

No taxation without reallocation: the distributional effects of tax changes

Stephanie Ettmeier*

University of Bonn

[Please click here for the latest version](#)

November 8, 2024

Abstract

This paper quantifies the distributional effects of tax changes in the United States. A functional vector autoregression framework is used to estimate the joint dynamics of tax shocks, the cross-sectional distribution of disposable income, and macroeconomic aggregates. I distinguish between changes in personal and corporate income taxes and investigate the distributional effects on families and business owners. While tax cuts boost aggregate disposable income, the benefits are spread unevenly. The increase in overall inequality is driven primarily by rising disparities among entrepreneurs, particularly in the upper tail of their distribution. Though families experience reduced within-group inequality, neither families nor entrepreneurs benefit more in aggregate terms than their non-targeted counterparts, challenging prevalent political narratives about tax policy beneficiaries.

JEL classification: C11, C32, E32, E62

Keywords: Income Distribution, Functional Vector Autoregressions, Tax Policy Shocks

*Correspondence: University of Bonn, Department of Economics, Adenauerallee 24-42, 53113 Bonn, Germany, ettmeier@uni-bonn.de. Declarations of interest: none. I thank Knut Are Aastveit, Benjamin Born, Minsu Chang, Chi Hyun Kim, Alexander Kriwoluzky, Daniel Lewis, Helmut Lütkepohl, Ralph Lütticke, Manuel Menkhoff, Gernot Müller, Gisle Natvik, Josefine Quast, Malte Rieth, Frank Schorfheide, Moritz Schularick, Lucas ter Steege, and participants at various seminars and workshops for helpful comments and discussions. Support by the German Research Foundation (DFG) through CRC TR 224 (Project C02) is gratefully acknowledged. Part of this research was conducted while I was visiting the University of Pennsylvania and Norges Bank Research, whose hospitality I gratefully acknowledge. I also thank the HPC Service of ZEDAT, Freie Universität Berlin, for computing time and the Dieter Schumacher Young Scholar Travel Fund and the DFG PP 1859 “Experience & Expectation” for travel funding. Petya Prodanova and Katharina Schramm provided helpful research assistance.

“My friends, history is clear: Lower tax rates mean greater freedom, and whenever we lower the tax rates, our entire nation is better off.”

Ronald Reagan, October 3, 1985

1 Introduction

What are the distributional effects of changes in tax policy? Over the last decades, the macroeconomic implications of tax changes have been the focus of empirical research and distributional evidence remains scarce. This is despite the explicit redistributory function of tax policy and prevalent political narratives on who should benefit from changes in tax policy. My paper presents this empirical evidence, quantifying the effect of tax changes on the cross-sectional distribution of disposable income for the US for the 1980 to 2006 period.

The fresh ingredient for my analysis is the functional vector autoregressive (fVAR) model of Chang et al. (2024); it allows me to study the causal effects of tax changes on the cross-sectional distribution of disposable income and macroeconomic variables jointly in a dynamic setup at business cycle frequency. I use micro-level data on after-tax income constructed from the Consumer Expenditure Survey (CEX) to approximate a log density of cross-sectional disposable income for each quarterly observation period. Together with aggregate macroeconomic data on tax revenues, government spending, GDP, non-durable consumption, and disposable income, these approximated log densities enter the fVAR model, which is estimated with Bayesian techniques.

I base the identification on the tax shock measure of Mertens and Ravn (2014), which isolates exogenous variation in tax policy changes from narrative sources accompanying the tax legislation process - a strategy introduced by Romer and Romer (2010). Including all major unanticipated exogenous federal tax liability changes that happened between 1980 and 2006, this measure can be interpreted as approximate changes in the average tax rate in the US. To document, in a similar manner, the heterogeneous effects of different tax types available

to governments along the distribution, in a second step, I employ the personal income and corporate income tax shock measure of Mertens and Ravn (2013) for identification.

The micro-level information of the CEX data allows me to scrutinize prevalent narratives on US tax policy. A systematic study of government documents covering the 1980 to 2006 period reveals that, over the entire sample and independent of the government's political background, three narratives repeatedly emerge: tax changes are directed toward low-income people, are supportive for large business owners, and are pro-family. To empirically validate these political statements, I decompose the cross-sectional disposable income distribution according to personal characteristics, discriminating between (i) entrepreneurs and non-entrepreneurs, and (ii) families and non-families.

I document that tax cuts throughout the 1980 to 2006 period generate a significant boost in GDP and aggregate disposable income, but lead to increased overall inequality. The benefits are spread unevenly across households: they hurt the bottom and center of the distribution and benefit the rich. For instance, after a one standard deviation cut in the average tax rate that increases aggregate disposable income by 0.12% at the median, the 5th percentile experiences a decrease in after-tax income of 0.01%, while the 95th percentile gains 0.12%.

This rise in overall inequality is driven primarily by entrepreneurs, particularly in the upper tail of their distribution, while families experience reduced within-group inequality. However, neither targeted group benefits more in aggregate terms than their non-targeted counterparts. Hence, my findings do not lend empirical substance to political rhetoric selling tax changes as targeted toward low-income households, though they confirm that tax changes affect business owners and families differently from other groups. High-income entrepreneurs emerge as the primary beneficiaries of these tax changes.

Since I employ a linear model, the effects of tax increases would be symmetric to the documented effects of tax cuts: Tax hikes would generate proportionally opposite responses, leading to decreased aggregate disposable income and reduced inequality. This symmetry

implies that tax increases would primarily affect high-income households, with the 90-50 ratio declining more than the 50-10 ratio, while having limited impact on lower-income groups.

The fVAR model framework, modeling the interaction between macroeconomic aggregates and cross-sectional level, lends itself particularly well for addressing the crucial question on the distributional impacts of aggregate tax shocks. It quantifies the distributional effects dynamically by taking into account the behavioral changes initiated by the tax intervention. The strength of the method is that it does so, without having to model the underlying micro-level heterogeneity in labor supply or saving decisions (Guvenen, 2011; Guner et al., 2011), explicitly, as the fVAR model focuses on the response of the distribution as opposed to the individual. In this respect, the empirical evidence of my study complements distributional analysis based on micro-simulation models, as carried out by the Urban-Brookings Tax Policy Center, the Congressional Budget Office, the Joint Committee on Taxation, and the Treasury Department's Office of Tax Analysis, as these simulations usually do not consider the behavioral responses induced by the tax change (Elmendorf et al., 2008; Auerbach et al., 2017).

Modeling the dynamics of the entire distribution compared to modeling the dynamics of pre-selected distributional statistics like the Gini-coefficient, provides a more comprehensive and unambiguous perspective on the distributional effects of tax changes. Unlike a VAR model that includes quantiles of the cross-sectional distribution that may cross in a forward simulation, the fVAR model is theoretically coherent, ensuring non-negative cross-sectional densities of disposable income that integrate to one.

Related literature This paper connects to two main strands of literature: studies on macroeconomic effects of tax shocks and analyses of their distributional impacts.

The macroeconomic effects of tax shocks are extensively studied (Blanchard and Perotti, 2002; Mountford and Uhlig, 2009; Romer and Romer, 2010; Barro and Redlick, 2011; Auerbach and Gorodnichenko, 2012; Cloyne, 2013; Mertens and Ravn, 2013; Caldara and

Kamps, 2017; Demirel, 2021; Cloyne et al., 2022; Ghassibe and Zanetti, 2022). Over the years, a consensus has emerged on what drives the size of the tax multiplier (Mertens and Ravn, 2014; Ramey, 2019). However, empirical evidence on the distributional impacts of tax shocks remains sparse.

Recent studies have begun exploring these distributional effects through various approaches. Zidar (2019) quantifies how the distribution of tax changes affects overall economic activity, examining trickle-down versus bottom-up economics. Similarly, Ferriere and Navarro (2024) demonstrate how tax distribution shapes government spending effects. Using a factor-augmented VAR model (FAVAR), Jackson et al. (2019) analyze how exogenous changes in tax progressivity affect disposable income distribution. Cloyne and Surico (2017) examine tax shock transmission through household debt levels using group-specific VAR models. At the firm level, Cloyne et al. (2023) study how corporate tax cuts affect different firm groups using constructed exogenous measures of federal corporate tax rates.

Several studies focus on specific segments of the income distribution. Mertens and Montiel Olea (2018) examine how tax changes for the top 1 % versus bottom 99 % affect economic activity and pre-tax incomes. Using CEX data, Misra and Surico (2014) analyze heterogeneous consumption responses to the 2001 and 2008 US tax rebates.

My study contributes the first comprehensive dynamic analysis of how exogenous tax changes affect the entire distribution of disposable income at business cycle frequency. It also connects to literature examining dynamic responses in micro-level behavior, particularly consumption expenditure, following aggregate tax shocks (Johnson et al., 2006; Parker et al., 2013). Unlike these panel studies, which focus on partial equilibrium effects and cannot directly estimate general equilibrium dynamics (Wolf, 2021), the fVAR model approach explicitly accounts for general equilibrium effects by modeling the interaction between macroeconomic aggregates and micro-level data.

The remainder of this paper is structured as follows. Section 2 summarizes the fVAR model framework and outlines the data, the identification, and the estimation approach. In

Section 3, I present the effects of an unanticipated cut in the average tax rate on the cross-sectional distribution of disposable income, while in Section 4, I decompose these effects. I analyze the distributional effects of different tax types, distinguishing between changes in the personal income and the corporate income tax rate and using micro-level information to quantify the distributional consequences of tax cuts on families and business-owners separately. Section 5 concludes.

2 The functional VAR model

The fVAR approach developed by Chang et al. (2024) allows me to study the distributional effects of aggregate tax shocks in a dynamic setup.¹ Unlike traditional VAR models, the fVAR model adds to the vector of macroeconomic aggregate variables the log of a cross-sectional distribution.

The $n_Y \times 1$ vector Y_t collects the macroeconomic variables and $\ell_t = \ln p_t(x)$ denotes the log of a cross-sectional density $p_t(x)$. In my application, I use disposable income as cross-sectional variable x . Y_t and ℓ_t are decomposed into a deterministic component $(Y_*, \ell_*(x))$ and fluctuations around the deterministic component:

$$Y_t = Y_* + \tilde{Y}_t, \quad \ell_t = \ell + \tilde{\ell}_t. \quad (1)$$

It is assumed that the deviations from the deterministic component evolve jointly according to the following linear fVAR law of motion, which can be interpreted as reduced-form fVAR model:

$$\begin{aligned} \tilde{Y}_t &= B_{YY} \tilde{Y}_{t-1} + \mathbf{B}_{Y\ell} [\tilde{\ell}_{t-1}] + u_{Y,t} \\ \tilde{\ell}_t(x) &= B_{\ell Y}(x) \tilde{Y}_{t-1} + \mathbf{B}_{\ell\ell} [\tilde{\ell}_{t-1}](x) + u_{\ell,t}(x). \end{aligned} \quad (2)$$

¹For better comparability, I follow closely the notation of Chang et al. (2024) for recapitulating the intuition of the method. Readers interested in further details on the implementation of the fVAR method are referred to the original study.

$\mathbf{B}_{Y\ell}[\tilde{\ell}_{t-1}]$ and $\mathbf{B}_{\ell\ell}[\tilde{\ell}_{t-1}](x)$ are integral operators and defined as $\mathbf{B}_{Y\ell}[\tilde{\ell}_{t-1}] = \int B_{Y\ell}(\bar{x})\tilde{\ell}_{t-1}(\bar{x})d\bar{x}$ and $\mathbf{B}_{\ell\ell}[\tilde{\ell}_{t-1}](x) = \int B_{\ell\ell}(x, \bar{x})\tilde{\ell}_{t-1}(\bar{x})d\bar{x}$. The matrix B_{YY} and the function $B_{\ell Y}(x)$ collect the coefficients. $u_{Y,t}$ is a mean-zero reduced-form error with covariance Ω_{YY} and $u_{\ell,t}(x)$ is a reduced-form error in a Hilbert space with covariance function $\Omega_{\ell\ell}(x, \bar{x})$.

The estimation of the log densities and the fVAR model as well as the data and identification is outlined in the following.

2.1 Estimation and implementation

The estimation of the fVAR succeeds in two steps. First, for every quarter t , a log density of cross-sectional disposable income is approximated. Second, the estimated coefficients of the approximated density are stacked with the macroeconomic aggregates into a linear VAR model which is estimated using Bayesian techniques. I select the approximation order of the densities and the hyperparameters for the prior distribution based on marginal data densities (MDD).

Density approximation I follow Chang et al. (2024) and address the challenge presented by the infinite dimension of the functional model by estimating a K -dimensional representation of the model. To achieve this, I approximate the log cross-sectional densities $\ell_t(x)$ by finite-dimensional sieves with K fixed spline basis functions and time-varying coefficients that capture the dynamics:

$$\ell_t(x) \approx \ell_t^{(K)}(x) = \sum_{k=1}^K \alpha_{k,t} \zeta_k(x) = [\zeta_1(x), \dots, \zeta_K(x)] \cdot \begin{bmatrix} \alpha_{1,t} \\ \vdots \\ \alpha_{K,t} \end{bmatrix} = \zeta'(x)\alpha_t. \quad (3)$$

The vector α_t includes the coefficients, while the vector $\zeta(x)$ collects a sequence of basis functions with knots x_k , $k = 1, \dots, K - 1$. I consider different approximation orders K and place the knots at predetermined percentiles of the empirical distribution of cross-sectional

disposable income. Table 1 summarizes the specifications. The sieve coefficients are estimated by maximum likelihood (MLE), compressed to remove potential collinearities and seasonally-adjusted.

Table 1: Knot placement

K	1st	2.5th	5th	10th	15th	25th	35th	50th	65th	75th	85th	90th	95th
4						✓		✓		✓			
6				✓		✓		✓		✓		✓	
8			✓	✓		✓		✓		✓		✓	✓
10	✓	✓	✓	✓		✓		✓		✓		✓	✓
14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The cross-sectional observations are pooled across i and t . $T = 108$, $N_{min} = 1353$ (1996Q1), and $N_{max} = 3289$ (2004Q1).

This approximation turns the reduced-form VAR model in Equation (2) to the following representation:

$$\begin{aligned} \tilde{Y}_t &= B_{YY}\tilde{Y}_{t-1} + \mathbf{B}_{Y\ell}^{(K)}[\tilde{\ell}_{t-1}^{(K)}] + u_{Y,t} \\ \tilde{\ell}_t^{(K)}(x) &= B_{\ell Y}^{(K)}(x)\tilde{Y}_{t-1} + \mathbf{B}_{\ell\ell}^{(K)}[\tilde{\ell}_{t-1}^{(K)}](x) + u_{\ell,t}^{(K)}(x). \end{aligned} \quad (4)$$

The coefficient matrix B_{YY} is of dimension $n_Y \times n_Y$, the function $B_{\ell Y}(x)$ is of dimension $K \times n_Y$ and approximated as $B_{\ell Y}(x) \approx B_{\ell Y}^{(K)}(x) = \xi'(x)B_{\ell Y}$. $\xi(x)$ is a second vector of $K \times 1$ basis functions. $\mathbf{B}_{Y\ell}^{(K)}[\cdot]$ and $\mathbf{B}_{\ell\ell}^{(K)}[\cdot](x)$ are the operators associated with the transition kernels, which are approximated as $B_{Y\ell}(\bar{x}) \approx B_{Y\ell}^{(K)}(\bar{x}) = B_{Y\ell}\xi(\bar{x})$ and $B_{\ell\ell}(x, \bar{x}) \approx B_{\ell\ell}^{(K)}(x, \bar{x}) = \zeta'(x)B_{\ell\ell}\xi(\bar{x})$, and of dimension $n_Y \times K$ and $K \times K$, respectively. The functional innovation $u_{\ell,t}$ is of dimension $K \times 1$ and approximated as $u_{\ell,t} \approx u_{\ell,t}^{(K)} = \zeta'(x)u_{a,t}$.

Functional VAR model estimation Equations (1), (3), and (4) can be combined to the following vector autoregressive system of dimension $n_Y \times K$ for the macroeconomic aggregates and the estimated sieves coefficients \hat{a}_t :

$$\begin{bmatrix} Y_t - Y_* \\ \hat{\alpha}_t \end{bmatrix} = \begin{bmatrix} \Phi_{YY} & \Phi_{Y\alpha} \\ \Phi_{\alpha Y} & \Phi_{\alpha\alpha} \end{bmatrix} \begin{bmatrix} Y_{t-1} - Y_* \\ \hat{\alpha}_{t-1} \end{bmatrix} + \begin{bmatrix} u_{Y,t} \\ u_{\alpha,t} \end{bmatrix}, \quad (5)$$

where $u_{Y,t} = [u_{Y,t}, u_{\alpha,t}]'$ is assumed to be Gaussian: $u_t \sim N(0, \Omega)$. Given the substantial number of cross-sectional units available in each quarter's data, I assume that the estimation error for the true spline coefficients is negligible for other sources of uncertainty in equation 5. Consequently, I treat the latter as a VAR model for observable variables.²

The fVAR model is estimated using Bayesian techniques described in Chan (2022) and Chang et al. (2024). This specification offers the advantage of enabling equation-by-equation estimation of the fVAR model while allowing for some asymmetry in the prior across equations, making it suitable for high-dimensional settings.

The starting point for the prior specification is the assumption that the elements of Φ follow an Inverse-Gamma scale mixture of Normals with zero mean. Two key hyperparameters control the prior: λ_1 governs the overall prior precision, while λ_2 determines the relative precision of coefficients capturing the effect of lagged α_t s on current Y_t s. As λ_2 approaches infinity, the cross-sectional density ceases to Granger-cause the aggregate variables, resulting in a block-triangular system. Chan's (2022) conjugate prior yields a posterior distribution with a convenient Inverse-Gamma Normal form, enabling direct sampling for draw generation. Furthermore, this formulation allows for analytical evaluation of the MDD.

Model selection I compute log MDD's to choose the hyperparameters λ_1 , and λ_2 , the lag order p , and the number of knots K used to approximate the cross-sectional densities. I evaluate five different approximation orders ($K \in 4, 6, 8, 10, 14$) and consider for each element in vector λ 30 equally-spaced values of $\ln \lambda_j$ on the interval $[-10, 20]$.

Table 2 summarizes the results. For each K , columns two to three show the estimated optimal λ_j , column four the optimal lag order, while column five gives the log MDD differ-

²For a more comprehensive approach to the fVAR estimation problem when α_t are treated as latent variables, refer to Chang et al. (2024).

entials with respect to $K = 4$. The log MDD is maximized for $K = 6$ and the optimal lag order is found to be one.

Table 2: Log MDD's and hyperparameter estimates

K	$\hat{\lambda}_1$	$\hat{\lambda}_2$	\hat{p}	MDD differential
4	20.9	7.39	1	0
6	20.9	20.9	1	2609
8	20.9	54.61	1	2555
10	54.61	7.39	1	2277
14	54.61	7.39	1	1784

Figure 1 shows the fitted densities for $K = 6$ for the start and the end of the sample and compares them against histograms. The distribution of disposable income is right-skewed. The approximated densities capture the form of the histograms and have a smooth surface.

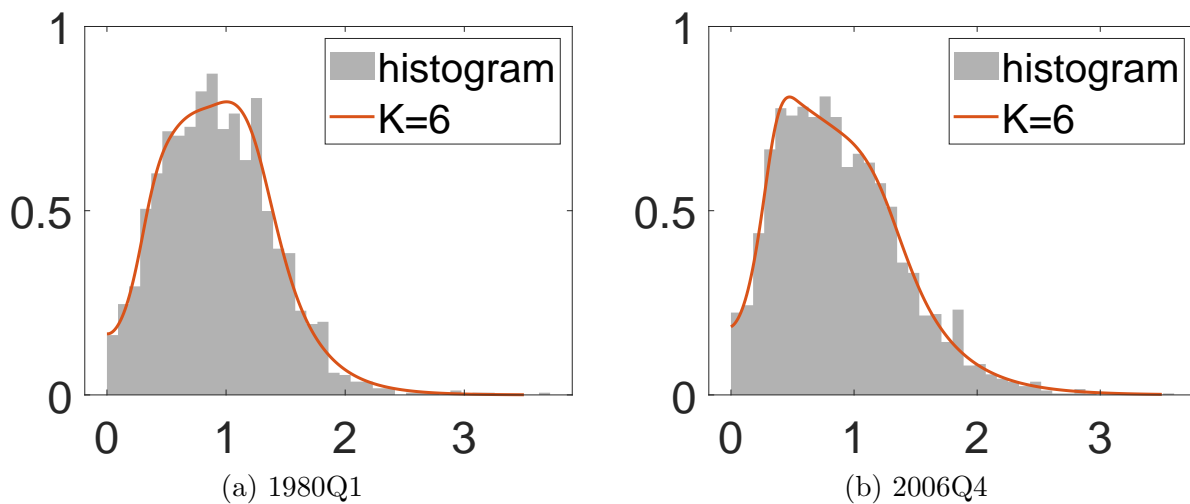


Figure 1: Fitted densities of disposable income distribution

Figure 2 presents percentiles of the estimated densities over time and compares them against their sample counterparts. The estimated percentiles move in tandem with the sample percentiles, indicating that the fitted densities capture well the evolution of cross-sectional disposable income over time. The 80th and 90th percentiles exhibit a pronounced increase in disposable income at the beginning of the 1980s. While this increase is permanent at the 90th percentile, disposable income at the 80th percentile falls below its initial value

at the end of the sample. The 10th, 20th, 30th, 40th, and 50th percentile evolve almost in parallel over time. Similar to the 80th percentile, the median and the percentiles below experience a decrease in level over the sample period.

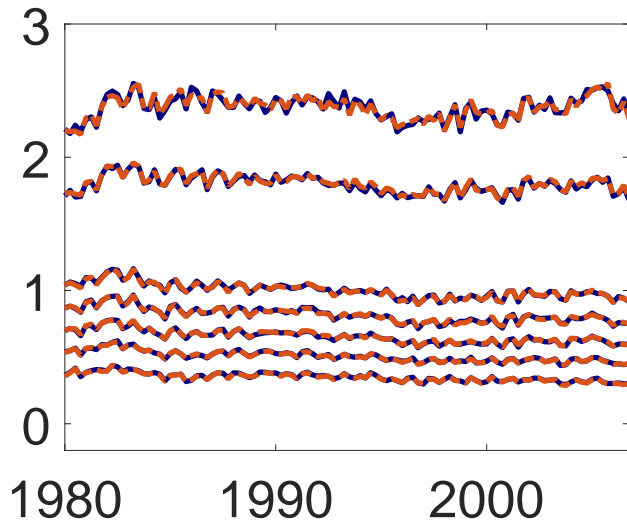


Figure 2: Percentiles (10th, 20th, 30th, 40th, 50th, 80th, and 90th) of disposable income distribution; sample percentiles (red), estimated percentiles (blue)

2.2 Data and identification

I estimate the model for the US for the period 1980Q1 – 2006Q4 using three types of quarterly data: (i) exogenous tax policy changes, (ii) macroeconomic time series, and (iii) cross-sectional data on disposable income. While data on exogenous tax policy changes and macroeconomic outcomes is available for the entire postwar period, quarterly cross-sectional data on disposable income is only available since 1980, thus determining the start of the sample.

Exogenous tax policy changes I use a narrative tax policy shock series to identify the causal effects of tax policy changes, in particular the tax policy instruments of Mertens and Ravn (2014). These instruments build on the work of Romer and Romer (2009, 2010), who classified all major Federal tax liability changes between 1950 to 2006 according to their motivations given by the executive and legislative decisionmakers. Mertens and Ravn (2014)

retain those tax changes that were not implemented for reasons related to changes in current or prospective future economic conditions and those that were implemented less than 90 days after becoming law (Mertens and Ravn, 2011). For each of these identified exogenous and unanticipated tax policy changes, a quantitative measure of projected tax revenue change is constructed from narrative sources and scaled by nominal GDP. Hence, the resulting shock series can be interpreted as approximate changes in the average tax rate.

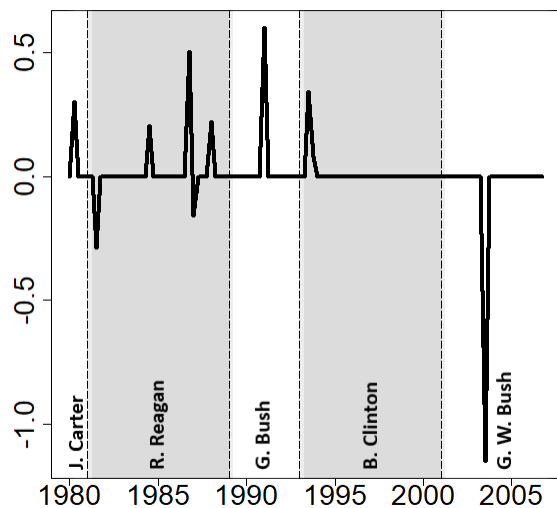


Figure 3: Narrative measure of unanticipated tax shocks of Mertens and Ravn (2014)

Figure 3 shows the shock instrument. For the 1980Q1 – 2006Q4 period, the series contains ten observations of tax liability changes. One of the changes falls in the presidency of Jimmy Carter, five in Ronald Reagan’s presidency, one in the George H.W. Bush presidency, two were legislated under Bill Clinton, and one under George W. Bush. Seven out of the ten changes increased the average tax rate. Tempalski (2006) or Romer and Romer (2009) include a detailed list on the tax bills major provisions.

To identify the structural effects of tax policy changes on macroeconomic and cross-sectional variables, I order the instrument first in the functional VAR model, a strategy pioneered by Kilian (2006) and Ramey (2011), and theoretically discussed in Plagborg-Møller and Wolf (2021).

Macroeconomic data Besides the tax policy shock instrument, I use five macroeconomic time series to estimate the model: (i) tax revenues, (ii) non-durable consumption expenditure, (iii) government spending, (iv) GDP, and (v) disposable income. I construct the variables from the National Income and Product Accounts (NIPA). All series are converted to per-capita terms and are used in log-levels. Appendix A includes a detailed data description.

Cross-sectional data Cross-sectional data on disposable income is constructed from the CEX conducted by the Bureau of Labor Statistics. I clean the data in the same way and apply the same definitions as in Heathcote et al. (2010). Appendix A summarizes the details. In panel (a) of Figure 4, I plot average log per-capita disposable income obtained from the CEX against log per-capita disposable income obtained from the NIPA tables. CEX disposable income is lower over the whole period, but follows a similar trend. The measurement error between CEX and NIPA income is well-documented in the literature and arises from underreporting in the CEX (Slesnick, 1992; Heathcote et al., 2010; Coeurdacier et al., 2015).

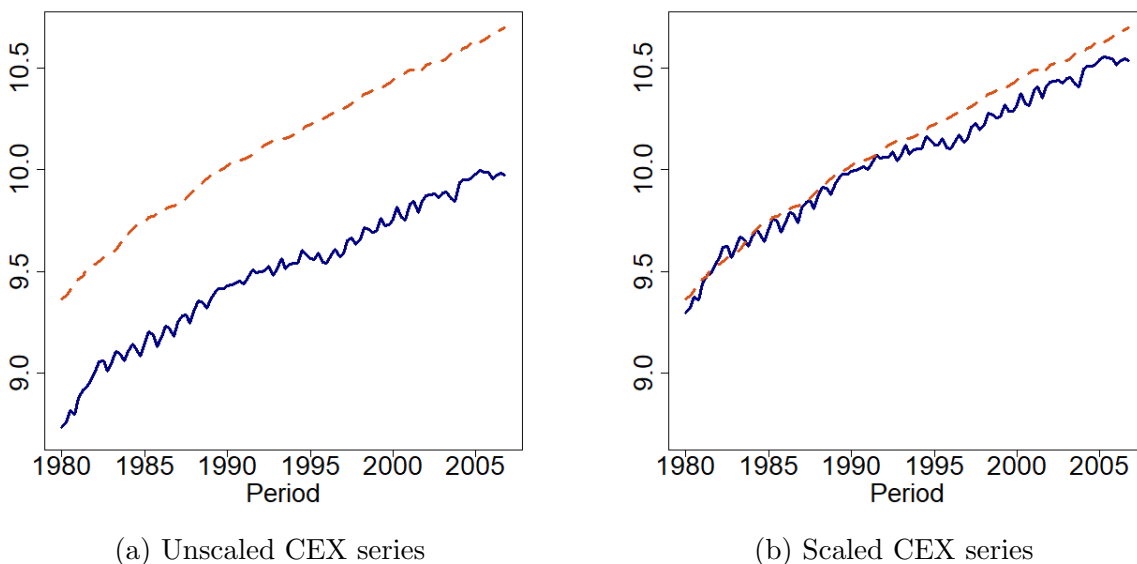


Figure 4: CEX average log per-capita disposable income (blue, solid) and NIPA log per-capita disposable income (red, dashed)

To remove the trend in the micro-level data and to correct for this underreporting bias I scale cross-sectional disposable income to the level of the aggregate. Let Y_t^D be NIPA aggregate per-capita disposable income and y_{it}^D cross-sectional per-capita disposable income from CEX. I calculate the scaling factor as $\frac{1}{T} \sum_{t=1}^T \text{median}(y_{it}^D, \dots, y_{Nt}^D)/Y_t^D \approx 0.57$ and define $y_{it}^{D*} = y_{it}^D/(0.57 \cdot Y_t^D)$. Hence, if $y_{it}^{D*} = 1$ the individual's disposable income corresponds to the level of aggregate disposable income per capita. The scaled micro-level series is plotted in panel (b) of Figure 4. To retain zero, or close-to-zero, observations of cross-sectional disposable income, I apply an inverse hyperbolic sine transformation to obtain x_{it} .

3 New insights on the effects of tax shocks

While the aggregate effects of tax shocks are well-studied, their distributional consequences are still undetermined. The fVAR allows me to quantify both in a unified framework.

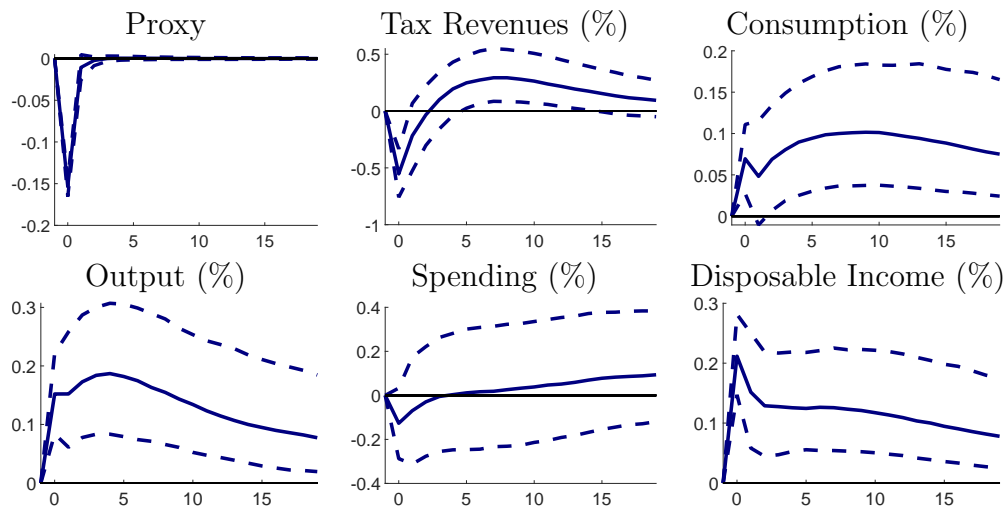


Figure 5: Aggregate responses to a one standard deviation tax cut; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

Aggregate responses I first outline the aggregate dynamics. Figure 5 displays the impulse responses of the aggregate variables in the fVAR to a one standard deviation tax cut. The solid lines show the posterior median responses, while the dashed lines represent the

corresponding 68-percent credible bands. The system is in steady-state at horizon $h = -1$ and the shock occurs at $h = 0$. The responses of the aggregate variables are qualitatively in line with previous findings in the literature (Mertens and Ravn, 2013, 2014). Tax revenues decrease on impact by 0.5 percent on the median and become positive within one year. The tax cut leads to an immediate increase in median consumption expenditure by 7 basis points and does not have an instantaneous effect on government spending. Output and disposable income show a similar pattern: the two variables rise on impact on the median by 15 and 21 basis points, respectively and stay above zero for four years.

Distributional responses How does the increase in aggregate disposable income change the cross-sectional distribution? Figure 6 shows the response of the disposable income distribution to a one standard deviation tax cut. These results are new to the literature.

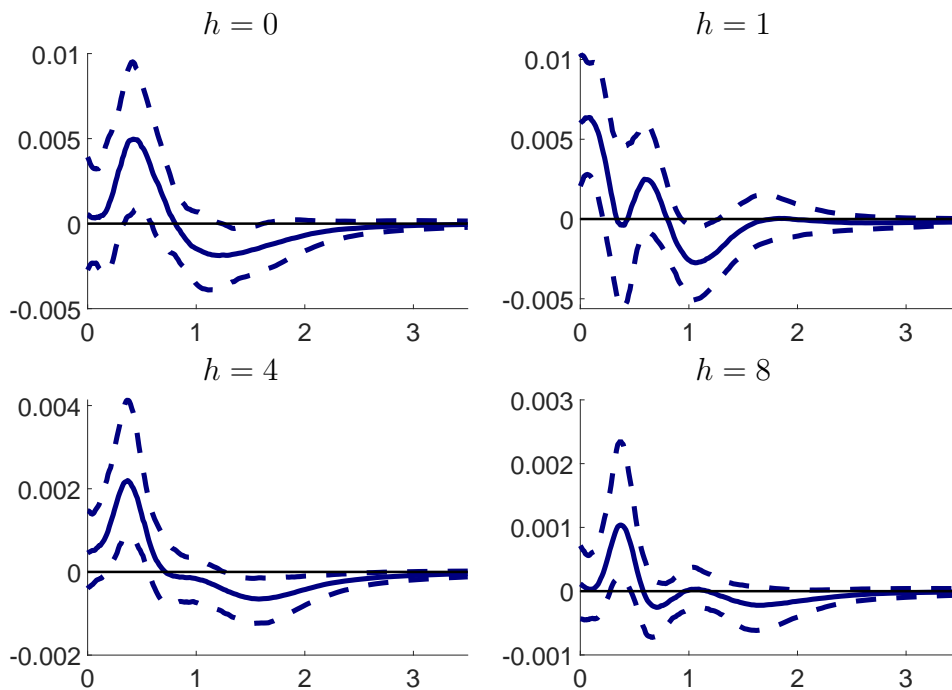


Figure 6: Density responses to a one standard deviation tax cut; median (blue, solid), 68-percent credible interval (blue, dashed)

The panels display the difference between the steady-state disposable income density and the shocked density for different horizons h . The x-axis shows the level of disposable income

and a value of one corresponds to an individual who has aggregate disposable income per capita available. The top-row panel on the left ($h = 0$) depicts the impact response. Because aggregate disposable income increases in response to the tax cut, the probability mass of the shocked density shifts to the right relative to the steady-state density.

The mass of individuals with less than aggregate disposable income per capita increases significantly over all horizons. This means that a larger proportion of the population falls below the average disposable income level, indicating a widening income gap and potentially increasing inequality. Most of the probability mass is added between 0 and 0.5. The mass of individuals with more than aggregate disposable income per capita and 2.5 drops significantly after one year, whereas the mass of individuals with disposable income over 2.5 is not affected by the tax shock. After eight quarters the negative density differential for disposable income between 0.6 and 2.8 reverts back to zero, while the positive differential for after-tax income between 0 and 0.6 is more persistent.

A major advantage of the fVAR model is that the response of the cross-sectional density can be converted into any distributional statistic. Figure 7 illustrates percentile responses to a one standard deviation tax cut. The percentile responses are computed as percentage changes relative to their steady-state level. All percentiles, except the 99th, shift down relative to their steady-state position. The tax cut has the largest impact on the 5th percentile, which declines significantly by more than one percent. From the 10th to the 95th percentile the decline becomes smaller and less persistent. Only the 99th percentile experiences a slight and short-lived increase. The observed percentile responses reflect an extreme concentration of income gains at the very top of the distribution, specifically above the 99th percentile. The finding is consistent with the density response in Figure 6, thus providing evidence that after a tax cut the mass in the left tail of the disposable income distribution is increasing.

The previous results show that tax cuts have heterogeneous distributional effects. In the following, I quantify the effects along the disposable income distribution. I compute the absolute effect of the tax change to shed light on (i) which percentile benefitted and (ii) by

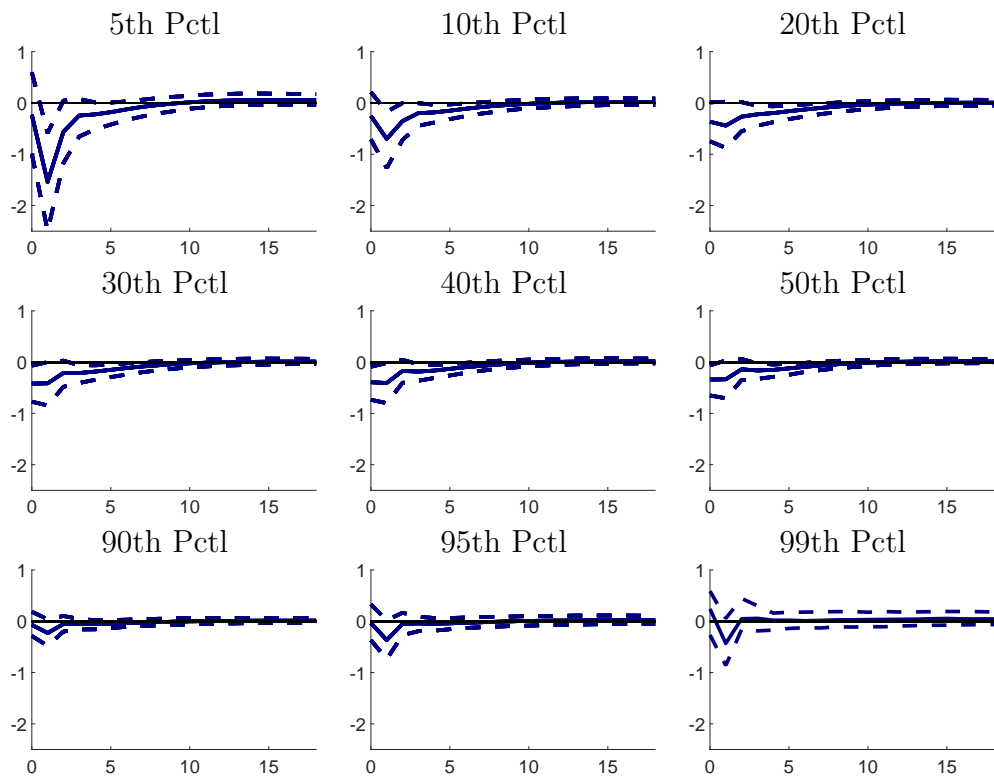


Figure 7: Percentile responses to a one standard deviation tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed)

how much from the tax cut. The absolute effect of the tax intervention per percentile is defined as

$$\underbrace{\left(\frac{\partial \ln x_{t+h}^{**}}{\partial IV_t} / \ln x^{ss} - 1 \right) \cdot 100}_{\text{Percentage change in log income at percentile ** relative to st.st. level}} + \underbrace{\frac{\partial Y_{t+h}^D}{\partial IV_t}}_{\text{Change in aggregate income}}, \quad h = 0, 1, \dots, H, \quad (6)$$

where $\frac{\partial Y_{t+h}^D}{\partial IV_t}$ is the response of aggregate disposable income to the tax shock IV_t , $\ln x^{ss}$ denotes the steady-state level of cross-sectional log disposable income and $\frac{\partial \ln x_{t+h}^{**}}{\partial IV_t}$ is the disposable income response at a certain percentile. For instance, $\frac{\partial \ln x_{t+h}^{90}}{\partial IV_t}$ is the response of log income to a tax cut at the 90th percentile. A positive absolute effect for a percentile means that the percentile has benefitted from the increase in aggregate disposable income, while a negative absolute effect states that the respective percentile is worse off after the tax change.

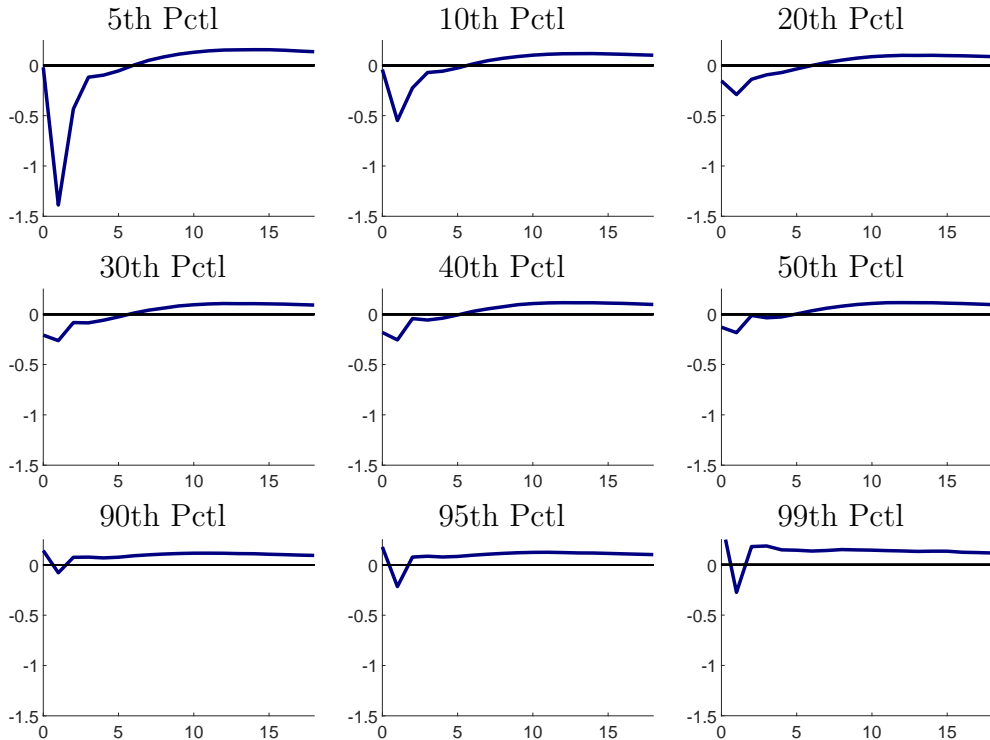


Figure 8: Absolute benefit (in percent) from a one standard deviation tax cut computed at the median.

Figure 8 displays the absolute effect of a one standard deviation tax cut on disposable income per percentile computed at the posterior median.³ The first finding is that the sign of the impact response differs across percentiles. While the percentiles at the bottom and center of the distribution are negatively affected by the tax cut, the immediate benefit becomes positive between the 80th and 90th percentile, growing toward the right tail of the distribution. Second, the differences in the size of the effect across percentiles are pronounced: whereas disposable income at the 5th percentile declines over the first year by 0.4 percent, disposable income at the 95th percentile increases in the same time by 0.11 percent and remains positive over the entire horizon.

To evaluate overall inequality, Figure 9 illustrates the dynamic responses of three income inequality measures (90-10, 50-10, and 90-50 ratios) following a one standard deviation tax cut. The 90-10-ratio summarizes the overall dispersion, while the 50-10 ratio, and the 90-50 ratio represent the dispersion in the left and right tail, respectively. All three ratios exhibit a significant increase, indicating a swift rise in inequality across the income distribution. The 90-10 and 90-50 ratios show more persistent effects, with elevated inequality lasting several quarters before gradually declining. In contrast, the 50-10 ratio displays a more transient response, quickly reverting close to its initial level. This pattern suggests that while the shock initially widens income gaps across the entire distribution, its longer-term effects are more pronounced in the upper half, potentially indicating a lasting benefit to higher-income groups confirming the previous evidence.

In summary, the average exogenous tax cuts in the US during the 1980 to 2006 period lead to an increase in after-tax income inequality: following a tax cut, aggregate disposable income increases, shifting the entire income distribution rightward. This shift is accompanied by significant changes in the distribution's shape. There's an increase in the mass of the left tail and a hollowing out of the middle class, indicating income polarization. Paradoxically, despite overall income growth, all percentiles up to the 98th shift downward relative to

³Appendix C contains the corresponding plot with credible bands.

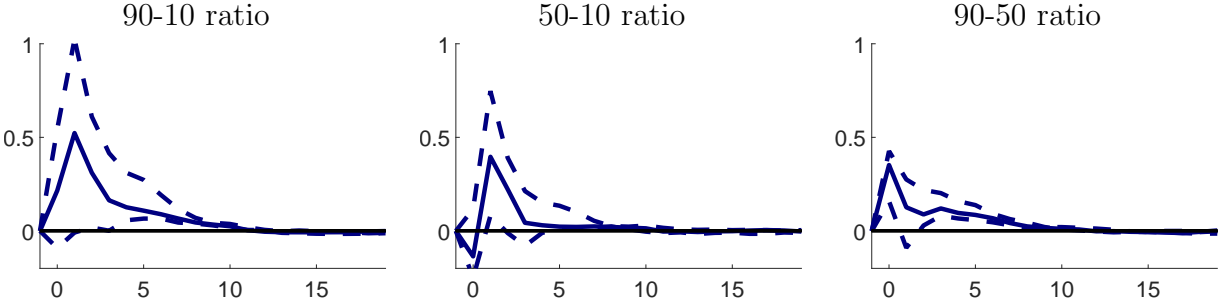


Figure 9: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed)

their previous positions, with only the 99th percentile moving up. This suggests highly concentrated gains at the top. Inequality measures corroborate these findings: the 90-10, 50-10, and 90-50 income ratios all spike immediately after the tax cut. While the 50-10 ratio quickly reverts, indicating transient effects on lower-income inequality, the 90-10 and 90-50 ratios show more persistent increases. This pattern implies that average tax cuts, while boosting aggregate income, exacerbate income inequality, particularly benefiting the highest earners while potentially leaving the majority of the population relatively worse off despite absolute income gains.

Discussion To analyze the role of government redistribution, I add social transfers as an additional variable to the set of macroeconomic aggregates in the fVAR model. The response of social transfers is shown in Figure 10. Following the tax cut, social transfers decline significantly, reaching a maximum decrease of approximately 0.2 percent after 5-7 quarters. The credible bands, spanning from -0.4 to 0.2 percent, indicate substantial uncertainty about the magnitude but support a generally negative response.

Changes in social transfers alone cannot explain the increased inequality documented earlier. While transfers decline for both groups, the slightly smaller reduction for below-median income households actually works against the overall increase in inequality we observe. Since inequality increases despite this pattern in transfer responses, other channels must be driving the disequalizing effects of tax cuts.

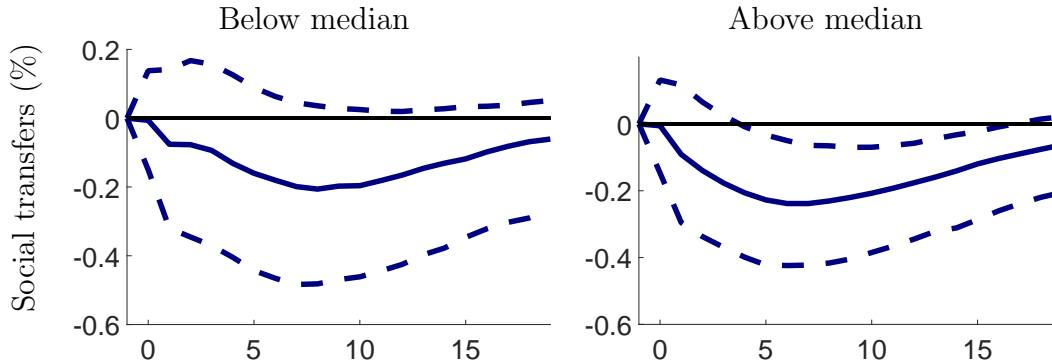


Figure 10: Response of social transfers to a one standard deviation tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed)

Having established that social transfers do not explain the increases in inequality, I next examine labor market responses to better understand the underlying mechanisms. To account for the labor market impacts of tax changes, I sequentially add the log of total employment per capita, the log of hours worked, and the log of the labor force relative to population to the set of aggregate variables. These labor market outcomes are constructed using the same data sources and definitions as in Mertens and Ravn (2013).

The labor market responses shown in Figure 11 provide insight into how tax cuts affect different segments of the income distribution. For both below and above median income groups, the effects operate through extensive margin (total employment and labor force participation) and intensive margin (hours worked) adjustments.

Total employment increases for both groups, though with different magnitudes. While individuals below the median experience a brief increase of about 0.01 percent, those above the median show a stronger and more persistent response of up to 0.1 percent. Both responses exhibit relatively tight credible bands in the first quarters, indicating robust effects.

The intensive margin responses also differ between groups. Hours worked increase modestly for both groups, with slightly larger effects for those below the median. However, the wide credible bands, particularly after the first few quarters, indicate substantial uncertainty about these effects regardless of income position.

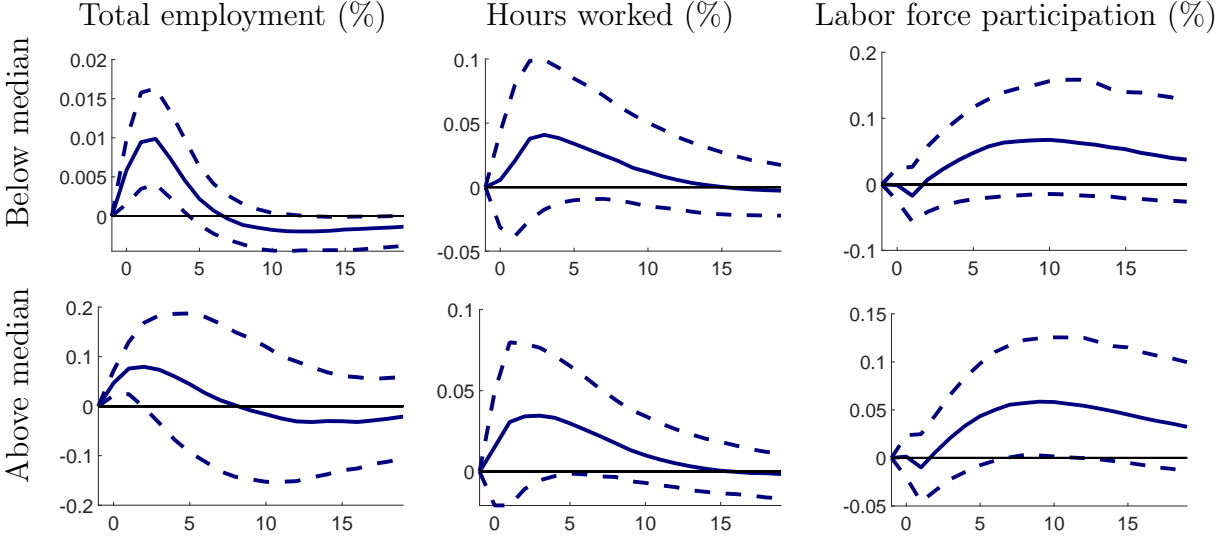


Figure 11: Response of labor market variables to a one standard deviation tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed)

Labor force participation shows the most similar pattern across groups, with both experiencing gradual increases but wide credible bands that include the possibility of negative effects in early quarters. The uncertainty in these extensive margin responses is particularly pronounced for below-median income individuals.

These labor market dynamics reveal that while tax cuts stimulate overall labor market activity, the employment benefits accrue more strongly to those above the median income. However, the relatively similar patterns in hours worked and labor force participation suggest that differences in extensive margin employment effects, rather than individual labor supply decisions, drive the uneven distribution of benefits from tax cuts. This pattern could reflect several mechanisms. Tax cuts might disproportionately stimulate job creation in sectors requiring higher skills or more experience, where above-median income individuals are typically employed. Additionally, these individuals often have better established professional networks and face fewer labor market frictions, allowing them to take advantage of new employment opportunities more quickly. The stronger employment response for above-median income individuals is also consistent with a “skill-biased” response to tax cuts, where the resulting economic stimulus generates employment opportunities that favor workers with

higher existing earnings capacity.

Robustness To ensure the robustness of my results, I conduct several sensitivity analyses by incorporating additional variables into the aggregate conditioning set. These analyses address fiscal policy expectations and tax progressivity over time.

Following Leeper et al. (2012) and Leeper et al. (2013), I construct an average forward tax rate derived from tax-exempt municipal bonds and Treasury securities with one-year and five-year maturities. For the period 1980Q1 to 2006Q4, I utilize yield data on AAA-rated municipal bonds from Bloomberg’s Municipal Fair Market Bond Index and market yields on constant-maturity-adjusted, non-inflation-indexed US Treasury securities from the Federal Reserve’s Statistical Release on Selected Interest Rates.

To control for changes in tax progressivity over time, I employ a measure constructed following Ferriere and Navarro (2024), defined as:

$$P = \frac{AMTR - ATR}{1 - ATR}$$

where AMTR is the Average Marginal Tax Rate and ATR is the Average Tax Rate. In a log-linear tax system, this progressivity measure (P) corresponds to the parameter capturing the curvature of the tax function.

The results of these sensitivity analyses are presented in Appendix C.

4 Decomposing the effects

While the baseline results in Section 3 focus on the distributional effects of the average exogenous tax rate changes implemented between 1980 and 2006, in this section I provide evidence on the distributional effects of different tax types. I follow Mertens and Ravn (2013) and decompose the average tax rate changes into personal and corporate income tax changes separately. Moreover, I use additional microlevel information to split the disposable income

distribution according to different personal characteristics. In particular, I differentiate between disposable income from (i) entrepreneurs and non-entrepreneurs, and (ii) families and non-families.

4.1 Nature of the change in tax code

To investigate the distributional effects of different tax types, I employ the narrative personal income and corporate income tax shock series derived in Mertens and Ravn (2013). Personal income tax liability changes mainly include marginal rate adjustments and tax deductions and credits. Corporate income tax liability changes incorporate mostly adjustments in depreciation allowances and investment tax credits. Across the 1980 to 2006 sample, Mertens and Ravn (2013) identify seven personal income and six corporate income tax changes.

To estimate the structural effects of personal and corporate income tax shock series, I include the two proxy variables in the vector of aggregate macroeconomic variables Y_t and use sign and covariance restrictions to identify the two shocks separately. Instead of tax revenues, like in the baseline specification outlined in Section 2.2, I include as Mertens and Ravn (2013) the average personal and corporate income tax rates, respectively.⁴

⁴Appendix A outlines their construction.

Table 3: Identifying restrictions

	Personal income tax shock	Corporate income tax shock
	Covariance restrictions	
	$E(IV_t^{PI}, \epsilon_t^{PI}) \geq 0$	$E(IV_t^{CI}, \epsilon_t^{CI}) \geq 0$
	$E(IV_t^{PI}, \epsilon_t^{PI}) \geq E(IV_t^{PI}, \epsilon_t^{CI})$	$E(IV_t^{CI}, \epsilon_t^{CI}) \geq E(IV_t^{CI}, \epsilon_t^{PI})$
Variable	Sign restrictions	
Personal income tax rate	≤ 0	•
Corporate income tax rate	•	≤ 0

Notes: Covariance restrictions and restrictions on the contemporaneous responses of variables to shocks. ≤ 0 and • denote the respective sign restrictions and unrestricted responses. PI and CI stands for personal income and corporate income, respectively.

Table 3 summarizes the identifying restrictions I use to separate the tax changes. Additional identifying restrictions become necessary because the personal and corporate income proxy series exhibit positive correlation (Mertens and Ravn, 2013). I follow Giacomini et al. (2022), by employing the same sign and covariance restrictions to decompose average tax changes into personal and corporate income tax changes. IV_t^{PI} and IV_t^{CI} denote the personal income and corporate income proxy variable and ϵ_t^{PI} and ϵ_t^{CI} represent the corresponding structural shock. It is assumed that each proxy variable is positively correlated with its associated structural shock and that each proxy variable is stronger correlated with its own structural shock than with the structural shock associated with the other proxy variable. Moreover, it is assumed that the response of each tax rate to its own structural shock following a tax cut is nonpositive.

Figure 12 shows the identified impulse responses to the aggregate variables.⁵ The left panel displays the responses to a one standard deviation personal income tax cut and the right panel illustrates the corporate income tax cut responses. Except for the only on impact

⁵To enhance visibility, the response of the proxy variable associated with the unconsidered structural shock (left panel: CI; right panel: PI) is not displayed. My findings are in line with the respective responses presented in Giacomini et al. (2022) and are available on request.

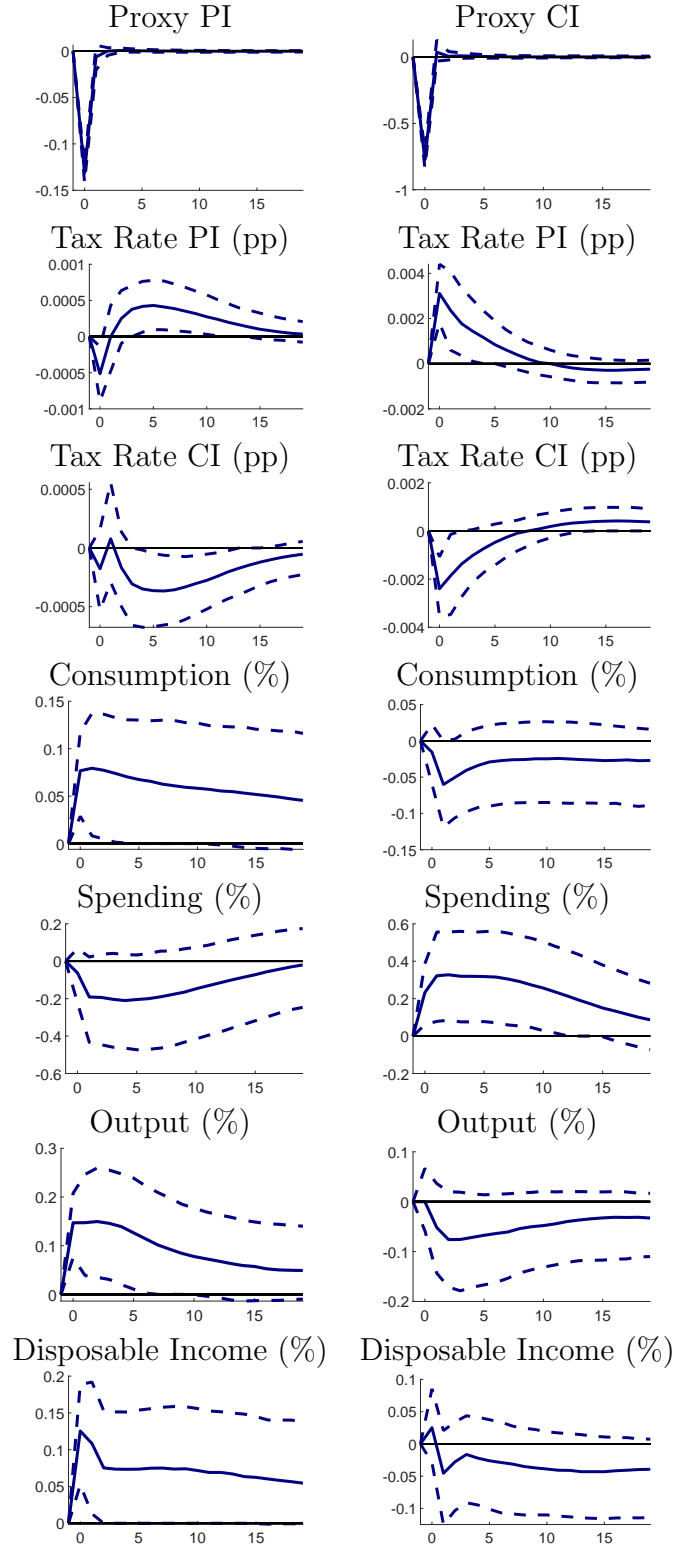


Figure 12: Aggregate responses to a one standard deviation personal (left panel) and corporate income(right panel) tax cut; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$. PI and CI stands for personal and corporate income, respectively.

positive output response following a corporate income tax cut, the findings are qualitatively in line with what was found in earlier and longer-spanning samples in the literature. By construction, the impact response of the tax rates associated with the structural shock of interest satisfy the sign restrictions. The personal income tax rate (left panel) and the corporate income tax rate (right panel) both decline. While a personal income tax cut decreases government spending by at most 20 basis points, a corporate income tax cut elicits a positive response of circa 20 basis points on impact at the median. Following a personal income tax cut, consumption and output increase over a period of five years, whereas a corporate income tax cut only produces on impact a slight positive response in output that is not precisely estimated. Both the personal and the corporate income tax cuts increase disposable income on impact: in the left panel disposable income rises on impact by twelve basis points and stays above its initial level for 20 quarters. Corporate income tax cuts lead to a less strong increase in aggregate disposable income. After an initial increase of three basis points, the response becomes negative, reverting back to zero after five years. However, the bands are wide including both positive and negative values.

The effects of personal income tax and corporate income tax cuts on income inequality measures shown in Figure 13 reveal distinct patterns. Personal income cuts generally lead on impact to increases in inequality across all measures (90-10, 50-10, and 90-50 ratios). Following the initial increase, inequality measures show a downward trend after two quarters. However, this decline is accompanied by widening credible sets, indicating increasing uncertainty in the estimates over time. In contrast, corporate income cuts show often opposing effects: an initial decrease in the 90-10 and 50-10 ratios, followed by a quick reversion towards baseline, while the 90-50 ratio experiences a slight increase before stabilizing. These differentiated impacts contrast with the more uniformly inequality-increasing effects observed for aggregate tax cuts. Notably, corporate income cut effects are estimated with greater uncertainty, as evidenced by wider confidence intervals.

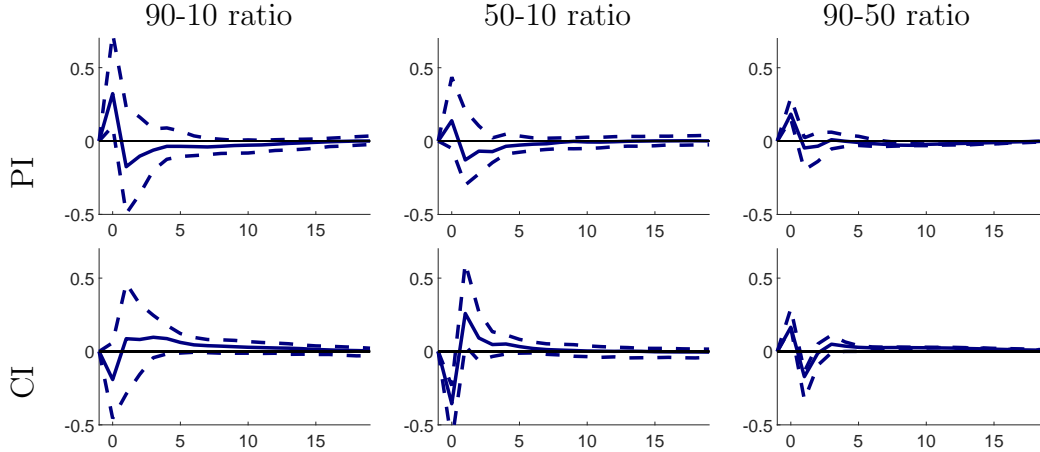


Figure 13: Response of 90/10 , 90/50, and 50/10 ratios to a one standard deviation tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed). Top panel: personal income tax cut (PI); bottom panel: corporate income tax cut (CI).

4.2 Personal characteristics

To investigate the heterogenous distributional effects of personal and corporate income tax cuts further, I partition the disposable income distribution according to personal characteristics. To learn which groups governments target when implementing their tax policy changes, I revert to the anecdotal evidence accompanying the tax policy process in the US. In particular, I study presidential speeches, the US Budget Reports, and the Economic Reports of the President.⁶ Over the entire sample, and, independent of the government’s political background, three narratives repeatedly emerge: tax changes (i) are directed toward low-income people, (ii) are pro-business, and (iii) pro-family. For instance, George W. Bush stated, on May 28, 2003, on the occasion of signing the Jobs and Growth Tax Relief Reconciliation Act:⁷

⁶Presidential speeches are retrieved from “The American Presidency Project”, accessible via <https://www.presidency.ucsb.edu/>. The Budget of the United States Government contains the Budget Message of the President, information on the President’s priorities, budget overviews organized by agency, and summary tables for every fiscal year. It can be accessed via <https://fraser.stlouisfed.org/title/budget-united-states-government-54?browse=1920s>. The Economic Report of the President is an annual report written by the Chairman of the Council of Economic Advisers. It can be accessed via <https://fraser.stlouisfed.org/title/economic-report-president-45?browse=1940s>.

⁷Appendix B provides a collection of further relevant examples from the narrative sources.

“We are helping workers who need more take-home pay. We’re helping small-business owners looking to grow and to create more new jobs. We’re helping families with children who will receive immediate relief.”

To assess these narratives empirically, I distinguish between disposable income (i) of entrepreneurs versus non-entrepreneurs, and (ii) families versus non-families. Entrepreneurs are defined as households with business income $\neq 0$. Families are defined as having at least one person below the age of 18 in their household. Appendix A provides all details.

Entrepreneurs Figure 14 compares the steady-state densities for entrepreneurs and non-entrepreneurs. The x-axis indicates the level of after-tax income. Both distributions are

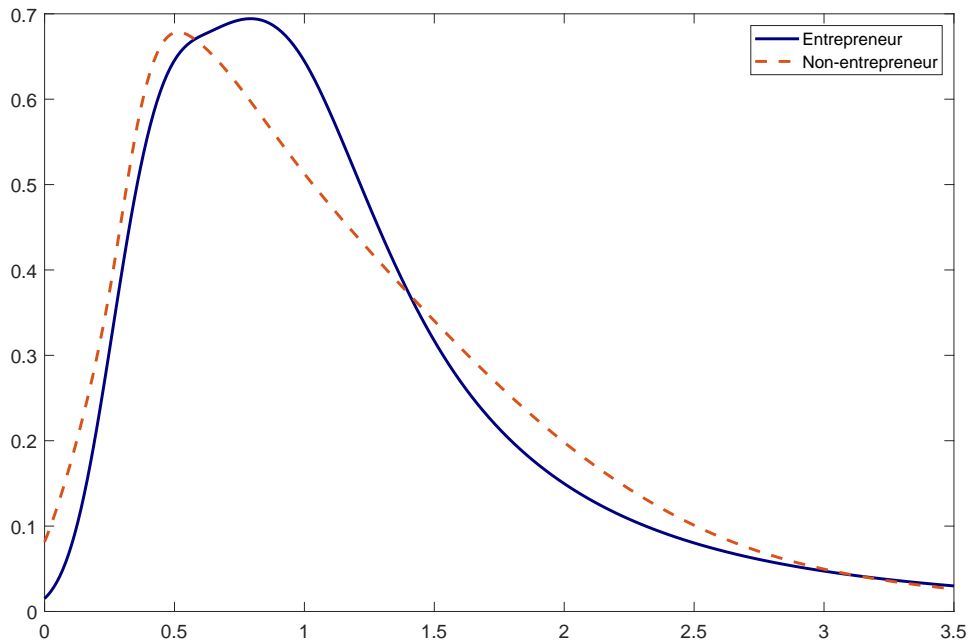


Figure 14: Steady-state density of disposable income of entrepreneurs (blue, solid) and non-entrepreneurs (red, dashed) income.

right-skewed and exhibit a similar shape. The mode of the disposable income distribution of entrepreneurs is shifted to the right. Figure 15 illustrates the aggregate response of disposable income for both entrepreneurs and non-entrepreneurs. For both entrepreneurs and non-entrepreneurs, disposable income shows a similar pattern: after a brief initial increase, it turns negative and remains below trend for approximately four years. While the wide credible

intervals, spanning both positive and negative values, indicate uncertainty about the precise effects, the similar aggregate responses suggest that neither group benefits more from US tax policy overall. However, examining the distributional responses reveals distinct patterns between entrepreneurs and non-entrepreneurs. Figure 16 illustrates the differential impact of corporate income tax cuts on income inequality among entrepreneurs and non-entrepreneurs. For entrepreneurs, all three inequality measures (90-10, 50-10, and 90-50 ratios) show larger initial increases compared to non-entrepreneurs. The 90-10 and 90-50 ratios remain elevated, indicating a persistent widening of overall and upper-half income disparities within this group. In contrast, the 50-10 ratio quickly returns to baseline, suggesting temporary effects on lower-half inequality. Non-entrepreneurs experience smaller, more volatile, and less persistent changes across all inequality measures. This differential response suggests that tax policy has particularly strong distributional effects among entrepreneurs. While the stable 50-10 ratio indicates uniform impacts on lower-income entrepreneurs, the persistently elevated 90-50 ratio reveals that higher-income entrepreneurs benefit more than those in the middle of the distribution. This pattern suggests that corporate tax cuts disproportionately benefit larger enterprises, while middle- and small-income entrepreneurs see less favorable outcomes.

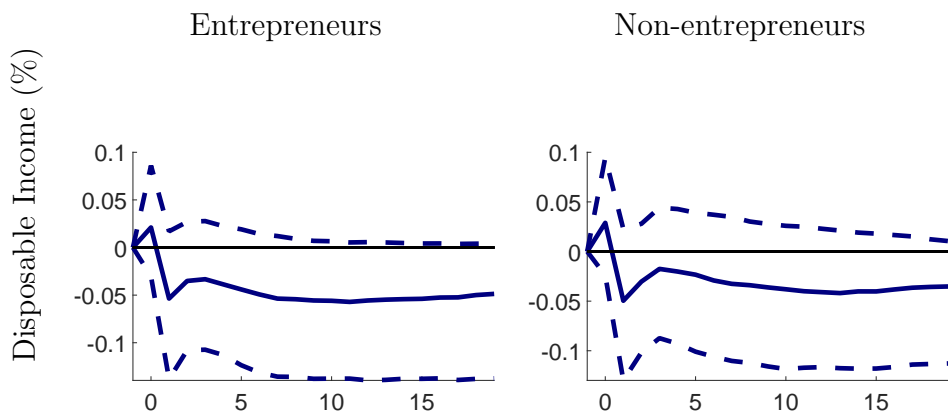


Figure 15: Aggregate response of disposable income to a one standard deviation corporate income tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed). Left panel: entrepreneurs; right panel: non-entrepreneurs.

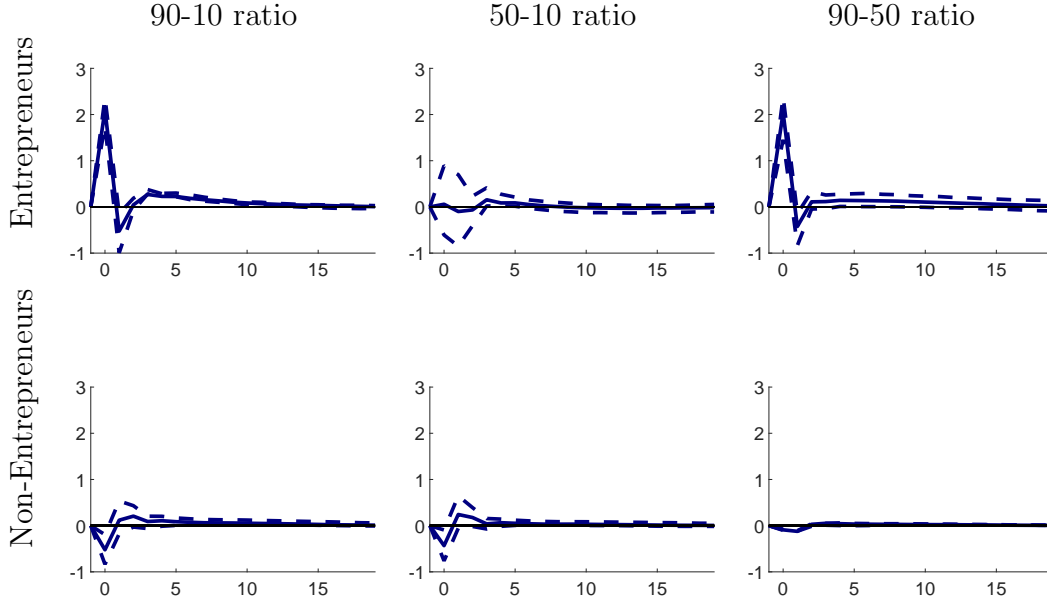


Figure 16: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation corporate income tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed). Top panel: entrepreneurs; bottom panel: non-entrepreneurs.

Families In the next step, I look at the distributional effects for families and non-families. Figure 17 shows the steady-state densities for families and non-families. Both distributions are right-skewed. The mode of the disposable income distribution of families lies at 0.7, while the disposable income distribution of non-families peaks at an income level of 0.5. Figure 18 shows the aggregate disposable income response for families and non-families. Both groups exhibit similar patterns, with non-families' income rising by 15 basis points on impact and families' by 11 basis points. This evidence challenges the political narrative that tax cuts specifically target and benefit families, as non-families show a marginally stronger response.

Figure 19 illustrates the differential impact of personal income tax cuts on income inequality measures for families and non-families. For families, all three inequality ratios (90-10, 50-10, and 90-50) show initial increases followed by significant decreases, settling near or slightly below their initial levels. This pattern suggests a small overall reduction in inequality for families. Non-families, conversely, experience sharp but brief downward spikes

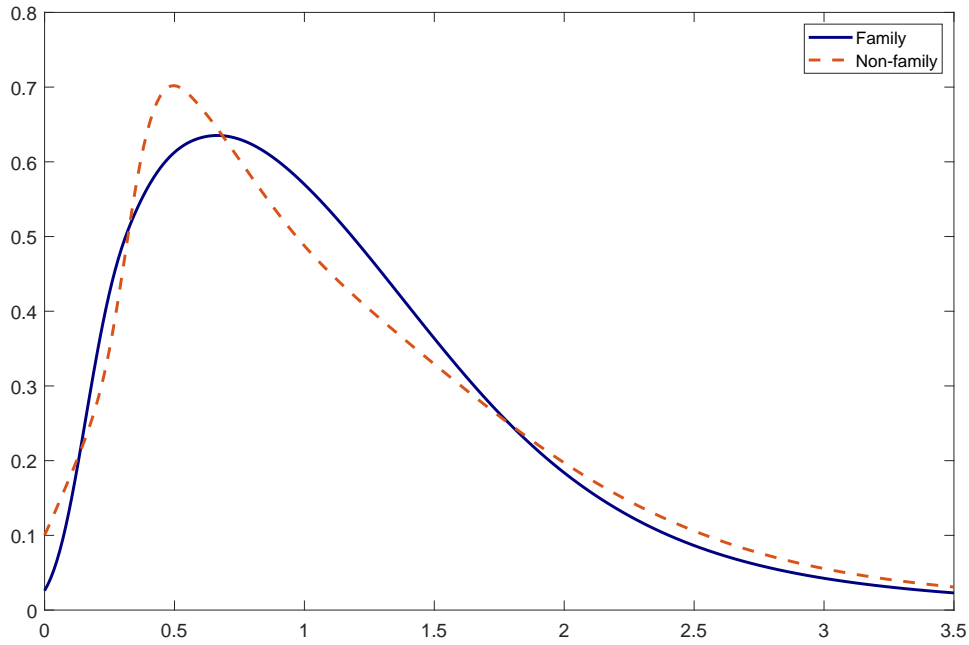


Figure 17: Steady-state density of disposable income partitioned into disposable income from families (blue, solid) and non-families (red, dashed).

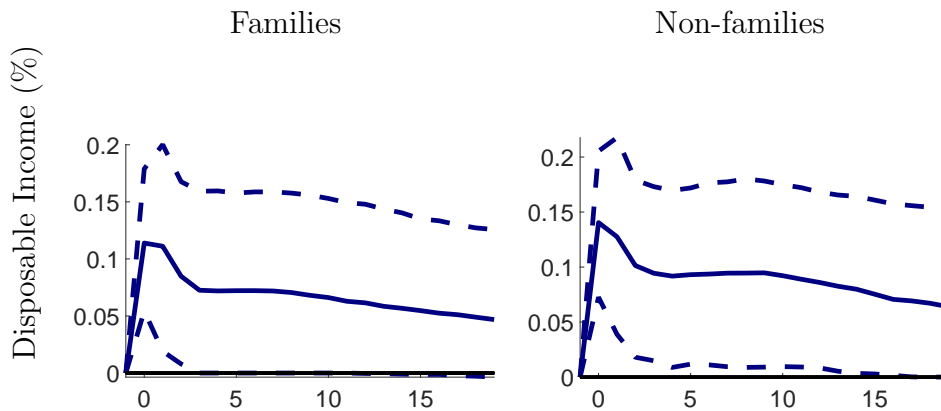


Figure 18: Aggregate response of disposable income to a one standard deviation corporate income tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed). Left panel: families; right panel: non-families.

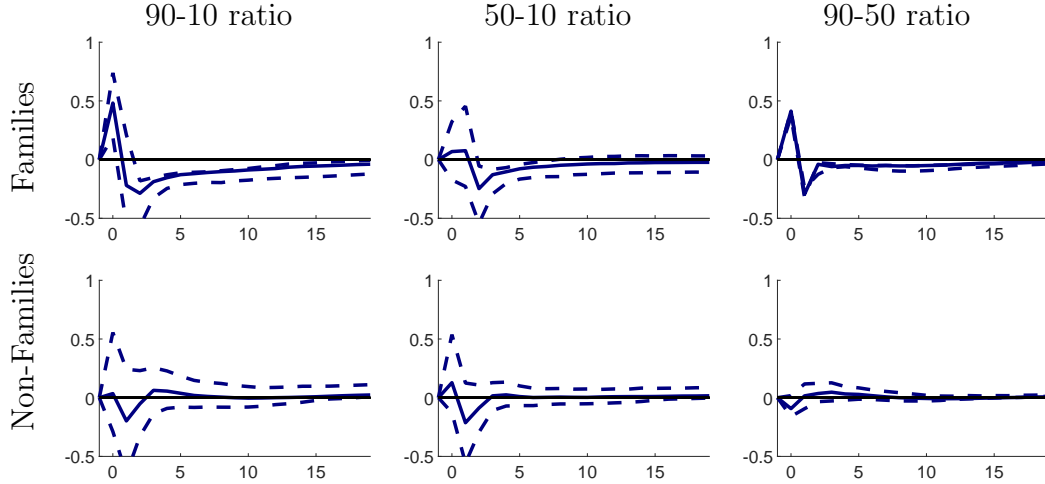


Figure 19: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation personal income tax cut in percent; median (blue, solid), 68-percent credible interval (blue, dashed). Top panel: families; bottom panel: non-families.

in all measures after one quarter, quickly returning to baseline with wide confidence intervals indicating high uncertainty. These patterns demonstrate that tax cuts have stronger and more persistent distributional effects on families than non-families. While the overall reduction in family income inequality is modest, the consistent and significant changes for families contrast with the transient, uncertain effects observed for non-families, indicating that tax policy more substantially influences income distribution within family units.

The distributional effects of tax cuts differ markedly between entrepreneurs and families. For entrepreneurs, inequality increases persistently, particularly in the upper half of the distribution (90-50 ratio), while lower-half inequality shows no significant change. This suggests that higher-income entrepreneurs benefit more than those in the middle of the distribution. In contrast, families experience an overall reduction in inequality, with all three inequality measures declining and settling below their initial levels. These patterns reveal that while tax cuts concentrate benefits among high-income entrepreneurs, they lead to more evenly distributed gains across the family income distribution. This contrast is particularly noteworthy as both groups are explicitly targeted by tax policy, yet experience fundamentally different distributional outcomes.

The decomposition in Section 4.2 illuminates the overall inequality increase following an aggregate tax shock, as discussed in Section 3. While inequality decreases for families and shows no significant change for non-families and non-entrepreneurs, it increases for entrepreneurs, particularly in the right tail of their distribution. This aligns with the findings of Smith et al. (2023), who demonstrate that entrepreneurs are disproportionately represented at the top of the income distribution. Their work suggests that changes in business income, primarily associated with entrepreneurs, play a significant role in overall income inequality trends. My results corroborate this view, indicating that the rise in entrepreneur inequality, especially among high earners, is the primary driver of the overall increase in inequality observed. Thus, the aggregate effect on inequality is predominantly supported by changes within the entrepreneurial segment of the income distribution, underscoring the outsized impact of high-income entrepreneurs on overall inequality measures.

5 Conclusion

How tax changes affect the distribution of income is a long-standing question in macroeconomics. In this paper, I provide the first comprehensive empirical analysis and estimate a fVAR model that interacts macroeconomic aggregates and the cross-sectional distribution of disposable income on US data for the 1980 to 2006 period. This setup allows me to quantify the distributional effects of aggregate tax shocks.

My findings provide evidence that the average tax cut in this period boosted GDP and aggregate disposable income, but the benefits are spread unevenly across households: it hurts households at the bottom and center of the distribution of disposable income and benefitted the rich. The increase in overall inequality is primarily driven by rising disparities among entrepreneurs, particularly in the upper tail of their distribution, while other groups show either declining inequality (families) or no significant changes (non-entrepreneurs and non-families).

Decomposing the cross-sectional disposable income distribution according to personal characteristics allows me to verify prevalent narratives surrounding US tax policy legislation. My findings do not support political statements that US tax policy benefitted low-income households, entrepreneurs and families. While both targeted groups (entrepreneurs and families) experience similar aggregate disposable income changes as their non-targeted counterparts, their distributional responses differ markedly. Among entrepreneurs, benefits concentrate among high-income earners, contradicting claims of broad entrepreneurial support. For families, despite more evenly distributed effects and reduced inequality within the group, they do not gain more than non-families in aggregate terms.

Although my analysis is silent on the long-term relationship between rising US income inequality and the contribution of tax policy, the results show that the analyzed tax changes have not shrunk the gap. I leave for future work the linking of the response of the distribution of disposable income to micro-level consumption expenditure and identifying the individuals in the distributions according to their micro-level characteristics.

References

- Auerbach, A. J. and Gorodnichenko, Y. (2012). Measuring the output responses to fiscal policy. *American Economic Journal: Economic Policy*, 4(2):1–27.
- Auerbach, A. J., Grinberg, I., Barthold, T., Bull, N., Elkins, W. G., Moomau, P., Moore, R., Page, B., Pecoraro, B., and Pomerleau, K. (2017). Macroeconomic modeling of tax policy: A comparison of current methodologies. *National Tax Journal*, 70(4):819–836.
- Barro, R. J. and Redlick, C. J. (2011). Macroeconomic effects from government purchases and taxes. *The Quarterly Journal of Economics*, 126(1):51–102.
- Blanchard, O. and Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *The Quarterly Journal of Economics*, 117(4):1329–1368.
- Caldara, D. and Kamps, C. (2017). The analytics of SVARs: A unified framework to measure fiscal multipliers. *The Review of Economic Studies*, 84(3):1015–1040.
- Chan, J. C. C. (2022). Asymmetric conjugate priors for large bayesian vars. *Quantitative Economics*, 13(3):1145–1169.
- Chang, M., Chen, X., and Schorfheide, F. (2024). Heterogeneity and aggregate fluctuations. *Journal of Political Economy*, 0(ja):null.
- Cloyne, J. (2013). Discretionary tax changes and the macroeconomy: New narrative evidence from the United Kingdom. *American Economic Review*, 103(4):1507–28.
- Cloyne, J., Kurt, E., and Surico, P. (2023). Who gains from corporate tax cuts? Working Paper 31278, National Bureau of Economic Research.
- Cloyne, J., Martinez, J., Mumtaz, H., and Surico, P. (2022). Short-term tax cuts, long-term stimulus. Working Paper 30246, National Bureau of Economic Research.

- Cloyne, J. S. and Surico, P. (2017). Household debt and the dynamic effects of income tax changes. *The Review of Economic Studies*, 84(1 (298)):45–81.
- Coeurdacier, N., Guibaud, S., and Jin, K. (2015). Credit constraints and growth in a global economy. *American Economic Review*, 105(9):2838–81.
- Demirel, U. D. (2021). The short-term effects of tax changes: The role of state dependence. *Journal of Monetary Economics*, 117:918–934.
- Elmendorf, D. W., Furman, J., Gale, W. G., and Harris, B. H. (2008). Distributional effects of the 2001 and 2003 tax cuts: How do financing and behavioral responses matter? *National Tax Journal*, 61(3):365–380.
- Ferriere, A. and Navarro, G. (2024). The Heterogeneous Effects of Government Spending: It’s All About Taxes. *The Review of Economic Studies*.
- Francis, N. and Ramey, V. A. (2009). Measures of per capita hours and their implications for the technology-hours debate. *Journal of Money, Credit and Banking*, 41(6):1071–1097.
- Ghassibe, M. and Zanetti, F. (2022). State dependence of fiscal multipliers: the source of fluctuations matters. *Journal of Monetary Economics*, 132:1–23.
- Giacomini, R., Kitagawa, T., and Read, M. (2022). Robust Bayesian inference in proxy SVARs. *Journal of Econometrics*, 228(1):107–126.
- Guner, N., Kaygusuz, R., and Ventura, G. (2011). Taxation and Household Labour Supply. *The Review of Economic Studies*, 79(3):1113–1149.
- Guvenen, F. (2011). Macroeconomics with heterogeneity: A practical guide. Working Paper 17622, National Bureau of Economic Research.
- Heathcote, J., Perri, F., and Violante, G. L. (2010). Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006. *Review of Economic Dynamics*, 13(1):15–51. Special issue: Cross-Sectional Facts for Macroeconomists.

- Jackson, L. E., Otrok, C., and Owyang, M. T. (2019). Tax Progressivity, Economic Booms, and Trickle-Up Economics. Working Papers 2019-034, Federal Reserve Bank of St. Louis.
- Johnson, D. S., Parker, J. A., and Souleles, N. S. (2006). Household expenditure and the income tax rebates of 2001. *American Economic Review*, 96(5):1589–1610.
- Kilian, L. (2006). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. CEPR Discussion Papers 5994, C.E.P.R. Discussion Papers.
- Leeper, E. M., Richter, A. W., and Walker, T. B. (2012). Quantitative effects of fiscal foresight. *American Economic Journal: Economic Policy*, 4(2):115–144.
- Leeper, E. M., Walker, T. B., and Yang, S.-C. S. (2013). Fiscal foresight and information flows. *Econometrica*, 81(3):1115–1145.
- Mertens, K. and Montiel Olea, J. L. (2018). Marginal tax rates and income: New time series evidence. *The Quarterly Journal of Economics*, 133(4):1803–1884.
- Mertens, K. and Ravn, M. O. (2011). Understanding the aggregate effects of anticipated and unanticipated tax policy shocks. *Review of Economic Dynamics*, 14(1):27–54. Special issue: Sources of Business Cycles.
- Mertens, K. and Ravn, M. O. (2013). The dynamic effects of personal and corporate income tax changes in the United States. *American Economic Review*, 103(4):1212–47.
- Mertens, K. and Ravn, M. O. (2014). A reconciliation of SVAR and narrative estimates of tax multipliers. *Journal of Monetary Economics*, 68:S1–S19. Supplement issue: October 19-20, 2012 Research Conference on “Financial Markets, Financial Policy, and Macroeconomic Activity” Sponsored by the Study Center Gerzensee and the Swiss National Bank.
- Misra, K. and Surico, P. (2014). Consumption, income changes, and heterogeneity: Evidence from two fiscal stimulus programs. *American Economic Journal: Macroeconomics*, 6(4):84–106.

- Mountford, A. and Uhlig, H. (2009). What are the effects of fiscal policy shocks? *Journal of Applied Econometrics*, 24(6):960–992.
- Parker, J. A., Souleles, N. S., Johnson, D. S., and McClelland, R. (2013). Consumer spending and the economic stimulus payments of 2008. *American Economic Review*, 103(6):2530–53.
- Plagborg-Møller, M. and Wolf, C. K. (2021). Local projections and VARs estimate the same impulse responses. *Econometrica*, 89(2):955–980.
- Ramey, V. A. (2011). Identifying government spending shocks: It’s all in the timing. *The Quarterly Journal of Economics*, 126(1):1–50.
- Ramey, V. A. (2019). Ten years after the financial crisis: What have we learned from the renaissance in fiscal research? *Journal of Economic Perspectives*, 33(2):89–114.
- Romer, C. D. and Romer, D. H. (2009). A narrative analysis of postwar tax changes. Mimeo, University of California, Berkeley.
- Romer, C. D. and Romer, D. H. (2010). The macroeconomic effects of tax changes: Estimates based on a new measure of fiscal shocks. *American Economic Review*, 100(3):763–801.
- Slesnick, D. T. (1992). Aggregate consumption and saving in the postwar United States. *The Review of Economics and Statistics*, 74(4):585–597.
- Smith, M., Zidar, O., and Zwick, E. (2023). Top wealth in america: New estimates under heterogeneous returns. *Quarterly Journal of Economics*, 138.1:515–573.
- Tempalski, J. (2006). Revenue effects of major tax bills. OTA working paper 81, U.S. Department of the Treasury.
- Wolf, C. K. (2021). The missing intercept: A demand equivalence approach. Working Paper 29558, National Bureau of Economic Research.

Zidar, O. (2019). Tax cuts for whom? Heterogeneous effects of income tax changes on growth and employment. *Journal of Political Economy*, 127(3):1437–1472.

Appendix A Data description

In this appendix, I outline how I construct the aggregate and cross-sectional variables.

Aggregate variables

Unless otherwise noted, the data is retrieved from the NIPA Tables published by the Bureau of Economic Analysis (BEA). All time series in nominal values are converted to real values by dividing them by the GDP deflator. To obtain per capita values, I divide the variables by the civilian non-institutional population of 16 years and older provided by Francis and Ramey (2009) ('civnipop16'). All variables are seasonally adjusted.

Average corporate income tax rate: The average corporate income tax rate is the variable 'ACITR' from the replication files of Mertens and Ravn (2013) and defined as federal taxes on corporate income excluding Federal Reserve banks divided by corporate profits.

Average personal income tax rate: The average personal income tax rate is the variable 'APITR' from Mertens and Ravn (2013) and defined as the sum of federal personal current taxes and federal contributions for government social insurance divided by the personal income tax base. The personal income tax base is defined as personal income less government transfers plus contributions for government social insurance.

Corporate income tax changes proxy variable: The narrative corporate income tax shock series from Section 4 is the variable 'm_CI' from the replication files of Mertens and Ravn (2013).

Disposable Income: Aggregate disposable income per capita is given by the logarithm of disposable personal income divided by population. The data on disposable personal income is retrieved from the FRED database of the Federal Reserve Bank of St. Louis (variable code: DSPI) and originates from the BEA (BEA account code: A067RC).

GDP deflator: The GDP deflator is the implicit price deflator for GDP (table 1.1.9, line 1) (index, 2012 = 100) divided by 100.

Government spending: Government spending per capita is the logarithm of the sum of federal consumption expenditures (table 3.9.5, line 10) and federal gross investment (table 3.9.5, line 11) divided by population.

Non-durable consumption expenditure: Non-durable consumption expenditure per capita is defined as the logarithm of the sum of non-durable goods (table 1.1.5, line 5) and services (table 1.1.5, line 6) divided by population.

Output: Output per capita is defined as the logarithm of GDP (table 1.1.5, line 1) divided by population.

Personal income tax changes proxy variable: The narrative personal income tax shock series from Section 4 is the variable 'm_PI' from the replication files of Mertens and Ravn (2013).

Social transfers: Social transfers are taken from Fred St. Louis (Federal government current transfer payments: Government social benefits: to person). The series is seasonally adjusted.

Tax revenue: Tax revenue per capita is the logarithm of the sum of federal current tax receipts (table 3.2, line 2), and contributions for government social insurance (table 3.2, line 10) minus corporate income taxes (table 3.2, line 8) divided by population.

Total tax changes proxy variable: The proxy variable used in Section 3 is the variable 'Tax Narrative' in the replication files of Mertens and Ravn (2014).

Cross-sectional disposable income

I use income data from the Family Characteristics and Income (FAMILY) files of the CEX. The CEX is a rotating panel of households selected to be representative of the US population

and is conducted by the Census Bureau for the Bureau of Labor Statistics. The CEX provides detailed information on consumption expenditures and income of each consumer unit (CU), which corresponds to households or families who are living at the same address. The survey additionally includes detailed demographic information about all CU members. Each CU stays in the sample for a maximum of four consecutive periods before it is dropped. Although the CEX started in 1960, continuous data is only available since the first quarter of 1980, which is the beginning of my sample.

I take disposable income from the dataset provided by Heathcote et al. (2010), in particular the variable 'tian' from the file 'cex_a.dta'. Disposable income is defined as the sum of wages, salaries, business income (farm and non-farm) earned by each member, financial income (interest, dividends and rent), private transfers (including private pensions, alimony and child support), public transfers (including social security, unemployment compensation, welfare and food stamps) minus total taxes paid (including federal, state, local and social security contribution).

In Section 4.2, I partition total disposable income into disposable income from (i) entrepreneurs and non-entrepreneurs and (ii) families and non-families. I use an indicator variable to partition total disposable income into disposable income of CUs with different characteristics. I define a CU as "entrepreneur"-CU if its business income $\neq 0$. Over the sample 1980 – 2006, the share of CU with business income is 9 % relative to 91 % without business income. A CU is counted toward the "family"-category if at least one individual below the age of 18 lives in the CU. This definition applies to 64 % of the CUs, as opposed to 36 % who are counted as "non-family".

Appendix B Tax policy narratives

This appendix collects anecdotal evidence on governmental statements accompanying the tax legislation process in the US. In particular, I study presidential speeches, the US Budget Reports, and the Economic Reports of the President. From these sources three narratives repeatedly emerge: tax changes (i) are directed toward low-income people, (ii) are pro-business, and (iii) pro-family. All sources were accessed last on September 28, 2022.

- **December 20, 1977, Jimmy Carter, Social Security Amendments of 1977 Remarks at the Bill Signing Ceremony:** This legislation is wise. It's been evolved after very careful and long preparation. It focuses the increased tax burdens, which were absolutely mandatory, in a way that is of least burden to the families of this Nation who are most in need of a sound income. The level of payments were raised for those who are wealthier in our country where they can most easily afford increased payments. In the past they've avoided the rate being applied to their much higher income than the average working family. <https://www.presidency.ucsb.edu/documents/social-security-amendments-1977-remarks-the-bill-signing-ceremony>
- **January 28, 1980, under Jimmy Carter, US Budget Fiscal Year 1981 (p. 61) on the Crude Oil Windfall Profit Tax Act of 1980:** Higher OPEC prices and the phased decontrol of domestic oil prices will result in high profits for domestic oil producers. Fairness requires that some of these windfall profits be returned to the Nation as a whole, to be used for public purposes including the reduction of oil imports, conservation of energy, and mitigation of the impact of higher energy prices on low-income Americans. The President, therefore, proposed a windfall profit tax to become effective January 1, 1980. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1981-19035>
- **April 02, 1980, under Jimmy Carter on the Crude Oil Windfall Profit Tax**

Act of 1980: When I proposed this tax I indicated that the revenues should be used for three basic purposes: one, to assist low-income households in bearing the burden of rapidly increasing energy costs; secondly, to improve the transit systems of our country, including not only rail but also buses and subways, and even the sharing of rides in other rubber-tired vehicles; and third, the development of alternative supplies of energy. <https://www.presidency.ucsb.edu/documents/crude-oil-windfall-profit-tax-act-1980-remarks-signing-hr-3919-into-law>

- **January 15, 1981, under Jimmy Carter, Annual Report of the Secretary of the Treasury on the State of the Finances 1980 (p. 43) on the Crude Oil Windfall Profit Tax Act of 1980:** As part of the act, increased personal and business tax subsidies are provided for conservation investments and the production of fuels from renewable and exotic sources. In addition the act contained three income tax provisions: A \$200 exclusion for interest and dividends (\$400 for married couples), repeal of carryover basis, and changes to last-in, first-out (LIFO) accounting rules. <https://fraser.stlouisfed.org/title/annual-report-secretary-treasury-state-finances-194/annual-report-secretary-treasury-state-finances-fiscal-year-1980-5626>
- **January 17 1981, under Jimmy Carter, Economic Report of the President 1981 (p. 166):** To shift additional national resources into investment, a larger than-usual share of the funds available for tax reduction will have to be devoted to investment incentives. But some other forms of tax relief are both feasible and desirable. The President's program⁸ proposes three principal areas of such relief. First, individuals and employers would receive an income tax credit sufficient to offset the rise in social security taxes which took place at the start of the year. This type of tax cut was chosen because it not only would reduce tax burdens but also lower business costs

⁸Refers to The Economic Revitalization Program

and thus help modestly with our inflation problem. Second, for workers who face a growing social security tax burden but earn too little to pay income taxes, the program would expand the earned income tax credit. This would more than offset the increase in social security taxes for our lowest-paid workers. Third, the program proposes a phased reduction in the tax burden on two-earner families by reducing the so-called "marriage penalty" that taxes married couples with roughly equal incomes at rates higher than unmarried couples with the same incomes. <https://fraser.stlouisfed.org/title/economic-report-president-45/1981-8152>

- **February 8, 1982, under Ronald Reagan, US Budget Fiscal Year 1983 (M6/p. 11) on the Economic Recovery Tax Act of 1981:** The Economic Recovery Tax Act of 1981 is the largest, most comprehensive, and most constructive tax bill ever adopted. [...] • The penalty tax rate on investment income has been eliminated. By dropping the top rate from 70 to 50%, the attractiveness of tax shelters will be reduced and the incentives for productive investment in stocks, bonds, new business ventures, and other financial assets will be increased. Our Nation's capital will again flow to the growth of business and jobs rather than to the vendors of protection from punitive taxation. • Marginal tax rates have been significantly lowered for the first time in two decades. The 23% across-the-board rate reduction will mean \$183 billion in lower taxes for individuals over the first 3 years. The financial reward for savings, work effort, and new production will stop diminishing and start rising once again. [...] • The confiscatory taxing of estates and inheritances has been halted as well. By raising the exemption to \$600,000, by lowering the rate to 50%, and by removing the limits on the marital deduction, 99.7% of all estates will eventually be exempt from estate taxation. Hard-working American farmers, small businessmen, investors, and workers can once again be confident that the sweat, sacrifices, and accumulations of a lifetime will belong to their heirs rather than their Government. <https://fraser.stlouisfed.org/title/budget->

- **February 10, 1982, under Ronald Reagan, Economic Report of the President 1982 (p. 7) on the Economic Recovery Tax Act of 1981:** To spur further business investment and productivity growth, the new tax law provides faster write-offs for capital investment and a restructured investment tax credit. Research and development expenditures are encouraged with a new tax credit. Small business tax rates have been reduced. <https://fraser.stlouisfed.org/title/economic-report-president-45/1982-8153>
- **February 2, 1983, under Ronald Reagan, Economic Report of the President 1983 (p. 139) on the Economic Recovery Tax Act of 1981:** To the extent that the accelerated cost recovery system in the Economic Recovery Tax Act of 1981 reduced the tax on earnings of depreciable property, it raised the real interest rate that business borrowers are willing to pay. In addition, large budget deficits in many countries have lowered national saving rates, tending to lead to higher real interest rates worldwide. <https://fraser.stlouisfed.org/title/economic-report-president-45/1983-8154>
- **February 1984, under Ronald Reagan, Economic Report of the President 1984 (p. 6) on the Economic Recovery Tax Act of 1981:** The Economic Recovery Tax Act of 1981 went beyond reducing tax rates to establish important reforms in the structure of the tax system. For businesses, the Accelerated Cost Recovery System increased the after-tax profitability of investments in plant and equipment. The sharp fall in inflation has also increased after-tax profit ability. As a result, investment in business equipment has recently been quite strong despite the high real interest rates. <https://fraser.stlouisfed.org/title/economic-report-president-45/1984-8155>
- **October 22, 1986, Ronald Reagan, Remarks on Signing the Tax Reform Act**

of 1986: And what about fairness for families? It's in our families that America's most important work gets done: raising our next generation. But over the last 40 years, as inflation has shrunk the personal exemption, families with children have had to shoulder more and more of the tax burden. With inflation and bracket-creep also eroding incomes, many spouses who would rather stay home with their children have been forced to go looking for jobs. And what of America's promise of hope and opportunity, that with hard work even the poorest among us can gain the security and happiness that is the due of all Americans? You can't put a price tag on the American dream. That dream is the heart and soul of America; it's the promise that keeps our nation forever good and generous, a model and hope to the world. For all these reasons, this tax bill is less a freedom—or a reform, I should say, than a revolution. Millions of working poor will be dropped from the tax rolls altogether, and families will get a long-overdue break with lower rates and an almost doubled personal exemption. We're going to make it economical to raise children again. Flatter rates will mean more reward for that extra effort, and vanishing loopholes and a minimum tax will mean that everybody and every corporation pay their fair share. And that's why I'm certain that the bill I'm signing today is not only an historic overhaul of our tax code and a sweeping victory for fairness, it's also the best antipoverty bill, the best profamily measure, and the best job-creation program ever to come out of the Congress of the United States. <https://www.presidency.ucsb.edu/documents/remarks-signing-the-tax-reform-act-1986>

- **January 29, 1987, under Ronald Reagan, Economic Report of the President 1987 (p. 21) on the Tax Reform Act of 1986:** This Act improves overall incentives for economic activity and reduces disparities in rates of taxation on different forms of economic activity. In the long run, after the transition problems of some sectors are resolved, this Act is estimated to increase net national product by approximately 2 percent. Evaluated at current levels of national income and product,

this implies approximately a \$600 gain in the annual income of the average American family, without any loss of Federal revenue. <https://fraser.stlouisfed.org/title/economic-report-president-45/1987-8158>

- **March 30, 1987, under Ronald Reagan, Annual Report of the Board of Trustees of the Federal Old Age and Survivors Insurance Trust Fund 1987 (p. 11) on the Tax Reform Act of 1986:** Other features of the Tax Reform Act, such as the elimination or restriction of several deductions and exemptions, will tend to raise contribution income as would possible favorable impacts on earnings and hours worked. Numerous other changes affecting business income and expenses for tax purposes may also affect Social Security contributions, especially from self-employed persons. <https://www.ssa.gov/oact/TR/historical/1987TR.pdf>
- **January 10, January 1989, under Ronald Reagan, Economic Report of the President 1989 (pp. 7–8) on the Tax Reform Act of 1986:** The Tax Reform Act of 1986 improved efficiency by eliminating many tax preferences that distort private decision-making. By reducing tax rates and tax loopholes, we have encouraged people to make money the old-fashioned way—by producing goods and services that people want, not by finding new ways to avoid taxes. The tax reforms have increased equity as well, as an estimated 4 million low-income individuals and families have been removed from the income tax rolls by 1988. <https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160>
- **January 10, 1989, under Ronald Reagan, Economic Report of the President 1989 (p. 63) on the Tax Reform Act of 1986:** The Tax Reform Act of 1986 did much to even effective tax rates between equipment and structures. However, tax reform raised effective corporate tax rates on business investment and removed the preferential treatment of business capital gains while retaining much of the advantage of investment in housing and consumer durables. <https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160>

[org/title/economic-report-president-45/1989-8160](https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160)

- **January 10, 1989, under Ronald Reagan, Economic Report of the President 1989 (p. 86) on the Economic Recovery Tax Act of 1981:** The act significantly reduced the average burden of taxation for American families compared with what it would have been without a change in the tax law. <https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160>
- **January 10, 1989, under Ronald Reagan, Economic Report of the President 1989 (p. 87) on the The Economic Recovery Tax Act of 1981:** The provision to allow expensing of up to \$5,000 worth of equipment in 1982 and 1983 is likely to have increased the return to all types of small business investment. <https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160>
- **January 10, 1989, under Ronald Reagan, Economic Report of the President 1989 (p. 88) on the Tax Reform Act of 1986:** The Tax Reform Act of 1986 also resulted in a somewhat higher effective marginal tax rate on capital income because it changed depreciation rules, the tax treatment of long-term capital gains, and repealed the investment tax credit. However, more uniform tax rates on alternative types of investments also resulted from a change in depreciation rules designed to improve the allocation of investment. Phasing out tax preferences such as the deduction of nonmortgage consumer interest on personal income tax returns was designed to change the allocation of private spending away from consumer durables toward business investment. <https://fraser.stlouisfed.org/title/economic-report-president-45/1989-8160>
- **February 6, 1992, under George Bush, Economic Report of the President 1992 (pp. 132–133) on the Tax Reform Act of 1986:** The earned income tax credit (EITC) was expanded, and along with increased personal exemptions and standard deductions, exempted more than 4 million low-income taxpayers from hav-

ing to pay Federal income taxes <https://fraser.stlouisfed.org/title/economic-report-president-45/1992-8163>

- **February 6, 1992, under George Bush, Economic Report of the President 1992 (p. 133) on the Omnibus Budget Reconciliation Act of 1990:** The Omnibus Budget Reconciliation Act of 1990 installed a variety of tax policy changes, in addition to the spending and deficit limitations discussed in last year's Economic Report of the President. The EITC was expanded, with supplemental credits added for families with young children and for health care expenses. Statutory marginal tax rates for the highest levels of income were equalized at 31 percent. A phase-out of personal exemptions, limitations on itemized deductions, and new excise taxes levied on furs, jewelry, and expensive cars effectively raised taxes for the affluent. <https://fraser.stlouisfed.org/title/economic-report-president-45/1992-8163>
- **February 6, 1992, under George Bush, Economic Report of the President 1992 (pp. 138–139):** By any of a variety of measures, the income tax and Social Security reforms beginning in the late 1970s have not significantly changed the redistributive effect of the tax system. The Individual Income Tax- Tax Chart 4-7 shows estimates from the Department of the Treasury of average Federal individual income tax rates for hypothetical four-member families with the median, half the median, and double the median income level, as reported by the Bureau of the Census. Median income for 1991 was estimated on the assumption that the real level of median income would not change from its 1990 level. Families are assumed to have only wage and salary income earned by one person. Comparisons made for the same type of family over time help to isolate the effect of changes in the tax system from changes in the sources and distribution of income and in demographics. The chart shows that the Federal individual income tax is progressive in each of the years because the average tax rate rises with income. In 1991, for example,

the average estimated income tax rate rises from 5.1 for families with half the median income to 15.1 for families with twice the median income. The average Federal income tax rate has fallen since 1980 for all three groups. The percentage change in average tax rates between 1980 and 1991 was virtually the same at all three relative income levels. <https://fraser.stlouisfed.org/title/economic-report-president-45/1992-8163>

- **February 6, 1992, under George Bush, Economic Report of the President 1992 (pp. 140–141):** CBO estimates in Table 4-4 indicate that the share of all Federal taxes paid by the highest income groups has increased since 1977, while the share paid by middle and lower income families has fallen. Thus, data developed separately by the Treasury Department and the Congressional Budget Office indicate that the Federal individual income tax and the overall Federal tax system redistribute income from high-income households to low-income households and thus are progressive. The degree of progressivity of, and the amount of redistribution within, the tax system has not changed significantly since the mid-1970s. <https://fraser.stlouisfed.org/title/economic-report-president-45/1992-8163>
- **February 7, 1994, under Bill Clinton, US Budget Fiscal Year 1995 (p. 4) on the Omnibus Budget Reconciliation Act of 1993:** In addition to budget discipline, we made dramatic changes that restored fairness to the tax code. We made the distribution of the income tax burden far more equitable by raising income tax rates on only the richest 1.2 percent of our people—couples with income over \$180,000—and by substantially increasing the Earned Income Tax Credit for 15 million low-income working families. Thus, nearly 99 percent of taxpayers will find out this year that their income tax rates have not been increased. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1995-19045>

- February 7, 1994, under Bill Clinton, US Budget Fiscal Year 1995 (p. 56) on the Omnibus Budget Reconciliation Act of 1993:** In addition to these and some smaller tax increases, OBRA-93 also contained a number of tax incentives. Expansion of the earned income tax credit (EITC) is one of the most important anti-poverty actions in recent history; when fully phased in, the increased EITC plus food stamps will lift from poverty families with children where at least one parent works full time. The EITC expansion is also a major step toward welfare reform - by making work pay.

 - Small businesses received important tax incentives.** The expensing allowance for investment, especially important for small business, was substantially increased. A targeted capital gains provision for new small businesses was enacted. The deduction for health insurance premiums of the self-employed was extended.
 - Extension of the credit for research and experimentation encourages technological advancement.** Alternative minimum tax relief was provided for business investment depreciation.
 - Empowerment Zones were enacted for the first time, to help in the renewal of targeted urban and rural areas.** The low-income housing credit, mortgage revenue bonds, and small-issue industrial development bonds were made permanent. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1995-19045>
- February 7, 1994, under Bill Clinton, US Budget Fiscal Year 1995 (p. 58) on the Omnibus Budget Reconciliation Act of 1993:** Fairness in OBRA-93. OBRA-93 achieved the Administration's objective of placing the heaviest tax burden on those most able to carry it, while lightening the load on those least able to pay. As a result, the tax system is more progressive than at any time since 1977, according to the Congressional Budget Office (CBO). OBRA-93 provisions affecting taxes are outlined above. The distributional impact of these and other provisions is shown in Table 2-1. Whether measured by the change in average taxes, the share of total new taxes raised, or the change in effective tax rates, the message is the same: The tax

system has been made fairer. • At the top of the income distribution, families with \$200,000 or more in annual income (1.3 percent of all families) will pay on average about \$23,500 in additional taxes per family, according to CBO estimates. In total, they will pay 80 percent of the taxes raised by OBRA-93 (\$33 billion out of \$41 billion). The effective tax rate for the average family in this upper income bracket is likely to increase from about 28 percent to almost 33 percent. • Families with \$100,000 to \$200,000 in income (5.2 percent of all families) will pay on average about \$650 more in taxes, raising their effective tax rates by one-half of one percentage point. In aggregate, they will pay about \$3.6 billion more in taxes. Thus, families with incomes over \$100,000 will shoulder about 90 percent of the taxes raised by OBRA-93. • Families with \$30,000 to \$100,000 in annual income will pay only slightly more in taxes, ranging on average from \$50 for families at the low end of this range, to \$312 for those nearer the top. The effective tax rates for families in this range will be increased by only a few tenths of a percentage point. • Families with incomes below \$30,000 will have their tax payments lowered on average \$41 to \$86 per year for a total decrease of \$3.3 billion—due largely to the historic increase in the earned income tax credit. The effective tax rates for families with incomes below \$20,000 will be lowered by about one-half to one percentage point. In other words, those at the low end of the income distribution will be better off because of OBRA-93. (See Chart 2-1.) Low and middle-income families are still protected by inflation indexing of the income tax rate brackets. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1995-19045>

- **February 14, 1994, under Bill Clinton, Economic Report of the President 1994 (p. 34) on the Omnibus Budget Reconciliation Act of 1993:** Finally, OBRA93 increased the top corporate tax rate and closed a variety of business tax loopholes, but also enhanced or created several tax incentives for investment. The net effect of these increases and decreases in business taxes should yield about \$8

billion in revenue by fiscal 1998. <https://fraser.stlouisfed.org/title/economic-report-president-45/1994-8093>

- **February 1, 1995, under Bill Clinton, US Budget Fiscal Year 1996 (p. 34) on the Omnibus Budget Reconciliation Act of 1993:** OBRA also included tax incentives to make the tax system fairer. It expanded the EITC—which, as discussed in Chapter 1, guarantees that any family with children and at least one parent who works full time eventually will rise above the poverty line. Today, the tax system is more progressive than at any time in 18 years. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1996-19046>
- **February 13, 1995, under Bill Clinton, Economic Report of the President 1995 (p. 22) on the Omnibus Budget Reconciliation Act of 1993:** The Administration’s first response to the dwindling income prospects of many working Americans took the form of a substantial expansion of the earned income tax credit (EITC). The EITC expansion, included in the Omnibus Budget Reconciliation Act of 1993 (OBRA93), increased the after-tax incomes of over 15 million American workers and their families. The EITC is a refundable tax credit that provides a bonus to eligible low-income workers—a bonus that can amount to over \$3,000 a year for a family with two children. Through the EITC these workers may realize after-tax incomes well in excess of their wages. <https://fraser.stlouisfed.org/title/economic-report-president-45/1995-8094>
- **August 5, 1997, Bill Clinton, Statement on Signing the Balanced Budget Act of 1997:** These bills will balance the budget in a way that honors our values, invests in our people, and cuts taxes for middle-class families. They are a victory for all parents who want a good education for their children and for all families working to build a secure future. This package is the best investment we can make in

America's future, and it prepares our Nation for the 21st century. [...] First, it strengthens our families by extending health insurance coverage to up to 5 million children. By investing \$24 billion, we will be able to provide quality medical care for these children—everything from regular check-ups to major surgery. I want every child in America to grow up healthy and strong, and this investment takes a major step toward that goal. I am also pleased that the Congress agreed to pay for this investment in our Nation's children in part with a 15-cents-a-pack tax increase on cigarettes. <https://www.presidency.ucsb.edu/documents/statement-signing-the-balanced-budget-act-1997>

- **May 16, 2001, under George W. Bush, Statement Of Administration Policy - (House) - (Rep. Thomas (R) California):** By reducing marginal tax rates, this bill would reduce the penalty on work, savings, and investment, begin the process of providing much needed immediate tax relief to the American people, and lay a foundation for further long-term economic growth. No one should be forced to pay more than a third of what they earn in taxes. In fact, 77 percent of the tax relief associated with cutting the top rate in H.R. 1836 would go to small business owners and entrepreneurs - the engines of growth in our economy. <https://www.presidency.ucsb.edu/documents/statement-administration-policy-hr-1836-economic-growth-and-tax-relief-reconciliation-act>

- **June 07, 2001, George W. Bush, Remarks on Signing the Economic Growth and Tax Relief Reconciliation Act of 2001:** Some months ago, in my speech to the joint session of Congress, I had the honor of introducing Steven Ramos to the Nation. Steven is the network administrator for a school district. His wife, Josefina, teaches at a charter school. They have a little girl named Lianna, and they're trying to save for Lianna's college education. High taxes made saving difficult. Last year

they paid nearly \$8,000 in Federal income taxes. Well, today we're beginning to make life for the Ramos' a lot easier. Today we start to return some of the Ramos' money and not only their money but the money of everybody who paid taxes in the United States of America. [...] With us today are 15 of the many families I met as I toured our country making the case for tax relief—hard-working Americans. I was able to talk about their stories and their struggles and their hopes, which made the case for tax relief much stronger than my words could possibly convey. [...] Tax relief is an achievement for families struggling to enter the middle class. For hard-working lower income families, we have cut the bottom rate of Federal income tax from 15 percent to 10 percent. We doubled the per-child tax credit to \$1,000 and made it refundable. Tax relief is compassionate, and it is now on the way. Tax relief is an achievement for middle class families squeezed by high energy prices and credit card debt. Most families can look forward to a \$600 tax rebate before they have to pay the September back-to-school bills. And in the years ahead, taxpayers can look forward to steadily declining income tax rates. Tax relief is an achievement for families that want the Government tax policy to be fair and not penalize them for making good choices, good choices such as marriage and raising a family. So we cut the marriage penalty. Tax relief makes the code more fair for small businesses and farmers and individuals by eliminating the death tax. Over the long haul, tax relief will encourage work and innovation. It will allow American workers to save more on their pension plan or individual retirement accounts. Tax relief expands individual freedom. The money we return, or don't take in the first place, can be saved for a child's education, spent on family needs, invested in a home or in a business or a mutual fund or used to reduce personal debt. [...] This tax relief plan is principled. We cut taxes for every income-tax payer. We target nobody in; we target nobody out. And tax relief is now on the way.

<https://www.presidency.ucsb.edu/documents/remarks-signing-the-economic-growth-and-tax-relief-reconciliation-act-2001>

- **February 5, 2002, under George W. Bush, Economic Report of the President 2002 (p. 45) on the Economic Growth and Tax Relief Reconciliation Act of 2001:** In short, the President delivered important tax relief in 2001, providing a solid foundation for renewed growth in consumer spending once confidence rebounds, and for an improved investment climate for businesses. The boost in aggregate demand should help provide a foundation for economy-wide recovery in 2002. <https://fraser.stlouisfed.org/title/economic-report-president-45/2002-8101>
- **February 15, 2002, under George W. Bush, Council of Economic Advisers' Report on the Economic Growth and Tax Relief Reconciliation Act of 2001:** In 2010 the estate tax will be eliminated. Small businesses have benefited from the lowering of individual income tax rates for owners of flow-through business entities such as sole proprietorships and partnerships. In 1998 there were close to 24 million flow-through businesses in the United States, including 17.1 million sole proprietors, 2.1 million farm proprietorships, 1.9 million partnerships, and 2.6 million S corporations. By 2006, when the tax cut will be fully phased in, the Treasury Department estimates that over 20 million tax filers with income from flow-through entities will receive a tax reduction. Finally, the President's tax cut strengthened families and has reduced the burden of financing education. <https://www.presidency.ucsb.edu/documents/council-economic-advisers-report>
- **May 9, 2003, under George W. Bush, STATEMENT OF ADMINISTRATION POLICY, (House), (Rep. Thomas (R) California and 52 sponsors), Statement of Administration Policy: H.R. 2 - Growth and Jobs Tax Act of 2003:** H.R. 2 accelerates the reductions in individual income tax rates that were enacted in the Economic Growth and Tax Relief Reconciliation Act of 2001 but that are not scheduled to take effect for some years. The legislation similarly accelerates the 2001 Act's increase in the child credit and its reduction of

the marriage penalty. The legislation also increases small business expensing and significantly reduces the double taxation of dividends. This bill is a strong and positive step forward that will help the economy create new jobs today while permanently raising the wages and living standards of American workers now and in the future. <https://www.presidency.ucsb.edu/documents/statement-administration-policy-hr-2-growth-and-jobs-tax-act-2003>

- **May 28, 2003, George W. Bush, Remarks on Signing the Jobs and Growth Tax Relief Reconciliation Act of 2003:** We are helping workers who need more take-home pay. We're helping seniors who rely on dividends. We're helping small-business owners looking to grow and to create more new jobs. We're helping families with children who will receive immediate relief. By ensuring that Americans have more to spend, to save, and to invest, this legislation is adding fuel to an economic recovery. We have taken aggressive action to strengthen the foundation of our economy so that every American who wants to work will be able to find a job. [...] The Jobs and Growth Act reduces Federal income taxes across the board. And today the Internal Revenue Service will post new withholding tax tables so that employers can begin leaving more money in the paychecks of American workers, starting next month. The Jobs and Growth Act increases the per-child tax credit from \$600 to \$1,000. So today I'm directing the Department of Treasury to issue checks of up to \$400 per child to 25 million eligible families. And those checks will begin arriving in July. This combination of income-tax rate reductions, a higher child credit, and a reduction in the marriage penalty will make a difference for families in every part of this country. A family of four with a total income of \$75,000 will receive a 19-percent reduction in Federal income taxes, saving \$1,122 per year, per family. A family of four with an income of \$40,000 will see their income taxes drop from \$1,178 to \$45, a 96-percent tax cut. And under this new law, 3 million individuals and families will have their Federal income-tax liability completely eliminated. Altogether, 34 million

families with children, including 6 million single moms, will receive an average tax cut of \$1,549 per year. Tax relief matters a lot to the average citizen here in America. This tax bill will make it easier for moms and dads to save for their children's education, and that's vitally important for the future of this country. The benefits of the Jobs and Growth Act will also go to investors. The top capital gains tax rate will be reduced by 25 percent, which will encourage more investment and risk taking, and that will help in job creation. The bill also allows for dividend income to be taxed at a lower rate. This will encourage more companies to pay dividends, which in itself will not only be good for investors but will be a corporate reform measure. It's hard to pay dividends unless you've actually got cashflow. The days when people could say, "Invest with me because the sky's the limit," will be changed by dividend policy. It's hard to promote the sky being the limit and pay dividends unless you're actually profitable and have cashflow. Getting—reducing the tax rate on dividends will also increase the wealth effect around America and will help our markets. And the good news is, a lot of senior citizens rely on dividend income to meet their daily needs, and under this legislation, 12 million seniors will receive an average tax reduction of \$1,401. We're delivering substantial tax relief to small-business owners and entrepreneurs. Most small-business owners are Subchapter S—own Subchapter S corporations or sole proprietorships or limited partnerships, so the small business pays taxes at the individual tax rate. By cutting individual tax rates and by delivering other incentives for investment in new equipment, 23 million small-business owners will receive an average tax cut of \$2,209.

<https://www.presidency.ucsb.edu/documents/remarks-signing-the-jobs-and-growth-tax-relief-reconciliation-act-2003>

- **July 24, 2003, under George W. Bush, Fact Sheet: President Visits Philadelphia to Discuss Economy and Child Tax Credit, Background: Jobs and Growth Tax Relief Reconciliation Act of 2003:** On May 28, 2003, President Bush signed the Jobs and Growth Tax Relief Reconciliation Act of 2003, an enormous

victory for American workers, American families, American investors, and American entrepreneurs and small businesses. This law will enable the American people and small businesses to keep more of their own money. The more money families and small businesses have to save and invest, the more likely it is that people looking for work will find a job. <https://www.presidency.ucsb.edu/documents/fact-sheet-president-visits-philadelphia-discuss-economy-and-child-tax-credit>

- **January 30, 2004, under George W. Bush, Economic Report of the President 2004 (pp. 44–45) on the Jobs and Growth Tax Relief Reconciliation Act of 2003 and other tax cuts:** The tax cuts provided further stimulus by increasing incentives for business investment. Some of these incentives came in the form of bonus depreciation for business investment, an expansion in the amount of expensing of investment available for small businesses. [...] The 2003 tax cut (JGTRRA)⁹ raised the bonus depreciation to 50 percent of the price of new equipment and extended the period of eligibility so that investments made by the end of 2004 would be covered. It also increased the cap on small-business expensing from \$25,000 to \$100,000 per year through 2005, effectively lowering the cost of investment for small businesses. These tax changes lowered firms' cost of capital and likely provided support for investment at a crucial time. The tax cuts also reduced the cost of capital and increased incentives for business investment by lowering tax rates on personal capital income. The 2001 tax cut (EGTRRA)¹⁰ phased out the estate tax and reduced marginal tax rates on all forms of income. These steps lowered the tax burden on capital income received from corporations and also on income received through sole proprietorships, partnerships, and S corporations (corporations for which income is taxed through individual tax returns). [...] According to one study, the cut in

⁹Refers to the Job Creation and Worker Assistance Act

¹⁰Refers to the Economic Growth and Tax Relief Reconciliation Act

taxes on capital income in the 2003 tax package (JGTRRA) reduced the marginal effective total tax rate on income from corporate investment by 2 to 4 percentage points. Lower taxes on dividends and capital gains also move the tax system toward a more equal treatment of debt and equity, of dividends and capital gains, and of corporate and noncorporate capital. This move increases economic efficiency because it promotes the allocation of capital based on business fundamentals rather than a desire for tax avoidance. <https://fraser.stlouisfed.org/title/economic-report-president-45/2004-8103>

- **February 2, 2004, under George W. Bush, US Budget Fiscal Year 2005 (p. 33) on the Jobs and Growth Tax Relief Reconciliation Act of 2003:** Enabling Families and Businesses to Plan for the Future with Confidence. America's families and businesses need certainty to plan effectively for the future. And while the future holds many uncertainties, Government policies should not needlessly add to them. Right now, key elements of the tax relief passed by the Congress and signed into law by President Bush—including the increase in the child tax credit, the marriage penalty relief, and the increased incentives for small business investing—will expire in a few years. For example, a married couple with two children and an annual income of \$40,000 would face a \$922 tax increase in 2005 if the provisions of the Jobs and Growth Act are not made permanent. This family needs to know today that it will have that \$922 in 2005 for its own needs, not the Government's. President Bush urges the Congress to make these vital tax reductions permanent. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-2005-19051>
- **February 2, 2004, under George W. Bush, US Budget Fiscal Year 2005 (p. 333) on the Jobs and Growth Tax Relief Reconciliation Act of 2003:** The Jobs and Growth Tax Relief Reconciliation Act of 2003 provided major bene-

fits for small business: • Small business owners receive 79 percent—about \$9.7 billion—of the tax relief from accelerating (from 2006 to 2003) the reduction in the top income tax bracket to 35 percent. • The amount of investment eligible for expensing quadruples—to \$100,000—beginning in 2003 for firms with investments less than \$400,000. This provides a large tax saving and investment incentive, and also reduces record-keeping burdens. <https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-2005-19051>

Appendix C Additional results

Additional results Section 3

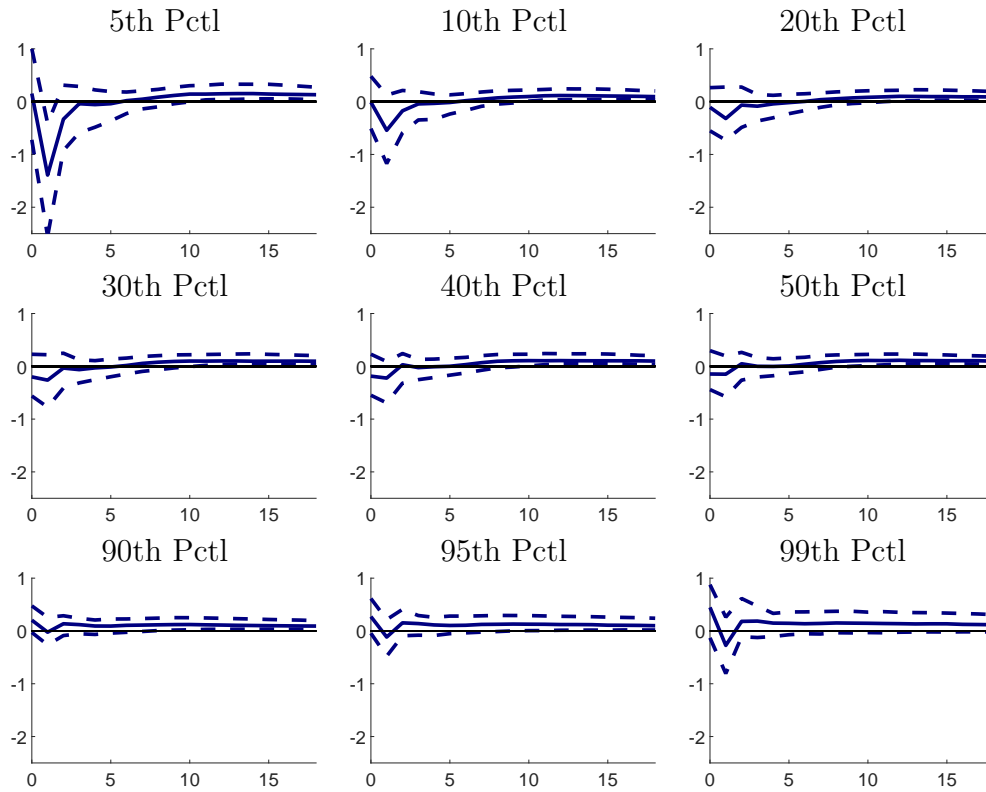


Figure 20: Absolute benefit (in percent) from a one standard deviation tax cut; median (blue, solid), 68-percent credible sets (blue, dashed).

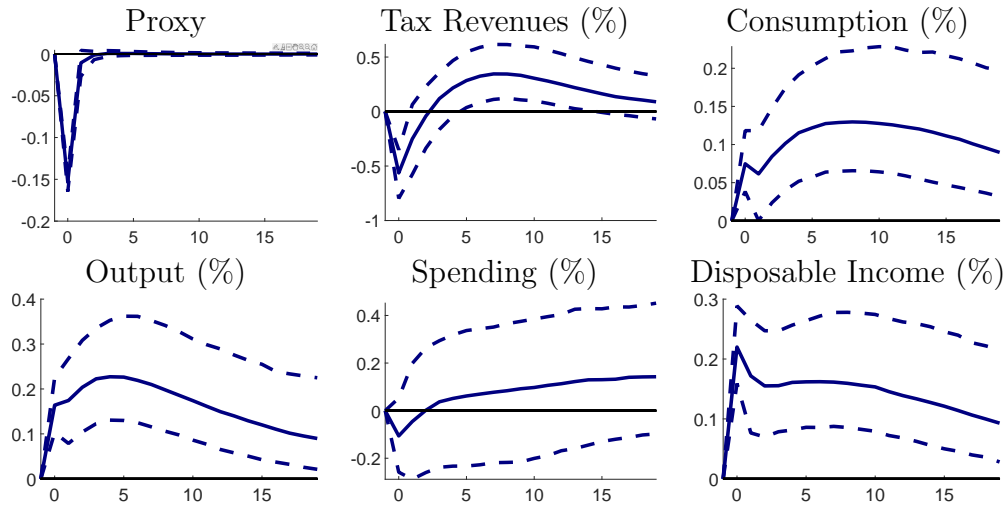


Figure 21: Aggregate responses to a one standard deviation tax cut for VAR model that includes forward tax rate; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

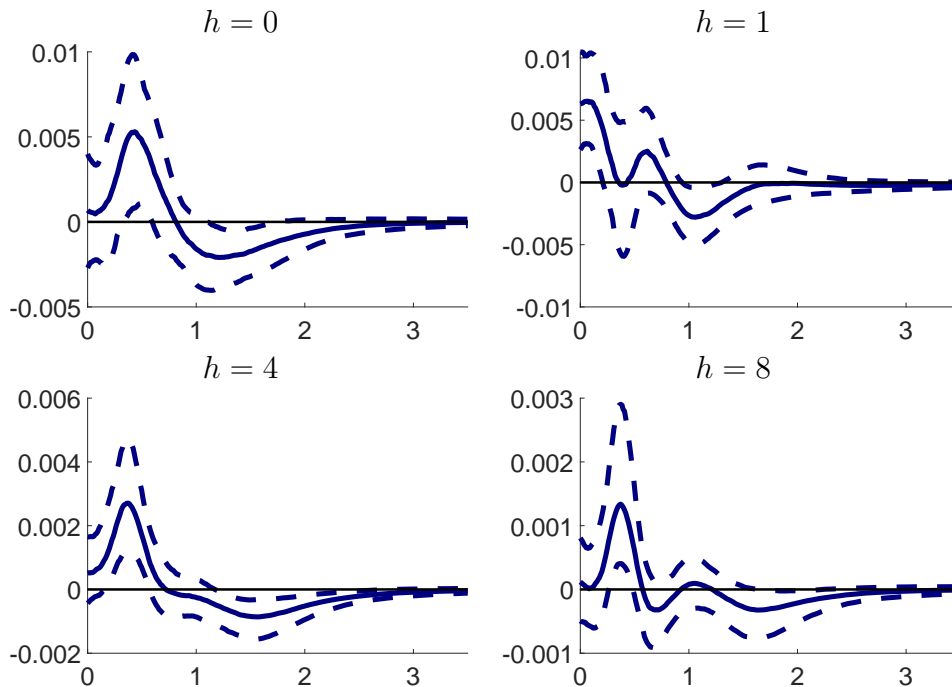


Figure 22: Density responses to a one standard deviation tax cut for VAR model with forward tax rate; median (blue, solid), 68- percent credible interval (blue, dashed)

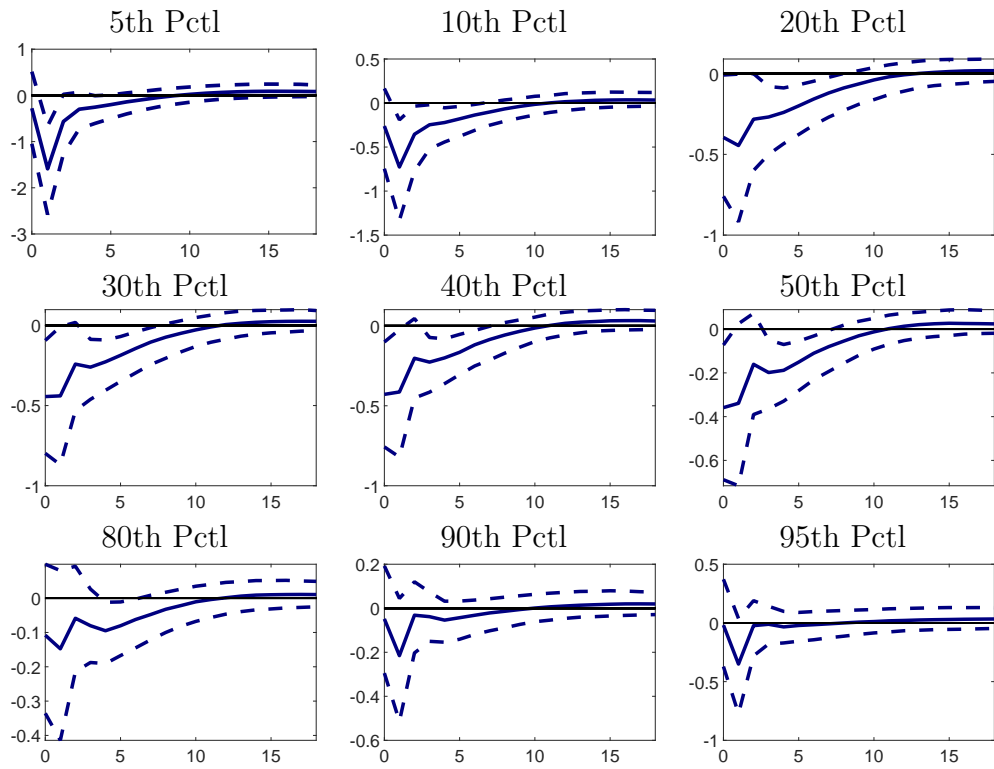


Figure 23: Percentile responses to a one standard deviation tax cut for the VAR model that includes the forward tax rate; median (blue, solid), 68-percent credible interval (blue, dashed)

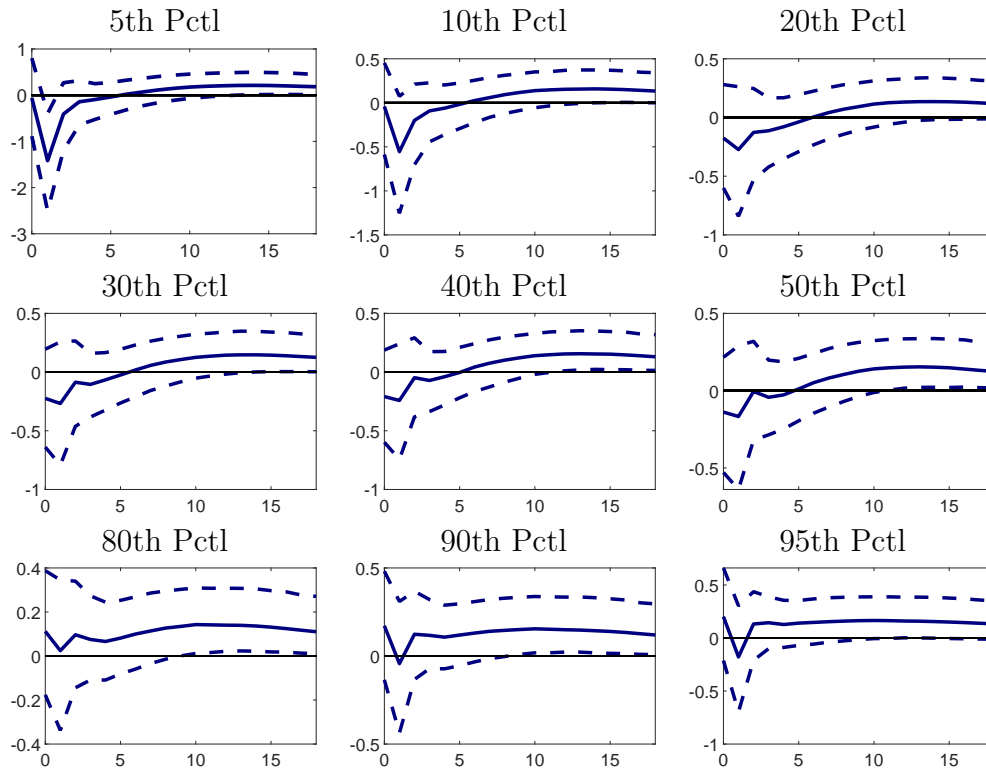


Figure 24: Absolute benefit (in percent) from a one standard deviation tax cut for VAR model that includes forward tax rate; median (blue, solid), 68-percent credible sets (blue, dashed).

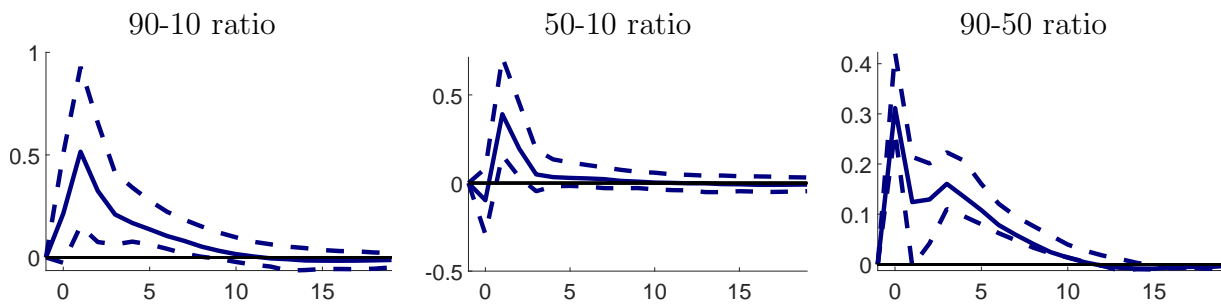


Figure 25: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent for VAR model that includes forward tax rate; median (blue, solid), 68-percent credible interval (blue, dashed)

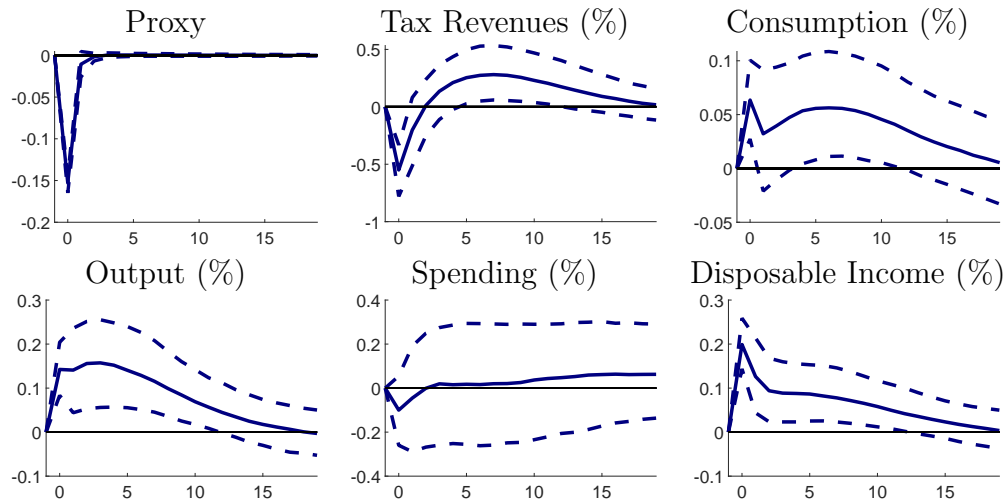


Figure 26: Aggregate responses to a one standard deviation tax cut for VAR model that includes total employment; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

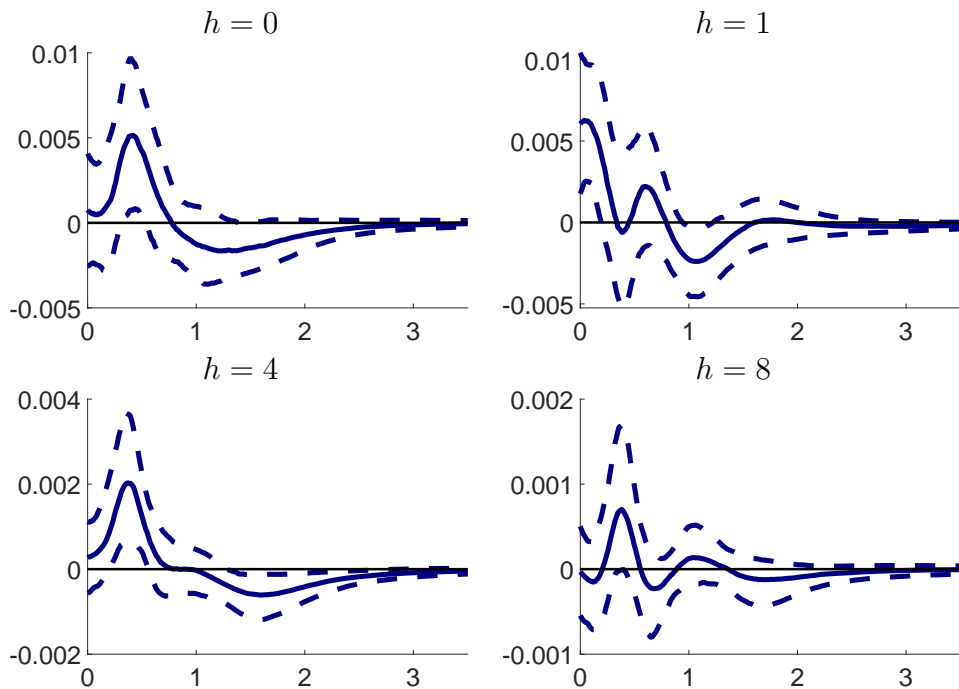


Figure 27: Density responses to a one standard deviation tax cut for VAR model with total employment; median (blue, solid), 68- percent credible interval (blue, dashed)

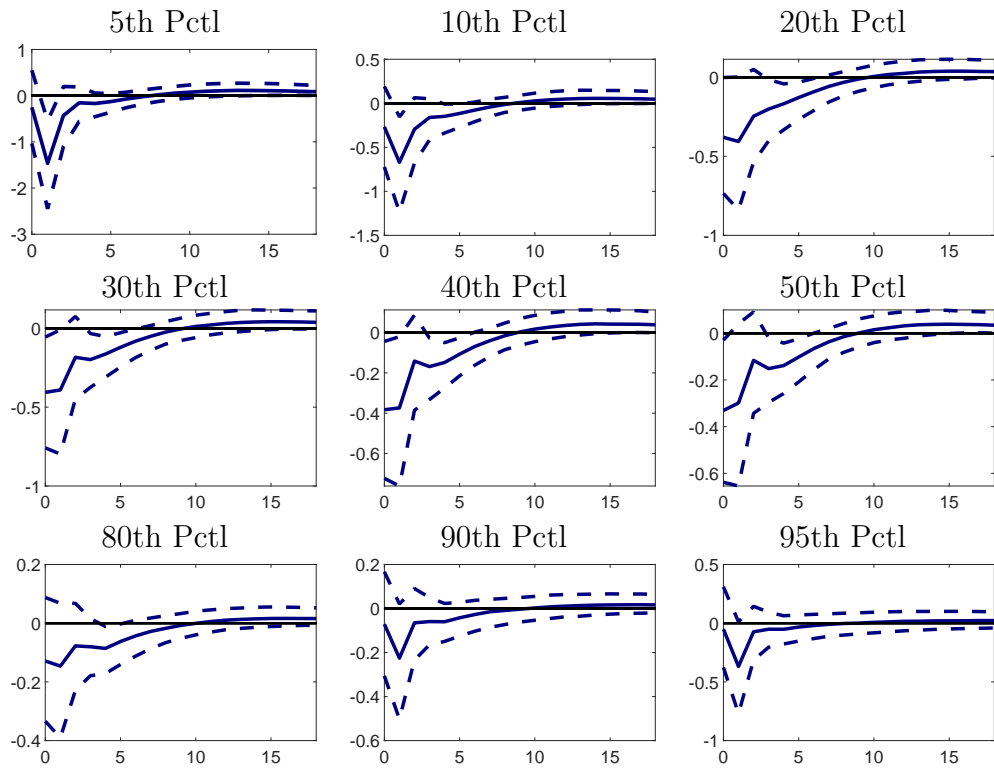


Figure 28: Percentile responses to a one standard deviation tax cut for the VAR model that includes total employment; median (blue, solid), 68-percent credible interval (blue, dashed)

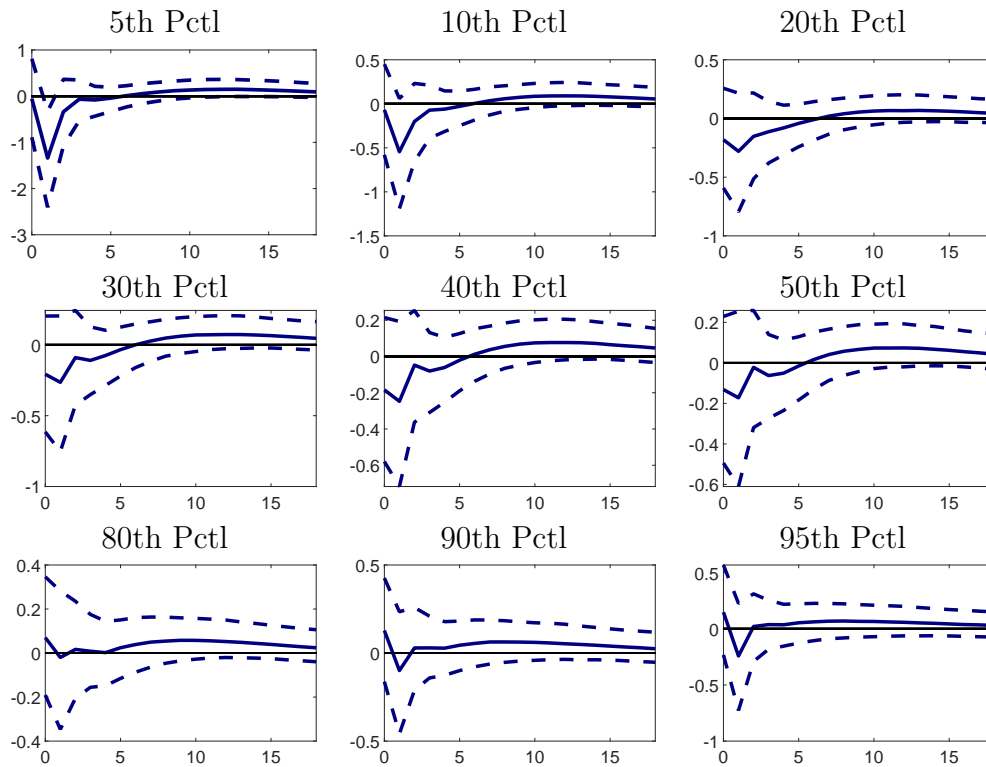


Figure 29: Absolute benefit (in percent) from a one standard deviation tax cut for VAR model that includes total employment; median (blue, solid), 68-percent credible sets (blue, dashed).

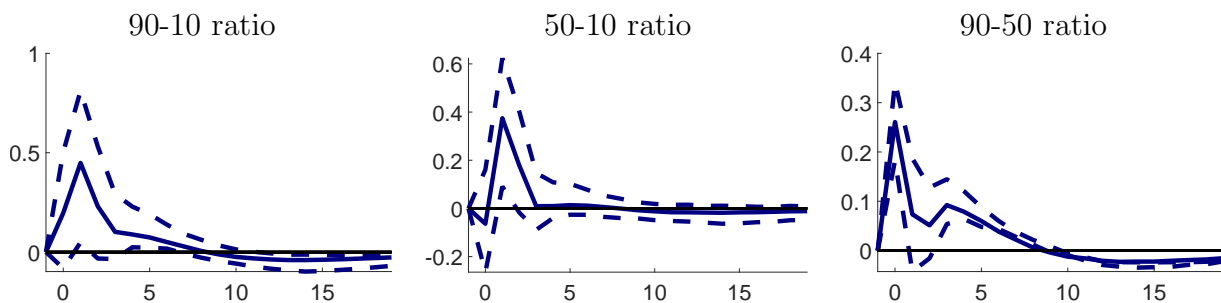


Figure 30: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent for VAR model that includes employment; median (blue, solid), 68-percent credible interval (blue, dashed)

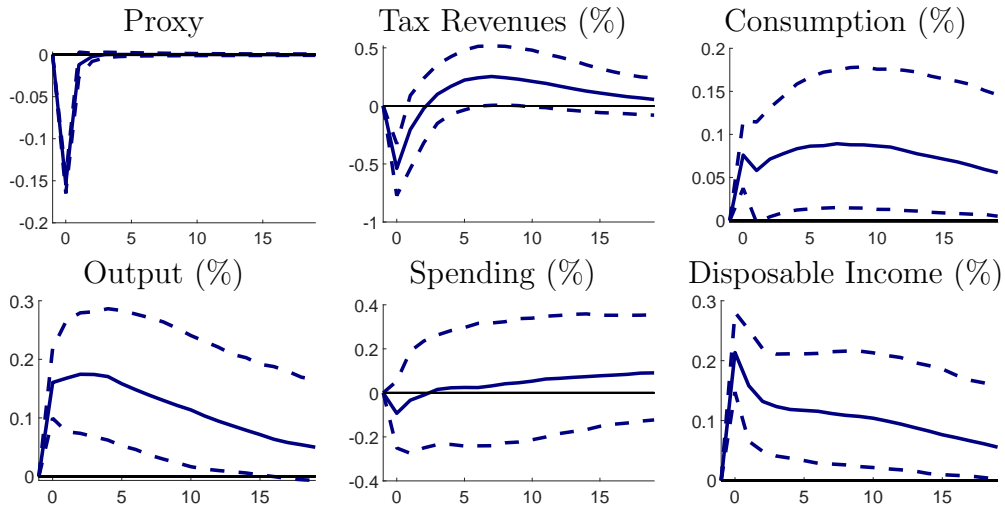


Figure 31: Aggregate responses to a one standard deviation tax cut for VAR model that includes hours worked; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

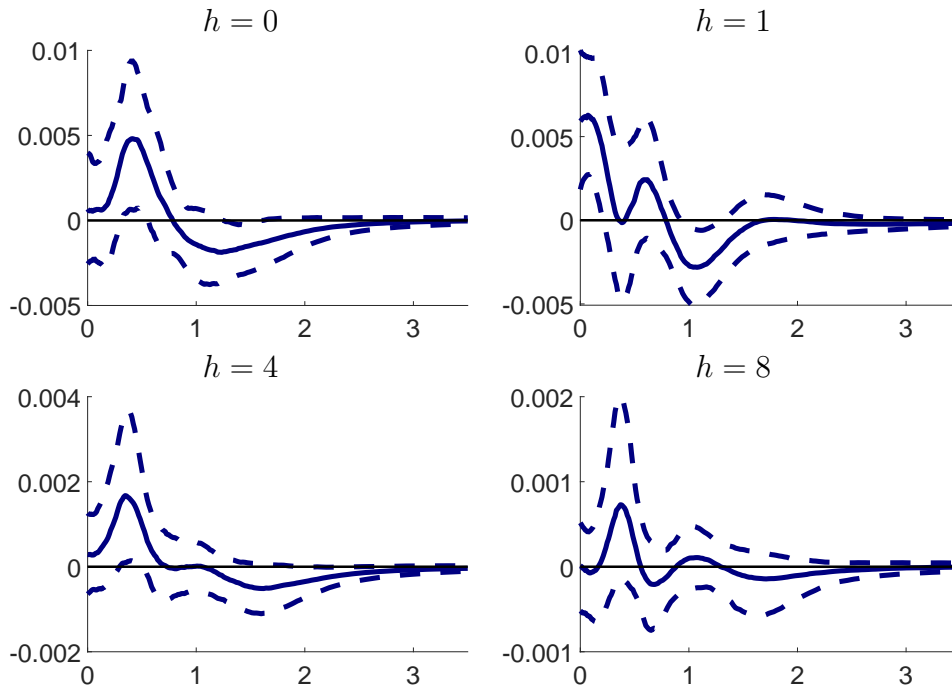


Figure 32: Density responses to a one standard deviation tax cut for VAR model with hours worked; median (blue, solid), 68- percent credible interval (blue, dashed)

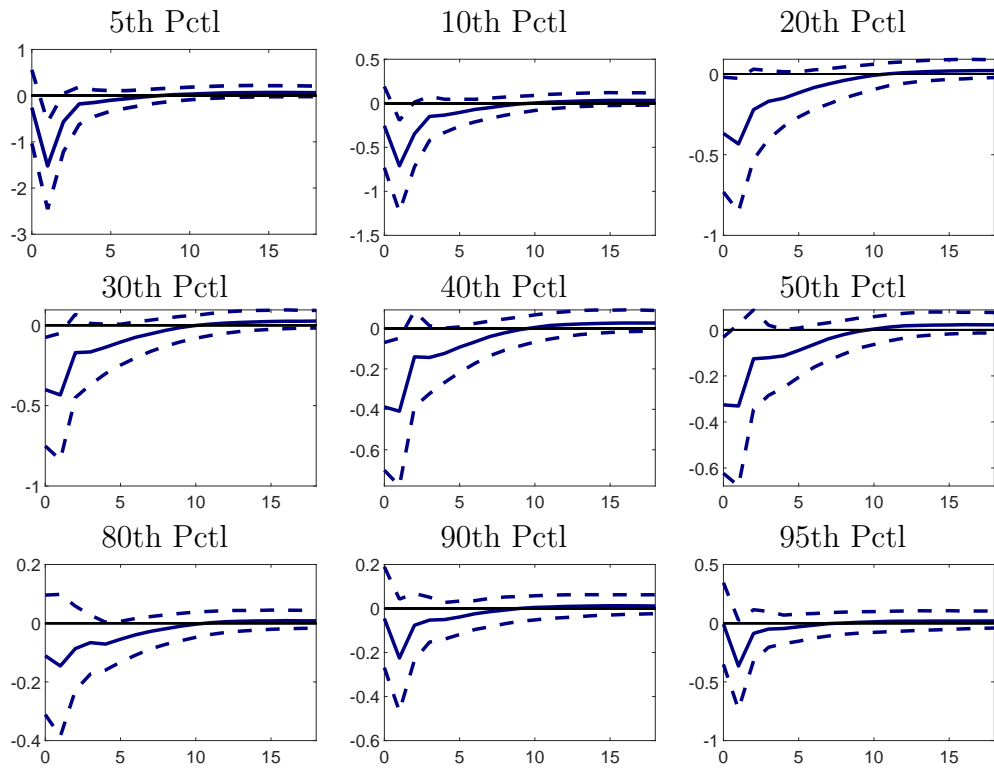


Figure 33: Percentile responses to a one standard deviation tax cut for the VAR model that includes hours worked; median (blue, solid), 68-percent credible interval (blue, dashed)

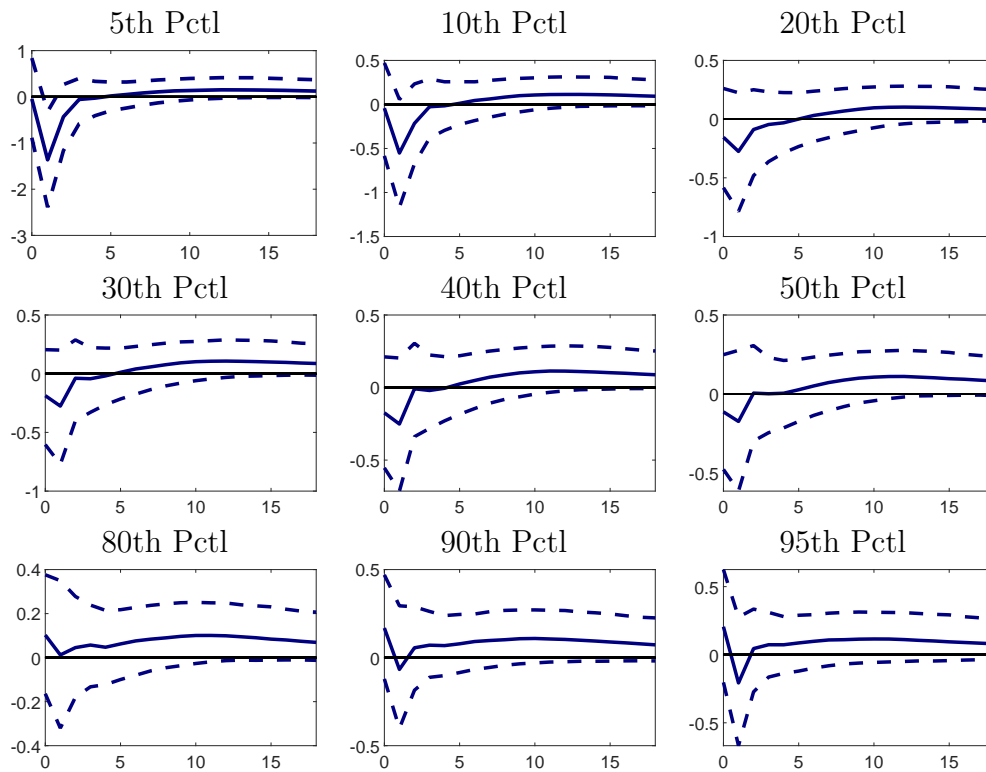


Figure 34: Absolute benefit (in percent) from a one standard deviation tax cut for VAR model that includes hours worked; median (blue, solid), 68-percent credible sets (blue, dashed).

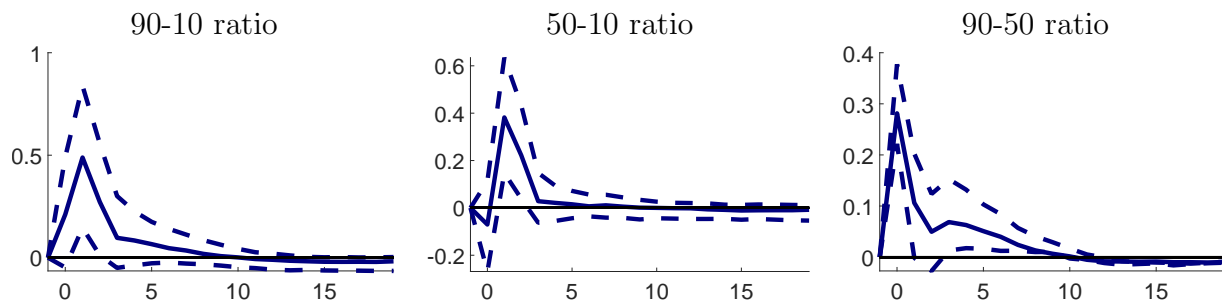


Figure 35: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent for VAR model that includes hours worked; median (blue, solid), 68-percent credible interval (blue, dashed)

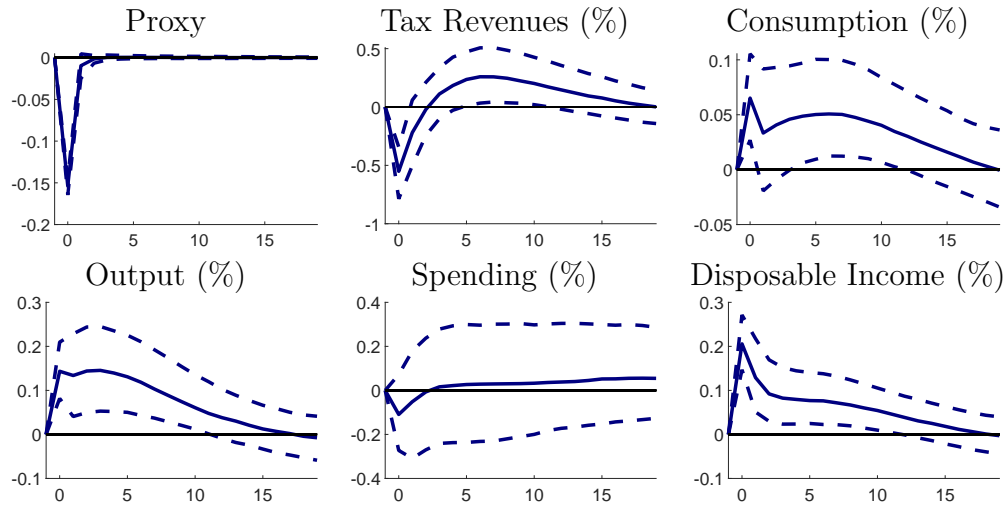


Figure 36: Aggregate responses to a one standard deviation tax cut for VAR model that includes the labor force; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

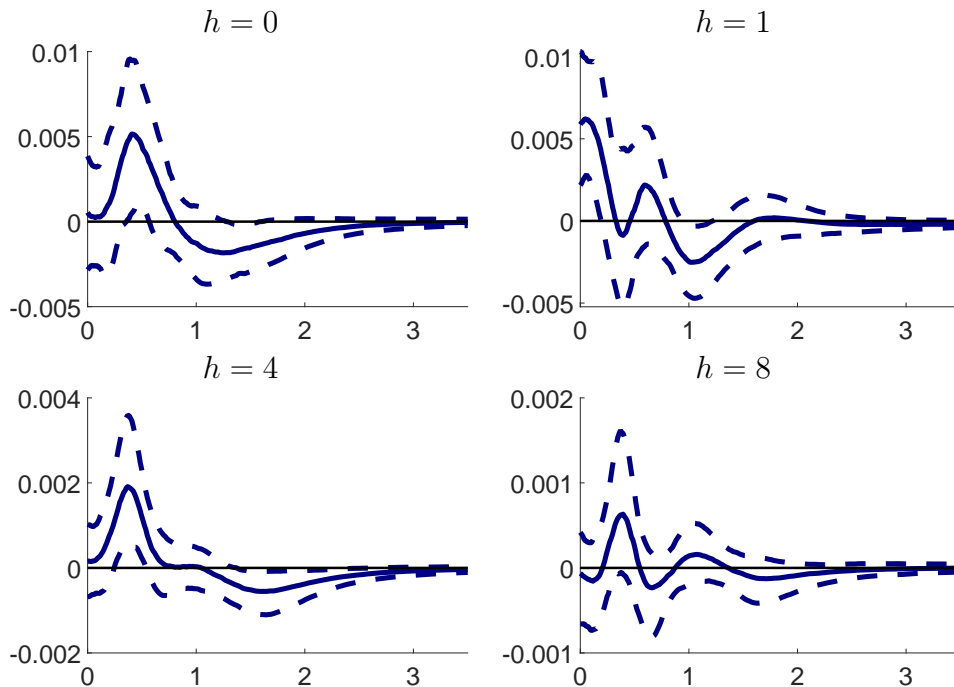


Figure 37: Density responses to a one standard deviation tax cut for VAR model with the labor force; median (blue, solid), 68- percent credible interval (blue, dashed)

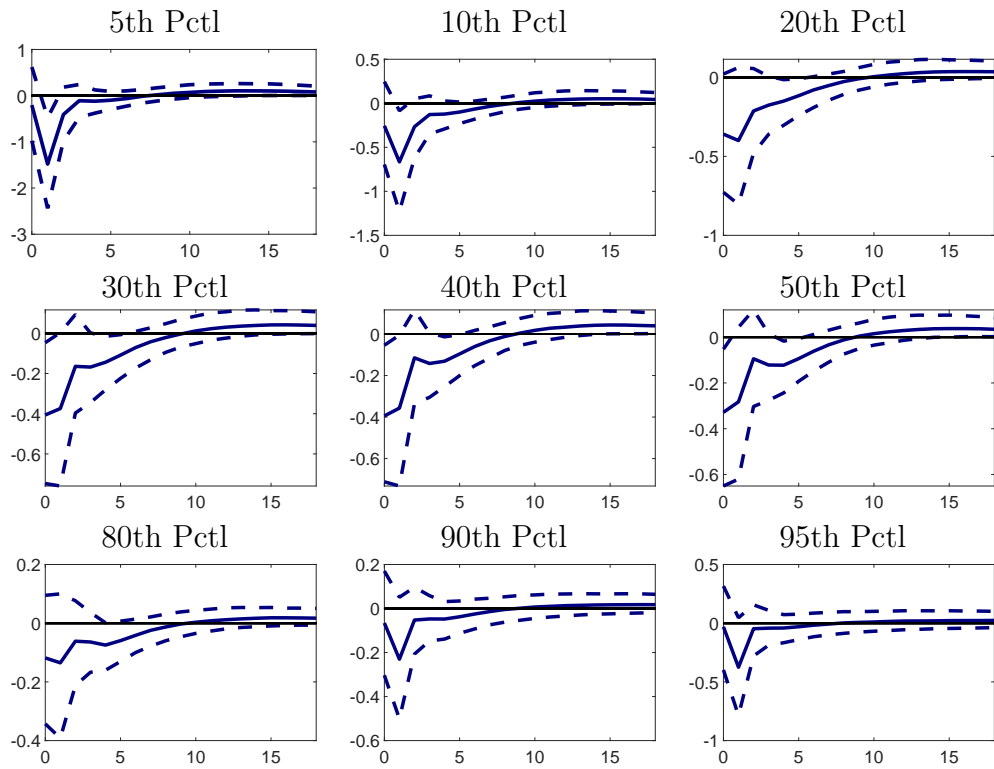


Figure 38: Percentile responses to a one standard deviation tax cut for the VAR model that includes the labor force; median (blue, solid), 68-percent credible interval (blue, dashed)

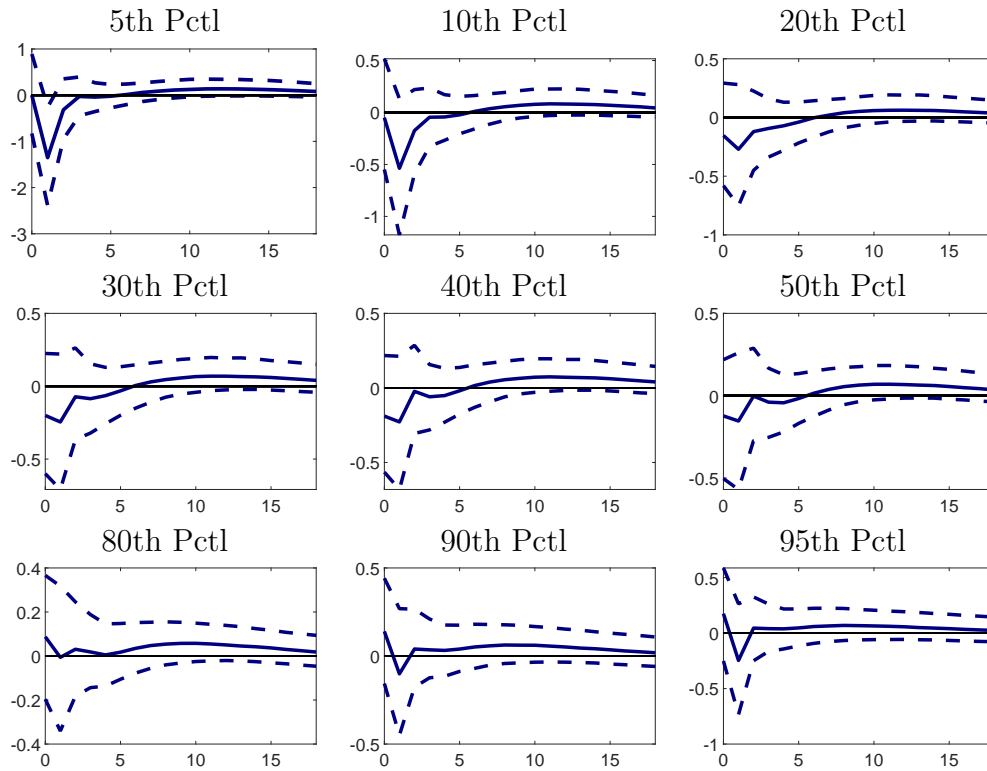


Figure 39: Absolute benefit (in percent) from a one standard deviation tax cut for VAR model that includes the labor force; median (blue, solid), 68-percent credible sets (blue, dashed).

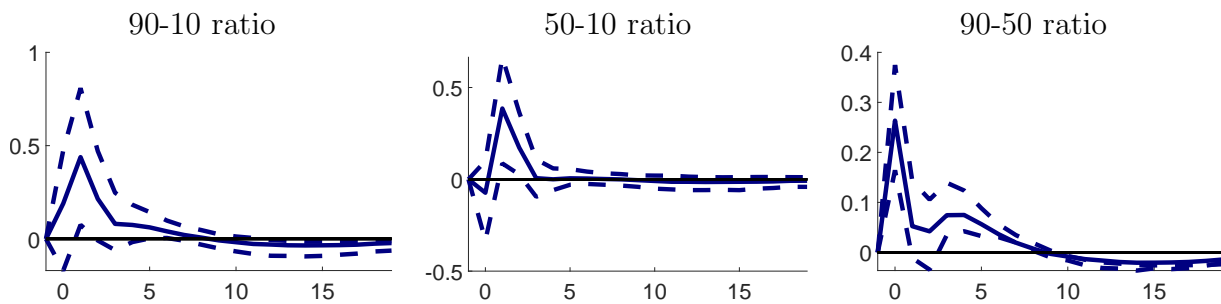


Figure 40: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent for VAR model that includes labor force; median (blue, solid), 68-percent credible interval (blue, dashed)

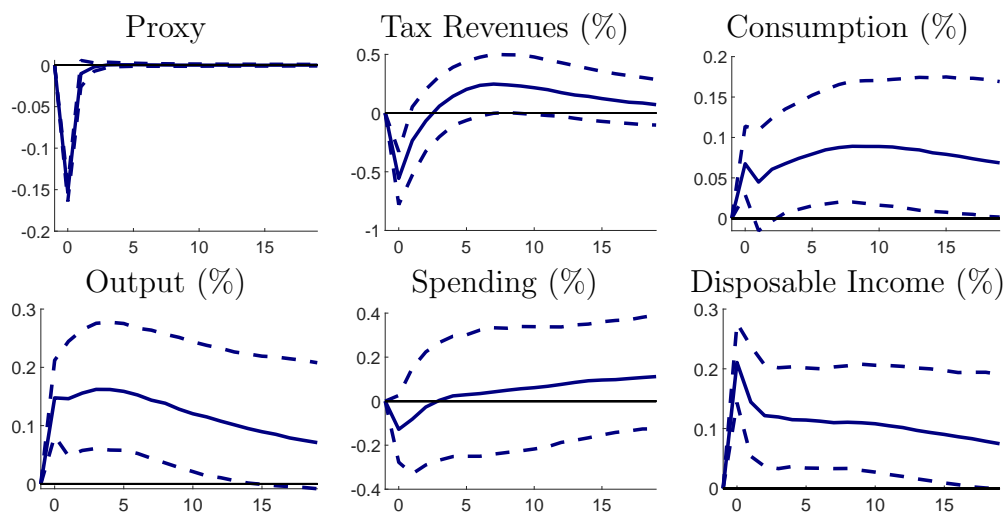


Figure 41: Aggregate responses to a one standard deviation tax cut for VAR model that includes tax progressivity; median (blue, solid), 68-percent credible interval (blue, dashed). Shock occurs at $h = 0$.

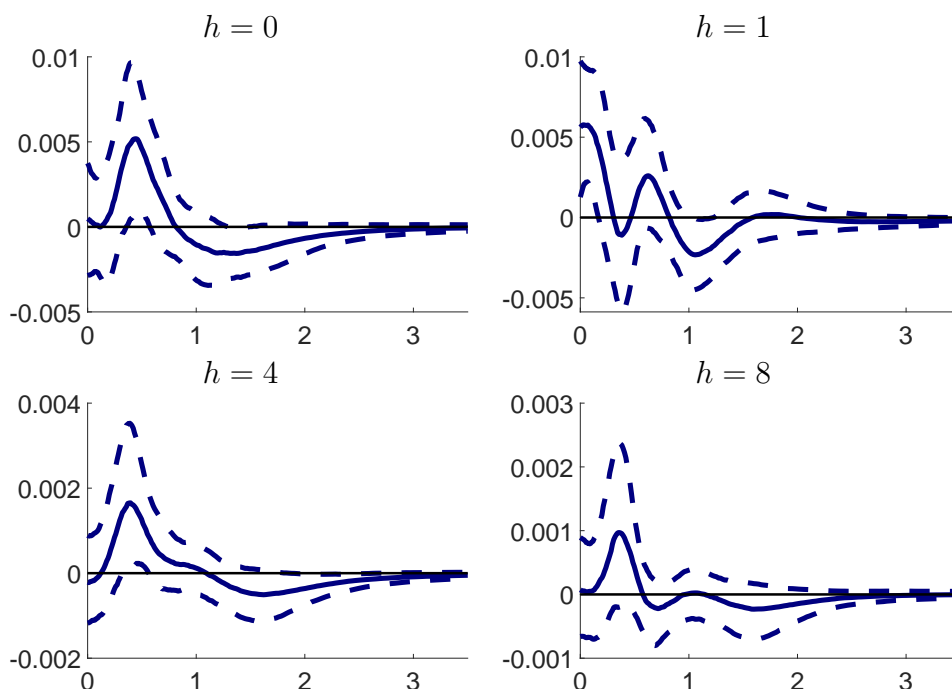


Figure 42: Density responses to a one standard deviation tax cut for VAR model with tax progressivity; median (blue, solid), 68- percent credible interval (blue, dashed)

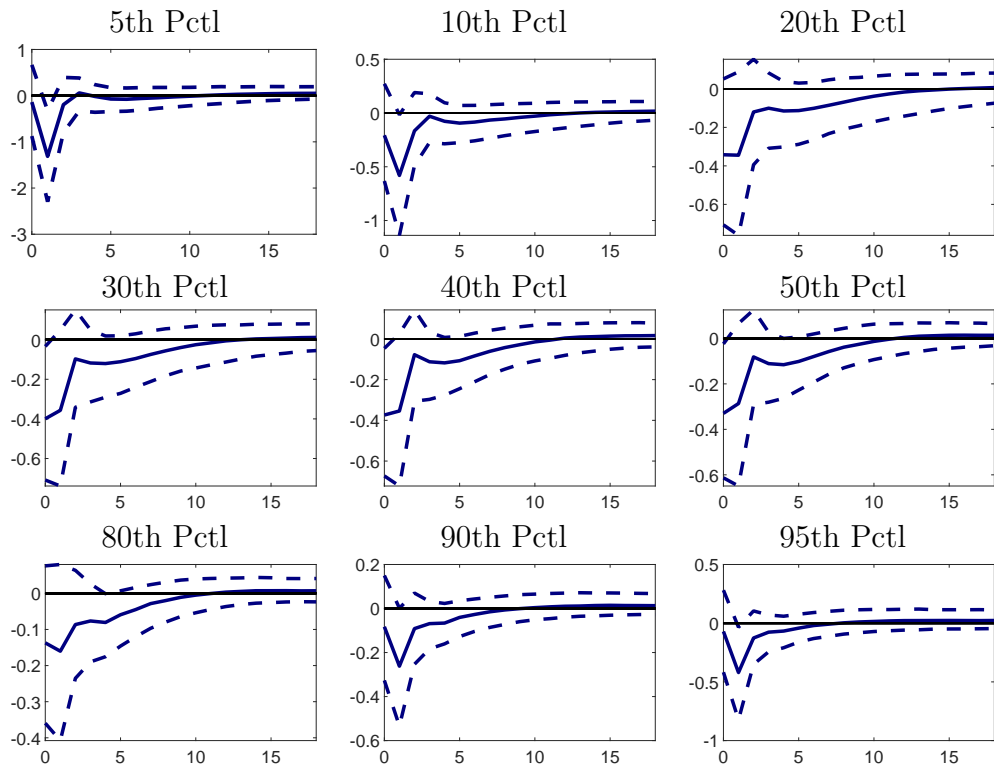


Figure 43: Percentile responses to a one standard deviation tax cut for the VAR model that includes tax progressivity; median (blue, solid), 68-percent credible interval (blue, dashed)

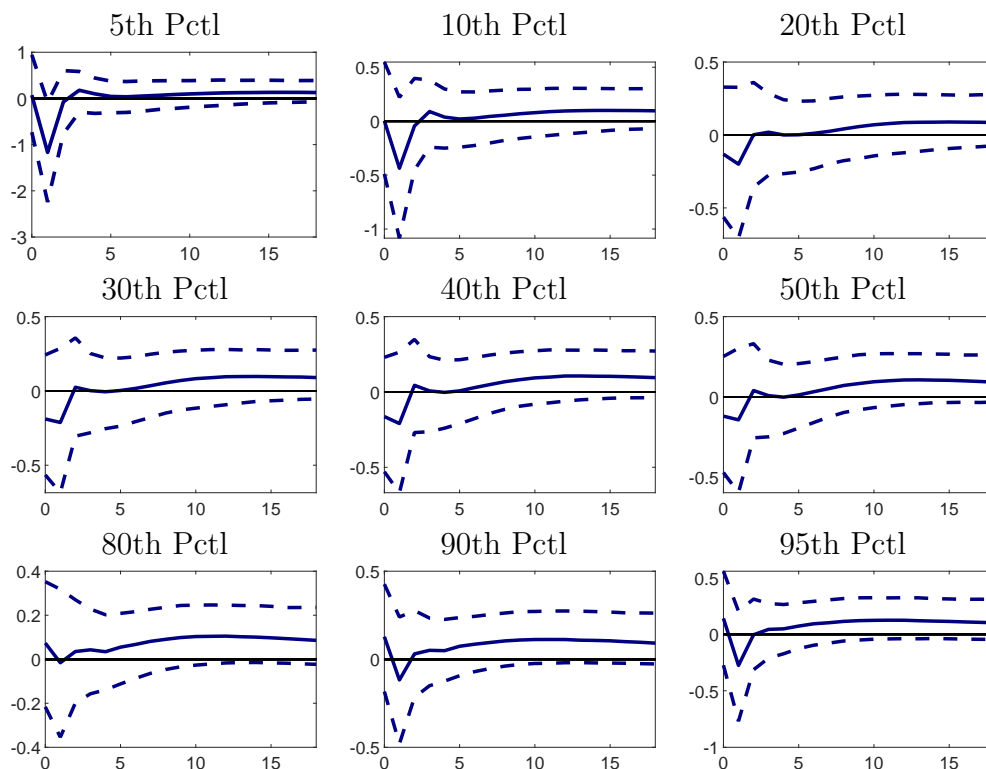


Figure 44: Absolute benefit (in percent) from a one standard deviation tax cut for VAR model that includes tax progressivity; median (blue, solid), 68-percent credible sets (blue, dashed).

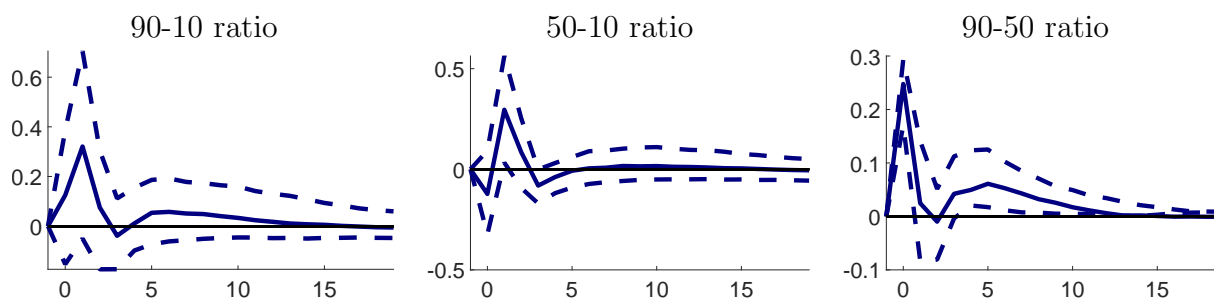


Figure 45: Response of 90/10, 90/50, and 50/10 ratios to a one standard deviation tax cut in percent for VAR model that includes tax progressivity; median (blue, solid), 68-percent credible interval (blue, dashed)