•			•			•	
XTPCSE			•			•			•			•			•
N	3604	3604	3604	3570	3570	3570	3536	3536	3536	3502	3502	3502	3468	3468	3468

Fixed Effect estimates, Panel-data linear feasible generalized least square estimates, and panel-corrected standard error (PCSE) estimates for linear cross-sectional panel data.
The dependent Variable is Inequality Growth.
Standard Errors in Parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A Data Appendix

The data source employed for the analysis are summarised in Table 8:

Table 8: Descriptive Statistics

	Definition	Abbreviation Used	Source
Inequality Growth	The measure is constructed using household income data from the Annual Social and Economic Supplement of the Current Population Survey (CPS). Change from year ago	inecgrowth	Fischer et al. (2019)
Inflation	The measure is quarterly averages of 12-month inflation rates within a quarter year. For example, the inflation rate for 2004.Q1 is the average of 12-month inflation rates of January, February, and March of 2004, relative to the corresponding months of 2003.	pi	Hazell et al. (forthcoming)
Income Growth	Income per capita, Change from year ago.	incgrowth	Fischer et al. (2019)
Federal Fund Rate	Federal Fund Rate, Change from year ago, percent.	dffr	Board of Governors of the Federal Reserve System (US), Federal Funds Effective Rate [DFF], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/DFF
Government Expenditure	Total Local and State Government Expenditure, Change from year ago	dGTE	U.S. Bureau of Economic Analysis, State and Local Government Current Expenditures [SLEXPND], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SLEXPND
Unexpected Inflation	Unanticipated inflation is the difference between actual inflation and forecast values from a year ago.	unexpingfl	The Survey of Professional Forecasters, The Federal Reserve Bank of Philadelphia; https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/survey-of-professional-forecasters
Unemployment rate growth	States quarterly unemployment rate, change from a year ago, percent.	dur	Fischer et al. (2019)

B Descriptive Statistics

Table 9 provides descriptive statistics.

Table 9: Descriptive Statistics

		Mean	Std. Dev.	Min	Max	N/n/T-bar
ineqgrowth	overall	.56	3.14	-11.07	12.35	3740
	between	.	.19	.10	1.00	34
	within	.	3.13	-11.26	12.32	110
pi	overall	2.28	1.38	-4.03	9.35	3740
	between	.	.23	1.82	2.90	34
	within	.	1.36	-3.72	9.21	110
incgrowth	overall	3.63	2.90	-105.82	12.08	3740
	between	.	.27	2.77	4.20	34
	within	.	2.89	-104.95	11.63	110
dffr	overall	-.31	1.40	-4.34	2.59	3740
	between	.	0	-.31	-.31	34
	within	.	1.40	-4.34	2.59	110
dGTE	overall	4.60	2.63	-1.38	11.98	3740
	between	.	0	4.60	4.60	34
	within	.	2.63	-1.38	11.98	110
unexpinfl	overall	-.34	1.42	-6.27	5.49	3740
	between	.	.23	-.80	.28	34
	within	.	1.40	-5.83	5.45	110
dur	overall	-.02	1.07	-4.8	6.57	3604
	between	.	.034	-.11	.05	34
	within	.	1.07	-4.82	6.64	106