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The Impact of Personal and Corporate Income Tax Shocks on Inequality in the US

by

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Abstract

This paper investigates how unanticipated tax shocks in the US impact income and consumption inequality. The responses of inequality data to two types of tax shocks, personal income tax shocks and corporate income tax shocks, are estimated from the first quarter of 1980 to the last quarter of 2006 using local projections. The results show fundamentally different effects of personal and corporate tax shocks. Higher personal taxes lead to an increase in income inequality and a decrease in consumption inequality. In contrast, higher corporate taxes lead to a decline in income inequality and a rise in consumption inequality.

Keywords: Personal income taxes, corporate income taxes, tax shocks, income inequality, consumption inequality

Index of Abbreviations

ACITR Average Corporate Income Tax Rate

APITR Average Personal Income Tax Rate

BLS Bureau of Labor Statistics

CEX Consumer Expenditure Survey

CI Corporate Income Tax Liabilities

CITS Corporate Income Tax Shock

EM Employment Taxes

FRED Federal Reserve Economic Data

II Individual Income Tax Liabilities

IRF Impulse Response Function

IVA Inventory Valuation Adjustment

LP-IV Local Projection - Instrumental Variable

NBER National Bureau of Economic Research

NIPA National Income and Product Accounts

PITS Personal Income Tax Shock

2SLS Two - Stage Least Squares

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1 Introduction

> "(...)America has achieved the distinction of becoming the country with the highest level of income inequality among the advanced countries."(Stiglitz, 2015, p. 379).

Income inequality is an increasingly essential and well-known problem in the US, as the rich still pay relatively low taxes compared to the poor (Stiglitz, 2016). Although governments attempt to reduce inequality through tax regulations, the structure of the progressive US tax system encourages entrepreneurship and leads to an unequal distribution of taxes (Stiglitz, 2016; Friedman, 2008; Alves and Afonso, 2019). Therefore, tax regulation is one of the reasons why income inequality in the US is steadily increasing. However, economists continue to disagree on how tax shocks affect inequality. In this paper, I examine the effects of two different tax shocks in the US and answer the following research question: To what extent do unanticipated tax shocks in the US affect income and consumption inequality?

To answer the research question, I estimate the impact of income tax shocks on income and consumption inequality data from 1980-2006 and discuss the results of impulse response functions (IRFs). Coibion et al. (2017) present the calculated inequality data. In addition, I distinguish between Personal Income Tax Shock (PITS) and Corporate Income Tax Shock (CITS) introduced by Mertens and Ravn (2013) and apply both to the inequality data in two regression models. The model methodology captures the tax shocks' effects through local projections. Finally, the results are the responses of the respective inequality variables to an increase in personal or corporate income tax.

The findings demonstrate that PITS and CITS have fundamentally opposing effects on income and consumption inequality. An increase in personal income taxes leads to a rise in income inequality and a reduction in consumption inequality. Conversely, higher corporate income taxes lead to decreased income inequality and increased consumption inequality. In addition, the effect of CITS on income inequality is relatively more significant than on consumption inequality. In the case of PITS, the impact on income and consumption inequality does not differ significantly.

Coibion et al. (2017) use US household data from the Consumer Expenditure Survey (CEX) to measure inequality, available in quarterly frequency. Inequality for the variables of interest (1) before- and (2) after-tax income, (3) labor earnings, (4) expenditure, and (5) consumption is captured by three different measures: the Standard Deviations, the Gini Coefficient, and the Difference between the 90^{th} and 10^{th} Percentile. Tax shocks are exogenous and unanticipated changes in US personal and corporate income tax liabilities and are available in quarterly frequency as well (Mertens and Ravn, 2013). I carry out regressions for a data period from 1980 to 2006, whereby the entire dataset is adopted unchanged. To obtain precise results, I run regressions with the Local Projection - Instrumental Variables (LP-IV) approach using the Average Personal Income Tax Tate Rate (APITR) for regressions on the PITS and the Average Corporate Income Tax Rate (ACITR) for regressions on the CITS as dependent variables. The estimated responses of inequality data to the dependent variable demonstrate the shock's impact.

An essential difference in this paper is that I take up Mertens and Ravn (2013)' suggestion and divide the tax shocks into PITS and CITS. Relevant studies on tax shocks mostly use some form of average tax rates or general legislated tax changes (Barro and Redlick, 2011; Romer and Romer, 2009). Moreover, in most cases, the tax shocks are estimated using the VAR approach (Favero and Giavazzi, 2012), while I use the modern approach of local projections. Ultimately, the effect of taxes, particularly on GDP and other macroeconomic variables, is a constant topic of academic debate (Ramey, 2016; Barro and Redlick, 2011; Prillaman and Meier, 2014). According to Mertens and Ravn (2013), for instance, tax cuts lead to positive impacts on GDP. The debate on the effects of taxes on inequality also receives attention (Dyrda et al., 2018; Alves and Afonso, 2019), with the characteristics of taxes and the differences in inequality being of particular importance to not form an overly broad statement. For this reason, the hypotheses I put forward in section 4 refer to further literature.

The following describes the structure of the paper. Section 2 presents the data by evaluating the data source and the inequality measures before explaining the data frame for this paper. Section 3 illustrates the econometric approach by first describing the identification of the tax shocks more extensively and then presenting details on the estimation strategy. Finally, section 4 discusses the results of PITS (and CITS) effects and addresses possible mechanisms behind the impacts. Furthermore, section 4.3 discusses potential limitations. Lastly, I conclude in section 5.

2 Data

The purpose of this section is to describe the source of the data used for the regressions to estimate the impact of the tax shocks. The first paragraph illustrates the data from the CEX in general. In contrast, the second paragraph describes the exact inequality data by explaining the inequality measures and some modifications the authors applied. Both paragraphs base on the paper "Innocent Bystanders? Monetary policy and inequality" from Coibion et al. (2017). The third paragraph explains the origin of additional data required for the later regressions. Lastly, the final paragraph summarizes the data frame that this paper entails.

As mentioned, the relevant data comes from the CEX, a comprehensive data source on US household consumption provided by the Bureau of Labor Statistics (BLS). The survey comprises two parts: the Interview Survey and the Diary Survey, whereby Coibion et al. (2017) only consider data from the Interview Survey. However, the Interview Survey yields up to 95% of the information on a typical household's consumption. The sample comprises 1500-2500 households, which should represent the US population well. The survey takes place in a monthly changing panel. The household data has been available quarterly since 1980. Each household gives an interview once a quarter for a maximum of five consecutive quarters. Income data is only collected in the last and first survey wave, while financial data is collected even less frequently, namely once in the last interview. In contrast, the CEX measures expenditure and consumption in every survey wave.

Coibion et al. (2017) use three different methods to measure the inequality of the CEX data, namely the Cross-sectional Standard Deviation of log levels, the Gini Coefficients of levels, and lastly, the Difference between the 10th and 90th Percentile of the log levels in each distribution. The Standard Deviations minimize the sensitivity towards outliers. However, they remove observations that are zero. The Gini Coefficient is a well-known instrument for measuring inequality and indicates the proportion to which a variable distributes evenly across the various components of the distribution. Lastly, the Difference between the Percentiles is similar to the Standard Deviation in its methodology, as it also neglects the zeros but does not react to outliers at the bottom ends of the distributions. Thus, to precisely analyze income and consumption inequality, the authors subdivide into the variables of (1) total before-tax income and (2) total after-tax income, (3) labor earnings, (4) total expenditure, and (5) consumption for all three

inequality measures. While labor earnings inequality represents the labor income only, total before- (and after-) tax income inequality includes labor income, transfers, financial income, and business income. Consumption inequality is divided into two types of measures. First, the narrow measure of consumption includes non-durable goods (e.g., food), some durable goods (e.g., televisions or furniture), and services. Second, the broad measure of consumption, i.e., total expenditure inequality, includes the above measures of narrow consumption and more special purchases such as cars, mortgage payments, or school fees. In addition, the authors made some modifications because income is measured less regularly than consumption data. For instance, Coibion et al. (2017) impute all incomes by using the mean for imprecise dollar amount data and use different regression models to generate values for missing income observations. In addition, they use the National Bureau of Economic Research (NBER) TAXSIM calculator, which follows the Kueng (2012) tax calculation specification for CEX data, to calculate taxes for each household itself, as self-reported taxes often have quality deficiencies. All inequality data is already calculated and provided by Coibion et al. (2017).

The chosen control variables are typical macroeconomic aggregates of interest in the context of taxes, namely real GDP, total government expenditures, and federal debt. They are from the Federal Reserve Economic Data (FRED) and available in quarterly frequency. In addition, I add the APITR and ACITR for the later LP-IV regression. The data for both variables are from Mertens and Ravn (2013) and are available in quarterly frequency. The National Income and Product Accounts (NIPA), a data source by the BLS, supplies the individual parts that compose both tax rates. I describe the equations, which form the APITR and ACITR, in the appendix under the point "A.1 Data for Estimation".

I have set the data range for this paper from the first quarter of 1980 to the last quarter of 2006. The data frame includes the five variables mentioned, measured in all three inequality measures. I adopt all values without modification from Coibion et al. (2017). Moreover, the data frame contains the PITS, CITS, APITR, and ACITR without modification from Mertens and Ravn (2013). Lastly, I also insert all three named control variables from the FRED. The data is available at a quarterly frequency. Consequently, the data file corresponds to 2376 observations, minus the column indicating the quarters, and contains every needed variable.

3 Econometric Approach

3.1 Identification

This subsection describes the identification of tax shocks, focusing on how tax shocks arise. The first paragraph describes the tax shocks' mathematical composition and refers entirely to Mertens and Ravn (2013). The subsequent section explains the exogeneity and the implementation of the tax shocks in legislation using past examples and related literature.

This paper uses tax shocks from "The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States" by Mertens and Ravn (2013). PITS and CITS are narrative and unanticipated changes in income tax liabilities in the United States. The following equations determine them:

$$\Delta T_{\mathrm{t}}^{\mathrm{PI,\ narr}} = \frac{\text{II tax liability change}_t + \text{EM tax liability change}_t}{\text{Personal Taxable Income}_{t-1}} \tag{1}$$

$$\Delta T_{\mathrm{t}}^{\mathrm{CI,\ narr}} = \frac{\text{CI tax liability change}_t}{\text{Corporate Profits}_{t-1}}. \tag{2}$$

Equation (1) shows the changes in personal income tax liabilities with the variables of individual income tax liabilities (II) and employment taxes (EM). Equation (2) demonstrates the changes in corporate income tax liabilities, with (CI) representing corporate income tax liabilities. According to Mertens and Ravn (2013), it makes sense to divide tax shocks into anticipated and unanticipated and corporate and personal income tax shocks because they have different effects. Also, they only include tax changes with an implementation period of less than one quarter. Accordingly, Mertens and Ravn (2013) exclude all shocks occurring after 90 days. Important to note is that they base their shocks solely on changes captured as exogenous by Romer and Romer (2009), which I describe in great detail in the next paragraph. In addition, the authors further apply a proxy SVAR approach. The shocks are given quarterly from the first quarter of 1950 to the last quarter of 2006. In this paper, however, I look at the period from the first quarter of 1980 to the last quarter of 2006. The appendix "B Figures" under "B.1 Tax Shock Figures" illustrates the two tax shocks. Moreover, the diagrams of the shocks demonstrate that CITS often show more extensive changes than PITS.

According to Romer and Romer (2009), exogenous tax changes classify as *deficit-driven* and as *long-run* tax changes that anticipated or current economic conditions in the short run cannot justify. Therefore, one characteristic of these developments is that they should not correlate with other changes that influence output in the other direction in the short run (Romer and Romer, 2009). One example of such a legislative measure is the Omnibus Budget Reconciliation Act of 1987, a deficit-driven, exogenous tax increase to reduce the deficit. The October 19, 1987, stock market crash encouraged the urge to agree and prompted the government to raise taxes. Another significant example in the used tax shock series is the Jobs and Growth Tax Relief Reconciliation Act of 2003, which represents an exogenous long-run tax cut. This act aimed to reach economic growth in the long term (Romer and Romer, 2009). Examples of implementing the goal of long-term economic growth include abolishing corporate income double taxation or the provision of 3.6 billion dollars for the federal states to finance "Personal Reemployment Accounts" for unemployed people to help cover the costs of finding work (Council of Economic Advisers, 2003).

3.2 Estimation Strategy

This subsection explains the regressions I run to estimate the effect of the tax shocks on the inequality data. In the first paragraph, I evaluate the regressions I run on the inequality data for the PITS and the CITS by explaining the local projections equation in detail. Subsequently, I present the local projection - instrumental variables approach, which I use to check the robustness and to obtain more accurate values. Therefore, the second paragraph provides details about the first-stage regression, while the third paragraph evaluates the second-stage regression.

The "local projection" method, developed by Jordà (2005), estimates impulse responses of variables to monetary or fiscal policy shocks. The approach models forward-shifted endogenous variables in sequential regressions. The method is a direct forecast type regression that can regress shocks on variables with simple ordinary least squares (Jordà, 2005). Consequently, I measure inequality data to PITS and CITS and receive estimations of IRFs. In my regression, local projections define the future value of the variable of interest using the following equation:

$$X_{i,t+h} = \alpha_h + \theta_h \cdot \varepsilon_t^j + \boldsymbol{\beta'} \cdot \mathbf{Y}_{i,t} + \xi_{t+h}, \quad h = 0, \ldots, H \tag{3}$$

The variables of interest $X_{i,t+h}$ are the inequality data from the data frame described in section 2. More specifically, the responses for each inequality measure (Standard Deviation, Gini coefficient, and 90th to 10th Percentile) for the variables before-tax and after-tax income, labor earnings, expenditures, and consumption, with my interpretation ultimately focusing on before- and after-tax income and consumption inequality. α_h indicates the Constant, θ_h is the Coefficient and ε_t^j represents the Tax Shocks where j can be the j = PITS or j = CITS. β is the Coefficient for the Control Variables. At the same time, I control for the typical macroeconomic aggregates of real GDP, total government expenditures, and federal debt, which the variable $Y_{i,h}$ indicates. I logarithmize to obtain more precise values for the regressions. Finally, ξ_{t+h} indicates the Error Term. Ultimately, I have set the period from the first quarter of 1980 to the last quarter of 2006. Moreover, I estimate the responses over a horizon of H = 20 quarters and lag the independent variables two times to shift the variables and create space for the future values of the variables. The independent variables include the respective tax shock beside the Control Variables. Furthermore, I lag the respective dependent variable to which the regression is applied two times. Finally, I add a standard confidence interval of 1.645 for each response.

To minimize the endogeneity problem between the variable of interest and the error term within the regression, I apply the local projection instrumental variables through the Two-Stage Least Squares (2SLS). In this extension of the local projections, I use the tax shocks ε_t^j as an instrument to regress the dependent variable X_1 on ε_t^j and thus avoid that X_1 correlates with the error term ξ_{t+h}. To establish this connection, I have set up the following equation for the first-stage regression:

$$X_1 = \alpha_h + \theta_h \cdot \varepsilon_t^j + \xi_t \tag{4}$$

As the dependent variable X_1 I choose the APITR for a regression on ε_t^j, for j = PITS and the ACITR for a regression on ε_t^j, for j = CITS. These dependent variables are a good measure because they are endogenous to the shock and exogenous to the variables of interest, which is the prerequisite for successfully applying 2SLS. α_h is still the Constant, θ_h is the Coefficient, and ξ_t the Error Term. Again, I lag the Control Variables, the PITS (and APITR), for a regression on APITR and CITS (and ACITR) for a regression on ACITR two times.

To obtain a complete LP-IV, for the calculated dependent variable I insert X_1 from equation (4) into the original equation for local projections from (3) instead of the tax shock ε_t^j. The modified equation (5) is shown below and represents the second-stage regression of the LP-IV.

$$X_{i,t+h} = \alpha_h + \theta_h \cdot \hat{X}_1^j + \boldsymbol{\beta'} \cdot \mathbf{Y}_{i,t} + \xi_{t+h}, \quad h = 0, \ldots, H \tag{5}$$

Except for $\hat{X}_1^j$, the variables remain the same as with the local projections regressions on the inequality data, which I describe in equation (3). The horizon of H = 20 and the given confidence interval of 1.645 also remain unchanged. Moreover, I lag the same variables for the respective inequality variable described in the first paragraph two times. Consequently, equation (5) regresses the impulse responses of the inequality variables on both PITS and CITS through a LP-IV. I regress for every already calculated inequality variable, which leads to a total of 15 (as I have five original variables measured with three inequality measures) regressions for each tax shock. The appendix under "B.2 Impulse Response Figures" illustrates the IRFs constructed with the LP-IV approach for both shocks. In the following section, however, I will discuss the results for before- and after-tax income and consumption inequality in more detail.

4 Discussion

4.1 Effects of Personal Income Tax Shocks (PITS) on Inequality

In this section, I evaluate the effects of the PITS. The first paragraph presents the responses of the inequality data to the PITS by describing the diagrams. Subsequently, I discuss possible mechanisms as to why the effects occur. Therefore, I examine three possible hypotheses, which I label (H1), (H2), and (H3) in the following three paragraphs and substantiate with literature.

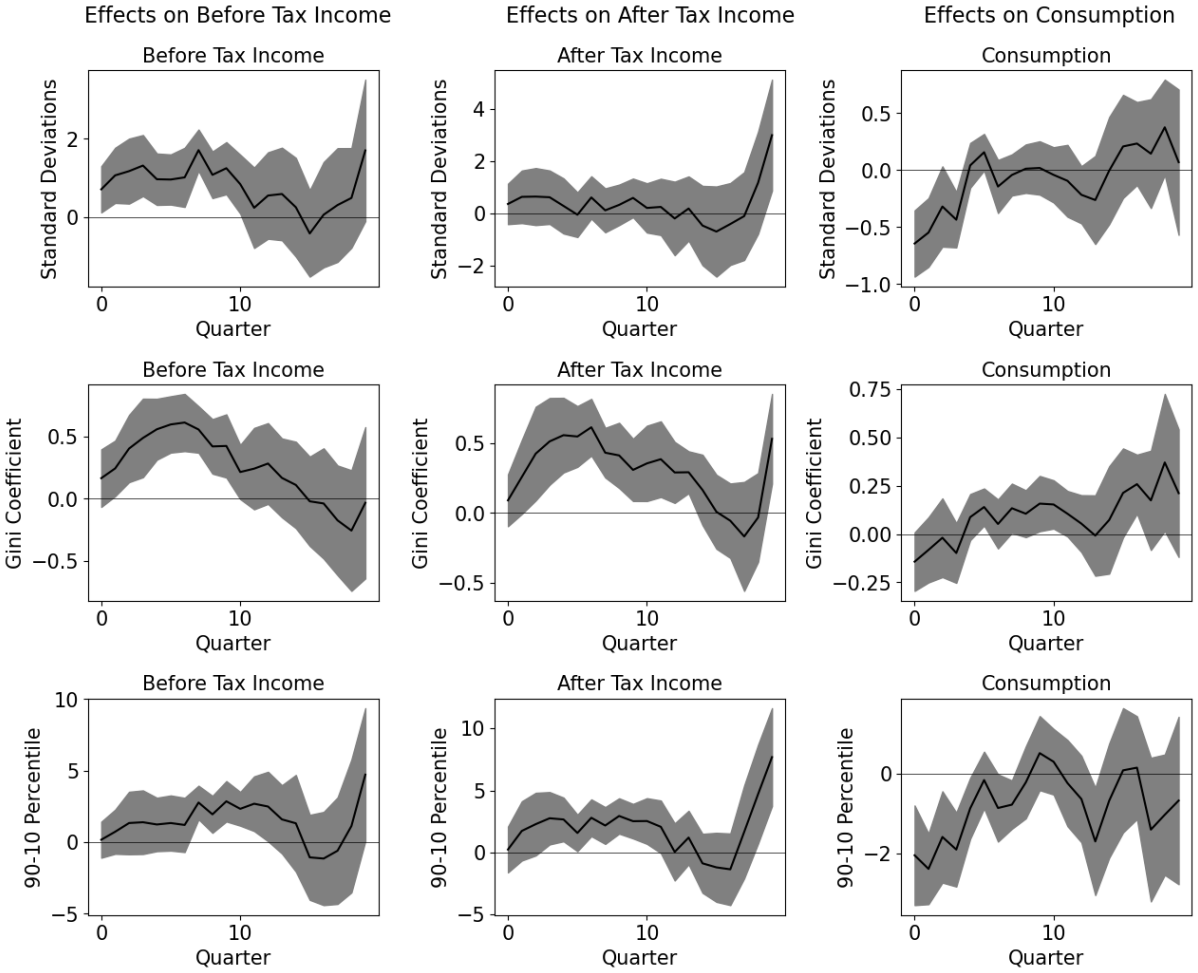

Figure 1: Impulse responses of before- and after-tax income and consumption inequality to a PITS

Notes: The figure illustrates impulse responses of inequality measures for before-tax income (left column), after-tax income (middle column), and consumption (right column) to a 1% PITS. The rows represent the different inequality measures, the first indicating Standard Deviation, the second showing the Gini Coefficient, and the third representing the Difference between the 90^{th} and 10^{th} Percentiles.

The LP-IV regression described in 3.2 concludes that higher personal taxes due to the PITS lead to greater before- and after-tax income inequality. In turn, a tax increase leads to a reduction in consumption inequality. Figure 1 demonstrates the results. The graphs showing income inequality responses are statistically significant in the positive range at the beginning, except for the Difference between the 90^{th} and 10^{th} Percentile measurement. One can neglect the insignificance of the Difference between the Percentiles due to the given robustness of three measurements and the similar shape of the response curves in all three measurements. The graphs on the right column in Figure 1 illustrate the responses of consumption inequality to higher taxes. The statistical significance is observed at the beginning of the graph, i.e., as a direct reaction to the shock in all three cases. The similar continuous course of the three impulse responses indicates robustness.

For the first possible mechanism that could be responsible for the effect of the PITS, I refer to the increasing income inequality within tax brackets being responsible for the overall increase in income inequality (H1). Tax progressivity, which leads to a higher tax rate for higher incomes, has the incentive to reduce income inequality. However, the before- and after-tax income results from my regressions do not deduct this behavior of tax progressivity, as there is no particular difference in the effect of the tax shock on the after-tax income. This result supports the hypothesis that the cause lies in the tax brackets. The Tax Reform Act of 1986 led to a sudden radical reduction in income tax brackets from the former 16 to only four tax brackets (Blundell et al., 2018), which falls within the period of my inequality data. Blundell et al. (2018) report that by 1998, the marginal tax rate for high-income earners decreased from 70% to 28% due to the Reform Act. This result supports the hypothesis of income inequality within tax brackets. Therefore, it is necessary to consider the extent to which people in the respective tax brackets differ in their income and how significant the effect of inequality within the group with the same tax rate can be.

The second possible mechanism that could explain the obtained results relies on the increasing income inequality in the US due to the shifting of corporate income tax by high earners (H2). Besides labor income, total personal income includes non-taxable income such as transfers and shares or business income, which is subject to a lower corporate tax rate and is unaffected by personal income taxes. Thus, it is possible for entrepreneurs or business owners, for example, to avoid specific personal tax increases (Friedman, 2008). According to Fried-

man (2008), these loopholes contribute to the inequality due to taxes because people pay taxes depending on their income composition, even if they are at a similar economic level. This mechanism behind the tax system leads people with similar incomes to pay very distinct taxes. Moreover, there is a shift from the traditional C-sectors to pass-through sectors because of the lower tax rates on income and the owners' level (Cooper et al., 2016). Business owners are generally high earners (Cooper et al., 2016). Dyrda et al. (2018) report that many tax regulations introduced since 1980 have made the pass-through legal form (e.g., S-corporations) attractive for businesses through low taxes on business income. Concluding, the share of pass-through entities in the US almost tripled by 2012 (Dyrda et al., 2018). The rise in entrepreneurship confirms the hypothesis that entrepreneurs pay little tax due to low corporate taxes and income inequality increases.

Finally, in the third hypothesis, I want to address that rising income inequality accompanies falling consumption inequality, contrary to my original expectation. Therefore, I take a critical look at the results in (H3) and give a personal, potential explanation as to why inequality in consumption is increasing. (H3) states that high-income earners consume less due to less disposable income. Higher personal taxes lead to lower disposable income and, thus, lower consumption. After that, the consumption gap between people with low and high disposable incomes is narrowing because consumption mainly consists of non-durable goods that households require for basic needs. Consequently, people with low incomes are unlikely to change their consumption, while people with high incomes, who may have previously consumed more than necessary, will now consume less. This change in high-income people's behavior reduces inequality in consumption. However, this potential approach is a theory that motivates further research in this area.

4.2 Effects of Corporate Income Tax Shocks (CITS) on Inequality

In this section, I evaluate the effects of CITS. Therefore, the first paragraph presents the responses of inequality data to CITS and briefly describes the figure. In the following two paragraphs, I list possible hypotheses that could justify the results and support them with literature. Lastly, I also provide a brief comparison of the two tax shock effects in the final paragraph.

Higher corporate taxes lead to a decrease in before- and after-tax income inequality. In contrast, higher taxes also cause consumption inequality to rise. Figure 2 illustrates the results. While the impulse responses for all measures of income inequality are statistically significantly negative, the responses for consumption inequality, except the Gini coefficient, are in a positive statistically significant area. In the case of consumption inequality, we can neglect the response of consumption inequality measured by the Gini Coefficient, even though it is in the negative range compared to the other two measures, as the shape of the response graph is very similar. All six before- and after-tax income graphs indicate a similar trend, illustrating a good measurement of the inequality variables.

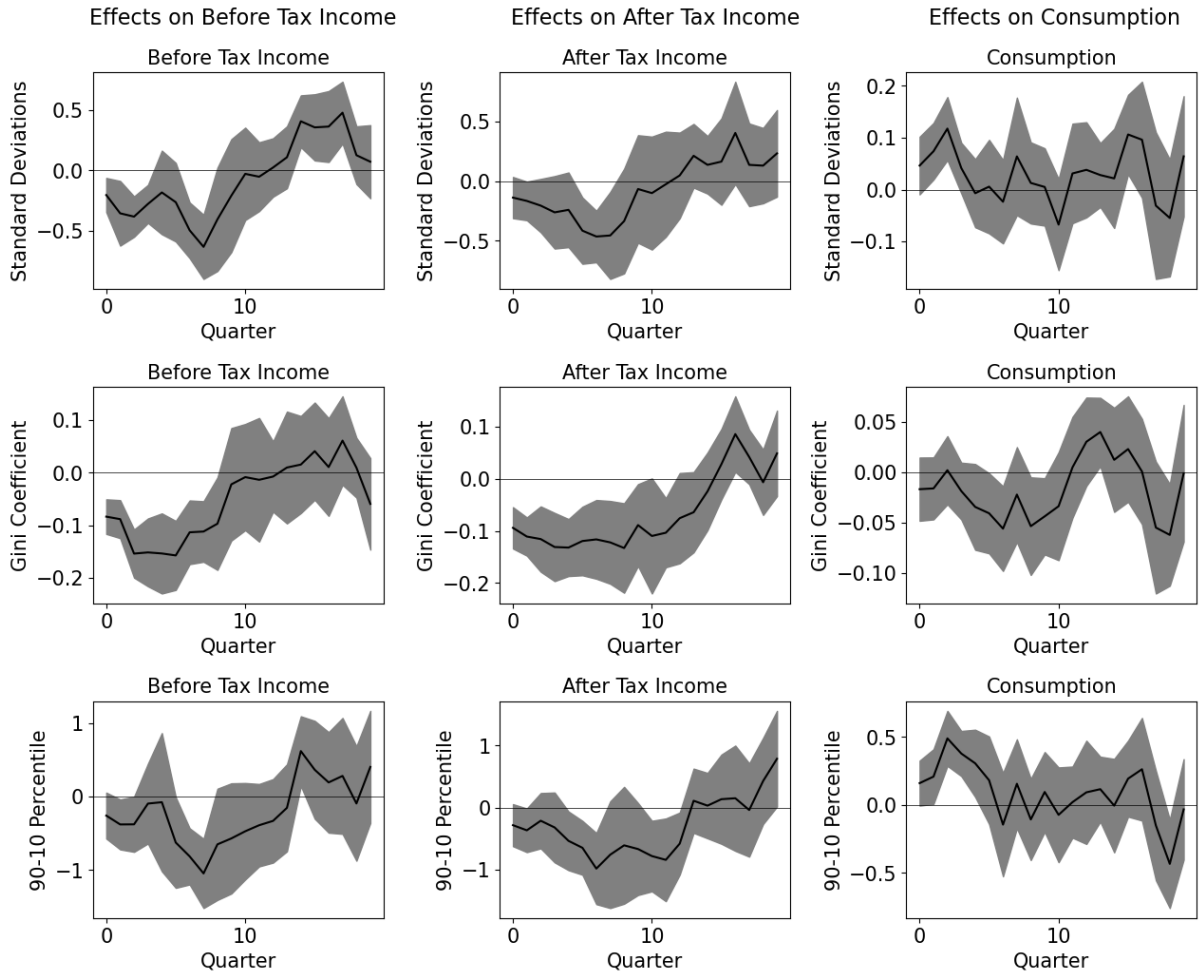

Figure 2: Impulse responses of before- and after-tax income and consumption inequality to a CITS

Notes: The figure illustrates impulse responses of inequality measures for before-tax income (left column), after-tax income (middle column), and consumption (right column) to a 1% CITS. The rows represent the different inequality measures, the first indicating Standard Deviation, the second showing the Gini Coefficient, and the third representing the Difference between the 90^{th} and 10^{th} Percentiles.

The first hypothesis states that higher corporate taxes impact high-income earners, who are now getting closer to low-income earners, and therefore, income inequality is reduced (H1). Higher corporate taxes mean that entrepreneurs or business owners, in particular, have to pay higher taxes, which primarily affects people with high incomes (Cooper et al., 2016). As they now have less business income (which is part of their income), this leads to a reduction in the income of high earners and, thus, to overall economic redistribution, as the effect does not impact people whose income consists mainly of labor income (mostly low-income earners). Consequently, income inequality decreases. Another result supporting this finding is that according to Alves and Afonso (2019), taxes on firms lead to a short-term reduction in income inequality.

With my second hypothesis, however, I propose a potential mechanism regarding the consequences of the behavior of businesses (or companies) and consumers. Higher prices mean people can afford less and consume less (H2). As higher corporate taxes primarily affect businesses, they will increase their prices for retail products (Baker et al., 2020). As a result, people can afford less, and low-income earners, in particular, are affected. However, high-income earners are not affected as much as low-income earners, as they have a higher income and hardly have to make any deductions. Consequently, this leads to increasing consumption inequality. Furthermore, (Alves and Afonso, 2019) argue for a negative correlation between household consumption and corporate taxes, which applies to received results.

Lastly, I compare the responses to the two tax shocks. A fundamental finding that emerges from the IRFs is that PITS and CITS have radically different effects on inequality, which initially confirms the assumption that separation of personal and corporate tax shocks is essential and thus supports the basic premise of (Mertens and Ravn, 2013). Moreover, it is noteworthy that income and consumption inequality in my regression respond differently to higher taxes in both cases. However, other studies also confirm that the relationship between income and consumption inequality is not necessarily similar, as is often assumed. For example, Krueger and Perri (2006), who also conducted a study with CEX data, report that an increase in income inequality is not associated with an increase in consumption inequality in their studies.

4.3 Limitations

In this section, I discuss some of the possible limitations of this paper. In the first paragraph, I focus on possible constraints of the available data, and in the second paragraph, I concentrate on potential measurement errors of the econometric approach.

First, survey data is usually more susceptible to misinformation than collected data. Although Coibion et al. (2017) use different methods to counteract this, it is still possible that households surveyed in the CEX inadvertently or deliberately provide false information and thus bias the data. In addition, self-calculating taxes using the NBER TAXSIM calculator is a fairly reliable tool widely utilized by other economists. Nevertheless, this carries the risk of an incorrect tax calculation. Moreover, the chosen tax shocks are narrative measures of changes that derive from historical sources and capture information about motivation, size, and timing of policy interventions (Mertens and Ravn, 2013). However, narrative shocks have the disadvantage that they often neglect more minor policy interventions, resulting in many observations that center on the value zero. Furthermore, the exact impact of new tax legislation is challenging to measure (Mertens and Ravn, 2013).

Although LP-IVs are reliable estimation approaches, they still carry the possible endogeneity problem and the problem of a linear relationship between the variables. Although there are significant results, there is a possibility that the endogenous relationship between the variables influenced the results and thus caused a measurement error. In addition, not all three inequality measures always fit the respective regression variables optimally, and therefore, the general interpretation and comparison of all three measures with one variable is essential.

5 Conclusion

To conclude, PITS and CITS have fundamentally different effects on income and consumption inequality. Higher personal income taxes lead to an increase in total income inequality and a decline in consumption inequality. On the other hand, higher corporate taxes lead to a decrease in total income inequality and a rise in consumption inequality. Before-tax and after-tax income does not change with either shock, which argues against successful tax progressivity.

Further, there are implications concerning tax shocks that policymakers need to consider. Meanwhile, progressive taxation only functions to a limited extent because, as can be seen, inequality continues to increase, especially for personal income. Therefore, more specific targeting is needed. In addition, policy should prepare for possible changes in people's behavior, e.g., consumption, in case of unanticipated shocks to prevent a sudden increase in consumption inequality. Concluding, tax shocks applied by policymakers reduce inequality only to a limited extent and sometimes even lead to a rise in inequality.

Lastly, one should note the following points. The results above stem from the self-calculated regressions described in section 3. Furthermore, the possible mechanisms behind these results originate solely from the literature reported in this paper. The US progressive tax system is complex, and inequality variables are sensitive to PITS and CITS. This paper encourages further research into inequality in the context of unanticipated tax shocks. Research on the effects of tax brackets and comparing the impacts on high-income and low-income earners is a compelling field to evaluate. In addition, this study is limited to the period up to 2006, so it is interesting to see if the PITS and CITS demonstrate the same effects in later years. Finally, it is essential to explore further why the US continues to have a tax system that, at its core, drives inequality through low corporate taxes for businesses.

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Appendix

A Data

A.1 Data for Estimation

$$\text{APITR}_t = \frac{\text{Personal Current Taxes}_t + \text{Contributions for Govt. Social Insurance}_t}{\text{Personal Taxable Income}_t} \tag{6}$$

$$\text{ACITR}_t = \frac{\text{Taxes on Corporate Profits}_t}{\text{Corporate Profits}_t} \tag{7}$$

The equations are given by Mertens and Ravn (2013). **APITR**: Components of the equation come from the NIPA, in quarterly frequency, from 1950 - 2006. **ACITR**: Components of the equation come from the NIPA, in quarterly frequency, from 1950 - 2006.

B Figures

B.1 Tax Shock Figures

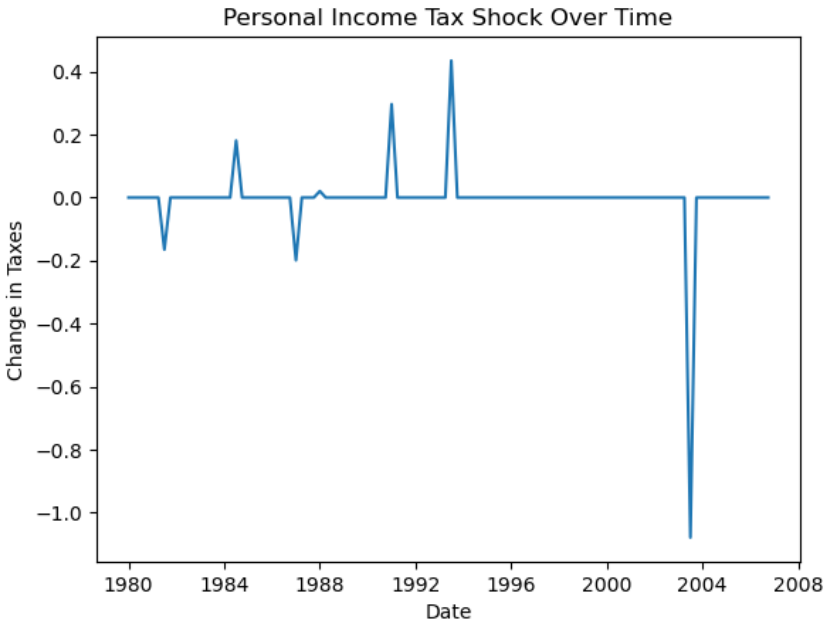

Figure 3: Personal Income Tax Shock (PITS)

Figure 4: Corporate Income Tax Shock (CITS)

B.2 Impulse Response Figures

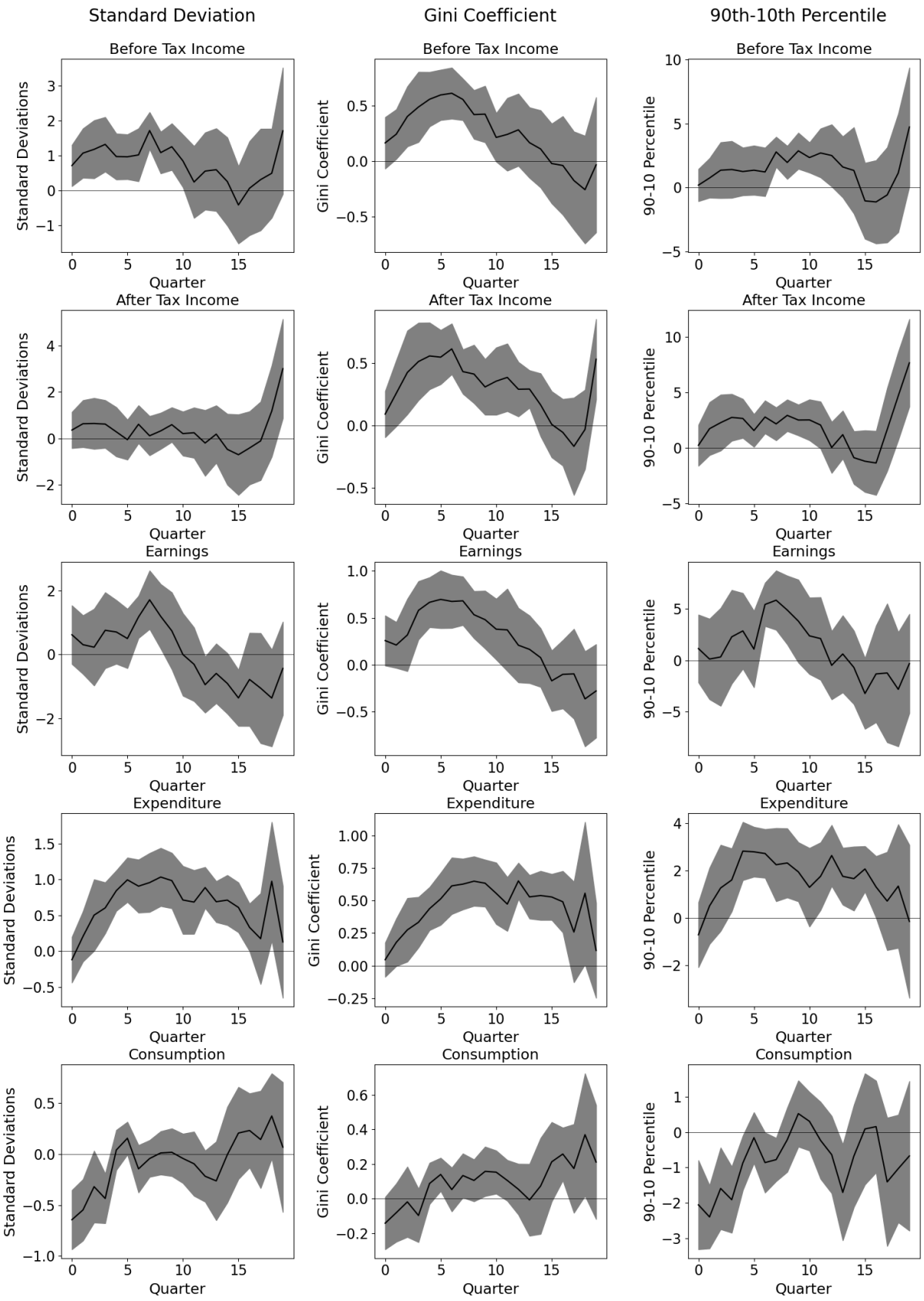

Figure 5: Impulse responses of before- and after-tax income, earnings, expenditure and consumption inequality to a PITS

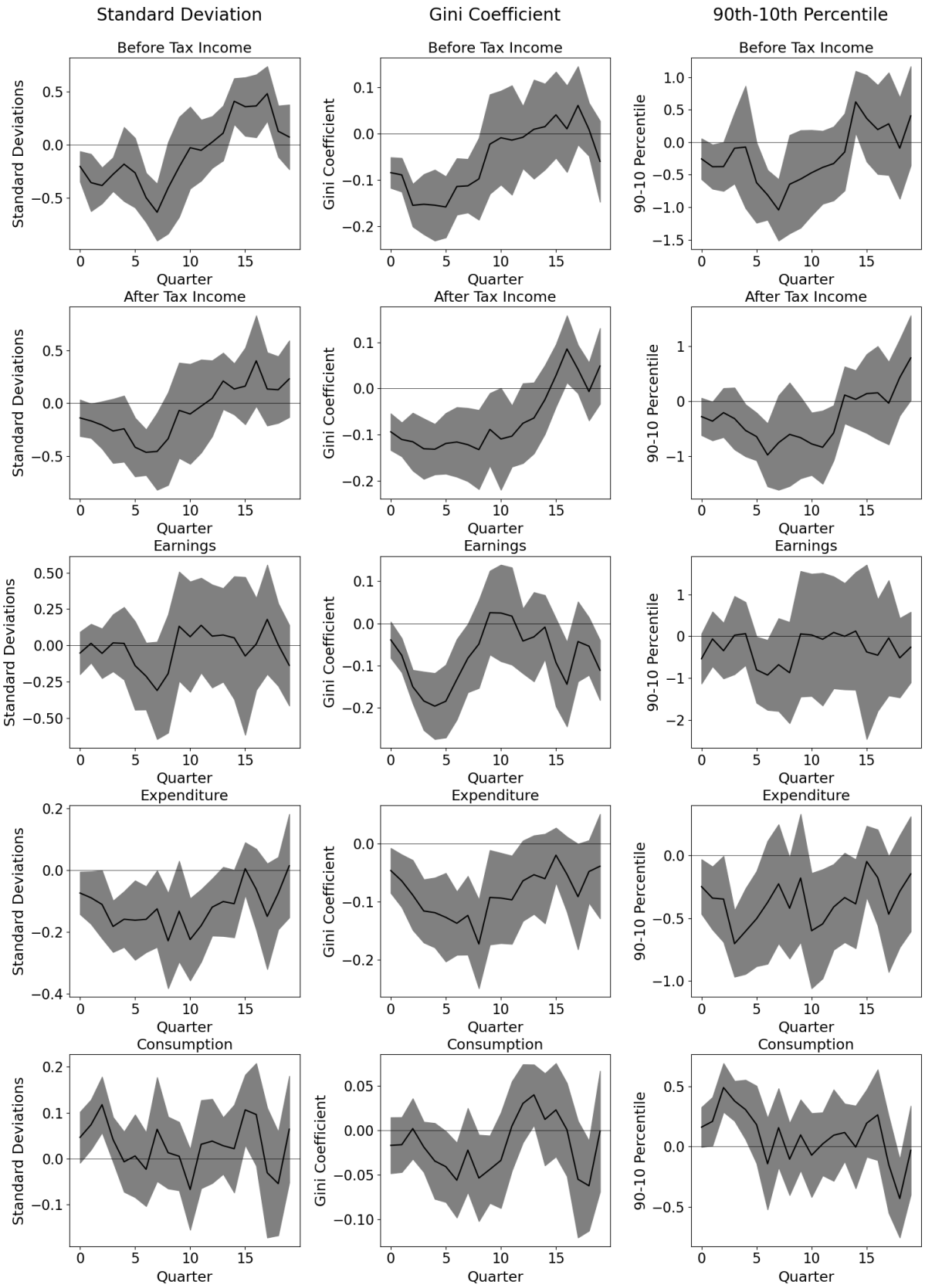

Figure 6: Impulse responses of before- and after-tax income, earnings, expenditure and consumption inequality to a CITS