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The impact of inflation on income inequality in the United States

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Abstrakt

Diese Studie untersucht den Einfluss der Inflation auf die Einkommensungleichheit in den Vereinigten Staaten anhand von auf Bundesstaatenebene erhobenen Daten aus den Jahren 1978 bis 2017. Unter Anwendung einer umfassenden empirischen Strategie, die unter anderem Ordinary Least Squares (OLS) und Instrumentalvariable-Regressionen (IV) umfasst, wird analysiert, wie sich Trend- und zyklische Inflation auf die Einkommensverteilung auswirken. Die Ergebnisse zeigen, dass die Trendinflation die Einkommensungleichheit im Allgemeinen verringert, was darauf hindeutet, dass Mechanismen wie Schuldenabbau und Lohnanpassungen einkommensschwächeren Haushalten zugutekommen. Im Gegensatz dazu verschärft die zyklische Inflation die Einkommensungleichheit, was mit Theorien übereinstimmt, die den unverhältnismäßigen Einfluss volatiler Inflation auf einkommensschwächere Gruppen betonen. Die Studie trägt zur Literatur bei, indem sie Einblicke in die doppelte Natur des Einflusses von Inflation auf die Einkommensungleichheit liefert und die Notwendigkeit weiterer Forschung hervorhebt, um die zugrunde liegenden Mechanismen dieser Beziehungen zu untersuchen.

Abstract

This study investigates the impact of inflation on income inequality in the United States, utilizing state-level data spanning from 1978 to 2017. Employing a comprehensive empirical strategy, including Ordinary Least Squares (OLS) and Instrumental Variable (IV) regressions, the analysis explores how trend and cyclical inflation influence income distribution. The results reveal that trend inflation generally reduces income inequality, suggesting mechanisms such as debt erosion and wage adjustments benefit lower-income households. Conversely, cyclical inflation exacerbates income inequality, aligning with theories that highlight the disproportionate impact of volatile inflation on lower-income groups. The study contributes to the literature by providing insights into the dual nature of inflation's impact on income inequality, emphasizing the need for future research to examine the underlying mechanisms of these relationships.

1. Introduction

Income inequality and inflation are two critical economic issues that significantly impact the well-being of societies. In the United States, inflation has experienced varying levels over the decades, with notable spikes in the 1970s and early 1980s, and more recently, a resurgence post-2020. For instance, the U.S. Bureau of Labor Statistics reported an annual inflation rate of 6.8% in 2021, the highest since 1982. Concurrently, income inequality has been on an upward trajectory, with the Gini coefficient, a common measure of income inequality, increasing from 0.397 in 1967 to 0.486 in 2020 according to the U.S. Census Bureau.

Understanding the relationship between inflation and income inequality is paramount as it provides insights into the broader implications of monetary policies and economic stability. Inflation erodes purchasing power, and its effects are not uniformly felt across different income groups. Low-income households, which spend a larger proportion of their income on essential goods and services, are disproportionately affected by quickly rising prices. This exacerbates income inequality, as inflation acts as a regressive tax, hitting poorer households harder. The dynamics between inflation and income inequality have significant implications for economic policy. Policymakers are often caught in a balancing act between curbing inflation and addressing income disparities. For example, contractionary monetary policies aimed at reducing inflation can lead to higher unemployment rates, disproportionately affecting lower-income workers and widening the income gap. Conversely, policies that are too lenient on inflation can erode real incomes and savings. Inflation, could also have a negative impact on income inequality as its reducing the real value of debt, where most creditors are parts of the top income deciles, reducing their real income as well as the financial expenses of their debtors who might have lower incomes.

The Federal Reserve’s dual mandate to achieve maximum employment and stable prices underscores the importance of understanding how inflation influences income distribution. This relationship becomes even more critical in today's context, where global economic shocks and supply chain disruptions have reignited inflationary pressures. The COVID-19 pandemic has highlighted the vulnerability of lower-income groups to economic shocks, and the subsequent fiscal and monetary responses have reignited debates about the long-term impacts of inflation.

Focusing specifically on the United States, rather than conducting an intercountry analysis, offers distinct advantages. The U.S. provides a unique context with its diverse economic landscape, federal structure, and extensive data availability. Studying the U.S. allows for a more granular analysis of regional variations in inflation and income inequality, which is critical for understanding the localized impacts of national policies. Analyzing the impact of inflation on income inequality within the U.S. is particularly useful for several reasons. Firstly, it enables a detailed understanding of the localized effects of inflation on different income groups, helping to identify which regions or demographics are most vulnerable. Secondly, this focus allows for the assessment of policy effectiveness, offering valuable insights into which strategies have succeeded or failed in mitigating the adverse effects of inflation on income inequality. Lastly, such an analysis can inform future policy decisions, ensuring that measures taken to control inflation do not inadvertently exacerbate income inequality.

2. Literature Review

There are divergent perpectives on the relationship between inflation. These conflicting notions arise from the diverse mechanisms proposed to explain how inflation influences income distribution. One such mechanism is the Kuznets curve effect, which suggests a potential alleviation of income inequality with economic growth influenced by inflation. This theory posits that in the early stages of economic growth, inequality rises as benefits are unevenly distributed, but as growth continues, the benefits become more widespread, potentially reducing inequality over time. Inflation, by stimulating economic activity, might accelerate this process and thus reduce inequality over time (Kuznets, 1955).

The real wage channel posits that wages, pensions, and benefits for poorer households are often not adjusted for inflation at the same rate as those for wealthier households. Consequently, the purchasing power of low-income individuals erodes more quickly, widening the income gap as inflation rises. Theoretical frameworks highlight how stagnant wages amidst rising prices can deepen income inequality (Cukierman and Lippi, 1999). Wealth distribution exacerbates these phenomena, with affluent individuals, holding more diversified assets such as stocks and real estate, which can appreciate with inflation. In contrast, lower-income individuals rely predominantly on fixed-income sources like wages and pensions, which do not adjust as readily to inflation (Albanesi, 2007).

The tax income bracket effect hypothesis introduces another layer of complexity. It suggests that inflation, by pushing nominal incomes into higher tax brackets without a corresponding increase in real income, raises tax burdens particularly for lower-income households. This bracket creep results in higher effective tax rates for those who are least able to afford it, thereby exacerbating income inequality. (Musgrave, 1992).

Adding to these theories is the debt deflation hypothesis, which suggests that unanticipated inflation redistributes wealth between debtors and creditors.

When inflation is higher than expected, it reduces the real value of debt, benefiting debtors (who are often lower-income households) and disadvantaging creditors (who are often wealthier). This redistribution can either diminish or exacerbate income inequality depending on the relative proportions of debt held by different income groups and the overall economic context (Doepke and Schneider, 2006). This hypothesis underscores the dynamic impact of inflation on the wealth distribution.

Empirical studies further contribute to the uncertainty regarding the relationship between inflation and income inequality. Romer and Romer (1999) highlight a positive association between inflation and income inequality through time-series analysis, attributing this effect to the disproportionate impact on low-income households. Cardoso (1995) and Pessino (1993) employ cross-sectional data and find that low-income households are disproportionately affected by inflation due to their higher proportion of cash holdings. Xu and Zou (2000) utilize panel data to demonstrate that wages and pensions for poorer households often do not keep pace with inflation, widening the income gap. Further empirical evidence from studies such as Afonso and Sequeira (2022), Bittencourt (2009), Elhini and Hammam (2021), and Roser and Cuaresma (2016), using a combination of panel data and time-series analyses, consistently supports the notion of a positive correlation between inflation and income inequality.

Another strand of empirical research concludes that the relationship between inflation and income inequality is a non-linear one. Chu et al. (2019) propose an inverted-U pattern, suggesting that inequality initially increases with inflation until reaching a critical threshold, beyond which it declines. Boel (2018) corroborates this view, indicating that inequality diminishes at low to moderate inflation rates but rises when inflation grows. This non-linear trend is echoed by Galli and van der Hoeven (2001), Monnin (2014), and Siami-Namini and Hudson (2019b) across OECD and developing countries, suggesting a U-shaped relationship. Bulir (2001) finds that while low inflation can ameliorate income inequality, hyperinflation exacerbates it substantially. Monnin (2014) identifies a U-shaped relationship between long-run inflation and income inequality, with a threshold inflation level around 13.3 percent. Similarly, N'Yilimon (2015) confirms a non-linear link between inflation and income inequality across developing countries. Balcilar et al. (2018) employ a semiparametric approach to demonstrate a non-linear relationship between inflation and income inequality in the US, with a positive correlation emerging beyond a certain threshold level of inflation.

Contrary to the non-linear perspectives, certain studies posit a negative correlation between inflation and income inequality. Empirical studies, including those by Beji (2019), El Herradi et al. (2022), and Gustafsson and Johansson (1999), align with this perspective, demonstrating a significant reduction in income inequality associated with inflation. Maestri and Roventini (2012), as well as Coibion et al. (2012), also identify a negative relationship between inflation and income inequality, reinforcing the notion of inflation's potential to mitigate economic disparities.

In essence, the literature underscores the absence of a clear and universally agreed-upon understanding of how inflation influences income inequality. In fact, a recent meta-analysis by Sintos (2023) analysed the results of 1767 estimates of the relationship of inflation on income inequality from 124 peer reviewed studies, with a roughly even distribution between results showing a positive and negative relationship. The multitude of proposed mechanisms, coupled with varying empirical findings, contributes to a landscape marked by uncertainty and conflicting views.

My study aims to contribute to this ongoing debate by focusing on state-level data in the United States. By examining the effects of inflation on income inequality within individual states, this research provides a more granular perspective that accounts for regional variations and policies. This approach addresses several gaps in the current literature. Firstly, inter-country studies often overlook the heterogeneity within countries, where regional economic conditions, cost of living, and policy implementations can vary significantly. By focusing on intra-country analysis, specifically state-level data in the US, this study captures the diverse economic environments and policy landscapes that influence the inflation-inequality relationship. Secondly, state-level analysis allows for the examination of localized economic factors such as state-specific fiscal policies, labor market conditions, and industrial compositions, which can significantly impact how inflation affects income distribution. These factors are often homogenized in inter-country analyses, potentially obscuring important nuances. By filling these gaps, my study contributes to a more nuanced understanding of the inflation-inequality relationship, offering policy-relevant insights that can inform state-specific economic strategies and interventions.

3. Data

The unique aspect of this analysis is its focus on the geographical and temporal dimensions. Unlike many studies that use inter-country datasets, this research examines intra-country dynamics at the US state level. This approach is chosen to control for national-level factors such as monetary policy and federal regulations, thus providing a clearer view of the relationship between inflation and income inequality within a consistent legal and economic framework. This method helps reduce the impact of country-specific institutional differences on the analysis. The United States offers a varied economic landscape, with significant differences in economic conditions, fiscal policies, and demographic characteristics across states. This heterogeneity makes it suitable for studying the impacts of inflation on income inequality across different economic contexts, thus enhancing the relevance and robustness of the findings. The regional differences in cost of living, industrial composition, and wage structures further justify the study at the state level.

Inter-country analyses, while offering insights into various economic systems, face challenges such as significant heterogeneity across countries, which can introduce noise and complicate analyses. Differences in data collection methods and statistical standards across countries may also affect the reliability and comparability of results. The complexity of the required control variables to account for inter-country differences can make the analysis cumbersome.

In contrast, the intra-country approach at the US state level benefits from a uniform legal and economic framework, which simplifies the dataset and reduces institutional noise. The high-quality, detailed state-level data allow for a precise analysis focused on localized economic conditions and state-specific policies. This approach simplifies the need for control variables and enhances the robustness of the findings. However, this method has limitations, particularly in generalizability to other countries with different economic systems. The consistency of national-level policies li3ke monetary policy across states might also limit the variation observed in the effects of inflation on income inequality. Despite these limitations, the advantages of focusing on state-level data for understanding regional disparities and informing localized policy decisions are substantial.

The dataset used in this research includes a balanced panel of 19 US states from 1978 to 2017. This period is longer than that of most empirical studies, providing a comprehensive view of long-term trends and economic cycles. The choice of states and the timeframe are based on the availability of data on the relevant variables.

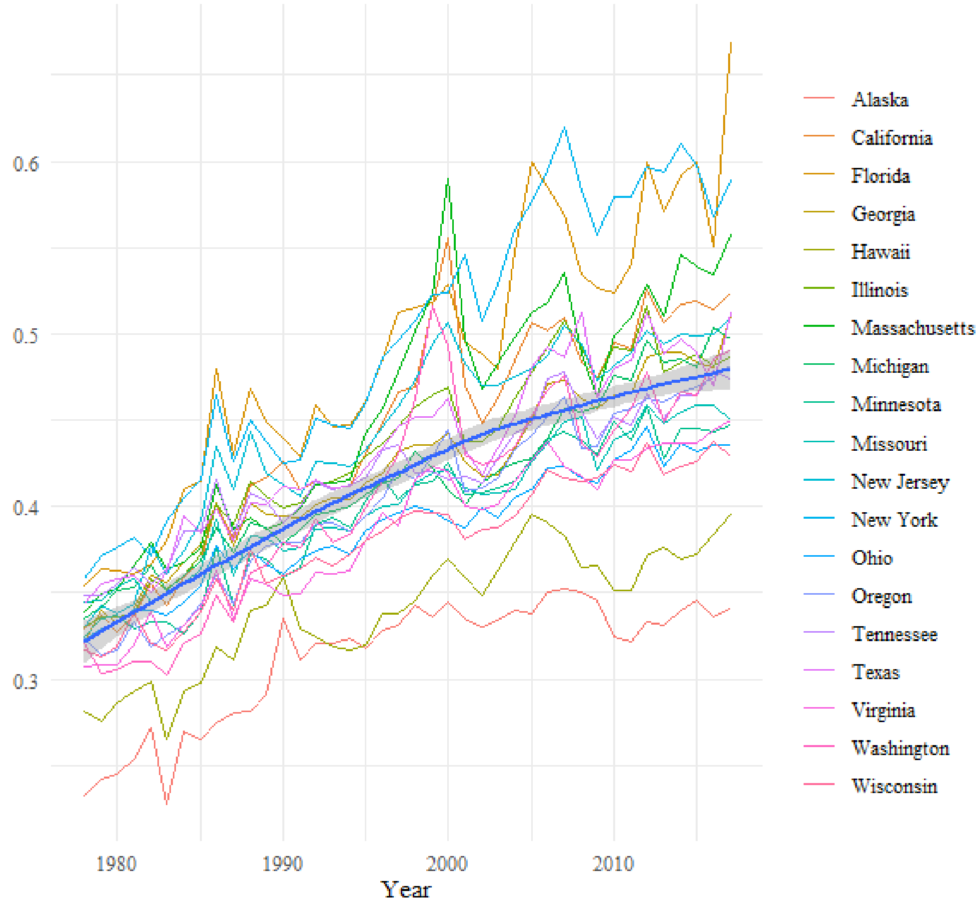
Inequality

The primary variables for my regression analysis are drawn from two sources. I obtained data on the income share of the top deciles for each US State from the World Inequality Database. Additionally, I sourced the Gini coefficient from the U.S. State-level Income Inequality Database, developed by Professor Mark W. Frank. I chose these two variables as proxies for inequality because they are among the most commonly used in both the literature and economic analysis.

A prominent assertion made by Thomas Piketty, one of the architects of the World Inequality Database, underscores the sustained growth of income inequality since World War II, culminating in a resurgence to early 20th-century levels. This trend is evident across all states in the dataset and the aggregate level. For instance, the share of income held by the top 10% surged from approximately 33% in 1978 to 48% in 2017.

At the state level, Alaska emerges as an outlier for its comparatively equitable income distribution, particularly evident in its lower percentiles' income shares. Consequently, the proportion of income accruing to the top percentiles is notably lower in Alaska. In 1978, for instance, the top 1% accounted for a mere 4.8% of income, with the top 0.1% earning only 1.1%. In contrast, New York in 2007 exhibited stark income disparities, with 36% of income concentrated among the top 1%, escalating to nearly 23% for the top 0.1%, particularly notable preceding the onset of the 2008 financial crisis, emanating from Wall Street, the epicenter of New York's financial hub. Subsequently, Florida

Figure 1 – Average share of Income of the Top 10 % in the United States (1978-2017)



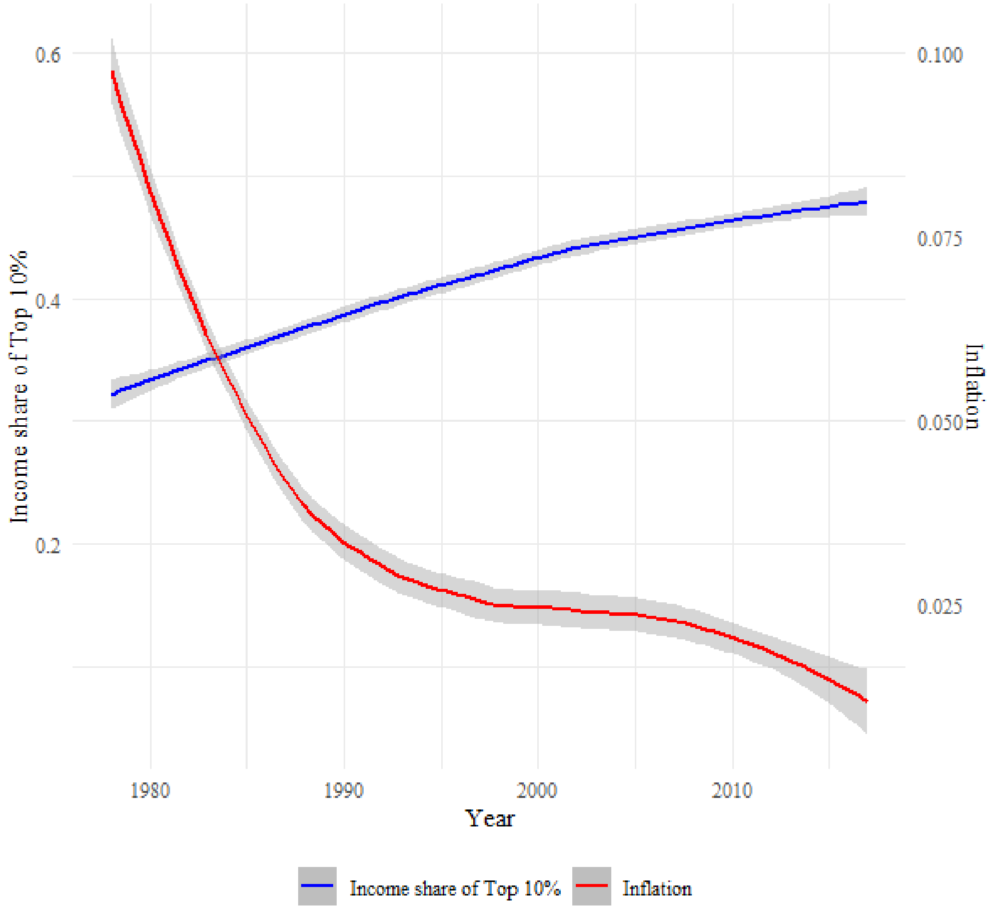
Source: World Inequality Database

emerged as a contender for the title of most unequal state, evidenced by its top 10% capturing 66.9% of income in 2017. Absent the income surge induced by the Mortgage-Backed Securities Bubble pre-2008 in New York, Florida would have surpassed it in income inequality across all categories.

Inflation

The analysis is based on state-level inflation data from Hazell et al. (2022). While the US Bureau of Labor Statistics (BLS) provides aggregate CPI data for the entire country, it does not offer state-specific indices. To fill this gap, Hazell et al. created new state-level price indices for the United States using micro-price data collected by the BLS for the CPI. This micro-price data, included in the CPI Research Database, covers thousands of individual goods and services, representing about 70% of consumer expenditures. However, due to the limited geographical areas where the BLS collects data, the dataset is restricted to 19 states and spans from 1977 to 2017.

Figure 2 – Average Inflation and Income share of the Top 10% in the US (1978-2017)



Source: U.S. Bureau of Labor Statistics; World Inequality Database

A distinct period of heightened inflation, known as the Great Inflation, is identified primarily during the 1970s and early 1980s. This epoch witnessed substantial price escalations, exemplified by Texas recording a peak inflation rate of 16.9% in 1980. Various factors, including shifts in monetary policy, external economic shocks, and the demise of the Bretton Woods system, collectively contributed to this inflationary surge, impacting nearly all states with inflation rates exceeding 10%. Subsequently, inflationary pressures subsided, stabilizing at an average of approximately 2.5% by 2017. Notably, the aftermath of the financial crisis in 2009 saw a brief period of deflation, characterized by declining prices. Georgia exhibited the most pronounced price decline, experiencing -2.6% inflation.

Figure 2 reveals that generally the relationship between the two variables, income of the top percentiles as well as inflation, have been developing in opposite directions, with income of the top 10% growing as inflation falls from 1978 to 2017. However, it is imperative to acknowledge that income inequality may be influenced by numerous factors beyond inflation. Consequently, additional variables are incorporated as control measures in the analytical framework.

Unemployment

The first control variable under consideration is unemployment. The theoretical underpinning regarding its impact stems from labor economics. The premise posits that a considerable portion of top earners in the population comprises entrepreneurs, who employ individuals from lower income percentiles. During periods of elevated unemployment, the bargaining power of workers diminishes, leading to stagnation in wage growth and subsequently bolstering the profits of companies owned by individuals within the top percentiles. Consequently, the anticipated relationship is negative, wherein lower unemployment rates are associated with a reduction in income inequality.

The highest unemployment rate within our dataset was recorded in Michigan in 1982, reaching 15.1%, whereas the lowest was documented in Virginia in 2000. Across the entire sample, the mean unemployment rate stands at 6.3%.

Data for unemployment is easily accessible as it has been a goal of fiscal and monetary policy for quite a while. I used the monthly Unemployment Rates reported be the U.S. Bureau of Labor Statistics, compiled by the National Conference of State Legislatures. Since the rest of my data is yearly, I chose the month of June to represent the given year.

GDP

One widely employed control variable in empirical research, as delineated in the existing literature, is Gross Domestic Product (GDP), alongside GDP per capita and their respective growth rates. Data pertaining to state-level domestic product is sourced from distinct repositories due to adjustments made by the Bureau of Economic Analysis in 1997, resulting in divergent time series. It is noteworthy that state-level GDP data is reported in nominal terms. To ensure comparability and to adjust for inflationary effects, nominal GDP figures are deflated using the general U.S. GDP deflator for the relevant period, with the base year set as 2015, as per data provided by the World Bank.

Unionization

The rationale for incorporating unionization as a control variable lies in its perceived influence on income inequality. By augmenting the bargaining power of laborers, unions typically secure higher wages, thereby reducing the proportion of profits allocated to business owners.

I decided to use the coverage rate of the unions instead of union membership, as coverage rates reflect the proportion of workers whose wages are negotiated by unions, encompassing both members and non-members. This distinction is crucial as it captures the broader impact of union activities on wage negotiations and, consequently, income distribution, which is of higher economic relevance in this analysis.

Data on unionization is only available from 1983 on U.S State level. To address the absence of explicit Unionization data for the years spanning 1978 to 1982, a methodological approach is adopted. Herein, the national average unionization membership rate is assumed for all states during this period.

Additionally, the average discrepancy between membership and coverage rates from 1983 to 2017 is added, which enables the derivation of coverage rates for each state during the 1978-82 timeframe.

Taxation Level and types

The amount of taxation in a state can be a predictor of the inequality level, assuming there is a progressive tax, where higher incomes are taxed more. Certain types of taxes can also target the income of the rich more ex. property tax, inheritance tax. I collected the data on the tax income for all states between 1950-2022, with detailed breakdowns of all taxation revenue in the US States.

I will focus specifically on the death and gifts tax represented as share of GDP. Some interesting unique issues arise when looking at outliers like Alaska, which has generally exceptionally low tax income, because most of its budget is covered by the Permanent Fund it established from its oil revenues. This way a state, which is generally the most equal, has an extremely low tax income. In order to combat these issues, I also focus on state expenditure data.

State Government Expenditure

Expenditures on Education, Welfare, Health, and Unemployment can be indicators of inequality and the data is easily accessible, making the inclusion of these a good proxy for income redistribution (Wolff and Zacharias, 2007; Afonso et al., 2010). I focused on the expenditures as share of state GDP, to capture the differences in general state government sizes, as shares of expenditures might be large, but with low total expenditure the nominal amount relative to state output is small.

Human Capital Attainment

Human capital attainment is often used as a control variable in the literature, with proxies such as high school and college attainment being commonly employed. Notably, these variables have been utilized as control variables in studies by Bulir (2001) and Balcilar et al. (2018), underscoring their importance in the analysis of income inequality.

TABLE 1 – SUMMARY TABLE OF LEVEL DATA

Variable	Min	State	Year	Mean	Max	State	Year
College Attainment	7.60	Tennessee	1978	16.81	30.76	Massachusetts	2017
GDP per capita	32,164	Tennessee	1982	60,786	180,322	Alaska	1981
Gini	44.71	Ohio	1978	56.77	72.00	Florida	2017
Highschool Attainment	39.74	Tennessee	1978	60.16	71.25	Massachusetts	2017
Inflation	-2.60	Georgia	2009	3.44	16.90	Texas	1980
Education as % GDP	0.73	Florida	1987	1.61	5.41	Hawaii	2009
State Expenditure as % GDP	5.22	Texas	1981	11.53	31.80	Alaska	2001
Gift Tax as % GDP	0.00	Wisconsin	2014	0.05	0.17	Massachusetts	1990
Health as % GDP	0.18	Minnesota	2013	0.65	1.88	Hawaii	2009
Share of top 10 %	22.78	Alaska	1983	41.40	66.87	Florida	2017
Public Welfare as % GDP	0.08	New York	1978	2.10	4.96	Alaska	2017
Unemployment Rate	2.25	Virginia	2000	6.27	15.13	Michigan	1982
Unionization Rate	4.64	Georgia	2008	18.52	36.01	New York	1983

Note: All variables except GDP per capita in %, GDP per capita in single USD 2015.
All variables with a timeframe of 1977-2017, no. observations = 741.

3.2 Tests for stationarity

Before turning to the econometric analysis, I made sure that the regular prerequisites for a robust panel data analysis are in place. I ran three separate panel data unit root tests, Levin-Lin-Chu (2002), Im-Pesaran-Shin (2003) and Maddala and Wu (1999) to see whether the individual variables mentioned are stationary. As expected from the exploratory analysis, Income Inequality, Unionization rates and GDP per capita are all characterized by a trend. Additionally, the share of expenditure on health as well as on public welfare cannot reject the null hypothesis of no stationarity. The tests show that unemployment, inflation, general expenditure, death and gift tax, and expenditure on education as share of GDP are all stationary time series. In order to fulfill the stationarity assumption, I will work with a differenced dataset from now on, showing the changes between consecutive periods, rather than level data.

TABLE 2 – UNIT ROOT TESTS ON LEVEL DATA

Variable	**Levin, Lin, Chu**	**Im, Pesaran, Shin**	**Maddala, Wu**
Share of income of top decile	8,46	11,57	0,91
Gini coefficient	8,40	-0,88	1,26
Unionization rate	-7,40***	-0,71	137,45***
GDP per capita	7,67	27,36	2,59
Trend GDP per capita	14,93	-5,68***	12,36
Cycle GDP per capita	-16,36***	-12,80***	396,57***
Unemployment Rate	-3,74***	-7,19***	41,73
Inflation	-10,11***	-5,63***	174,94***
Trend Inflation	-14,33***	-12,97***	291,48***
Cycle Inflation	-23,05***	-19,38***	635,02***
Education as % GDP	1,47	-1,084	13,08
Expenditure as % GDP	2,51	-1,87*	7,69
Death and Gift tax as % GDP	-5,01***	-3,87***	77,69***
Health as % GDP	2,64	21,07	18,12
Public Welfare as % GDP	5,63	37,53	2,70
High School Attainment	12,76	-2,47***	59,47***
College Attainment	12,34	4,05	7,43

4. Methodology

The methodology builds on two peer reviewed papers studying the relationship between inflation and income inequality, namely Balcilar et al. (2018) as well as Monnin (2014). The former is the only recent research paper using a US State level panel dataset, the latter builds on a panel of OECD countries. My approach is to build on the methodology used in Balcilar et al. (2018), by including the techniques mentioned in the Monnin analysis. Both papers use a pooled panel regression model with differenced variables of the form:

$$(1) \qquad \Delta y_{it} = \Delta\alpha_i + \beta_{INF}\, INF + \beta_i \Delta x_{it} + \varepsilon_{it}$$

$$\text{for } i = 1,2,\dots,N \text{ and } t = 1,2,\dots,T$$

where N is the number of individual states and T is the number of periods in the dataset. The dependent variable y_{it} is a measure of income inequality. α_i is a scalar, INF stands for Inflation, β_i is a vector of coefficients, x_{it} is a matrix of control variables discussed above and ε_{it} is a vector of error terms. My analysis will also include a fixed effects and random effects regression to make use of the balanced panel structure of the data.

I plan to divide my analysis into four distinct steps. First, I will compare data used in Balcilar et al. (2018) to the dataset I described above. The main difference is inflation. I use the state level CPI built by Hazell et al. (2022), based on data from the U.S. Bureau of Labor Statistics, whereas the Balcilar paper uses a dataset from the revised 2009 version of the Berry–Fording–Hanson state cost of living index of Berry et al. (2000), a panel from 1960 to 2009. We use the same sources for income inequality, unemployment, human capital attainment and GDP per capita.

Next, I will add a set of control variables, to capture a clearer picture of the relationship between inequality and inflation. Specifically, I will include

Unionization, wealth taxes and proxies for redistribution policy described in chapter 3 to minimize the risk of omitted variable bias.

The third step in my analysis is to introduce a Hodrick-Prescott filter on inflation and GDP per capita, separating the trend and cyclical parts of each time series similar to the approach has been used by Monnin (2014), as well as Galli and van der Hoeven (2001). Analyzing both trend and cyclical components of inflation can aid in understanding how persistent inflation trends influence income distribution over time and how short-term spikes or drops in inflation can have immediate impacts on income inequality, as different income groups have varying abilities to hedge against inflation or benefit from deflation.

Lastly, I run both a linear regression equation and one with an additional squared term for inflation, allowing me to capture a potential non-linear relationship between inflation and inequality similarly to Bulir (2001), Romer and Romer (1998) and Monnin (2014).

One aspect which is crucial for obtaining truthful results is checking for endogeneity. Endogeneity in this setting might occur due to several reasons. First, there is reverse causality, where inflation may influence income inequality, but income inequality might also affect inflation through policy responses or economic behaviors. Second, omitted variable bias can arise if there are unobserved factors that impact both inflation and income inequality, such as macroeconomic policies, global economic conditions, or structural changes in the economy, however this is largely captured by including additional control variables mentioned beforehand.

To tackle endogeneity, I use an Instrumental Variable (IV) regression. Specifically, I employ the lag of trend inflation as an instrument for current trend inflation. This choice is motivated by both theoretical and empirical considerations. Lagged inflation is a plausible instrument because it is determined by past economic conditions and policy decisions, which are unlikely to be directly influenced by current income inequality. This temporal separation helps to ensure that lagged inflation is exogenous to the current income inequality measurement. Additionally, focusing on trend inflation reflects the underlying inflationary pressures and policy stances that are more stable and predictable over time, reducing the likelihood of being influenced by short-term fluctuations or shocks that might simultaneously affect income inequality.

The literature supports the use of lagged inflation as an instrument in macroeconomic studies. For instance, Easterly and Fischer (2001) utilized lagged inflation to instrument for current inflation in their analysis of inflation and its effects on the poor, finding it a strong predictor and addressing endogeneity concerns. Similarly, Galli and van der Hoeven (2001) used lagged inflation as an instrument in their study of inflation's impact on income inequality in developing countries, demonstrating its effectiveness in isolating the causal impact of inflation.

I intend to utilize a balanced panel dataset in my research to effectively capture cross-sectional variations. In addition to the standard OLS regression, used in a large share of the relevant literature and IV, I will employ a fixed effects (FE) regression to control for individual-specific characteristics that remain constant over time. Following this, I will conduct a random effects (RE) regression to examine whether incorporating individual heterogeneity across the panel leads to any improvements in the model's explanatory capacity and the statistical significance of the estimated coefficients.

5. Results

5.1 Comparison to relevant literature and adding controls

Balcilar et al. (2018) uses two different specifications in his analysis, a regular OLS, an OLS with lagged inflation as explanatory variable. The paper uses GDP per capita, College and Highschool attainment rates and unemployment as control variables. The table below shows the coefficients for the impact of inflation on both the income share of the top decile and Gini coefficient. There are three distinct columns, one reporting the results of Balcilar et al., one reporting the results of the Balcilar et al specification but using my dataset, and one for the specification using my dataset with added controls for unionization, wealth taxes and redistribution.

TABLE 3 - COMPARISON OF RESULTS FROM BALCILAR ET AL., THE SAME SPECIFICATION WITH MY DATASET AND ADDITIONAL CONTROLS

	Coefficients for the impact of Inflation		
	Balcilar et al.	**My data**	**With Controls**
Share of top 10%			
OLS	-0,029	-0,014	-0,020
OLS with lagged inflation	-0,048	0,045	0,052
Gini Coefficient			
OLS	0,034	0,049**	0,049***
OLS with lagged inflation	-0,028	0,047**	0,055***
Sample size	1546	741	741

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

In comparing the results between Balcilar et al. (2018) and my dataset regarding the impact of inflation on income inequality measures in Table 3, several distinctions and similarities are evident. Balcilar et al. found coefficients suggesting a negative relationship between inflation and the share of income going to the top 10%, although these findings did not achieve statistical significance. Similarly, in my dataset, the coefficients for this relationship are not statistically significant, indicating that inflation may not significantly affect the top income share in either study. This non-significance persists even after including additional controls, as indicated by the third specification. The inclusion of these controls, while slightly increasing the magnitude of the coefficients (from -0,014 to -0,020 for OLS and from 0,045 to 0,052 for OLS with lagged inflation), does not alter the overall insignificance of the results.

Regarding the Gini coefficient, Balcilar et al. reported a positive coefficient suggesting that inflation contributes to higher income inequality, but again, this result lacked statistical significance. In contrast, my dataset reveals a stronger and statistically significant positive association between inflation and the Gini coefficient. This significant relationship remains robust even after introducing additional controls, with the coefficient for OLS maintaining its value at 0,049 but increasing in significance. For OLS with lagged inflation, the coefficient rises from 0,047 to 0,055, with enhanced statistical significance. The addition of these controls not only solidifies the robustness of the positive relationship between inflation and income inequality but also amplifies the observed effect.

Overall, while both specifications suggest potential links between inflation and income inequality, the significance and magnitude of these relationships vary. The non-significant findings for the top 10% income share in both studies highlight the complexities of data sources and model specification. However, the results with the Gini coefficient as the dependent variable suggest a statistically more significant relationship in my dataset compared to Balcilar et al. The controls help to clarify and strengthen the observed impacts, making the relationship between inflation and income inequality more pronounced and statistically significant.

5.2 Hodrick – Prescott filter and nonlinear relationship

In this part of the analysis, I employed the next two steps of the methodology to examine the impact of inflation on income inequality, measured by the share of the top 10% income and the Gini coefficient, both using by the methodology implemented by Monnin (2014). First, I applied a Hodrick-Prescott (HP) filter to decompose inflation and GDP per capita into trend and cycle components. Second, I added a squared term for trend inflation to test for non-linear relationships. The regression outputs are presented in Table 4, showing four different specifications.

TABLE 4 - REGRESSION OUTPUT OF AFTER APPLYING THE HODRICK PRESCOTT FILTER AND SQUARING LONG-TERM INFLATION

	Top 10% share		**Gini**	
	(1)	**(2)**	**(3)**	**(4)**
Trend Inflation	-0,117	0,334	-0,270*	-1,425***
	(-0,57; 0,34)	(-1,01; 1,68)	(-0,58; 0,04)	(-2,32; -0,53)
Trend Inflation ^2		-0,026		0,082***
		(-0,11; 0,06)		(0,03; 0,14)
Cycle Inflation	-0,018	-0,021	0,058**	0,083***
	(-0,09; 0,05)	(-0,09; 0,05)	(0,01; 0,11)	(0,03; 0,13)
Adjusted R^2	0,072	0,073	0,046	0,082
Sample Size	741	741	741	741
Inflation Turning Points		5,72		8,64

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

For the share of the top 10% income earners, the first specification reveals that trend inflation has a coefficient of -0.117 with a confidence interval ranging from -0.57 to 0.34. This indicates no significant effect of trend inflation on the top 10% income share. The cyclical component of inflation also shows no significant impact, with a coefficient of -0.018. These results suggest that changes in inflation, whether viewed as long-term trends or short-term cycles, do not significantly affect the income share of the top 10% of earners.

In the second specification, which includes the squared term for trend inflation, the coefficient for trend inflation changes to 0.334. However, this change remains statistically insignificant. The squared term itself is also not significant, with a coefficient of -0.026. This lack of significance in both specifications suggests that neither linear nor potential non-linear effects of trend inflation influence the income share of the top 10% in a meaningful way.

Turning to the Gini coefficient in Table 4, the results show a more nuanced picture. In the third specification, the trend inflation coefficient is -0.270, with a confidence interval from -0.58 to 0.04. This result indicates a marginally significant negative impact of trend inflation on the Gini coefficient at the 10% significance level. The cyclical component of inflation is significant, with a coefficient of 0.058, suggesting that short-term inflation fluctuations tend to increase income inequality. This finding aligns with the notion that cyclical inflation can exacerbate income disparities, likely due to its more immediate and variable impacts on different segments of the population.

In the fourth specification, which includes the squared term for trend inflation, the results become more striking. The trend inflation coefficient changes to -1.425, with a confidence interval ranging from -2.32 to -0.53, indicating a strong and significant negative effect on the Gini coefficient at the 1% significance level. The squared term for trend inflation is positive and significant, with a coefficient of 0.082, revealing a non-linear relationship. This implies that while initial increases in trend inflation reduce income inequality, the effect diminishes and eventually reverses as inflation continues to rise. This U-shaped relationship suggests that moderate inflation may help reduce inequality, but higher levels of inflation could lead to greater inequality.

The economic significance of these findings is crucial. For the top 10% income share, the lack of significant coefficients suggests that changes in inflation growth do not have a tangible effect on the income distribution within the top decile, whose sign can be determined. Even if one would consider solely the size of the coefficients, economically they would be insignificant with small coefficients for both trend and cyclical inflation, as a 1 percentage point difference in the growth of trend inflation changes the top 10% income share by 0.1 p.p. Assuming the average change in trend inflation of 25 basis points, this effect is negligible. In contrast, the results for the Gini coefficient indicate that changes in trend inflation have a substantial impact on overall income inequality. Specifically, a 1 percentage point increase in the change of trend inflation decreases the change in the Gini coefficient by 1.425 percentage points.

To put this into context with actual data: if trend inflation increases from 3% in year 1 to 4% in year 2, representing a 1 percentage point increase, and the Gini coefficient was the mean Gini coefficient in the data set of 41.4 % in year 1, the Gini coefficient would decrease to approximately 39.975% in year 2. This demonstrates a significant reduction in income inequality due to the change in trend inflation.

Moreover, the inclusion of the squared term for trend inflation allows for the investigation of non-linear relationships. This is crucial for understanding whether the effect of inflation on income inequality intensifies or diminishes at higher levels of trend inflation. The significant positive coefficient for the squared term in the Gini regression (0.082) indicates that the effect of trend inflation on income inequality is indeed non-linear with a turning point at 8.64 p.p. increase in trend inflation in a year. Below this threshold, increases in trend inflation reduce inequality, but above it, further increases in trend inflation exacerbate inequality. The dataset includes a maximal change in trend inflation of 25 basis points, making the change of 8.64 p.p. extremely unlikely, hence the relationship, although non-linear should be looked at as a negative one in most scenarios. These turning points, while informative, should be interpreted cautiously due to the marginal significance and inherent variability in the data. This result is in line with the results of Monnin (2014), who also found a U-shaped relationship between trend inflation and the Gini coefficient in his analysis of OECD countries, with a turning point at 13.3 p.p.

The coefficients on short term inflation suggest a 0.083 p.p. increase in the Gini coefficient for each percentage point increase in cyclical inflation. Although the coefficient might seem economically insignificant at first glance, with an 18 times smaller effect on Gini than that of trend inflation, when considering the usual variance of cyclical inflation, the effect is quite pronounced. Cycle inflations maximum change in one year was 9.2 p.p., assuming this change the effect on the Gini coefficient could reach almost 0.7 p.p. an effect in line with the economic significance of trend inflation.

5.3 Endogeneity and IV regression

To address endogeneity, as discussed in Chapter 4, I use an Instrumental Variable regression. Specifically, I employ the lag of trend inflation and its squared term as instruments for current trend inflation and its squared term.

The Two-Stage Least Squares approach I use can be described by the following equations:

First Stage:

$$(2) \qquad \Delta TINF_{it} = \alpha_0 + \alpha_1 \Delta TINF_{it-1} + \Delta TINF_{it-1}^2 + \gamma X_{it} + \epsilon_{it}$$

Second Stage:

$$(3) \qquad \Delta y_{it} = \beta_0 + \beta_1 \Delta\widehat{TINF}_{it} + \beta_2 \Delta\widehat{TINF}_{it}^2 + \beta_3 \Delta CINF_{it} + \delta X_{it} + \mu_{it}$$

$$\text{for } i = 1,2,\dots,\text{N and t} = 1,2,\dots,\text{T}$$

Where Δy_{it} is the change in the income inequality measure, $\Delta TINF_{it}$ is the change in trend inflation, $\Delta CINF_{it}$ is the change in cycle inflation and δX_{it} represents the control variables and their coefficients.

Table 5 shows the results of the four separate specifications of the IV regression. For the Top 10% income share, the IV regression results indicate that neither trend inflation nor its squared term has a statistically significant effect. The coefficient for trend inflation is -0.168, with a confidence interval ranging from -0.65 to 0.32, and for the squared term, it is -0.024, with a confidence interval from -0.12 to 0.07. Similarly, cycle inflation shows no significant impact, with a coefficient of -0.021. These findings are consistent with the results from the OLS regression in subchapter 5.2, suggesting that inflation does not significantly affect the income share of the top 10%.

TABLE 5 - REGRESSION OUTPUT OF 2SLS RESULTS

	Top 10% share		**Gini**	
	(5)	**(6)**	**(7)**	**(8)**
Trend Inflation	-0.168	0.254	-0.575***	-1.662***
	(-0.65; 0.32)	(-1.25; 1.75)	(-0.90; -0.25)	(-2.65; -0.67)
Trend Inflation ^2		-0.024		0.088***
		(-0.12; 0.07)		(0.02; 0.15)
Cycle Inflation	-0.021	-0.023	0.091***	0.099***
	(-0.10; 0.05)	(-0.10; 0.05)	(0.04; 0.14)	(0.04; 0.15)
Adjusted R^2	0.072	0.053	0.073	0.079
Sample Size	741	741	741	741
F-Test	27873.11***	27873.11***	19114.23***	19114.23***
Wu-Hausman	0.226	34.67***	0.832	10.52***

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

In contrast, the results for the Gini coefficient reveal a more substantial impact of inflation. In specification (7) the coefficient for trend inflation is -0.575 and is statistically significant at the 1% level, with a confidence interval from -0.90 to -0.25. This indicates a strong negative effect of trend inflation on overall income inequality. The squared term for trend inflation in specification (8) is positive and significant at the 1% level, with a coefficient of 0.088, suggesting a non-linear relationship where initial increases in trend inflation reduce inequality, in line with the findings of the OLS specification in Table 4. Cycle inflation also has a significant positive impact on the Gini coefficient, with a coefficient of 0.091.

The F-tests for the instruments show high values (27873.11 and 19114.23) and are highly significant ($p < 0.001$), indicating that the instruments are strong predictors of the endogenous variables. The Wu-Hausman test results are mixed: it is significant for the specifications with squared terms (6,8) indicating endogeneity is present and the IV approach is necessary, but not significant for the linear specifications (5,7).

Comparing these IV results to the OLS results in subchapter 5.2, we see that the IV approach provides more nuanced insights into the effects of inflation on income inequality. While the OLS results for the Top 10% share were insignificant, the IV results confirm this finding. For the Gini coefficient, although endogeneity was present, the IV results highlight a significant and non-linear relationship between trend inflation and income inequality, which was also observed in the OLS results but is now more pronounced and robust.

Overall, the IV regression results suggest that addressing endogeneity is crucial for accurately estimating the impact of inflation on income inequality. The use of lagged trend inflation as an instrument strengthens the validity of the findings, particularly for the Gini coefficient, where the relationship between inflation and income inequality is both significant and non-linear. The IV approach not only aligns with the OLS results but enhances the reliability and clarity of the observed effects.

5.4 Fixed effects regression

Following the analysis using OLS and IV, I now turn to a fixed effects regression to further investigate the relationship between inflation and income inequality. Fixed effects regression allows for controlling individual-specific characteristics that are constant over time, thus providing a more robust analysis by accounting for unobserved heterogeneity. This method will enable us to isolate the impact of inflation on income inequality measures while controlling for time-invariant factors. Each state has unique characteristics—such as institutional frameworks, demographic composition, and economic structures—that do not change over time. By using a fixed effects model, we can control for these state-specific factors, ensuring that the observed effects of inflation on income inequality are not confounded by these unchanging characteristics. This approach is crucial for accurately capturing the true relationship between inflation and income inequality, as it eliminates the bias that could arise from omitting these time-invariant variables.

The usual regression equation of the fixed effect regression is:

$$y_{it} - \overline{y}_i = \beta_i(x_{it} - \overline{x}_i) + \varepsilon_{it} \tag{4}$$

$$\text{for } i = 1,2,\dots,\text{N and } t = 1,2,\dots,\text{T}$$

where the variables with the bar are averages for each variable throughout the timeseries. Since we used differenced data to ensure stationarity the current regression equation is:

$$\Delta y_{it} - \Delta\overline{y}_i = \beta_i(\Delta x_{it} - \Delta\overline{x}_i) + \Delta\varepsilon_{it} \tag{5}$$

$$\text{for } i = 1,2,\dots,\text{N and } t = 1,2,\dots,\text{T}$$

describing the changes in each variable, accounting for individual effects by subtracting each states' average change during the period of study from any given period t.

For the top 10% income share, visible in Table 6 (9), the fixed effects model reveals that trend inflation has a coefficient of 0.339 with a confidence interval ranging from -1.03 to 1.71, indicating no significant effect on the top 10% income share. This result is consistent with the OLS findings, where trend inflation also showed no significant impact. The cyclical component of inflation also shows no significant impact, with a coefficient of -0.024.

For the Gini coefficient (10), the fixed effects model shows a trend inflation coefficient of -1.385 with a confidence interval of -2.29 to -0.48, indicating a strong and significant negative effect at the 1% significance level. The squared term for trend inflation is significant with a coefficient of 0.081, suggesting a non-linear relationship where the impact of trend inflation on the Gini coefficient is more complex. This result is consistent with the OLS findings, where the squared term was also significant, indicating that the relationship between trend inflation and income inequality follows a U-shaped curve. The cyclical component of inflation has a significant positive coefficient of 0.081, similar to the OLS results.

TABLE 6 - REGRESSION OUTPUT FOR THE FIXED EFFECTS REGRESSION AND RANDOM EFFECTS REGRESSION

	Fixed Effects Model		**Random Effects Model**	
	Top 10%	**Gini**	**Top 10%**	**Gini**
	(9)	**(10)**	**(11)**	**(12)**
Trend Inflation	0,339	-1,385***	-0,334	-1,425***
	(-1,03; 1,71)	(-2,29; -0,48)	(-1,01; 1,68)	(-2,32; -0,53)
Trend Inflation ^2	-0,027	0,081***	-0,026	0,082***
	(-0,11; 0,06)	(0,03; 0,14)	(-0,11; 0,06)	(0,03; 0,14)
Cycle Inflation	-0,024	0,081***	-0,021	0,083***
	(-0,10; 0,05)	(0,03; 0,13)	(-0,09; 0,05)	(0,03; 0,13)
Adjusted R^2	0,051	0,067	0,046	0,082
Sample Size	741	741	741	741

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

The adjusted R-squared values for the fixed effects model are lower compared to the OLS results, with 0.051 for the top 10% income share and 0.067 for the Gini coefficient. This indicates that the fixed effects model explains a smaller proportion of the variance in the dependent variables compared to the OLS model. To evaluate whether the inclusion of entity-specific fixed effects in the fixed effects model significantly improves the model fit compared to the OLS model, I use the F-test on both specifications. The p-value in all tests is close to one, failing to reject the null hypothesis that individual effects are significant, confirming that the pooled regression is the better choice.

5.5 Random effects regression

An alternative for the fixed effect regression in panel data analysis is the random effects model. The regression equation in this case is the following:

$$\Delta y_{it} = \beta_0 + \beta_i \Delta x_{it} + v_{it} \tag{6}$$

$$\text{for } i = 1,2,\ldots,N \text{ and } t = 1,2,\ldots,T$$

where we define $v_{it} = a_i + \varepsilon_{it}$ as the composite error term; we assume that the fixed effects a_i are uncorrelated with each explanatory variable in all time periods.

The latter two specifications in Table 6 present the results of the random effects model, where trend inflation shows coefficients of -0.334 with a confidence interval of -1.01 to 1.68 for the top 10% income share (11), and -1.425 with a confidence interval of -2.32 to -0.53 for the Gini coefficient (12). These coefficients are similar to those observed in the OLS and fixed effects models, indicating no statistically significant impact of trend inflation on the top 10% income share across countries.

Similarly, the squared term for trend inflation in the random effects model is -0.026 with a confidence interval of -0.11 to 0.06 for the top 10% income share, and 0.082 with a confidence interval of 0.03 to 0.14 for the Gini coefficient. These coefficients also mirror those found in the OLS and fixed effects models, suggesting a significant negative effect of trend inflation on the Gini coefficient, and highlighting a non-linear relationship, consistent with previous findings.

These findings imply that country-specific factors (captured by fixed effects) and random country-specific effects do not significantly enhance the explanatory power of the model in this context.

5.6 Robustness of Results

Following the analysis using random effects and fixed effects models to explore the relationship between inflation and income inequality, I conducted robustness testing to ensure the reliability of our findings.

Initially, the ordinary least squares (OLS) model for the Gini coefficient indicated heteroskedasticity (top 10% income was homoscedastic), as evidenced by a significant result in the Breusch-Pagan test ($BP = 105.85$, $p < 0.001$). This indicated that the variance of error terms in the OLS model was not consistent across observations, potentially biasing standard errors, and hypothesis testing.

To address this issue, I applied robust standard errors using the HC1 estimator. The coefficients in the model showed minimal changes, suggesting that while heteroskedasticity affected the original OLS estimation, its impact on the estimated coefficients was limited. Specifically, the coefficients for trend inflation (-1.425, $p < 0.01$), trend inflation squared (0.082, $p < 0.01$), and cycle inflation (0.083, $p < 0.01$) remained highly significant and unchanged after robust standard errors were applied.

Next, I split my dataset into different periods and geographies in order to check whether the effects and sizes of coefficients differ based on the timeframe or choice of states. I conducted additional regression analyses using two periods: 1978-1997 and 1998-2017.

Examining trend inflations impact on the share of income in the tops decile across split periods, shown in Table 7, revealed deviations from the original findings. In the earlier period (1978-1997), trend inflation exhibited a coefficient of 0.025, remaining statistically insignificant, similar to the original results. However, in the later period (1998-2017), the coefficient increased substantially to 2.371. This stark contrast suggests a potential time-dependent effect that was not captured in the original analysis, hinting at varying impacts of inflation on income distribution across different decades.

TABLE 7 – REGRESSION OUTPUTS OF OLS REGRESSIONS WITH SPLIT PERIODS

	Top 10% share		**Gini**	
	1978-1997	**1998-2017**	**1978-1997**	**1998-2017**
Trend Inflation	0,025	2,371	-2,768***	2,033
	(-1,56; 1,61)	(-2,59; 7,33)	(-3,97; -1,56)	(-0,92; 4,98)
Trend Inflation ^2	0,007	-0,269	0,156***	-0,391
	(-0,08; 0,09)	(-1,57; 1,04)	(0,09; 0,22)	(-1,17; 0,39)
Cycle Inflation	-0,067*	0,052	0,128***	0,012
	(-0,15; 0,01)	(-0,09; 0,20)	(0,07; 0,19)	(-0,07; 0,10)
Adjusted R^2	0,037	0,173	0,123	0,077
Sample Size	380	380	361	361

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

Similarly, the squared term for trend inflation showed no significant effects in either period. Cycle inflation, while marginally significant in the earlier period, displayed no significant impact in the later period, indicating temporal variability in short-term inflation fluctuations and their influence on income concentration.

The analysis of trend inflation on the Gini coefficient also yielded divergent results between split periods. In the earlier period, trend inflation had a substantial and significant negative coefficient of -2.768, consistent with the original findings suggesting that higher trend inflation reduced income inequality. However, in the later period the coefficient increased to 2.033, losing statistical significance. This shift implies a less stable relationship between trend inflation and income inequality over time. Moreover, the squared term for trend inflation showed significant positive effects in the earlier period, indicating a non-linear relationship, where moderate inflation initially reduced inequality. In contrast, the later period showed significant negative effects suggesting a reversal where higher inflation levels exacerbated income inequality.

The significant variation observed in coefficients across split periods for both dependent variables suggests that the relationship between inflation measures and income distribution metrics is not uniform over time, with the earlier period showing a strong negative relationship in line with the general findings and the latter years data, showing no significant impact of inflation on income inequality.

TABLE 9 – REGRESSION OUTPUTS OF OLS REGRESSIONS WITH STATES SPLIT AFTER LEVEL OF URBANIZATION

	Top 10% share		**Gini**	
	Urban	**Non-Urban**	**Urban**	**Non-Urban**
Trend Inflation	0.177	0.496	-2.452***	-0.588
	(-2.21; 2.56)	(-0.88; 0.52)	(-3.72; 1.18)	(-1.83; 0.66)
Trend Inflation ^2	-0.001	-0.038	0.154***	0.025
	(-0.13; 0.13)	(-0.12; 0.05)	(0.08; 0.22)	(-0.54; 0.11)
Cycle Inflation	-0.040	0.001	0.093***	0.078***
	(-0.17; 0.09)	(-0.07; 0.07)	(0.02; 0.16)	(0.01; 0.14)
Adjusted R^2	0.143	0.058	0.129	0.111
Sample Size	361	380	361	380

*Note: *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level*

As the next step I split the data into Urban and Non-urban regions, to assess if the observed relationships hold across different demographic regions. Urban states typically have higher population densities, more significant economic activities, and different socio-economic dynamics compared to non-urban states. These differences could potentially influence how inflation affects income inequality, making it essential to consider these two groups separately.

The regression results for the urban and non-urban states are summarized in Table 8. Comparing these results to the findings in Chapter 5.2 reveals several key insights.

For the Top 10% income share, neither urban nor non-urban states show significant coefficients for trend inflation. Similarly, the squared term for trend inflation is not significant in both groups, indicating no significant non-linear effects. These findings align with the original results in Chapter 5.2, where trend inflation did not significantly impact the top 10% income share.

The results for the Gini coefficient reveal more substantial differences. In urban states, trend inflation has a highly significant negative impact on income inequality, indicating that increases in trend inflation significantly reduce income inequality. Conversely, in non-urban states, the coefficient for trend inflation is not statistically significant, indicating no significant impact. The squared term for trend inflation in urban states is also significant, suggesting a non-linear relationship where initial increases in trend inflation reduce inequality, but higher levels of inflation could increase it. This non-linear effect is not observed in non-urban states.

Cycle inflation shows significant positive coefficients for the Gini coefficient in both urban and non-urban states. These findings suggest that short-term inflation fluctuations tend to increase income inequality in both settings, though the effect is slightly more pronounced in urban areas.

I initially addressed heteroskedasticity in the ordinary least squares (OLS) model, finding that minimal changes in coefficients confirmed robustness despite the variance issue. When I split the dataset by periods and geographical regions, I observed notable deviations in coefficient magnitudes and statistical significance compared to the original findings. Both temporal and geographical splits highlighted non-uniform effects of inflation on income distribution, casting doubt on the robustness of the results of the original specification in subchapter 5.2 and 5.3.

6. Conclusion

The relationship between inflation and income inequality in the United States is a multifaceted one, influenced by various economic, social, and policy-driven factors. The analysis conducted in this study provides several critical insights into how inflation impacts income distribution, particularly within the context of US state-level data from 1978 to 2017.

The results reveal that trend inflation has a reducing effect on income inequality. This is in line with literature showing that moderate, predictable inflation can erode the real value of debt, benefiting borrowers who are often lower-income households. By reducing the real burden of debt repayments, trend inflation can enhance the financial stability of these households and thus reduce income inequality. This perspective aligns with arguments presented by Romer and Romer (1999), who suggested that moderate inflation could reduce inequality by redistributing wealth from creditors to debtors.

Conversely, the study finds that cyclical inflation significantly increases income inequality. This aligns with literature which suggests that volatile inflation creates economic uncertainty and disproportionately impacts lower-income households. Cyclical inflation, characterized by short-term fluctuations, can lead to unpredictable price changes that affect consumer purchasing power and savings differently across income groups. Lower-income households, which spend a larger proportion of their income on necessities, are more vulnerable to such fluctuations. This finding resonates with the observations made by Piketty (2013), who documented how economic instability and inflation volatility can widen income disparities.

The robustness checks conducted in this study, including the use of Instrumental Variable (IV), reinforce the reliability of the findings. The IV regression, using lagged trend inflation as an instrument, provides stronger evidence of the causal relationship between inflation and income inequality. The significant coefficients for trend inflation in the IV models suggest that addressing endogeneity is crucial for accurately estimating the impact of inflation. Furthermore, the robustness tests involving temporal and geographical splits of the data indicate that the relationship between inflation and income inequality is not uniform over time or across regions. The earlier period (1978-1997) shows a stronger negative impact of trend inflation on the Gini coefficient, whereas the later period (1998-2017) indicates a weaker relationship. Similarly, the urban versus non-urban analysis reveals that the effects of inflation are more pronounced in urban states, highlighting the importance of considering regional economic dynamics in future policy considerations.

Future research should continue to explore the mechanisms through which inflation affects income inequality, particularly focusing on the roles of monetary policy, fiscal policy, and labor market dynamics. Further studies could investigate the impact of different types of inflation (e.g., cost-push versus demand-pull inflation) on income inequality. Understanding these distinctions could provide more targeted policy recommendations for managing inflation while minimizing its adverse effects on income distribution. Another important direction for future research is to explore the difference in effect between long-term and cyclical inflation on income inequality, considering opposite coefficients for the relationship in the results of this analysis were found. This would provide a more holistic view of how inflation influences economic disparities. Lastly, expanding the analysis to include more recent data, particularly post-2020, could provide insights into how contemporary inflationary pressures, driven by global supply chain disruptions and pandemic-related economic shocks, are affecting income inequality. This would ensure that the findings remain relevant and applicable to current economic conditions.

In conclusion, this study underscores the significant and complex relationship between inflation and income inequality in the United States. The findings highlight the dual nature of inflation's impact, where trend inflation can reduce inequality through mechanisms such as debt relief and wage adjustments, while cyclical inflation increases inequality due to economic instability. By providing robust state-level evidence, this research contributes to the ongoing debate on the inflation’s impact on inequality and offers valuable insights for policymakers aiming to balance inflation control with the goal of reducing income inequality.

Appendix 1: Literature

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Appendix 2: Online Sources

https://wid.world/data

https://www.bls.gov/cpi/regional-resources.htm

https://www.ncsl.org/labor-and-employment/state-unemployment-rates

https://labor.alaska.gov/trends/trendspdf/dec99.pdf

https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS?locations=US

https://apps.bea.gov/regional/histdata/releases/1204gsp/index.cfm´

https://www.kaggle.com/datasets/davidbroberts/us-gdp-by-state-19972020

https://state-local-finance-data.taxpolicycenter.org.

https://www.census.gov/programs-surveys/stc/data/datasets.html

http://www.unionstats.com/