One Hundred Years of U.S. State Taxation*

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Abstract

We analyze the evolution of U.S. state tax rates since 1910 and state tax revenues from 1942 until 2022. Tax policy shifted rapidly at the beginning of the 20$^{\text{th}}$ century, but in many ways has remained remarkably stable over the past fifty years. Even as tax rates change frequently and vary widely across states, the degree of heterogeneity across states in rates and revenues is very similar over time. We document two key insights for empirical researchers using variation in tax policy for identification. First, tax changes do not appear to be driven by economic conditions, as neither the timing of tax changes nor tax rates themselves exhibit a predictable pattern around state recessions. Second, throughout the time period we study, many tax changes occur simultaneously, particularly for personal, corporate, and sales taxes. Because the coinciding changes are typically moving in the same direction, researchers should use caution when attributing effects to a specific type of tax, and we show that estimates can be sensitive to controlling for additional tax rates.

JEL Classification: D72, H20, H71, H73, H77, N32

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U.S. state tax policies have changed dramatically since the beginning of the 20th century. At that time, no states collected personal income, corporate income, or sales taxes, yet today these taxes make up 75% of state tax revenues. Throughout this period, state tax revenues rose substantially, growing from less than 1% of U.S. GDP to more than 5% today. While some tax rates grew five- or six-fold on average, others experienced an equally-sized decline. In this paper, we study these and other policy changes over the past 113 years, in order to deepen our understanding of the tax setting process and its implications for empirical research on taxation.

We employ a novel dataset of U.S. state tax rates covering personal income taxes (top and minimum rates), corporate income taxes (top and minimum rates), sales taxes, gasoline taxes, cigarette taxes, and alcohol spirit taxes. Our data begin in 1910, the first year any state collected any of these taxes, and extend to 2022. These taxes together have generated at least 50% of state tax revenue since the 1930s, and 80% of tax revenue since 1970, with the remainder primarily consisting of property taxes, motor vehicle and other license taxes, and other selective sales taxes (such as for insurance premiums and public utilities). We supplement our tax rate data with detailed state tax revenue data from 1942 to 2022.

Our analysis consists of two parts. In the first part, we describe how tax rates and revenues changed across states and over time. In the second part, we analyze two aspects of tax changes that are most relevant to empirical researchers: whether tax changes occur simultaneously, and whether they appear to be driven by economic conditions.

The evidence presented in this study serves two major purposes. First, it provides insight into the plausible causes of tax policy heterogeneity, both across states and across time. The long time horizon of study allows for better positioning of recent trends and findings (volatility, responsiveness, etc.) within their historical frame of reference, thus helping us to understand if they are markedly different from long-term historical norms. Second, it provides crucial context for interpreting findings from the empirical tax literature. A large body of empirical tax research exploits short-term variation in tax rules to measure the

economic effects of taxation. While these studies allow researchers to identify causal effects, they often focus on one tax type at a time and disregard the long-term tax shifts occurring in the background – factors which may have important influences on the studied outcomes.

Our descriptive analysis demonstrates that in many ways, tax policy has remained remarkably stable in aggregate over the past half-century. While states adopted many new types of taxes at the beginning of the 20th century to fuel growing expenditures, since 1970 they very rarely adopt new tax types or cancel existing ones. Stability in the types of taxes collected has led to stability in tax revenues – states have collected approximately 5% of U.S. GDP in tax revenue consistently since the 1980s. States differ in their choices of tax rates, but we show that the degree of heterogeneity across states in tax rates and revenues (measured as the coefficient of variation, i.e., standard deviation divided by the mean) has remained similar over time.

Our results are consistent with and complementary to the findings of Rhode and Strumpf (2003) who document a substantial convergence in state expenditure policies over the 20th century, but show a similar level of policy heterogeneity during the last 30 years of the century. At the same time, our results differ from some international evidence that documents a decline in corporate tax rate heterogeneity between 1990 and 1995 (Slemrod, 2004). Rhode and Strumpf (2003) argue that, as mobility costs have declined over time, a Tiebout model predicts greater heterogeneity in equilibrium; tax competition models should generally predict the opposite (see Goodspeed, 1998; Wilson, 1999; Genschel and Schwarz, 2011, for reviews). Our evidence thus does not provide support to either Tiebout or competition forces.

Next, we show that the aggregate stability masks frequent tax changes, often large in magnitude, that occur consistently through the period of study. On average, 15 states changed at least one tax type in a given year, with personal and corporate income taxes changed by more than 10% of the states with those taxes in a typical year. We show that many of these changes occur simultaneously: 34% of tax reforms (i.e., state-year observations

with one or more tax change) involve changes of two or more tax rates and 11% involve three or more rates. This pattern is particularly true for tax increases and for personal, corporate, and sales tax rates. Among all increases in the top income tax, 46% coincided with a corporate tax increase, and 18% coincided with a sales tax increase. Simultaneous tax changes are common for both small and large tax changes, and across all decades studied.

Finally, we show that tax changes do not appear to be driven by economic conditions, as proxied by the fluctuations in the state personal income (SAINC1) series from the Bureau of Economic Analysis. We present evidence from three tests. First, we show that the timing of tax changes does not appear to be influenced by state recessions. While changes frequently happen during recessions, the co-occurrence rates are not different from a simulated benchmark that assumes that the timing of tax changes is simply random. Second, we estimate stacked event studies around state recessions and find no statistically or economically significant effects of state recessions on tax rates. The simple time series also do not demonstrate any notable deviations from trend around state tax reforms. Finally, we show that a quartic in state income changes and in each of its four lags explain less than 1 percent of the variation in the timing of tax changes. All three pieces of evidence thus suggest that economic considerations are unlikely to be the driving cause of state tax changes.

These findings are relevant for empirical researchers who rely on tax variation as a source of identification. Since most of the tax analysis is aimed at understanding the effects of taxes on economic outcomes, our results suggest that tax changes provide plausibly exogenous variation for identification. At the same time, our evidence highlights that researchers should be careful when attributing estimated effects to a specific tax change since tax rates often follow a trend, and tax changes are frequent and often implemented as part of a package (i.e., at the same time as changes in other tax rates). We illustrate this issue by examining the relationship between income taxes and income inequality, and show that both the statistical and economic significance of estimated effects can change depending on the inclusion of other tax rates in the analysis.

This paper builds on a small literature that documents basic facts about state tax policies. Suarez Serrato and Zidar (2018) and Slattery and Zidar (2020) provide a comprehensive overview of state business tax policies, including but not limited to rates, from 1980 to 2010. In the closest study, Baker et al. (2024) explore the relationships between personal, corporate, and sales tax rates at the state and local level from 1977 to 2022. We complement these studies by substantially extending the period of analysis to the beginning of the 20$^{\text{th}}$ century, by considering a wider range of tax types, and by studying different aspects of tax setting processes.

Several caveats to our analysis arise from the fact that tax policies are very complex and cannot be summarized with one variable. First, we choose to focus on tax rates because these are most salient to voters, subject to extensive media coverage, and changed frequently. However, when possible, we extend our analysis to include tax revenues, which reflect the combination of rates, base rules, and other dimensions of tax policy. Furthermore, the excise taxes that we consider (gasoline, cigarette, and alcohol taxes) have uniform tax base rules and are highly comparable. A second caveat is that we exclude property taxes from our analysis, as they are heavily influenced by the tax base, and thus the statutory tax rate alone provides little information about the true tax burden. Relatedly, we do not study local taxes, largely because the vast majority of local tax revenue accrues from property taxes. Property taxes make up only a small portion of state tax revenue (less than 5% since 1950) but account for the majority of local tax revenue and, as a consequence, for a large share of combined state and local taxes. Nonetheless, we acknowledge the importance of base rules, property taxes, and local taxes, and encourage future researchers to study them.

1 Data

Tax Rate Data. We collect state tax rate data from 1910 to 2022 for the following tax rates: minimum and top personal income, minimum and top corporate income, sales, cigarette per

pack, gasoline per gallon, and alcohol spirit per gallon. We complement this information with corresponding federal tax rates.

For years prior to 1950, the primary source of data are the *Proceedings of the Annual Conference on Taxation under the Auspices of the National Tax Association*. These annual publications summarize enacted tax changes, as well as some of the proposed but failed tax changes. Alcohol spirit tax rate data has been obtained from Ponicki (2004). For years starting with 1950, our primary source of data are the *Council of State Governments Book of the States*. Whenever possible, we cross-validate tax data with other sources, such as Tax Foundation, Tax Policy Center, OTPR's World Tax Database, Centers for Disease Control and Prevention, the Federation of Tax Administrators, Federal Highway Administration, and official state websites.

Personal and corporate income tax rates include statutory rates plus any applicable surtaxes which were common in the first half of the 20th century. Sales, cigarette, and gasoline tax rates include state-level taxes as well as any mandatory and uniform across counties local taxes or other mandatory surtaxes. For gasoline taxes, the tax rate is the rate collected by the distributor/supplier/retailer in each state, and includes inspection fees, environmental clean-up fees, and other related mandatory fees. Sales taxes on gasoline are generally excluded, with the exception of a few states that include prepaid sales taxes. For cigarette and alcohol taxes, we omit (a small number of) state-year observations in which tax rates were set as a percent of the price.

When tax rates change, we record the new tax rate in the year it becomes effective even if the change occurs at the end of the calendar year.

Tax Revenue Data. In addition, we collect information on state and federal tax revenues. Our primary source for state tax revenue data is the U.S. Census Bureau's *Data Base on Historical Finances of State Governments*, which is based on periodic censuses of governments and annual surveys of government finances operating under various names throughout the years. This database contains tax revenues by category and state biannually

starting in 1942, and annually 1950-2006. It also contains total state tax revenues by category (e.g., total sales tax across all states) on an irregular basis starting in 1902. We supplement with the U.S. Census Bureau's *Annual Survey of State Government Tax Collections* for years 2007-2022.

Federal tax revenue statistics are from the Internal Revenue Service, and include excise tax revenues collected by other agencies (i.e., by the Bureau of Alcohol, Tobacco, and Firearms and the Customs Service). For years 2000 and later, we collect these data directly from the IRS *Data Book* and *Statistics of Income*. For years 1999 and earlier, we collect them indirectly via the *Historical Statistics of the United States*.

Since tax revenues grow systematically both with population and GDP, when comparing states to each other and across time, we use revenue per capita as a percent of U.S. GDP per capita as our outcome variable. This measure accounts for state-specific population trends as well as the overall U.S. GDP growth trend.

Adjustments and Sample Restrictions. We inflation-adjust nominal rates of cigarette, gasoline, and alcohol excise taxes, as well as all tax revenues, to 2020 dollars using the BLS CPI series.

Unless otherwise specified (e.g., Figure 2), our analysis focuses on states that have a certain type of tax in place i.e., on states with non-zero tax rates. When studying revenues, we omit states that do not have a certain tax type even if this state collects some amount of revenue in that category (from related taxes). We typically omit Alaska from all figures that show tax revenues, as these are exceptionally volatile and reach extreme highs.[1]

When specifically studying tax change events (i.e., the frequency or simultaneity of changes), we disregard tax changes that are smaller than 0.1 percentage points for personal, corporate income tax, and sales taxes. For excise taxes, tax changes are measured in real terms but identified using nominal rates (i.e., if the nominal rate remains the same, we do not consider it a tax rate change; if the nominal rate has changed, we calculate the magnitude

[1] Alaska is included in overviews of total revenues nationwide in Figure 1 and Appendix Figure A.1.

as the change in real terms from the previous year). We also disregard excise tax changes that are smaller than \$0.005. The latter restriction allows us to disregard the frequent but small changes in gasoline taxes that arise from automatic adjustment rules implemented in some states. Because we focus on states with non-zero tax rates, unless otherwise specified (e.g., in Appendix B) we only consider intensive margin tax changes; tax adoptions and cancellations are excluded.

Finally, since our focus is on tax policy, we treat each state-year as an observation and do not weight by population. States are included in the data beginning the year when they joined the union.

2 Evolution of Tax Revenues and Tax Rates

We start by describing the evolution of tax revenues, types of taxes collected, and tax rates over time. We show that across all dimensions, tax policy changed rapidly at the beginning of the 20$^{\text{th}}$ century. However, since 1970, aggregate tax revenues and tax types have been remarkably stable. States differ widely in their choice of tax rates, but the amount of variation between states in tax rates and tax revenues has remained consistent since 1940. Averaging across states, some tax rates have increased sharply, while others have declined, and while state tax revenues are correlated with federal tax revenues, the tax rates themselves evolve differently at each level of government. Finally, we see little relationship between states' tax adoption processes and their future tax rates and revenues, suggesting that the heterogeneity in tax adoptions early in the 20$^{\text{th}}$ century is not primarily driven by underlying state tastes and preferences.

Tax Revenues. Figure 1 documents the dramatic increase in tax revenue collection at the federal and state level. We see that while federal tax revenues exploded rapidly from 1930 and stabilized by 1950, state tax revenues grew gradually over time, stabilizing around 1970. Post-stabilization, the federal government collects an equivalent of 15-20% of U.S.

GDP as tax revenue, while state governments combined collect an equivalent of 5% of U.S. GDP.[2] The revenue growth coincides with revenue pressures from the introduction of the New Deal programs (enacted between 1933 and 1938) and World War II expenditures.

Figure 1 also shows that the reliance on different types of taxes changed dramatically over time. At the beginning of the 20th century, federal tax revenues were primarily derived from excise taxes on tobacco and alcohol, and state tax revenues were primarily derived from property taxes. The tax types that generate the most revenue today were non-existent in 1910, and the adoption of these taxes corresponds to the large increases in spending – primarily adding to, rather than substituting for, other tax revenues.

Today, at both the state and federal level, personal income taxes account for the largest share of revenue (40% and 55% respectively). Both state and federal personal income tax shares have been stable at current levels since 2000. Sales taxes are popular at the state level, while payroll taxes are the second largest category at the federal level (30% each). Both shares have been slowly rising over time. Corporate taxes lag behind, accounting for 10% or less at both the state and federal level. Yet, while at the state level, corporate revenue has been kept steady, federal corporate revenue has been decreasing over time. Excise taxes on motor fuel, tobacco, and alcohol together represent about 5% of state tax revenue. At the federal level, motor fuel, tobacco, and alcohol excise taxes were historically important but together only make up a 1% share today.

In this study, we focus on the tax types that have constituted the vast majority of state tax revenue during our time period: personal, corporate, sales, motor fuel, tobacco, and alcohol. These six taxes have generated the majority of tax revenue since the 1930s, and have consistently accounted for about 80% of state tax revenue since 1970. The remainder is comprised of property taxes (which has decreased from the majority share of state tax revenue to less than 2% today), motor vehicle and other license taxes, and other selective

[2]In contrast, local government revenues have remained largely constant over the years at around 3% of GDP, with the exception of 1920-1940 when local revenues reached a maximum of 7% of U.S. GDP. See Appendix Figure A.1.

sales taxes such as those for insurance premiums and public utilities.

Tax Adoptions. In Figure 2, we focus on the choices by states of whether and when to adopt each of the six tax types. We first note that state tax adoptions are not always consistent with federal adoptions. Personal income and corporate income taxes were first adopted by states in 1911, approximately contemporaneously with implementation at the federal level.[3][4] However, gasoline taxes were first adopted by states in 1919, and were universal by the time the federal government implemented one in 1932. Similarly, sales taxes were first implemented by states in 1932, while the federal government has never collected such a tax. On the other hand, despite long-standing federal versions of these taxes, states did not begin to collect cigarette taxes until 1921 or spirit taxes until 1933.[5]

The speed of adoption by states also varies across tax types. While cigarette and gasoline taxes were adopted rapidly (all states had a gasoline tax and 40 states had a cigarette tax by 1950), personal income, corporate income tax, alcohol taxes, and sales taxes were adopted more gradually. These adoptions proceeded in three waves: with a large number of adoptions in the 1910-20s (personal and corporate only), in the 1930s, and a last wave in the 1960s (though alcohol taxes were mostly unchanged after 1950). As a result, most tax adoptions were completed by the early 1970s, and since then very few states have introduced or canceled a tax. Despite this stability, there remains heterogeneity across states in the composition of their tax types. For each of personal, corporate, and sales taxes, there remain 5-9 states that have not yet adopted the tax, and one-third of states do not collect an alcohol tax.

Tax Rates. Figure 3 describes the distribution of state tax rates over time, focusing on states with non-zero rates only. Tax rates have varied widely over the past hundred years, and the various tax types follow different patterns: sales and cigarette taxes increased

[3] A federal corporate income tax was implemented in 1909. The 16th Amendment, which explicitly gave the federal government the power to collect income taxes, was passed by Congress in the same year but not ratified by the states until 1913.

[4] Two states – North Carolina and Virginia – had a version of an income tax since the late 19th century. Both produced a small amount of revenue and were rather restrictive relative to the modern income tax counterparts. Nonetheless, we chose to include these in our analysis as they taxed income (Comstock, 1920).

[5] Berry and Berry (1992); Howe and Reeb (1997) discuss the plausible causes of state tax adoptions.

on average over time, gasoline and alcohol taxes have decreased steadily since 1930, and personal and corporate income taxes followed an inverse-U trend, peaking at 1975 and 1990 respectively. Unlike tax revenues and tax adoptions, tax rates continue to change in the most recent decades.

However, as with other dimensions of state tax policy, we find substantial heterogeneity across states, and the degree of this heterogeneity remains consistent over time. Figure 4 shows this formally by plotting the coefficient of variation for each tax rate over time. We see stable variation in tax rates over time, and similar stability in tax revenues.[6] Our results are consistent with and complementary to the findings of Rhode and Strumpf (2003) who document a substantial convergence in state expenditure policies over the 20th century, but show a similar level of policy heterogeneity during the last 30 years of the century. At the same time, our results differ from some international evidence that documents a decline in corporate tax rate heterogeneity between 1990 and 1995 (Slemrod, 2004). Rhode and Strumpf (2003) argue that, as mobility costs have declined over time, a Tiebout model predicts greater heterogeneity in equilibrium; tax competition models should generally predict the opposite (see Goodspeed, 1998; Wilson, 1999; Genschel and Schwarz, 2011, for reviews). Our evidence thus does not provide support to either Tiebout or competition forces.

While a direct comparison of the many tax base rules (or the tax base itself) for each type of tax is beyond the scope of this paper, we can indirectly observe their impact in two ways. First, figures describing the distributions of revenues over time are available in Appendix Figure A.2. For sales, gasoline, and alcohol taxes, tax rates and revenues show a similar pattern. However, the pattern is different for income and tobacco taxes/revenues. For example, while personal and corporate top income rates show an inverse U-shape pattern, personal income tax revenue has been strictly increasing, while corporate revenue remained flat. These differences highlight the importance of tax base features in determining the overall revenue outcomes (Suarez Serrato and Zidar, 2018). For example, one potential

[6]The large spike in Figure 4(d) is not a data error, and is a consequence of the *Bacchus Imports, Ltd. v. Dias* case in Hawaii which led to alcohol revenues being held in escrow from 1980 until their release in 1988.

explanation for the continuous increase of personal income tax revenues is the devaluation of dollar-valued income tax brackets and personal exemptions. In contrast to income taxes, tobacco tax rates increased dramatically in the most recent 20 years, yet tobacco revenue largely remained the same, and even decreased over time, consistently with the decline in smoking rates.

Second, in Appendix Figures A.3 and A.4, we compare tax revenues and rates at the federal level to the state average. Overall, with the exception of corporate income revenues, state and federal tax revenues exhibit qualitatively similar patterns over time and high degrees of correlation, ranging from 0.5 for tobacco revenues to 0.95 for alcohol revenues. Only corporate tax revenues show a negative correlation, but the relationship is weak at -0.3. Turning to tax rates, average state taxes also move similarly to federal ones. However, for each tax type (again with the exception of corporate taxes), the correlation is weaker for tax rates than it is for revenues. For tax rates, alcohol shows the highest degree of correlation at 0.82, while gasoline taxes show the lowest at 0.1. While corporate revenues exhibited a negative correlation, corporate rates show a relatively high positive correlation – the top rates at 0.43 and the minimum rates at 0.26. Taken together, these results suggest that state decisions about the tax base (e.g., tax brackets) may evolve similarly on average to federal rules, such that tax revenues overall show more comparable patterns despite more diverging patterns in tax rates.

Relationship Between Tax Adoption Process & Future Tax Policy. States varied substantially in all aspects of the tax adoption process – timing, duration, and order. In Appendix B, we study the relationship between this tax adoption process, and states' geography and future tax policy. Beginning in Appendix Figures B.5-B.6, we show by geographical region the duration of the tax adoption process for each state and the relationship between the adopted tax rate and the prevailing average. In contrast to Feir et al. (2023) who found evidence of geographic policy diffusion of property tax adoptions among First Nations in Canada, and to DellaVigna and Kim (2022) who find that geographic proximity played an

important role in the diffusion of a varying set of policies across the U.S. states prior to 2000, the adoption process of U.S. state taxes does not appear to follow a well-defined geographic pattern.

A natural question is to what extent the adoption pattern seen in Figure 2 is predictive of future rates or revenues. Our analysis in the remainder of Appendix B suggests that it is not very predictive. Specifically, we plot the tax rates and revenues over time for states that adopted taxes early versus late (Figures B.7–B.9), completed the adoption process quickly or slowly (B.10-B.11), or introduced tax types in different order (B.12–B.14). Our results show no persistent differences in tax rates or tax revenue compositions irrespective of how, when, and in which order states adopted the six tax types we study.

Our results suggest that the heterogeneity in tax adoptions is unlikely to be driven by underlying state tastes or preferences. We see that some tax types are adopted uniformly and quickly (like the gasoline tax), while other taxes are adopted much more slowly or not at all. In addition, between states that adopted a given tax earlier versus later, in most cases, tax rates converge quickly: suggesting that preferences for early adoption are not typically correlated with preferences for high or low tax rates. Thus, rather than being driven by underlying state preferences, the tax adoption process was more likely driven by political constraints, as argued by Berry and Berry (1992).

Furthermore, state tax adoptions overall show a strong time pattern, where the years prior to 1970 are dynamic with many adoptions, yet the years after are remarkably stable. This closely resembles the trend for state tax revenue: when states cease adopting new tax types, revenue (as a percent of GDP) ceases to dramatically grow. Of course, this pattern does not speak to a causal direction. One possibility is that new tax adoptions became politically infeasible, limiting tax revenue growth. Alternatively, it may be that state expenditures grew quickly in the post-war period due to new social programs and shifts in intergovernmental interactions (Baicker et al., 2012), but these trends slowed in later years, thus curbing tax adoptions.

3 Understanding the Timing of Tax Changes

The previous section demonstrated that while tax policy changed rapidly in the early 20th century, it has remained remarkably stable since at least 1970: tax rates and revenues changed gradually, and showed similar levels of variation over time. However, this stability prevailed despite the large number of tax changes occurring throughout the time period of study.

Across all tax rates, each year saw an average of 15 states changing at least one tax rate, ranging from no changes in the earliest years to 35 states in 1983. Gasoline taxes are changed the most frequently, by 16% of states in an average year, while personal/corporate income and tobacco taxes are changed by 11-13% of states each year. Alcohol and sales taxes are adjusted the least frequently, by 6-8% of states on average each year.[7] Appendix Figure C.15 provides these statistics for each year. Overall, we see some periods with more frequent changes (e.g., 1980s) and other periods with less. Nonetheless, tax changes are numerous throughout the period of study, and they do not appear to follow a well-defined pattern. For example, we do not see a consistent clustering of tax increases or decreases, and in many years, tax increases and decreases occur in the same year.

In Appendix Figures C.16-C.19, we show that states vary both in how frequently they adjust each tax type and how this frequency has changed over time. For example, from 1910 to 1969, Mississippi adjusted its tax rates the most, with 40 changes (C.17); however, from 1970 to 2022, Mississippi was the 5th least likely state to make any tax rate changes (C.18). Overall, we see little relationship between the number of times the state changed its tax rates in the pre-1970 versus post-1970 periods (C.19). Finally, we show that for most periods and most tax types, we see a weakly negative relationship between the frequency of tax changes and the average tax change magnitude (see bottom panels of Figures C.16-C.18). This shows that some states prefer to make many small changes, while other states prefer infrequent but more substantial rate changes. Appendix Figure C.20 shows the full distributions of tax

[7] All calculated as a percent of states that have a non-zero tax rate in that year.

change magnitudes, overall and separately for increases and decreases; while tax changes can be small, large and economically meaningful tax changes also occur frequently.

In this section, we seek answers to two questions about the timing of these frequent tax changes: (1) are tax rates changed concurrently, and (2) to what extent are tax changes exogenous to economic conditions? The answers to these questions are important for our interpretation of empirical research on taxation, as well as for our understanding of tax policy setting processes in general.

To the first question, we show that a large proportion of tax changes occur simultaneously, with tax increases being especially likely to coincide with other tax increases. As we discuss in an illustrative example, when estimating the effect of a particular tax rate (here, the effect of income taxes on income inequality), adding an additional tax rate to the analysis can impact the statistical and economic significance of the initial estimates.

To address the second question, we analyze the extent to which the timing of tax changes coincides with state recessions, study how tax rates change before and after recessions, and measure the overall explanatory power of economic conditions on the timing of tax changes. Across these methodologies, our results consistently suggest that economic considerations are unlikely to be systemically driving the state-level tax changes we observe.

3.1 Simultaneity of Tax Changes

We first explore whether different tax types are changed in the same year, and if yes, whether states tend to increase or decrease all tax rates across the board, or instead, shift tax structures by increasing some rates while decreasing others. In Figure 5, among the increases (or decreases) in each tax on the horizontal axis, the vertical bars specify the share that coincides with an increase (or decrease) in another tax type in the same state and year. For example, Figure 5(c) shows that among all of the times that states decreased the corporate income tax, 10% occurred alongside an increase in the cigarette tax in the same state and year. The results are striking: a large number of tax changes occur simultaneously! Overall, 34% of

tax reforms (i.e. state-year observations with one or more tax change) involve changes of two or more tax rates, and 11% involve three or more rates.

This pattern is particularly true for tax increases, and for personal, corporate, and sales tax rates. We see that 46% of top income tax rate increases coincided with a corporate rate increase, and 18% coincided with a sales tax rate increase. Meanwhile, personal income tax *decreases* coincided with corporate tax *decreases* in 29% of cases. Corporate tax increases and decreases also show a high overlap with both personal and sales taxes. However, Figure 5(d) provides strong evidence against tax substitutions: when states increase their tax rates, they rarely cut other tax types to compensate. Instead, we find many instances of multi-tax increases or decreases. A possible explanation for the observed patterns is that certain combinations of tax changes are more politically feasible than others (Bierbrauer et al., 2021).

Figure 6 explores whether simultaneous tax changes primarily occurred during a specific time period only, or represent a persistent pattern over time. We see that, in most decades, around 40-50% of personal and corporate income taxes coincide, with the exception of the 1990-2010 period, when the coincidence rates fell to 20-30%. Similarly, across decades, between 10% and 30% of sales tax changes coincided with personal and/or corporate income tax changes.[8]

Appendix Figures D.22-D.23 repeat the analysis of Figures 5-6 but restrict the sample to large changes only. For personal, corporate, and sales taxes, a tax change is considered large if it is greater or equal to 1 percentage point, which approximately corresponds to the 50th percentile of tax change magnitudes.[9] The cutoffs for excise taxes are given by the 50th percentiles: \$0.184 per pack for cigarette taxes, \$0.054 per gallon for gasoline taxes, and \$2.956 per gallon for alcohol spirit taxes (all changes expressed in 2020\$). While the

[8]Since most simultaneous tax changes are of the same direction, Figure 6 does not distinguish between increases and decreases. Appendix Figure D.21, shows simultaneity by decade separately for all combinations of changes: increases/increases, decreases/decreases, decreases/increases, and increases/decreases. The pattern is consistent with the averages shown in Figure 5. Appendix Figure D.24 shows the same analysis restricted to large tax changes only, with consistent results.

[9]See Appendix Figure C.20 for the full distributions of tax change magnitudes relative to the cutoffs.

coincidence rates are slightly lower, the pattern remains: we see large coincidence rates for personal, corporate, and sales tax increases, and personal and corporate tax decreases.

Finally, Appendix Figure D.25 shows simultaneity rates but focuses on the minimum and top income tax rates among states with non-flat tax schedules. Once again we see a large degree of co-occurrences among increases and decreases, however, the coincidence rates differ: top income tax rates increase in more than 60% of the cases when the minimum rate increases, but the minimum rate is raised in 35% cases of top rate increases, with a similar pattern for corporate rates. Put simply: top rates are changed more frequently than minimum rates.

This simultaneity analysis highlights the importance of paying attention to other tax changes when using cross-state tax variation in empirical studies. This is particularly important for researchers who employ variation in personal, corporate, and sales taxes, as well as for studies of tax increases in general, as these are most likely to occur as a bundle. Empirical researchers must be mindful of such co-occurrences when attributing their estimated effects to a particular tax change, because the simultaneous tax changes tend to be of the same direction – simultaneous increases or simultaneous decreases, making attribution particularly difficult. Our results echo the contemporaneous findings of Baker et al. (2024), who reach similar conclusions for the years 1977-2022.[10]

To illustrate this point, consider the following example. Piketty et al. (2014) estimate the relationship between U.S. top income shares and the top federal personal income tax rate and find a statistically significant relationship. In Panel A of Appendix Table D.1 we show that a similar relationship exists for federal corporate income taxes, and if one considers both personal and corporate taxes together, only the corporate income taxes exhibit an economically and statistically significant effect on U.S. top income shares. Robinson et al. (2024) extend this analysis to state-level inequality measures and state income taxes. The

[10]Baker et al. (2024) also discuss a related concern when state and local tax changes occur simultaneously. They find that among sales tax changes, states and localities move in opposite directions from one another, creating a similar attribution concern for empirical researchers. However, they find no relationship between states and localities for income tax changes.

results follow a similar pattern: they find a statistically significant relationship between state top income shares and state top personal income taxes, as well as between top income shares and corporate income taxes. Once both personal and corporate taxes are included, only state corporate income taxes exhibit an economically and statistically significant effect on state top income shares. Panel B of Appendix Table D.1 reproduces these results. While this evidence abstracts away from such important considerations as causality and does not negate the key message – that tax rates relevant to top-income individuals are likely to affect top income shares – the evidence nonetheless demonstrates the potential pitfalls of automatically assigning the explanatory power to the studied tax alone.

In terms of which taxes show a robust effect, our example also differs from the conclusions of Baker et al. (2024). They estimate the relationship between state-level employment growth and personal, corporate, and sales tax rates. Relative to analyzing one tax at a time, including additional taxes leads to only 10-30% reductions in all of the estimated effects (though only personal tax rates continue to be statistically significant). Together the two pieces of evidence suggest that which tax rate is "the rate that matters" will vary with the setting studied: corporate rates are likely to be more relevant for super high-income individuals and therefore inequality outcomes, but all taxes may equally matter for state-level employment outcomes.

3.2 Do Economic Conditions Drive Tax Changes?

To explore whether tax changes appear to be driven by economic conditions, we provide three forms of analysis. First, we show whether tax changes coincide with state recessions. Second, we study how tax rates change around recessions. And third, we measure the overall explanatory power of economic conditions on the timing of tax changes. Our evidence overwhelmingly suggests that economic considerations are unlikely to be the driving cause of state-level tax changes, or that economic conditions' influence is not systematic over time.

We use annual state total personal income data (SAINC1 series, 1929-2022) from the

Bureau of Economic Analysis as a proxy for state-level economic conditions, because state-level GDP data is not available until 1963. Our analysis focuses on state recessions because these are most likely to trigger a tax policy response. We identify state recessions by applying the Bry-Boschan method (Bry and Boschan, 1971; Brown, 2017) to each state's inflation-adjusted SAINC1 series. The Bry-Boschan method identifies the peaks and troughs in the level of a time series, thus marking the beginnings and ends of expansions and contractions. Our specification uses a window of one year, where each phase is at least one year, and a complete cycle is at least two years. Because the Bry-Boschan method identifies recessions using the previous peak, it is unsuitable for cycles where the previous peak is unobserved, such as the Great Depression because the SAINC1 income data is available only since 1929. For this reason, we exclude the Great Depression years and only consider recessions starting in 1940 onwards. As a robustness check, we also consider a simpler approach to defining economic downturns, as years with income growth lower than –3%.[11]

Simultaneity of Recessions and Tax Changes. Our first approach explores the extent to which tax changes occur simultaneously or immediately following economic downturns. Of course, such co-occurrences need not be causal in nature, and may occur by pure chance, especially, if tax changes are numerous as is the case for top personal income taxes. For this reason, we supplement the observed coincidence rates with simulated ones, which are calculated as follows: we keep the number of tax changes fixed but randomize their timing. We then calculate the number of random matches. We repeat this procedure 100 times and then show the average number of simulated coincidences, as well as the 5^{th} and 95^{th} percentiles. The above exercise does not prove the existence of causal responses, but provides suggestive evidence for or against such a relationship.

Panel A of Figure 7 shows the percent of all tax changes that occur during state recessions. Figure 7(a) shows that between 13% and 20% of all tax changes occur during the

[11] See Appendix Figure E.26 for the number of states in a recession by year, for our main and alternative measure of recessions. Appendix Figure E.27 shows the duration of recessions for both measures, among the stacked sample used in the event study specification described below.

years of recessions. Nonetheless, most of these co-occurrences appear to be coincidental: the observed shares are very similar in magnitude to simulated shares, with the exception of cigarette taxes. Figures (b) and (c) show that tax increases are slightly less likely than tax decreases, but overall the rates are not very different from simulated shares, only personal income and gasoline tax decreases appear slightly more frequently than random chance would suggest. Panel B explores this question further by showing the share of state recessions that coincide with a tax change. Personal income tax rates change in 21% of state recessions, corporate taxes are changed in 15% of cases, while sales taxes are changed in 9% of recessions; but once again, the observed shares are similar to simulated shares. Overall, the results are most consistent with co-occurrences happening largely by chance.

Appendix Figures E.28 and E.29 show that we obtain qualitatively equivalent results when we consider shorter or longer windows around recessions, define recessions differently or focus on large tax changes only. However, results vary across periods: Appendix Figure E.30 shows that in some periods, we observe fewer tax changes during recessions than the random chance would produce, while in other periods – many more, and yet in other periods – approximately as many as the simulated benchmark. Overall, the evidence points to an inconsistent relationship between economic conditions and tax change timing.

Tax Rates Before and After Recessions. Our first analysis suggested that economic downturns are unlikely to change the timing of tax changes. However, it remains possible that recessions affect the nature of tax changes implemented, even if they do not change their timing. We investigate this next, using a stacked difference-in-differences (DID) specification to study how tax rates evolve around state recessions.

Stacked DID approaches (like those used in Callison and Kaestner, 2014; Cengiz et al., 2019; Deshpande and Li, 2019; Butters et al., 2022) avoid the well-known issue of including already-treated units as an implicit part of the control group, and allow us to use multiple recessions per state as identifying variation.[12] We use the specification including sample

[12]Recent work by de Chaisemartin and D'Haultfoeuille (2020), Sun and Abraham (2021), Callaway and Sant'Anna (2021), and Goodman-Bacon (2021) has shown that conventional two-way fixed effects specifica-

weights proposed by Wing et al. (2024), who show that the resulting estimator identifies an aggregate average treatment effect on the treated.

The basic idea in a stacked DID approach is to individually identify "sub-experiments," which include units treated in the same year, plus clean control units that are not treated in the years shortly before and after the treatment year. In our setting, each sub-experiment contains one or more treatment states that enter a recession in the same year, plus one or more control states that do not experience any recessions in the surrounding window. We also ensure that the pre-treatment years are not part of a post-treatment period for an earlier recession.[13] As long as the above conditions are satisfied, states may be included in multiple sub-experiments. To avoid the compositional bias discussed by Wing et al. (2024), we require a balanced panel in event time.

These sub-experiments are then "stacked" together by event time, such that all treated units are treated in period 0 and all control units are not treated within the event window. Then, DID and event study specifications can be estimated on this stacked dataset, without raising the staggered treatment timing issue referenced above, using the equation:

$$Y_{sta} = \sum_{\substack{k=-3 \\ k\neq -1}}^{2} \beta_k \, Treat_{sa} \, 1\{t = k\} + \gamma \, Treat_{sa} + \eta_t + \varepsilon_{sta}, \tag{1}$$

where Y_{sta} represents the tax rate in state s, at event time t of sub-experiment a. $Treat_{sa}$ is equal to one if state s experiences a recession in sub-experiment a and zero otherwise, thus capturing cross-sectional differences in tax rates between treated and control states. η_t

tions can lead to biased estimates when treatment time varies across units, as it does in the case of state recessions. However, much of the literature on alternative DID estimators has focused on settings where units are treated a maximum of once (e.g., state adoptions of a policy), while in our setting, states experience multiple recessions over our time period of study. The stacked DID approach allows us to address both of these challenges.

[13]For example, in our preferred specification with three pre-periods and three post-periods, to be included in the "2000 sub-experiment" treatment group, states must experience a recession beginning in 2000, and not have experienced any recessions from 1995-1999. A previous recession ending in 1994 is the latest possible because 1995 and 1996 would be included in the post-period for that episode, leaving 1997, 1998, and 1999 as a clean pre-period for the 2000 recession. The control group includes all states that did not experience any recessions from 1995-2002. For this sub-experiment, the year 2000 (year of treatment for the treated states) will correspond to period 0 for both treated and control states.

are event time fixed effects, which control for idiosyncratic time trends. The coefficients of interest, β_k, capture the effect of treatment on tax rates in event time k, relative to excluded period –1. We use sample weights

$$Q_{sa} = \begin{cases} 1 & \text{if } \ Treat_{sa} = 1, \\ \frac{N_a^T/N^T}{N_a^C/N^C} & \text{if } \ Treat_{sa} = 0, \end{cases} \tag{2}$$

where N_a^T is the number of states that are treated in sub-experiment a, N^T is the total number of states that are treated across all sub-experiments, and N_a^C and N^C give similar counts for the control groups. Wing et al. (2024) show that this weighted regression is equivalent to estimating an event study for each sub-experiment separately, then averaging the estimates where each sub-experiment is weighted by its share of the treated sample (N_a^T/N^T).[14] We cluster standard errors at the state level, thus allowing for dependence within states, even across sub-experiments.

Our main analysis uses an event window from time –3 to 2, where a state recession begins in period 0.[15] The choice of window involves a simple tradeoff – the longer the window, the "cleaner" are the control and treatment units and the better our ability to pick up dynamic effects. At the same time, longer windows restrict the sample of "qualified" treatment and control units, thus narrowing the scope of our analysis and reducing power. Appendix Figures E.26-E.27 show which recession episodes are included in our preferred specification and their duration; we also consider alternative event windows and obtain similar qualitative conclusions.

Figure 8 presents the results for states with non-zero tax rates, and results for all states (thus allowing for both intensive and extensive margin responses) are available in Figure E.31. We use tax rates as our outcome variable – rather than the logarithm of tax rates – in order to

[14] Furthermore, they show that estimating Equation 1 without the weights in Equation 2 does not in general identify any convex combination of the sub-experiment effects. The same is true for adding *sub-experiment* × *state* and *sub-experiment* × *event time* fixed effects.

[15] In our stacked dataset, recessions typically last only a single period. By period 1, only 32% of treated states are still in a recession, and by period 2 that drops to 17%. See Figure E.27.

include states with zero tax rates. Across tax types and specifications, we see no statistically significant nor economically meaningful changes in tax rate levels around recessions. The one potential exception is for cigarette taxes, where tax rates do not meaningfully change in the first year of the recession but increase in the following two years. However, this finding is not robust to our definition of recessions: when we consider an alternative definition as years with income growth lower than –3% in Appendix Figure E.32, we find no statistically significant effect and the point estimates are near zero. Our results imply that overall, recessions affect neither the timing nor the magnitude of tax changes in a systematic way.

We consider several additional robustness checks, and our results are qualitatively similar. Appendix Figures E.33 and E.34 show that results remain the same when we consider shorter or longer windows around recessions. Finally, focusing on personal income taxes for conciseness, Appendix Figure E.35 explores whether states differ in their propensity to change taxes in response to recessions. We see no differential responses in (a) states that require a supermajority to pass tax changes as compared to states that do not, (b) in states with a government trifecta versus in states with a divided government, (c) in states with governor term limit versus without, (d) in states with or without rainy day funds, (e) in states that allow deficits versus in states that do not, and finally (f) in states with above or below median black shares of the population.

Since recessions tend to affect many states (and countries) simultaneously, one may be concerned that our results underestimate true effects, because voters and legislators in control states may choose to "act" in anticipation of a possible recession, or in an attempt to avert one. If this were the case, then both treated and control states would behave similarly, but we would observe a change in trend around the time of recession. Figure E.36 shows the simple time series of treated and control states around recessions. Once again, we do not see any notable changes in tax trends around recessions, either for the treated or for the control states.

Overall Explanatory Power. Our previous results showed that both the timing and

the level of tax rates are unlikely to be driven by economic downturns. However, it remains possible that economic conditions affect tax rates in some non-linear fashion. As our final test, we measure the overall explanatory power of economic conditions on the timing of tax policy changes using a flexible non-linear specification.

For each tax type, Figure 9 shows the adjusted R^2 from regressing the indicator of a tax change on the percent change in state income from the previous year and its four lags, as well as on the 4^{th} degree polynomial of each (for a total of 20 variables). In addition, we show how the explanatory power increases when we control for state and year fixed effects. We also show results for the timing of tax increases and tax decreases separately (Appendix Figure E.37), using only large tax changes (E.38), considering both extensive and intensive tax changes (E.39), or using levels of income (rather than growth) as the independent variables (E.40).

Across specifications and tax types, the results are conclusive: economic conditions account for less than one percent of the variation in the timing of tax changes that occurred between 1930 and 2022. Immutable state characteristics and year fixed effects bring the explanatory power to 10 percent or less. Period-specific regressions (in 15-year increments) show slightly higher levels of explanatory power, likely due to the smaller number of observations used.

To conclude, the three tests that we perform, all suggest that economic conditions do not have a persistent, predictable influence on tax changes. Our results do not imply that economic conditions do not affect tax policies at all, merely that this effect is not systematic. One possible explanation for our results is that recessions arise for distinct reasons and, as a consequence, require distinct solutions. Alternatively, tax responsiveness may be driven by other factors – e.g., political environment.

4 Conclusion

In this paper, we examine how U.S. state tax rates and state tax revenues have evolved from 1910 until 2022. We study the evolution of the composition of taxes collected, tax rates and revenues, and the nature of tax changes.

We show that in the first half of the 20$^{\text{th}}$ century, state tax systems changed drastically and quickly: states adopted new forms of taxes and doubled their tax revenues. States differed in how they achieved budgetary goals, implementing different compositions of tax types. Nonetheless, by the 1970s, state policies reached a form of aggregate stability: the pace of change, rate and revenue variation across states, and total revenues collected stabilized and did not change dramatically over the past half-century. However, states continued to frequently change tax rates, often simultaneously, but seemingly not in response to economic conditions.

Our work suggests two avenues for future work. First, our analysis focused on tax rates and ignored tax base rules. More work is needed to understand how tax base rules changed over time, and how they affect tax revenues and overall tax policy responsiveness. Second, our analysis shows that while tax changes are plentiful, they do not appear to be driven by economic conditions. Understanding what causes changes in tax rates (and tax base rules) will improve our understanding of tax systems.

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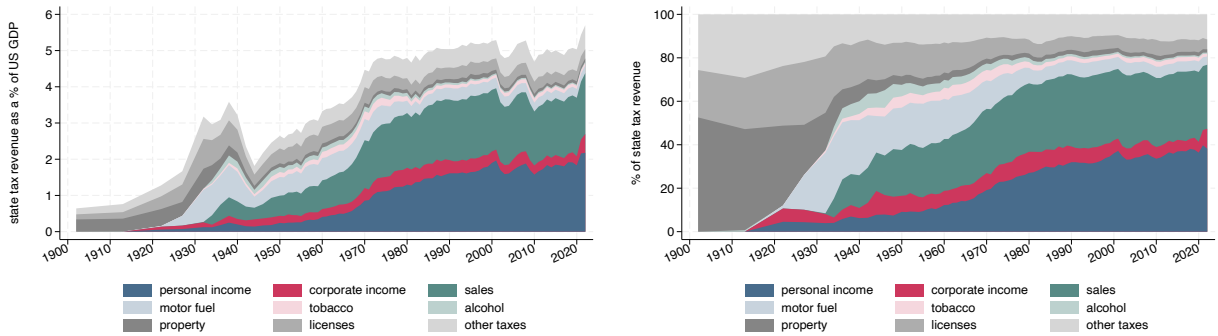
Figure 1: Tax Revenues Over Years: Federal and All States Combined

(a) Federal: As Percent of GDP

(b) Federal: Revenue Shares

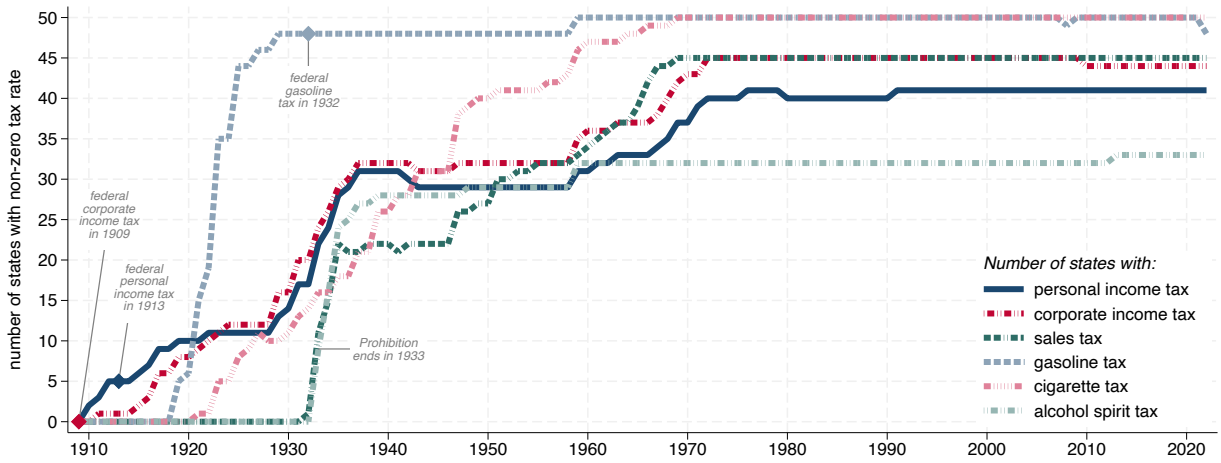
(c) All States: As Percent of GDP

(d) All States: Revenue Shares



Notes: Figures (a) and (c) show the federal or the sum of all state tax revenues as a percent of U.S. GDP. Figures (b) and (d) show, for each tax type, its share of federal or overall state tax revenues. These statistics are shown for all states combined. The "other taxes" category includes all other federal/state tax revenues. For state taxes, these include insurance premium taxes, public utilities taxes, other selective sales taxes, death and gift taxes, severance taxes, amusement sales taxes, pari-mutuels taxes, and documentary and stock taxes. See Figure A.1 for the overall tax revenue compositions. Figure A.3 presents the time series of state average and federal revenues.

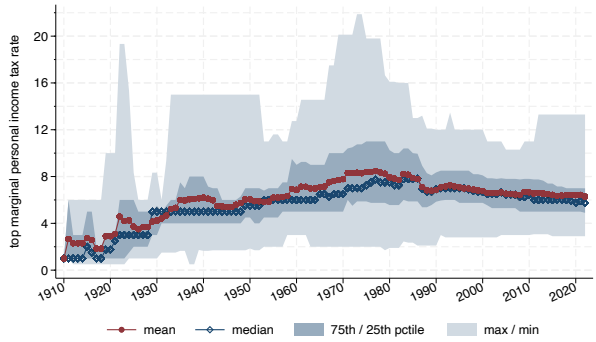
Figure 2: Tax Adoptions by State



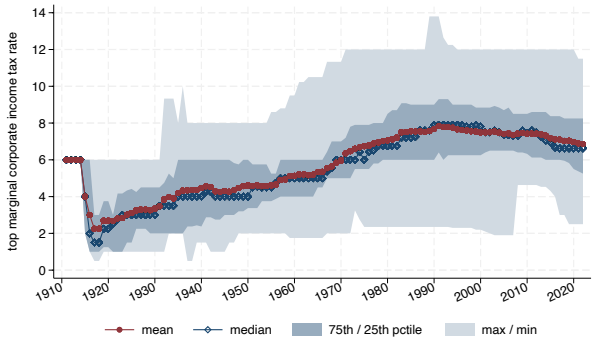
Notes: This figure shows the number of states with a non-zero tax rate for each of the six tax rates of focus. The diamond symbol marks years that the tax was adopted at the federal level, excluding federal cigarette and alcohol spirit taxes (in place continuously since 1862). See Appendix B for details on how the timing, the order, and the duration of the adoption process relate to future tax rates and revenues.

Figure 3: State Tax Rates Over Years

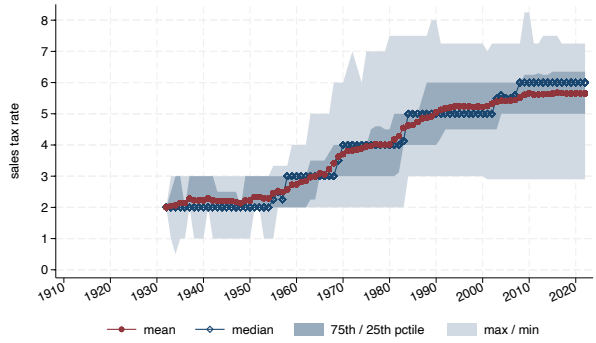
(a) Top Personal Income Tax Rate



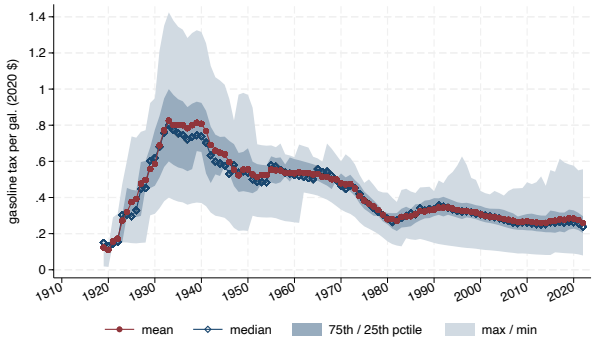
(b) Top Corporate Income Tax Rate



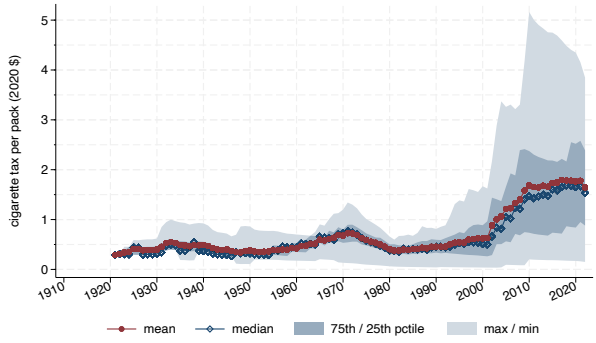
(c) Sales Tax Rate



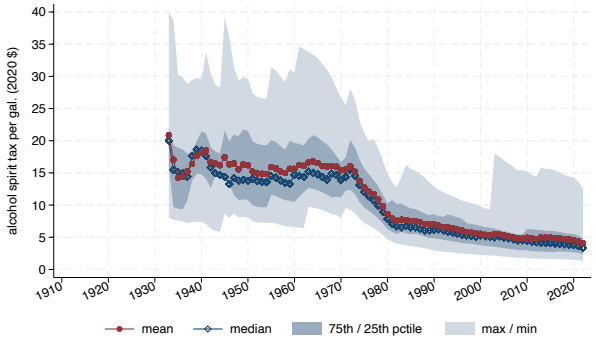
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



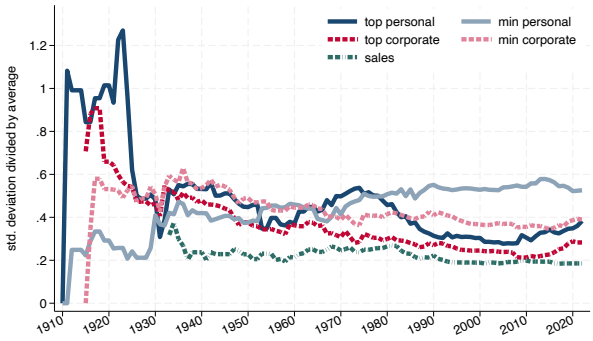
(f) Alcohol Spirit Tax Rate



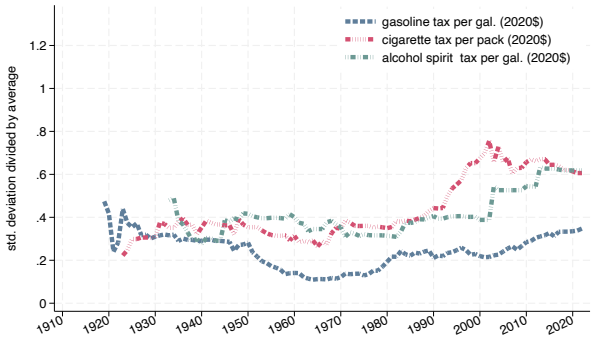
Notes: These figures show the average, median, 25$^{\text{th}}$ and 75$^{\text{th}}$ percentiles, minimum, and maximum across states of (a) top personal income tax rates, (b) top corporate income tax rates, and (c) standard sales tax rates, all in percent; (d) gasoline excise tax rates, (e) cigarette excise tax rates, and (f) alcohol spirit excise tax rates, all in 2020 dollars. Only non-zero rates are included. See Figure A.2 for equivalent tax revenue figures. Figure A.4 presents the time series of state average and federal tax rates.

Figure 4: Coefficient of Variation Over Years

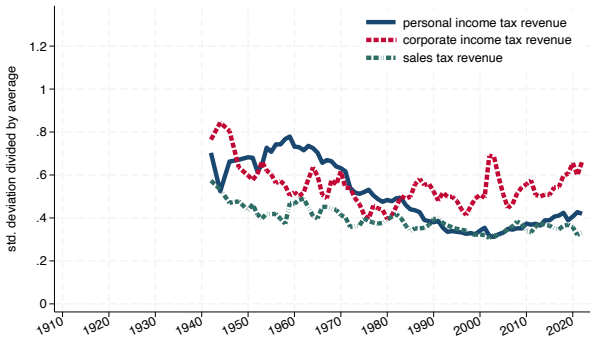
(a) State Tax Rates



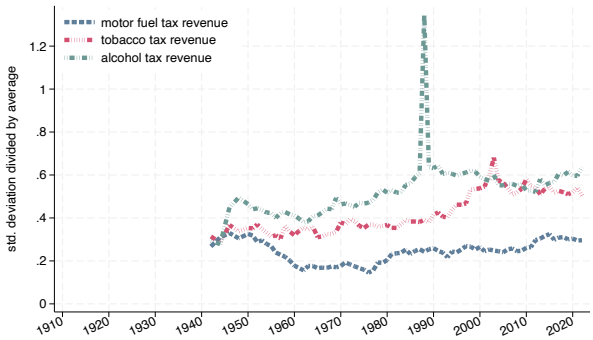
(b) State Excise Tax Rates



(c) State Tax Revenues



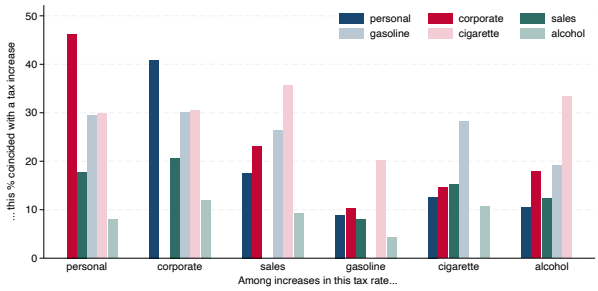
(d) State Excise Tax Revenues



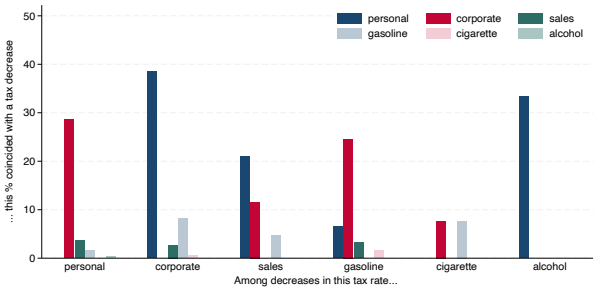
Notes: Figures (a) and (b) plot the coefficient of variation (standard deviation divided by the average) for state tax rates, while figures (c) and (d) show the same statistic for state tax revenue per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Years where only one state has a particular tax are not shown. Alaska tax revenues are omitted as these are exceptionally volatile. The large spike in figure (d) is not a data error, and is a consequence of the *Bacchus Imports, Ltd. v. Dias* case in Hawaii which led to alcohol revenues being held in escrow from 1980 until their release in 1988.

Figure 5: Simultaneity of Tax Changes in the Same State and Year: All Years

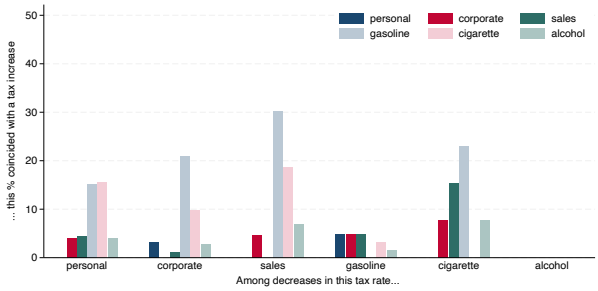
(a) % of Increases Coinciding with Increases



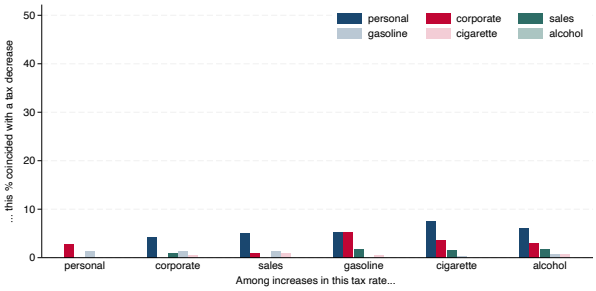
(b) % of Decreases Coinciding with Decreases



(c) % of Decreases Coinciding with Increases



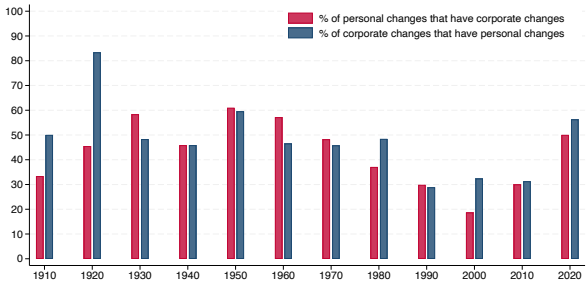
(d) % of Increases Coinciding with Decreases



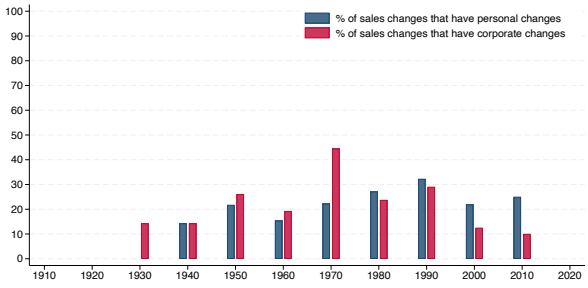
Notes: These figures explore the extent to which states change one tax rate while simultaneously changing another tax type (i.e., in the same year). All years in the sample are included. Among the increases (or decreases) in each tax on the horizontal axis, the vertical bars specify the share that coincides with an increase (or decrease) in another tax type in the same state and year. These other tax types are identified by the color of the bar (top personal income tax rates, top corporate tax rates, standard sales tax rates, cigarette excise tax rates, gasoline excise tax rates, or alcohol spirit excise tax rates). For example, Figure (a) shows that among all of the increases in top personal income tax rates, 46% occurred in the same year as an increase in the top corporate income tax rate in the same state. See Figure D.22 for large tax changes. See Figure D.25 for equivalent min/top personal/corporate rate changes.

Figure 6: Simultaneity of Tax Changes in the Same State and Year: By Decade

(a) Income Taxes



(b) Sales & Income Taxes

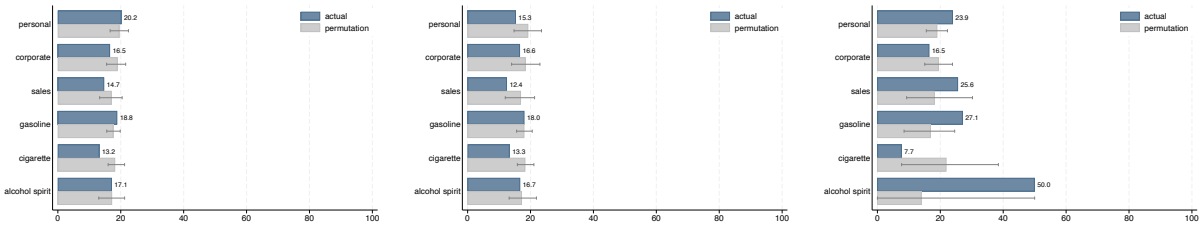


Notes: These figures explore the extent to which states change one tax rate while simultaneously changing another tax type (i.e., in the same year). Separately for each decade, we show the percent of changes in one tax that coincide with changes in another tax (where changes may be increases or decreases). Throughout, only intensive margin tax changes are included; tax adoptions and cancellations are excluded. See Figure D.23 for large tax changes. See Figure D.21 for analysis by decade, separately for increases & decreases.

Figure 7: Co-Occurrences of Tax Changes and Recessions

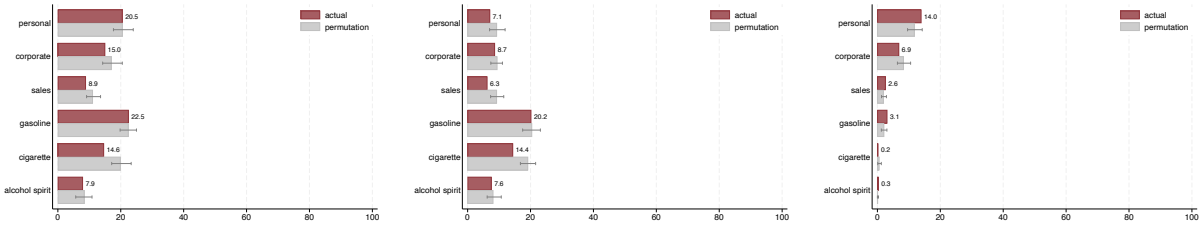
Panel A: Percent Tax Changes Occuring During Recessions

(a) tax changes (b) tax increases (c) tax decreases



Panel B: Percent of Recessions that Coincide with Tax Changes

(d) tax changes (e) tax increases (f) tax decreases

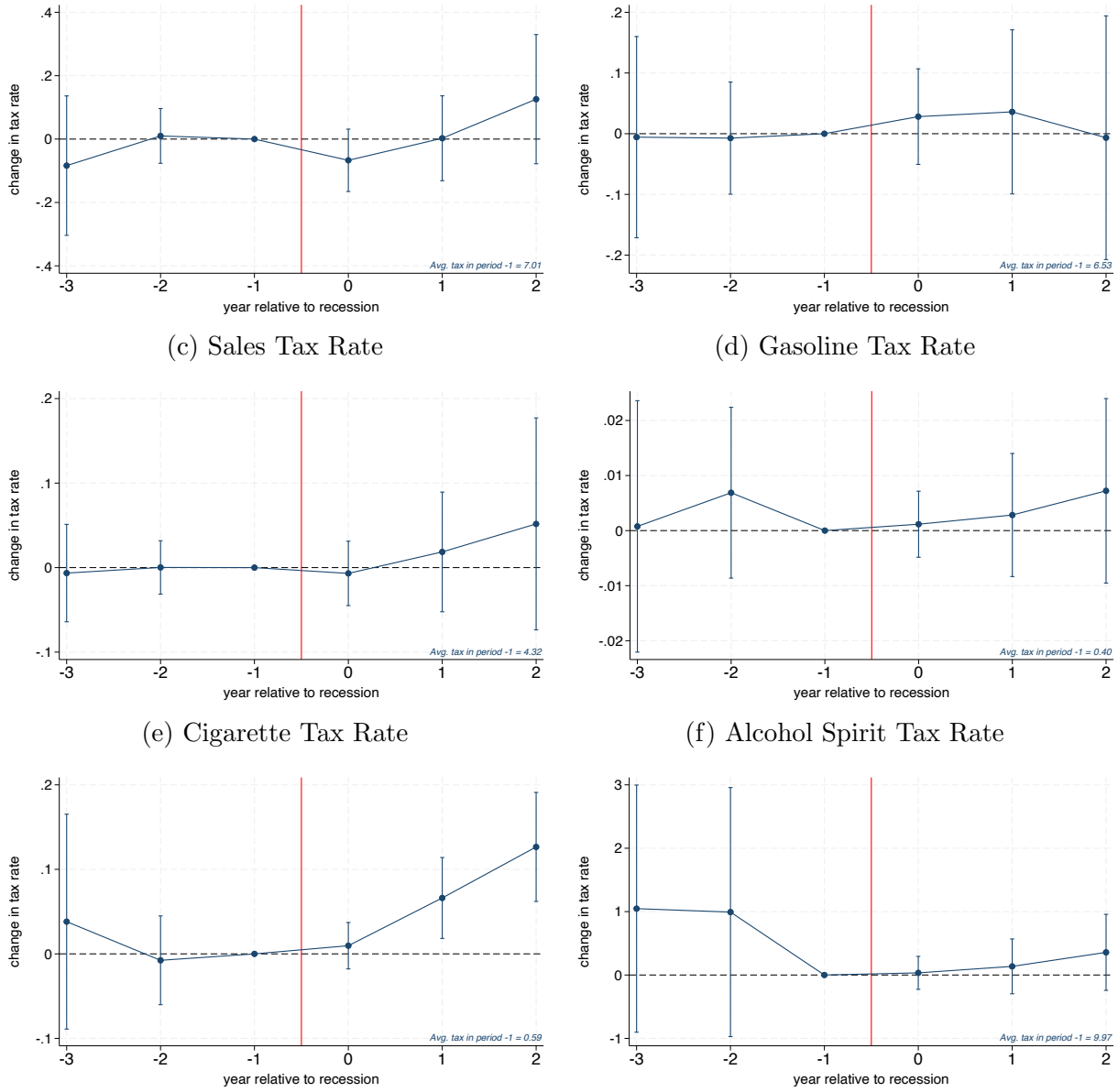


Notes: Figures (a)-(c) show the percent of tax changes, tax increases, and tax decreases that occur during state recessions, while Figures (d)-(f) show the percent of recession episodes that include at least one tax change, tax increase, or tax decrease. In all figures, the top blue or red bars show actual observed percentages, while the bottom grey bars show the simulated average, calculated by randomizing the timing of tax changes 100 times. The thin interval bars show the 5^{th} and 95^{th} percentiles of the simulated percentages. Only intensive margin tax changes are included (tax adoptions and cancellations are excluded); when randomizing, only years with non-zero tax rates are included. We identify recessions with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. See Figures E.28-E.30 for alternative specifications using shorter or longer windows around recessions, defining recessions differently, focusing on large tax changes only, or focusing on specific years.

Figure 8: Tax Rates Before and After Recessions

(a) Top Personal Income Tax Rate

(b) Top Corporate Income Tax Rate



(c) Sales Tax Rate

(d) Gasoline Tax Rate

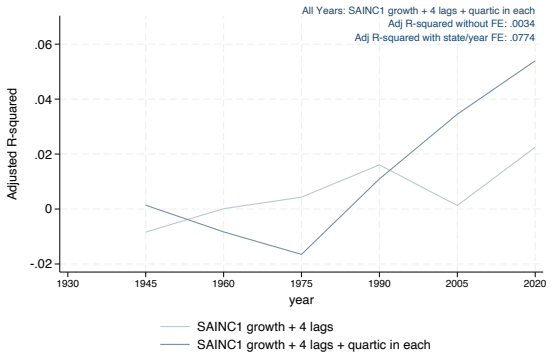
(e) Cigarette Tax Rate

(f) Alcohol Spirit Tax Rate

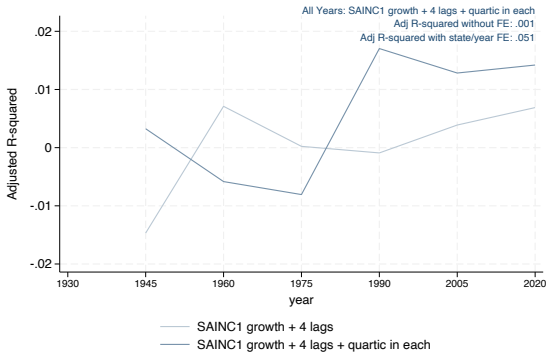
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. See Section 3.2 for more details. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022 (see Figures E.26-E.27). Only states with non-zero rates are included. Standard errors are clustered at the state level and 95% confidence intervals are reported. See Figures E.31-E.36 for robustness checks.

Figure 9: Overall Explanatory Power Of Economic Conditions On Tax Changes

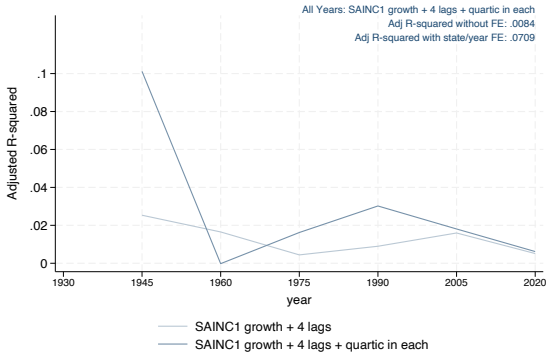
(a) Top Personal Income



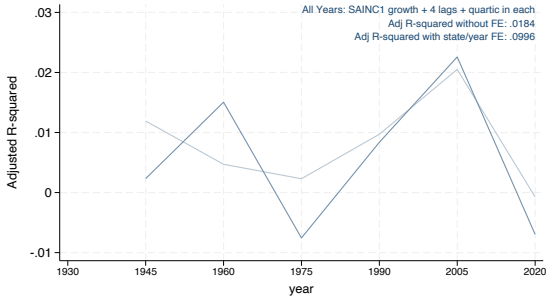
(b) Top Corporate Income



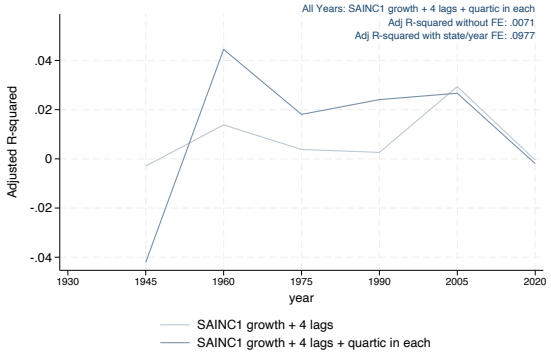
(c) Sales Tax



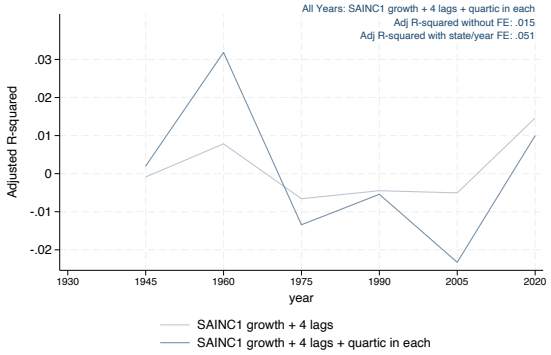
(d) Gasoline Tax



(e) Cigarette Tax



(f) Alcohol Spirit



Notes: These figures show the adjusted R^2 from estimating a regression of the indicator variable of a tax change of a given tax type on the yearly changes in real annual state total personal income (SAINC1) and its four lags (5 variables), a quartic in each (20 variables), and state and year fixed effects. Only states with non-zero rates are included. See Figures E.37-E.40 for robustness checks.

APPENDIX FOR ONLINE PUBLICATION

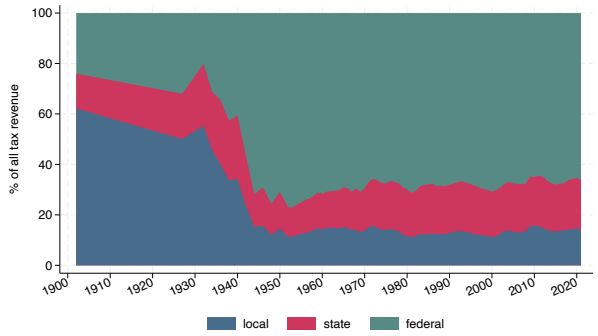
"One Hundred Years of U.S. State Taxation"

by Sarah Robinson and Alisa Tazhitdinova

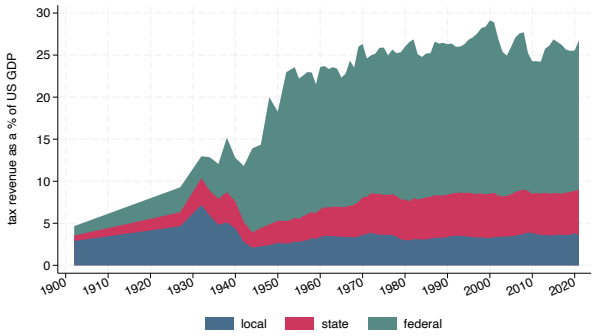
A Evolution of Tax Revenues and Tax Rates

Figure A.1: Tax Revenue by Level of Government

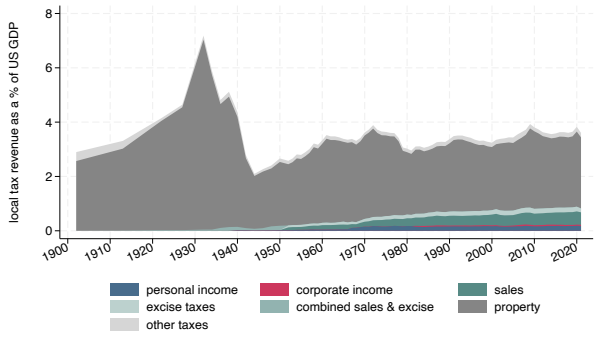
(a) Revenue Shares



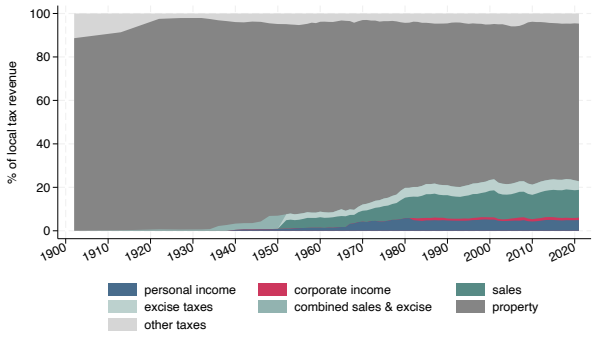
(b) Tax Revenue as a Percent of U.S. GDP



(c) Local: As a Percent of GDP



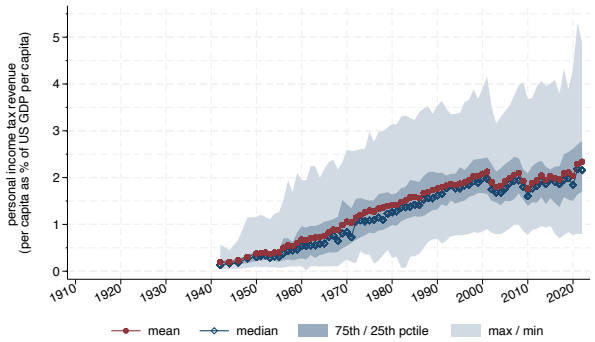
(d) Local: Revenue Shares



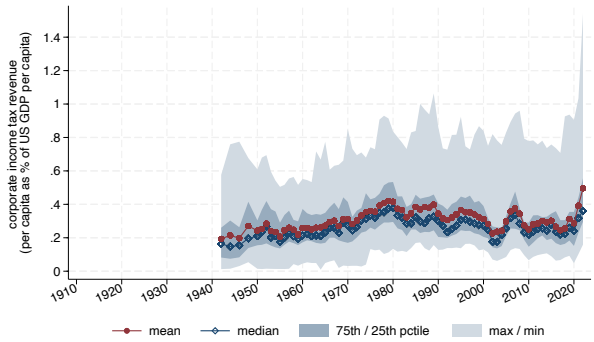
Notes: Figure (a) shows, for each level of government, its share of total U.S. tax revenues. Figure (b) shows the tax revenue as a percent of U.S. GDP, broken down by level of government. Figures (c) and (d) focus on local tax revenues by tax type, showing each as a percent of U.S. GDP or as a share of overall local tax revenues. Total local tax revenues are collected from the Historical Statistics of the United States (1902-1995) and the Tax Policy Center, State and Local Finance Data (1996-2021). See Figure 1 for other measures of tax revenue.

Figure A.2: State Tax Revenues Over Years

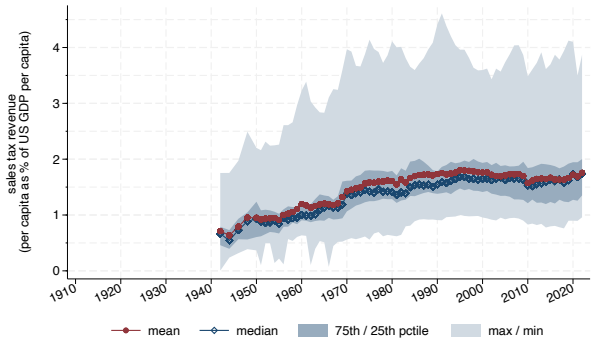
(a) Personal Income Tax Revenue



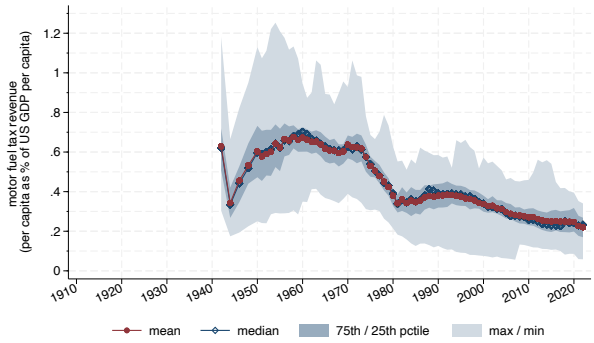
(b) Corporate Tax Revenue



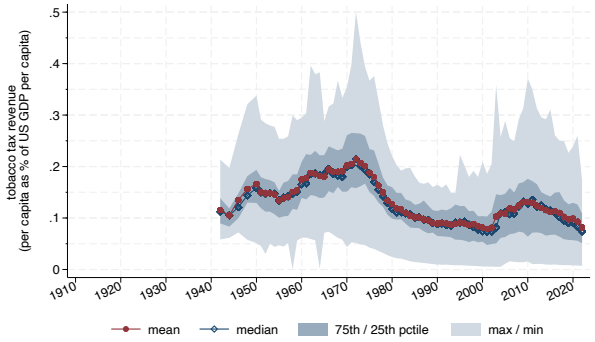
(c) Sales Tax Revenue



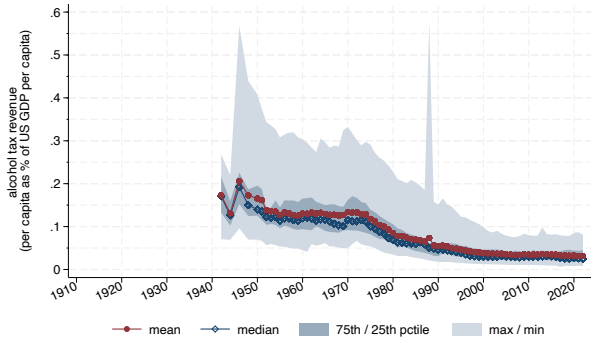
(d) Motor Fuels Tax Revenue



(e) Tobacco Tax Revenue



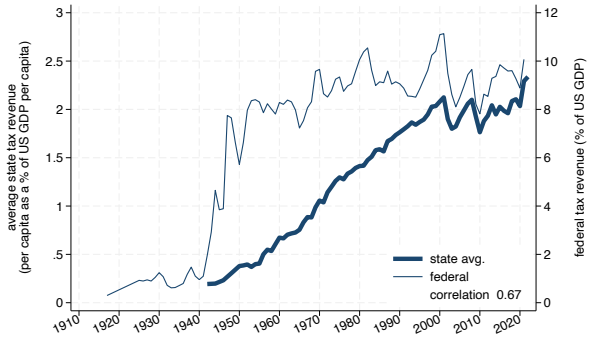
(f) Alcohol Tax Revenue



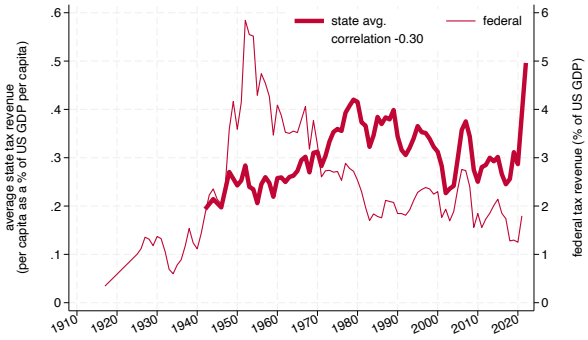
Notes: These figures show the average, median, 25$^{\text{th}}$ and 75$^{\text{th}}$ percentiles, minimum, and maximum across states of (a) personal income tax revenue, (b) corporate tax revenue, (c) sales tax revenue, (d) motor fuel tax revenue, (e) tobacco tax revenue, and (f) alcohol tax revenue. Revenues are measured per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Alaska tax revenues are omitted as these are exceptionally volatile. Equivalent tax rate figures are shown in Figure 3.

Figure A.3: Comparing State and Federal Tax Revenues Over Time

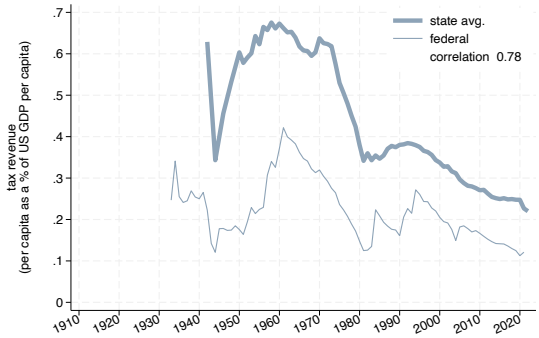
(a) Personal Income Tax



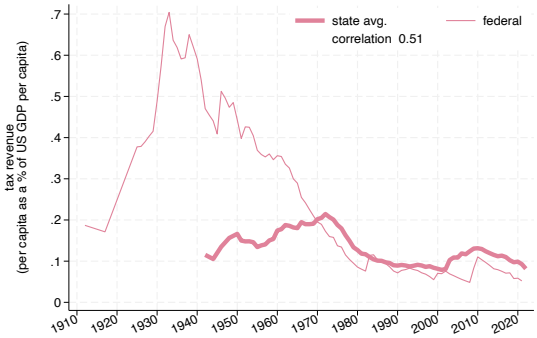
(b) Corporate Income Tax



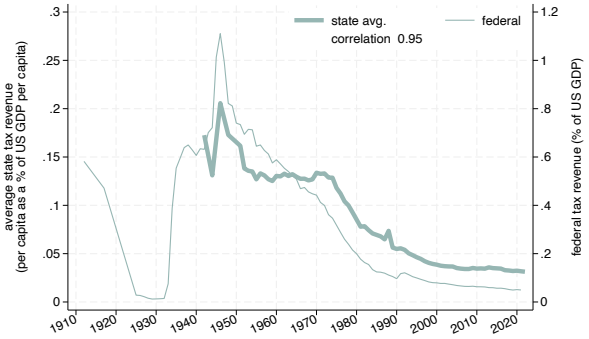
(c) Motor Fuel



(d) Tobacco



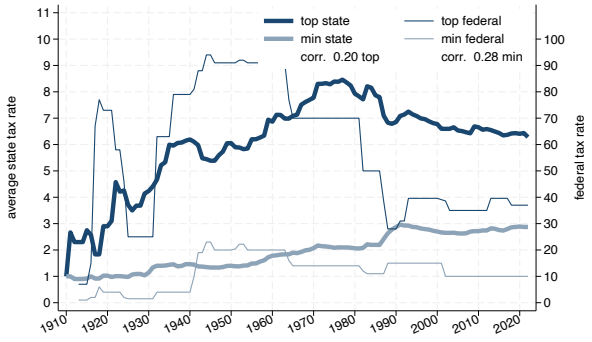
(e) Alcohol



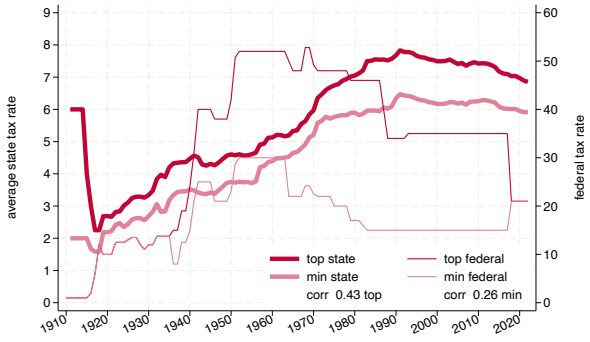
Notes: These figures show average state and federal tax revenues, separately for (a) personal income, (b) corporate income, (c) motor fuel, (d) tobacco, and (e) alcohol. The correlation between the state average and the federal tax revenues is also reported. Revenues are measured per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Alaska tax revenues are omitted as these are exceptionally volatile. Tax revenue percentiles are shown in Figure A.2.

Figure A.4: Comparing State and Federal Tax Rates Over Time

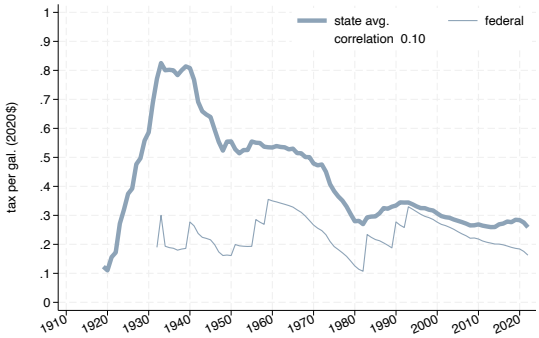
(a) Personal Income Tax Rates



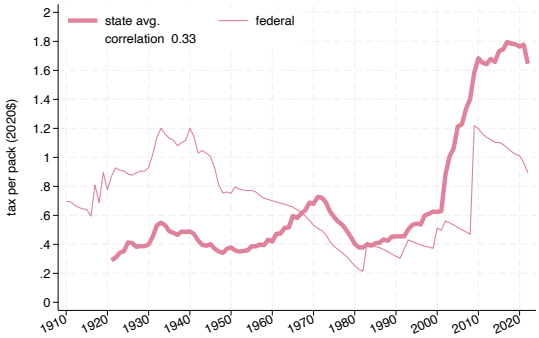
(b) Corporate Income Tax Rates



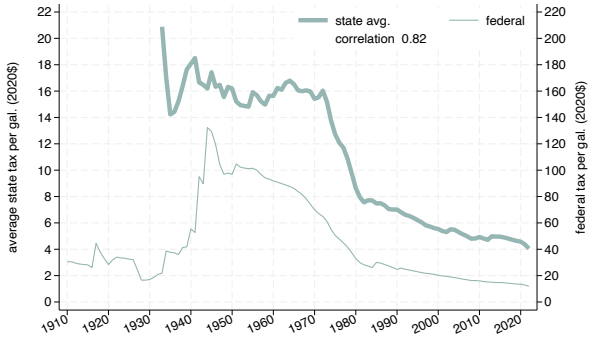
(c) Gasoline Tax Rate



(d) Cigarette Tax Rate



(e) Alcohol Tax Rate



Notes: These figures show average state and federal tax rates over time, separately for (a) top personal income tax rates, (b) top corporate income tax rates, both in percent; (c) cigarette excise tax rates, (d) gasoline excise tax rates, and (e) spirit excise tax rates, all in 2020 dollars. The correlation between the state average and the federal tax rates is also reported. Only non-zero rates are included. State tax rate percentiles are shown in Figure 3.

B Tax Adoption Patterns

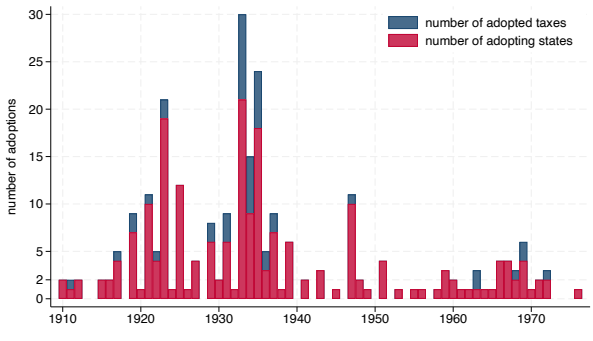
In this section, we seek to understand whether the timing, duration, and order of the tax adoption process predicts future tax rate or revenue patterns. Figure B.5 shows the overall number of adoptions by year, as well as when the adoption process started and ended for each state. Figure B.6 shows the tax rate in the year of adoption and how it compares to the average prevailing rate.

Figures B.7–B.9 explore how the year when each tax is first adopted affects future tax rates and tax revenue compositions. Figures B.10-B.11 explore rates and revenues by the duration of the adoption process, i.e., how fast each state adopted its tax rates (all rates that are eventually adopted by 2022). Finally, Figures B.12–B.14 explore the order of tax adoptions, i.e., which tax type was adopted first.

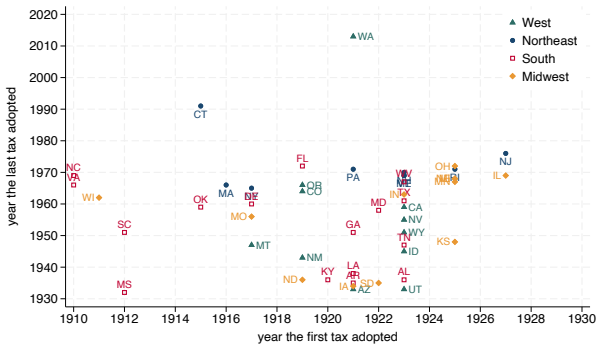
Our results consistently show no persistent differences in tax rates or tax revenue compositions irrespective of how, when, and in which order states adopted the six tax types we study. This suggests that the tax adoption process was most likely driven by political constraints, rather than reflecting state-specific characteristics.

Figure B.5: State Tax Policies: Tax Adoptions

(a) Number of Tax Adoptions (1910-1976)



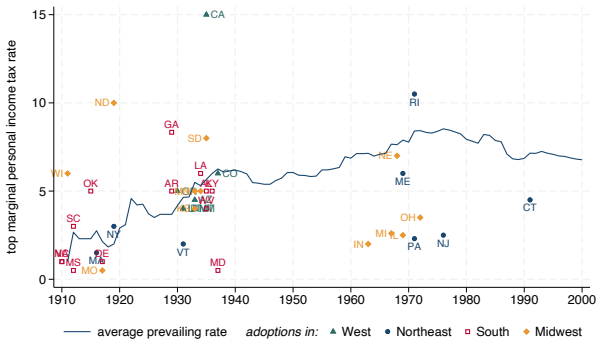
(b) First & Last Tax Adoption



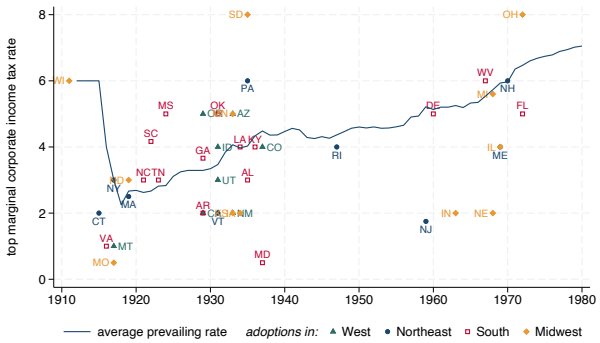
Notes: Figure (a) shows the number of states that adopted a tax for the first time, as well as the number of taxes that were adopted in each year (as states sometimes adopt more than one tax within the same year). Two late adoptions are not shown: Connecticut adopting a personal income tax in 1991 and Washington adopting an alcohol spirit tax in 2013. Figure (b) shows the first year that each state adopted one of the six tax rates, as well as the last year that the state adopted a tax.

Figure B.6: Tax Rate in the Year of New Tax Adoption

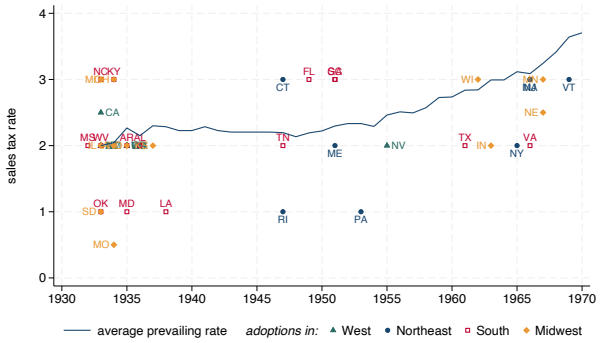
(a) Top Personal Income Tax Rate



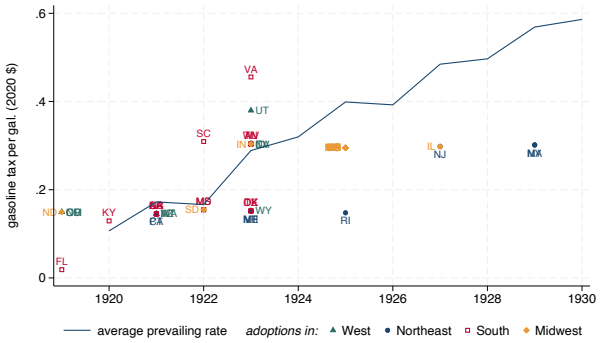
(b) Top Corporate Income Tax Rate



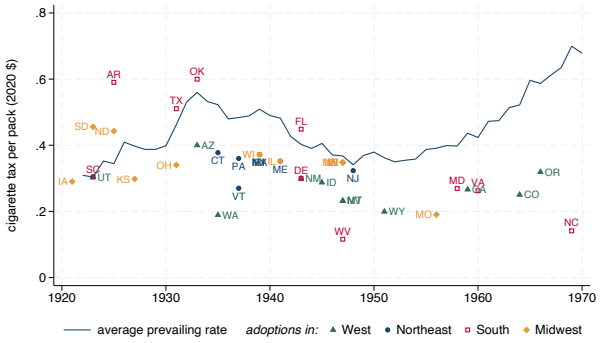
(c) Sales Tax Rate



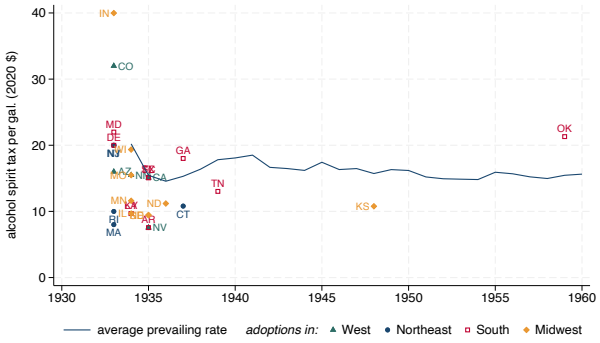
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



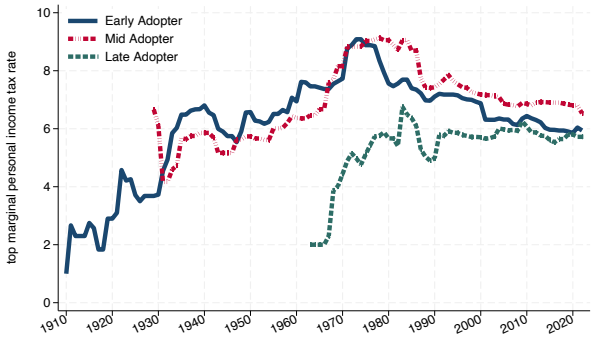
(f) Alcohol Tax Rate



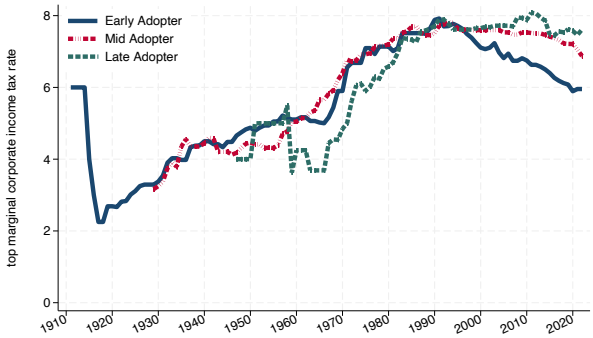
Notes: These figures show the tax rate when the tax was first adopted as well as the prevailing average tax rate at the time. The prevailing average in a given year excludes states that first adopted the tax in that year, and also excludes tax rates of zero. In Figure (f), the adoption by Washington of an alcohol spirit tax in 2013 is not shown.

Figure B.7: Average Tax Rates By Timing of Adoption

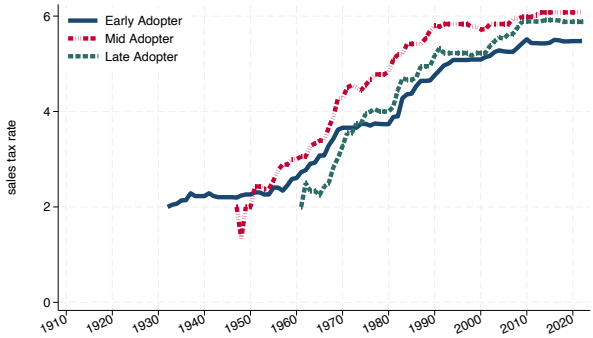
(a) Top Personal Income Tax Rate



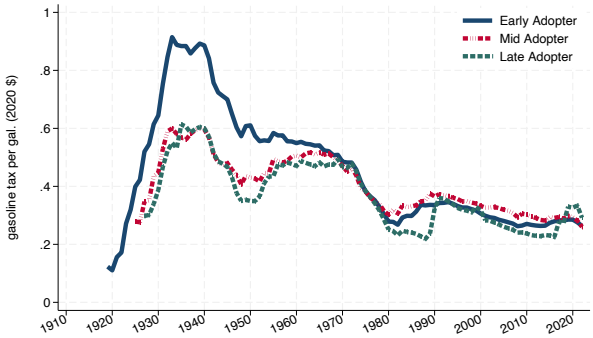
(b) Top Corporate Income Tax Rate



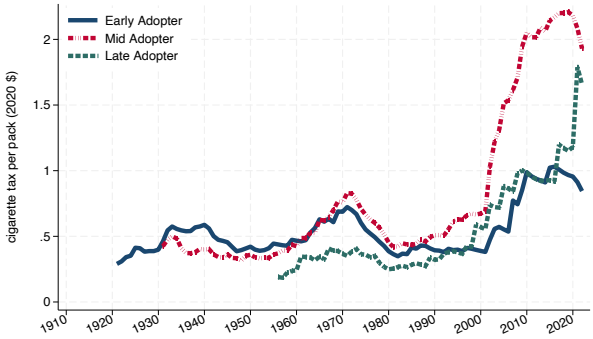
(c) Sales Tax Rate



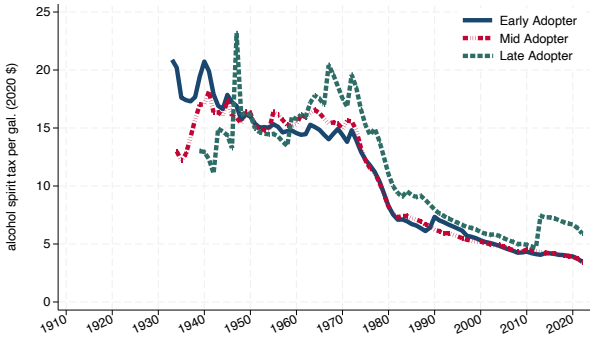
(d) Gasoline Tax



(e) Cigarette Tax



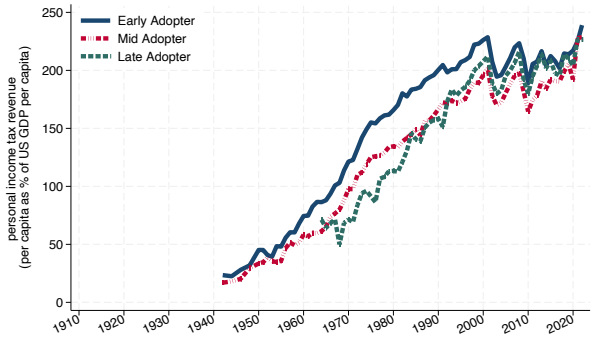
(f) Alcohol Spirit Tax



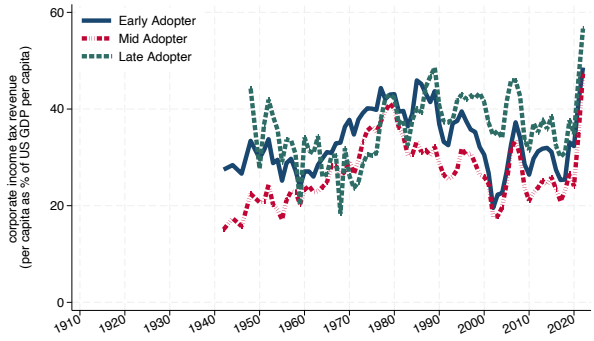
Notes: These figures show the average tax rate for states, separately for early, middle, and late adopters, for (a) top income tax rates, (b) top corporate tax rates, and (c) standard sales tax rates, all in percent; (d) gasoline excise tax rates, (e) cigarette excise tax rates, and (f) alcohol spirit excise tax rates, all in 2020 dollars. Note that the years of adoption categorized as "early" vs. "late" vary by tax type, and can be inferred from the figures. Only non-zero rates are included.

Figure B.8: Average Tax Revenues By Timing of Adoption

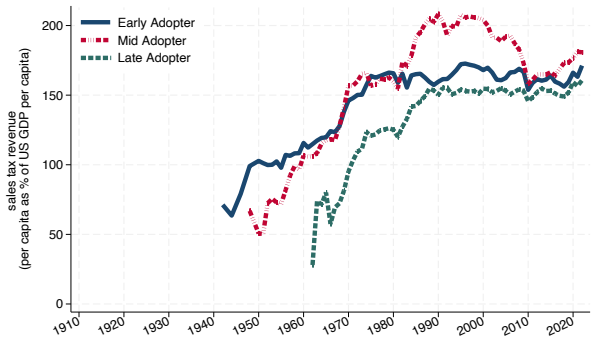
(a) Income Tax Revenue



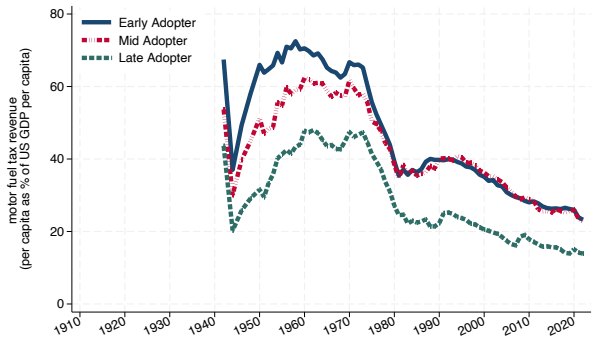
(b) Corporate Tax Revenue



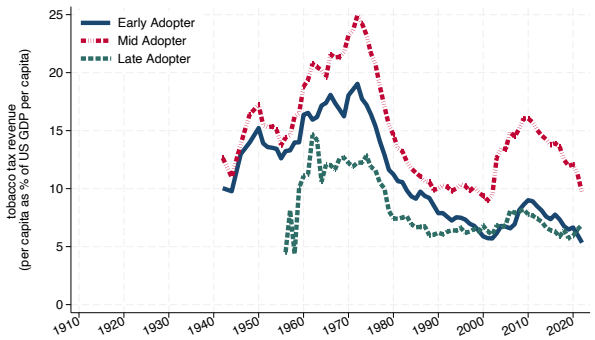
(c) Sales Tax Revenue



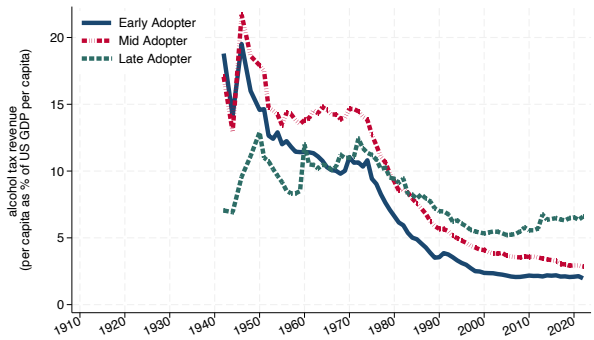
(d) Motor Fuel Tax Revenue



(e) Tobacco Tax Revenue



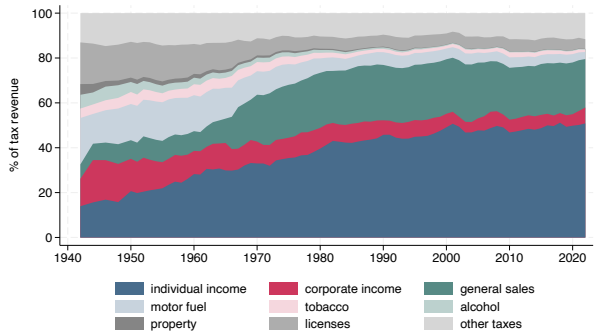
(f) Alcohol Tax Revenue



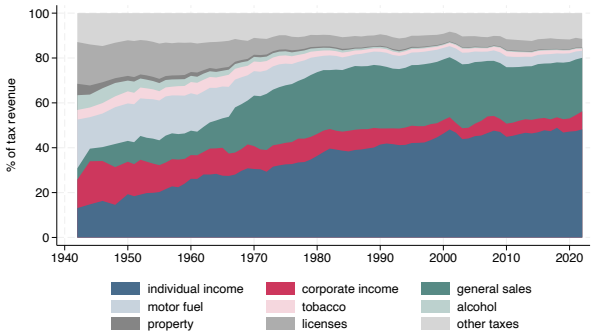
Notes: These figures show the average tax revenue for states, separately for early, middle, and late adopters, for (a) personal income, (b) corporate income, (c) sales, (d) motor fuel, (e) tobacco, and (f) alcohol. Note that the years of adoption categorized as "early" vs. "late" vary by tax type, and are consistent with Figure B.7. Revenues are measured per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Alaska tax revenues are omitted as these are exceptionally volatile.

Figure B.9: Tax Revenue Shares by Timing of Adoption

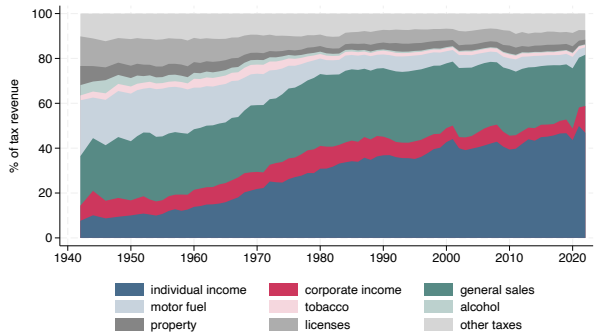
(a) Personal Income Tax – Early



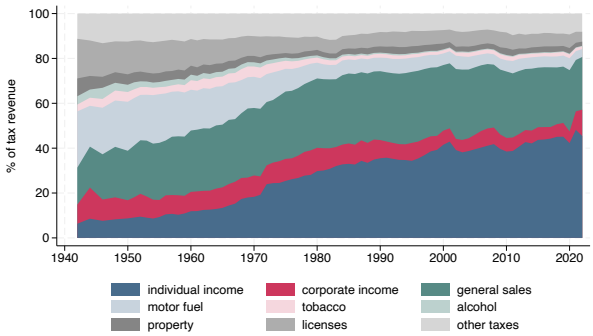
(b) Corporate Income Tax – Early



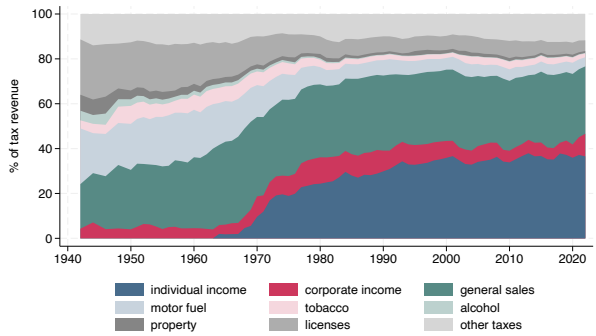
(c) Personal Income Tax – Mid



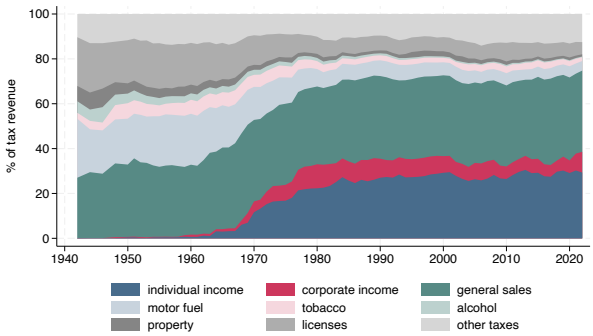
(d) Corporate Income Tax – Mid



(e) Personal Income Tax – Late



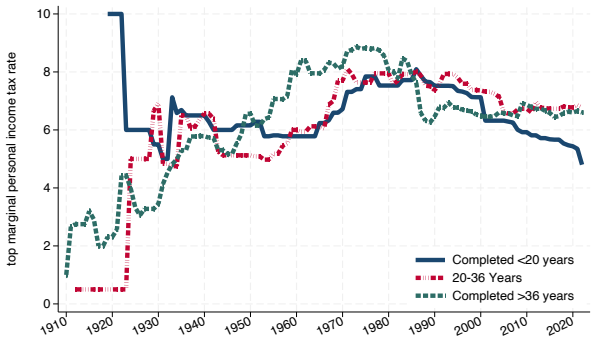
(f) Corporate Income Tax – Late



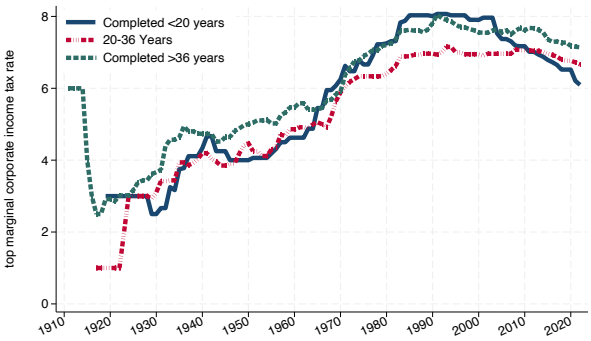
Notes: These figures show the share of overall tax revenue by tax type, separately for early, middle, and late adopters. Note that the years of adoption categorized as "early" vs. "late" vary by tax type, and are consistent with Figure B.7. Alaska tax revenues are omitted as these are exceptionally volatile.

Figure B.10: Average Tax Rates By Duration of Overall Tax Adoption Process

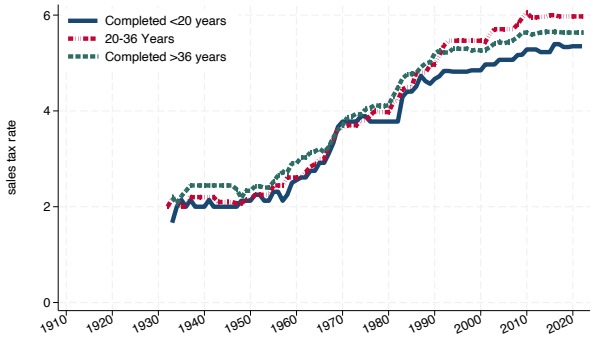
(a) Top Personal Income Tax Rate



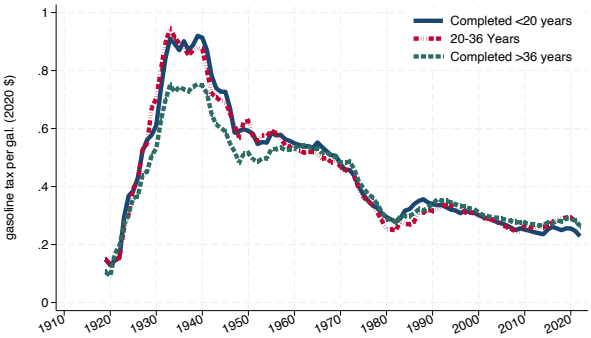
(b) Top Corporate Income Tax Rate



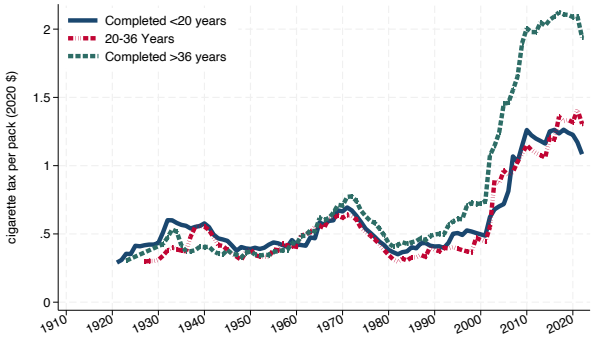
(c) Sales Tax Rate



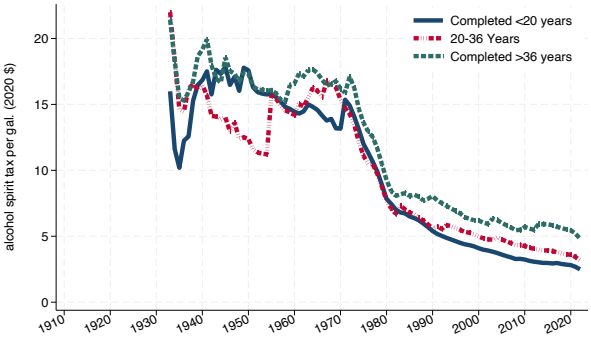
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



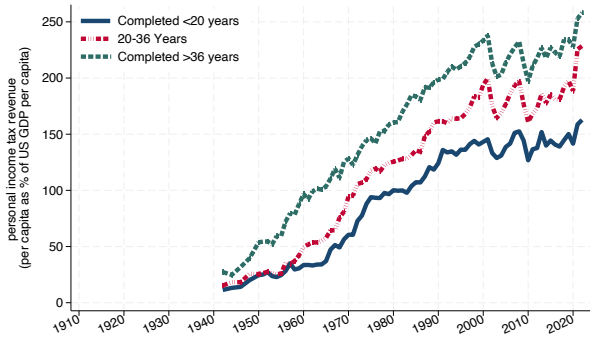
(f) Alcohol Spirit Tax Rate



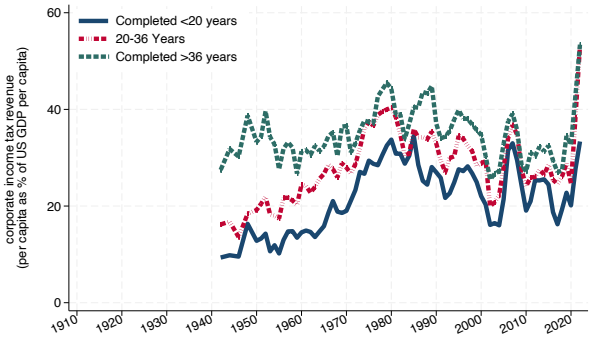
Notes: These figures show the average tax rate for states, separately by how long it took each state to complete its tax adoption process, for (a) top income tax rates, (b) top corporate tax rates, and (c) standard sales tax rates, all in percent; (d) gasoline excise tax rates, (e) cigarette excise tax rates, and (f) alcohol spirit excise tax rates, all in 2020 dollars. Only non-zero rates are included.

Figure B.11: Average Tax Revenues By Duration of Overall Tax Adoption Process

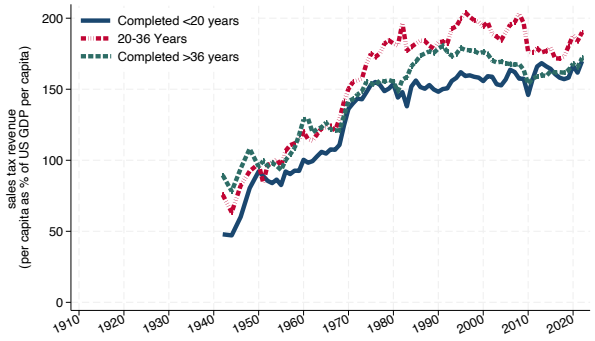
(a) Personal Income Tax Revenue



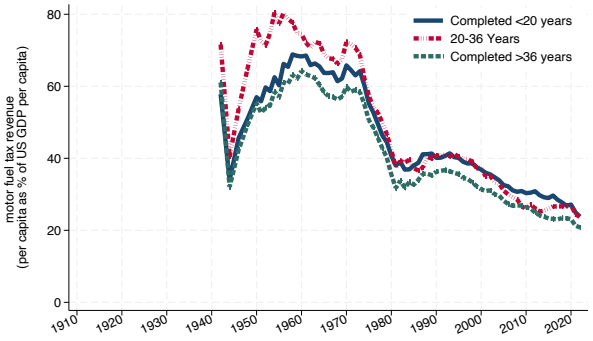
(b) Corporate Income Tax Revenue



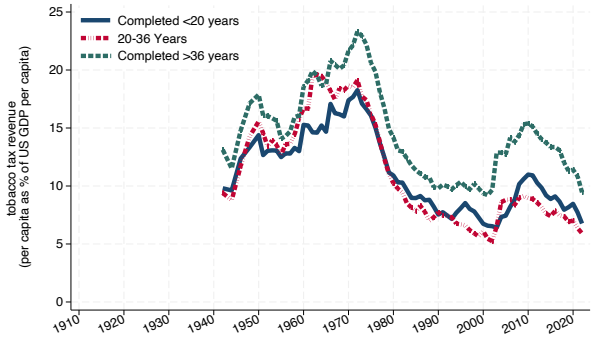
(c) Sales Tax Revenue



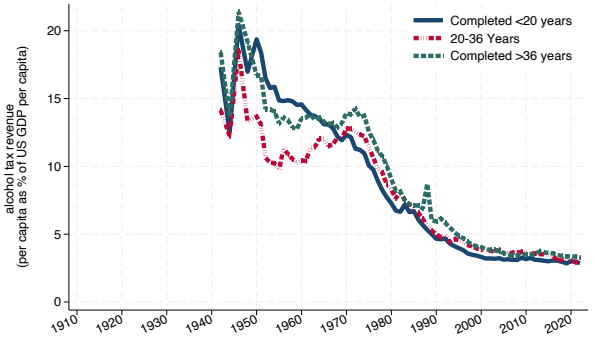
(d) Motor Fuel Tax Revenue



(e) Tobacco Tax Revenue



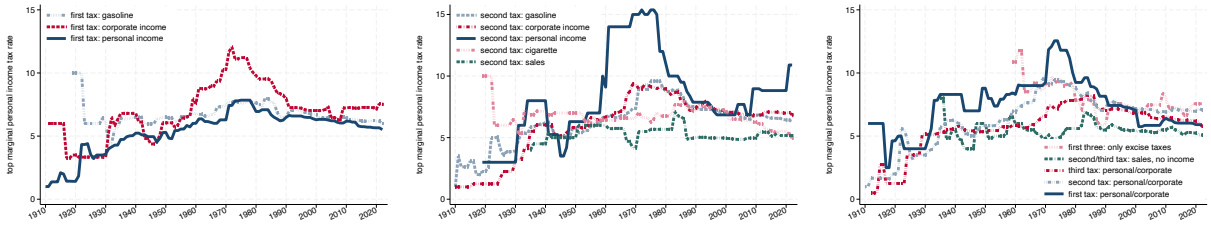
(f) Alcohol Tax Revenue



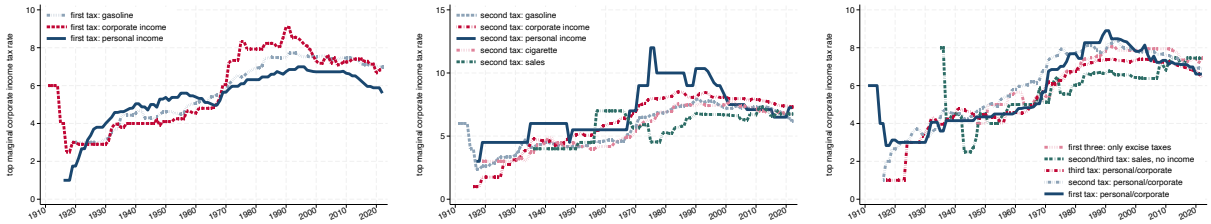
Notes: These figures show the average tax revenue for states, separately by how long it took each state to complete its tax adoption process, for (a) personal income, (b) corporate income, (c) sales, (d) motor fuel, (e) tobacco, and (f) alcohol. Revenues are measured per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Alaska tax revenues are omitted as these are exceptionally volatile.

Figure B.12: Average Tax Rates By Order of Tax Type Adoption

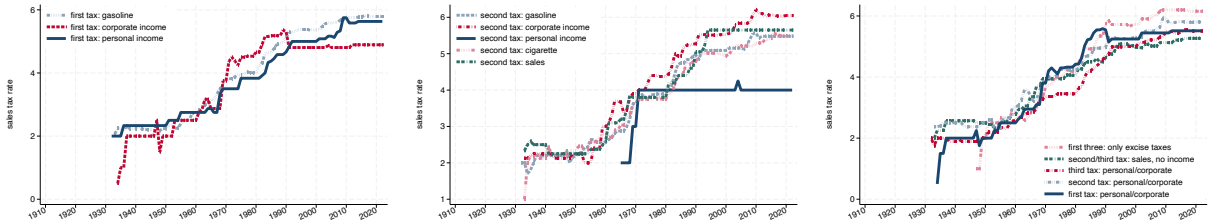
Panel A: Average Top Personal Income Tax Rates



Panel B: Average Top Corporate Income Tax Rates

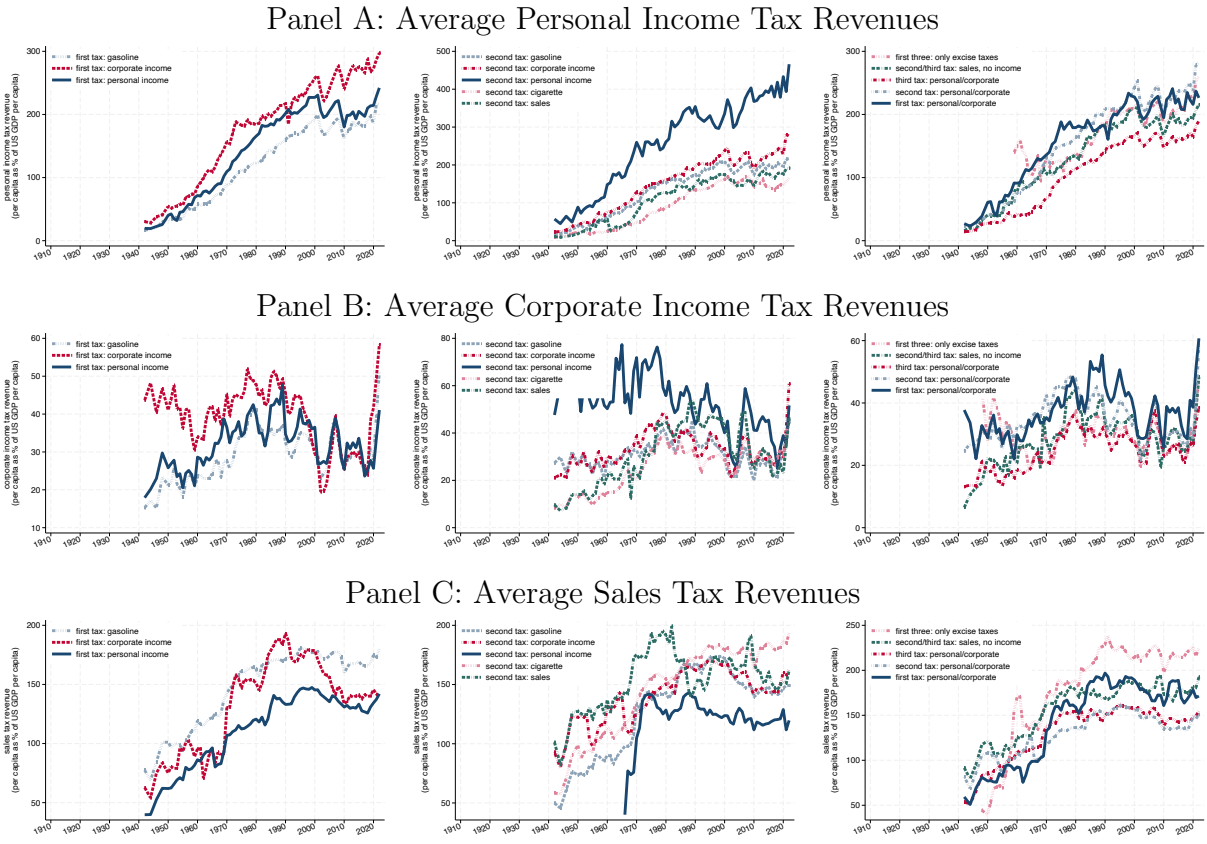


Panel C: Average Sales Tax Rates



Notes: These figures show average personal, corporate, and sales tax rates, for states with different orders of tax adoptions. For example, whether states adopted gasoline, personal income, or corporate tax first, second, or third. Within each figure, the groups of states are mutually exclusive, and groups are listed from highest to lowest priority (in cases where a state fits into multiple categories). Only non-zero rates are included.

Figure B.13: Average Tax Revenues By Order of Tax Type Adoption

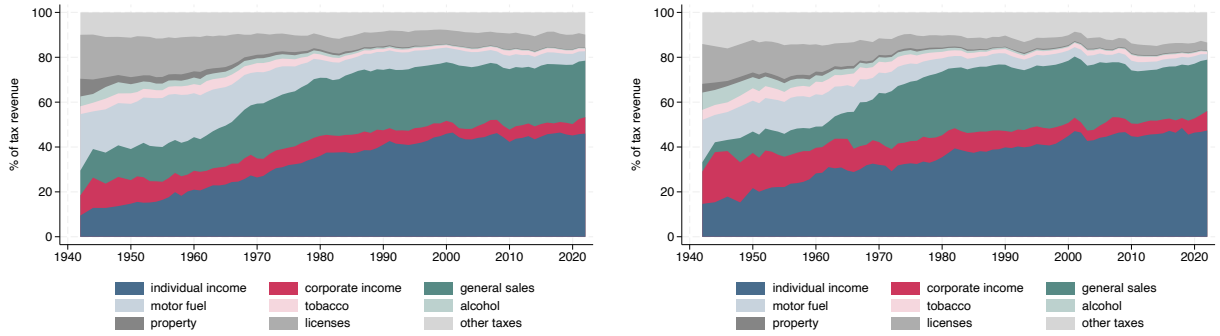


Notes: These figures show average personal, corporate, and sales tax revenues, for states with different orders of tax adoptions. For example, whether states adopted gasoline, personal income, or corporate tax first, second, or third. Within each figure, the groups of states are mutually exclusive, and groups are listed from highest to lowest priority (in cases where a state fits into multiple categories). Revenues are measured per capita as a percent of U.S. GDP per capita. Only states with non-zero tax rates are included. Alaska tax revenues are omitted as these are exceptionally volatile.

Figure B.14: Tax Revenue Share by First Tax Type

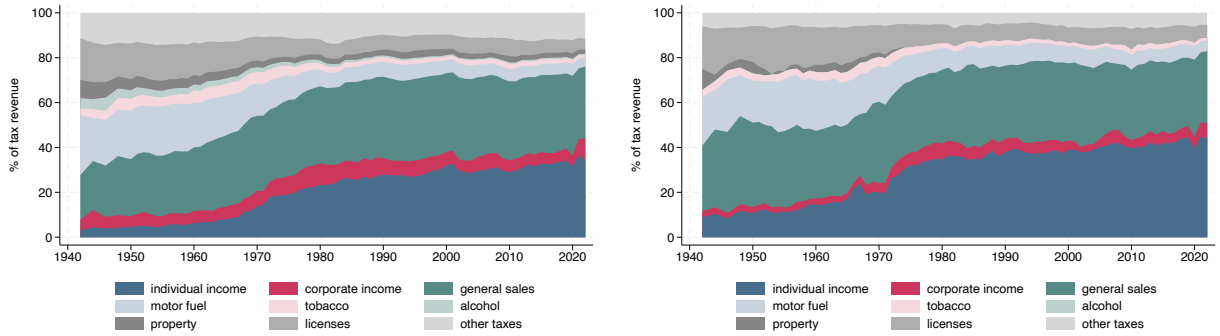
(a) Personal Income Tax

(b) Corporate Income Tax



(c) Gasoline Tax

(d) Cigarette Tax

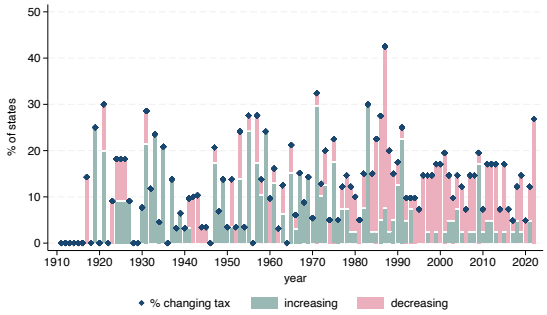


Notes: These figures show the share of overall tax revenue by tax type, separately for states that first adopted (a) personal income tax, (b) corporate income tax, (c) gasoline tax, or (d) cigarette tax. No state adopted sales or alcohol tax prior to adopting a personal, corporate, gasoline, or cigarette tax. Alaska tax revenues are omitted as these are exceptionally volatile.

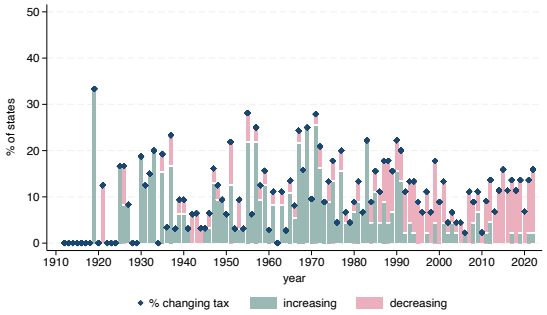
C Frequency of Tax Changes

Figure C.15: Timing of State Tax Changes

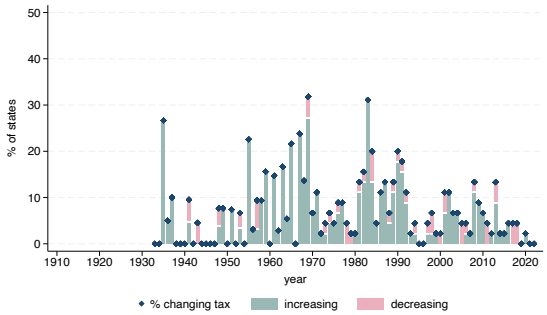
(a) Top Personal Income Tax Rate



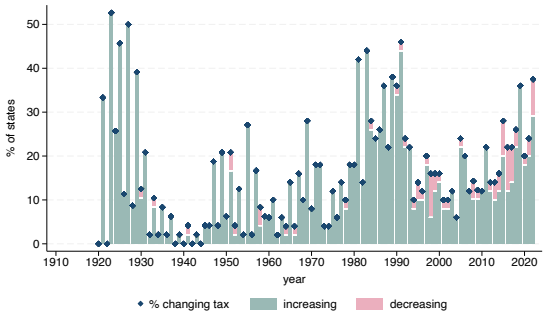
(b) Top Corporate Income Tax Rate



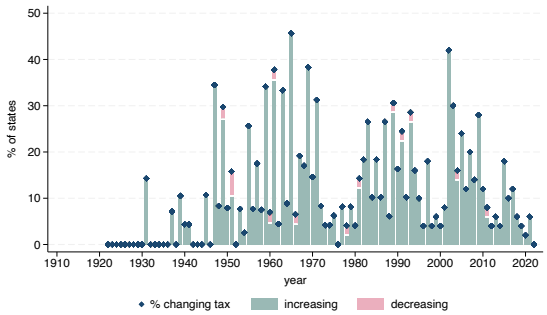
(c) Sales Tax Rate



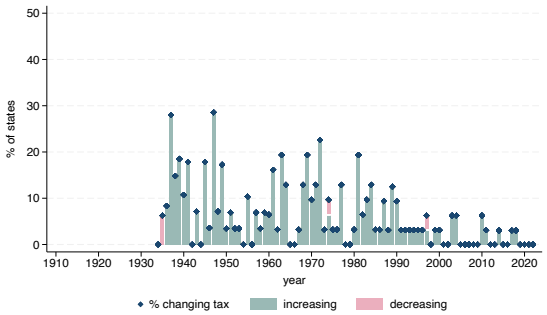
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



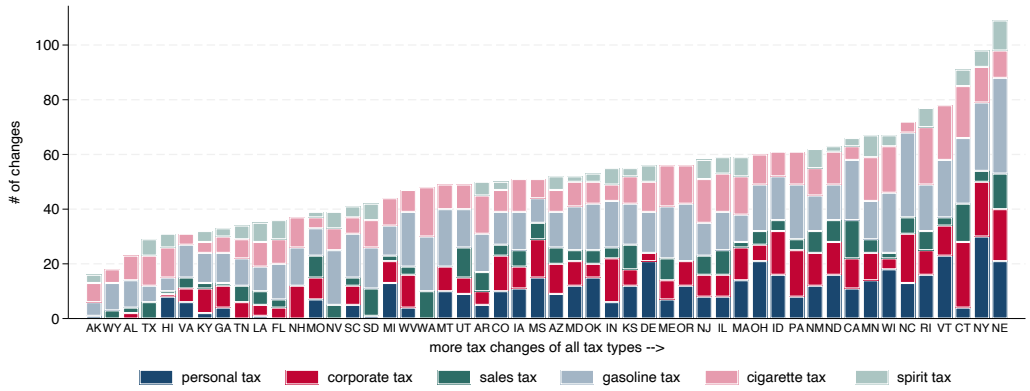
(f) Alcohol Spirit Tax Rate



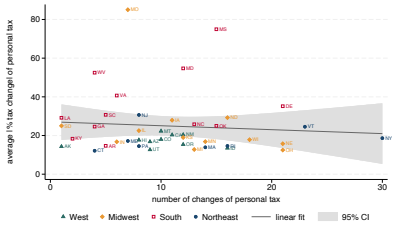
Notes: These figures show the percent of states that change a given tax rate in a given year (scatter points), increase it (green bars), or decrease it (pink bars). Only states with non-zero tax rates are included, and only intensive margin tax changes are included (tax adoptions and cancellations are excluded). These statistics are shown for (a) top personal income tax rates, (b) top corporate income tax rates, (c) standard sales tax rates, (d) gasoline excise tax rates, (e) cigarette excise tax rates, and (f) alcohol spirit excise tax rates.

Figure C.16: Tax Changes By State

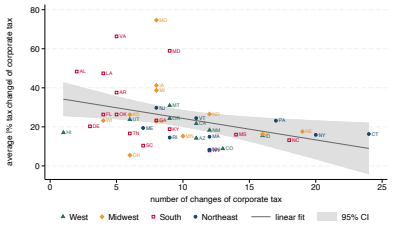
(a) Number of Tax Changes by State and Tax Type



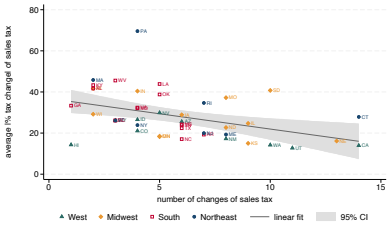
(b) Top Personal Income



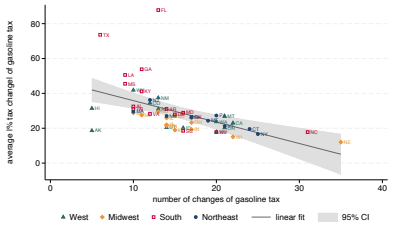
(c) Top Corporate Income



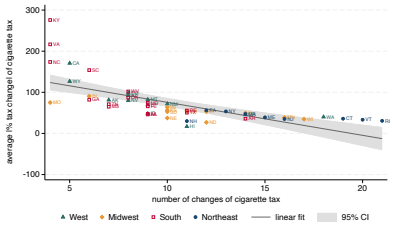
(d) Sales Tax



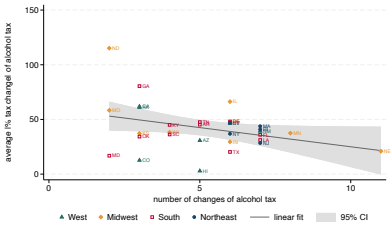
(e) Gasoline Tax



(f) Cigarette Tax



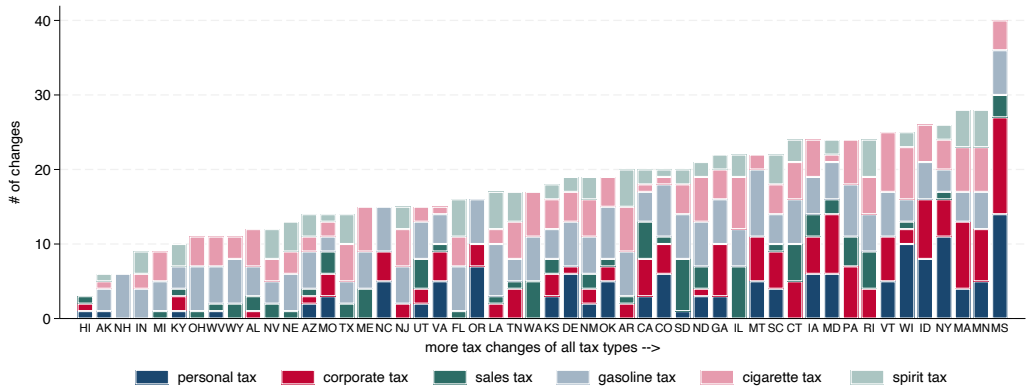
(g) Alcohol Spirit Tax



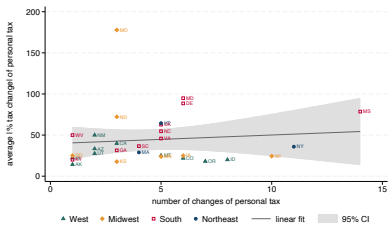
Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top personal income tax, top corporate income tax, standard sales tax, cigarette excise tax, gasoline excise tax, and alcohol spirit excise tax). Figures (b)-(g) show, for a given tax rate, the relationship between the number of tax changes and their magnitude (the average percent change in absolute value). Additionally displayed is the linear fit for this relationship, as well as the 95% confidence interval reflecting the uncertainty in both the slope and the intercept.

Figure C.17: Tax Changes By State (1910-1969)

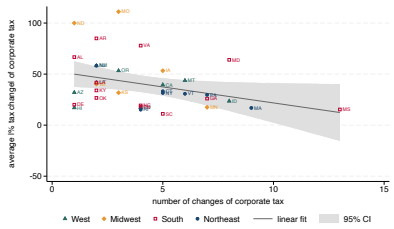
(a) Number of Tax Changes by State and Tax Type



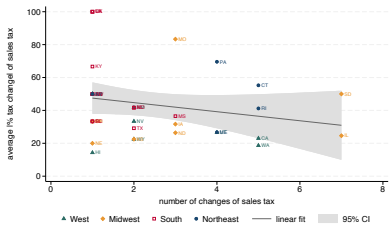
(b) Top Personal Income



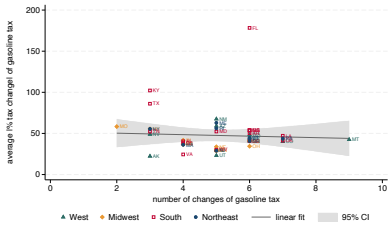
(c) Top Corporate Income



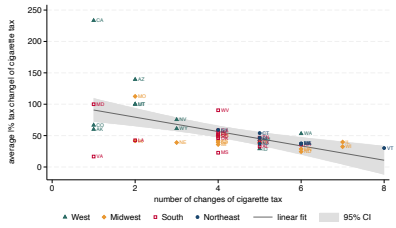
(d) Sales Tax



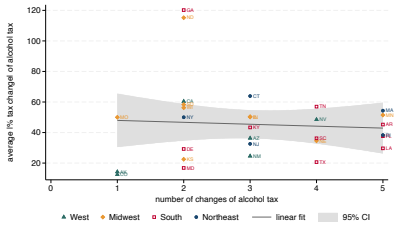
(e) Gasoline Tax



(f) Cigarette Tax



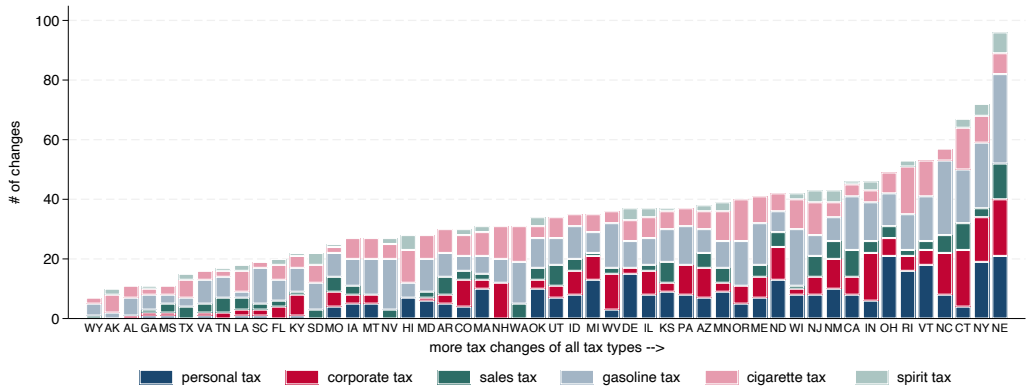
(g) Alcohol Spirit Tax



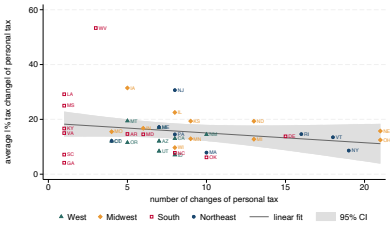
Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top personal income tax, top corporate income tax, standard sales tax, cigarette excise tax, gasoline excise tax, and alcohol spirit excise tax). Figures (b)-(g) show, for a given tax rate, the relationship between the number of tax changes and their magnitude (the average percent change in absolute value). Additionally displayed is the linear fit for this relationship, as well as the 95% confidence interval reflecting the uncertainty in both the slope and the intercept. Only tax changes 1910-1969 are included.

Figure C.18: Tax Changes By State (1970-2022)

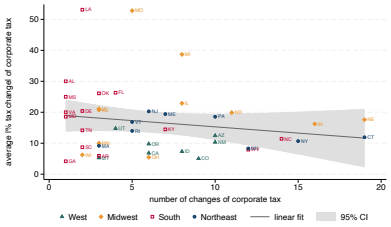
(a) Number of Tax Changes by State and Tax Type



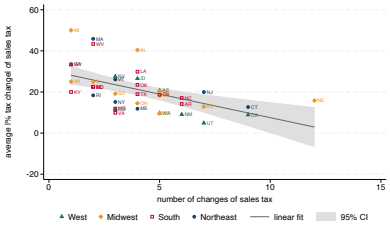
(b) Top Personal Income



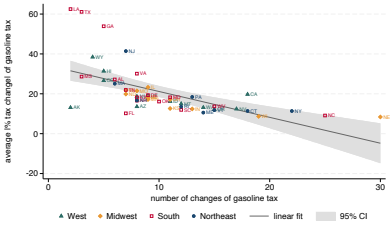
(c) Top Corporate Income



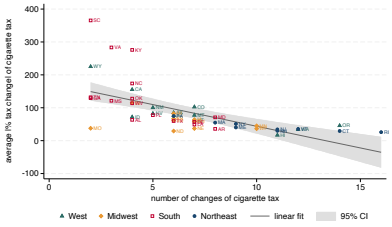
(d) Sales Tax



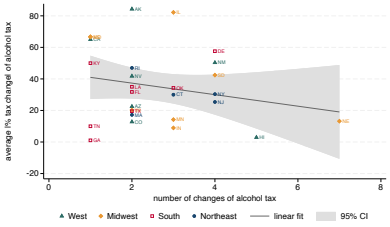
(e) Gasoline Tax



(f) Cigarette Tax



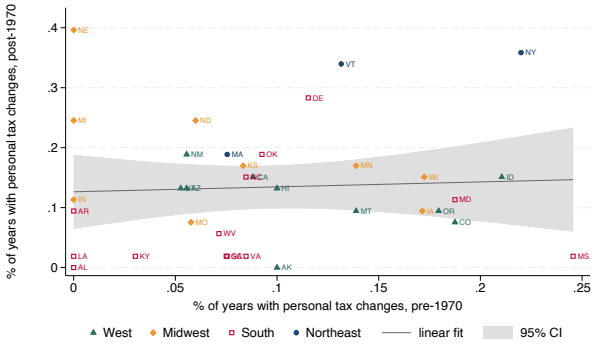
(g) Alcohol Spirit Tax



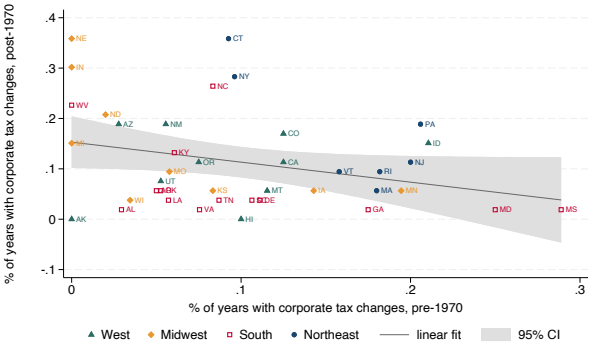
Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top personal income tax, top corporate income tax, standard sales tax, cigarette excise tax, gasoline excise tax, and alcohol spirit excise tax). Figures (b)-(g) show, for a given tax rate, the relationship between the number of tax changes and their magnitude (the average percent change in absolute value). Additionally displayed is the linear fit for this relationship, as well as the 95% confidence interval reflecting the uncertainty in both the slope and the intercept. Only tax changes 1970-2022 are included.

Figure C.19: Frequency of Tax Changes Pre-1970 vs. Post-1970

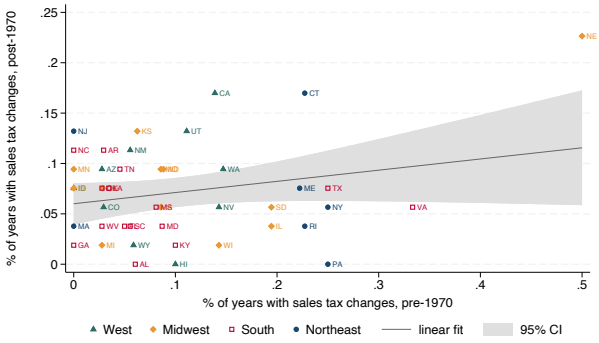
(a) Top Personal Income Tax Rate



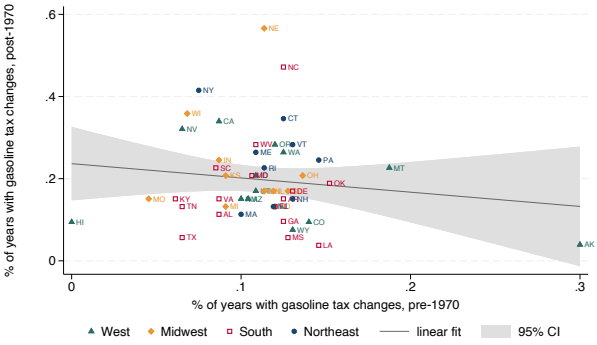
(b) Top Corporate Income Tax Rate



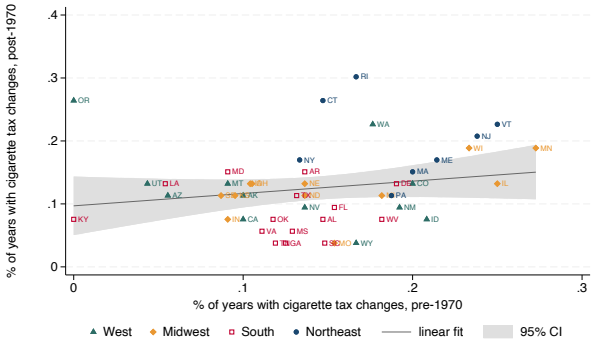
(c) Sales Tax Rate



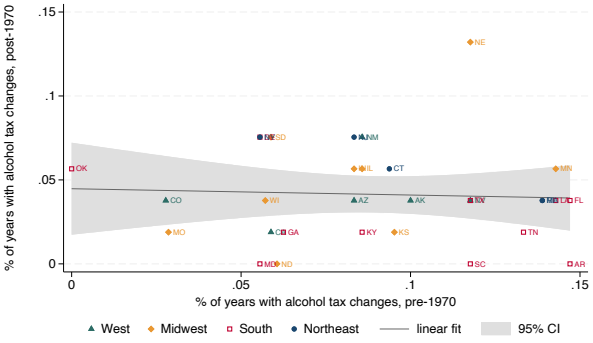
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



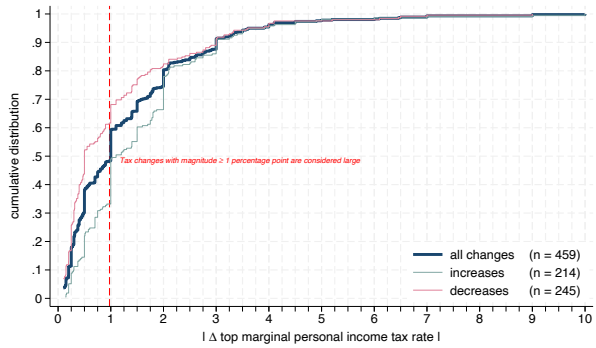
(f) Alcohol Spirit Tax Rate



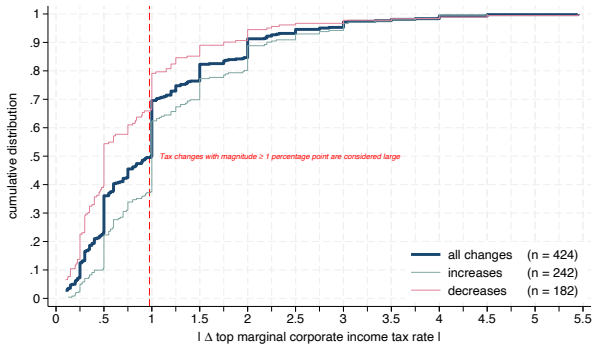
Notes: These figures show the relationship between each state's frequency of tax changes before and after 1970, separately for each type of tax. Tax changes are calculated as the number of tax changes divided by the number of years when the state had a non-zero tax. Additionally displayed is the linear fit for this relationship, as well as the 95% confidence interval reflecting the uncertainty in both the slope and the intercept.

Figure C.20: Cumulative Distribution of Tax Changes by Magnitude

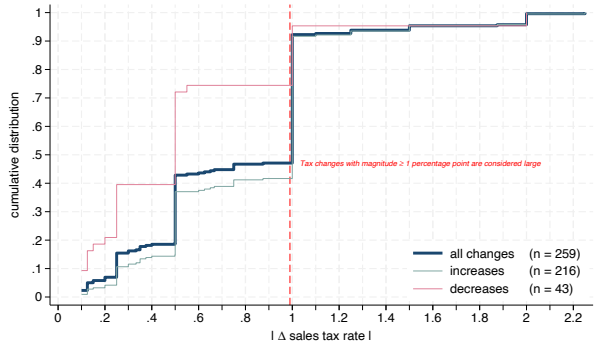
(a) Top Personal Income Tax Rate



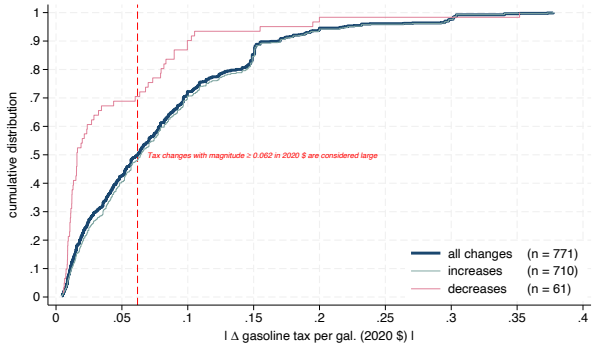
(b) Top Corporate Income Tax Rate



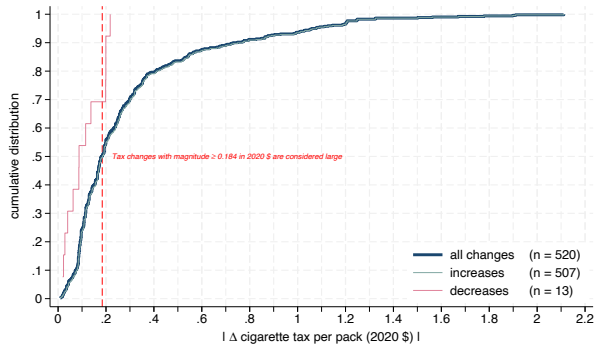
(c) Sales Tax Rate



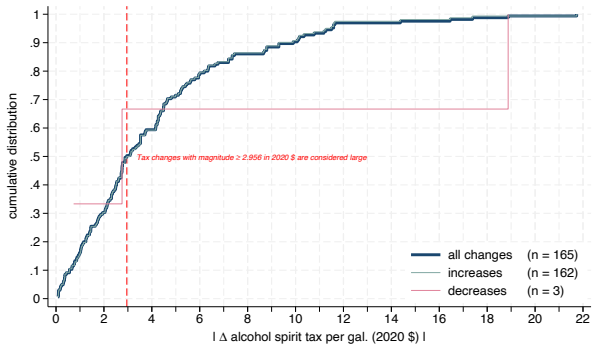
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



(f) Alcohol Spirit Tax Rate



Notes: These figures show the distribution of tax increases, tax decreases, and tax changes overall by magnitude, as well as the minimum size for "large" tax changes by tax type. Large tax changes are restricted to changes that are at or above the 50$^{\text{th}}$ percentile for magnitude (based on tax changes overall). Only intensive margin tax changes are included; tax adoptions and cancellations are excluded.

D Simultaneity of Tax Changes

Table D.1: The Effect of Personal and Corporate Income Taxes on Top Income Shares
Panel A: U.S. Top Income Shares & Federal Taxes (following Piketty et al., 2014)

	(1) Top 1%	(2) Top 1%	(3) Top 1%
1 – Top Personal Income Rate	0.200***		0.033
	(0.034)		(0.022)
1 – Top Corporate Income Rate		1.177***	1.118***
		(0.065)	(0.075)
Observations	96	96	96

Panel B: State Top Income Shares & State Taxes (reproduced from Robinson et al., 2024)

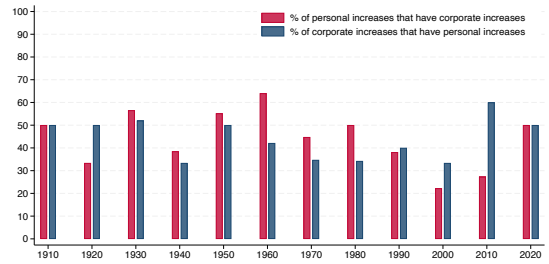
		Top 1%	Top 1-0.1%	Top 0.1-0.01%	Top 0.01%
(1)	Top Personal Income Rate	-0.007*	-0.004	-0.009**	-0.017**
		(0.004)	(0.003)	(0.004)	(0.006)
(2)	Top Corporate Income Rate	-0.017**	-0.009**	-0.023**	-0.038**
		(0.007)	(0.004)	(0.009)	(0.014)
(3)	Top Personal Income Rate	-0.000	-0.001	-0.000	-0.002
		(0.003)	(0.003)	(0.004)	(0.008)
	Top Corporate Income Rate	-0.017**	-0.008**	-0.023**	-0.037**
		(0.007)	(0.004)	(0.010)	(0.017)
Avg. Top Personal Income Rate		4.400	4.400	4.400	4.400
Avg. Top Corporate Income Rate		4.464	4.464	4.464	4.464
Avg. Top X% Share		13.203	8.141	3.107	1.955
Observations		5,016	5,016	5,016	5,016
State & Year FEs		Yes	Yes	Yes	Yes

Notes: Panel A replicates and extends the results from Table 1 of Piketty et al. (2014). The outcome variable is ln(top 1% U.S. share), and the independent variables are the federal top personal and/or corporate income tax rates. Panel B reproduces the results from Table 1 of Robinson et al. (2024). The outcome variables are state log income shares shown in the first row e.g., ln(top 1% state share). The independent variables are the state top personal and/or corporate income tax rates. In addition to the independent variables listed, each specification includes state and year fixed effects. Standard errors clustered at the state level, * $p < 0.10$, ** $p < 0.05$, ***$p < 0.01$,

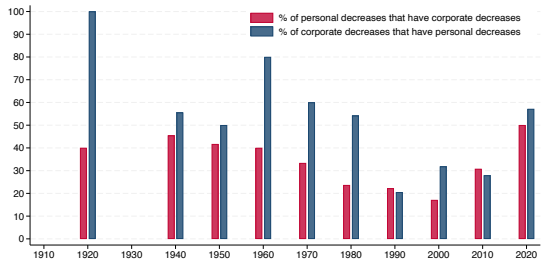
Figure D.21: Simultaneity of Tax Changes in the Same State and Year: By Decade

Panel A: Income Taxes

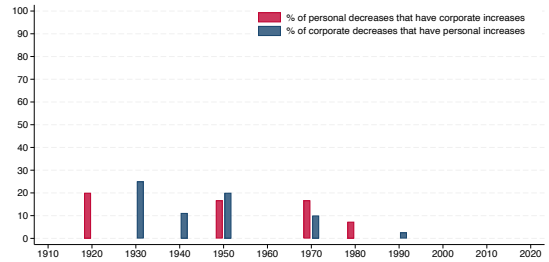
(a) % of Increases Coinciding with Increases



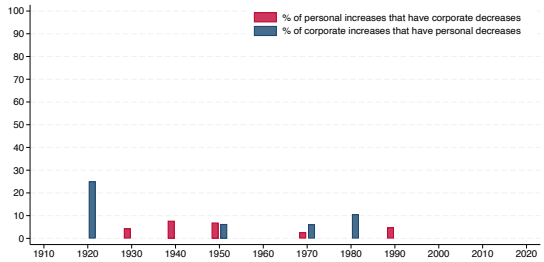
(b) % of Decreases Coinciding with Decreases



(c) % of Decreases Coinciding with Increases

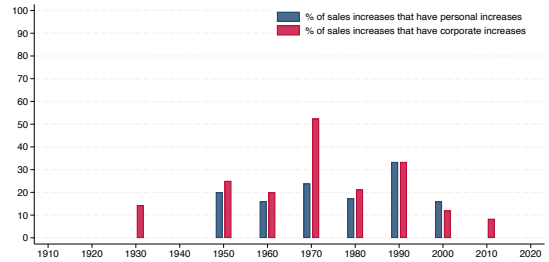


(d) % of Increases Coinciding with Decreases

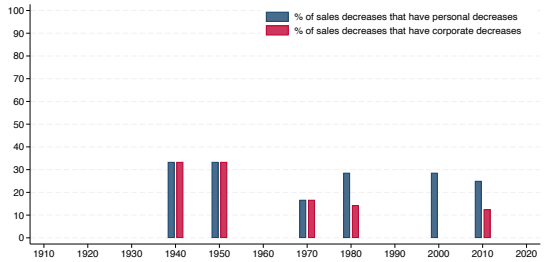


Panel B: Sales & Income Taxes

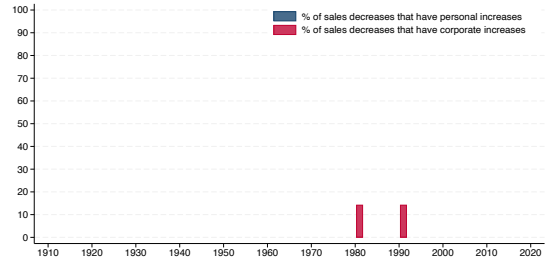
(e) % of Increases Coinciding with Increases



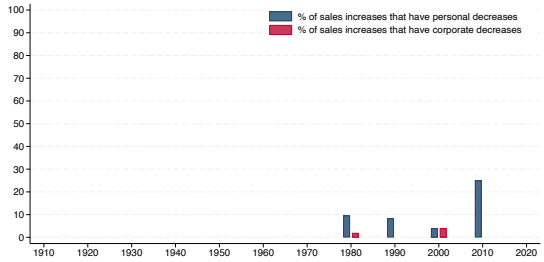
(f) % of Decreases Coinciding with Decreases



(g) % of Decreases Coinciding with Increases



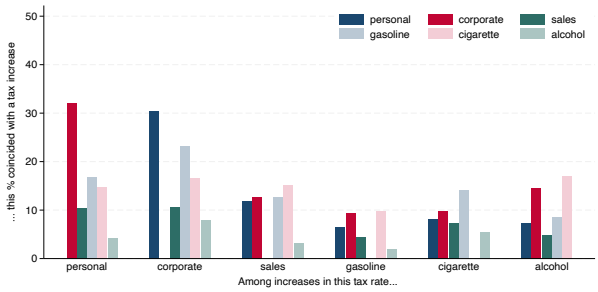
(h) % of Increases Coinciding with Decreases



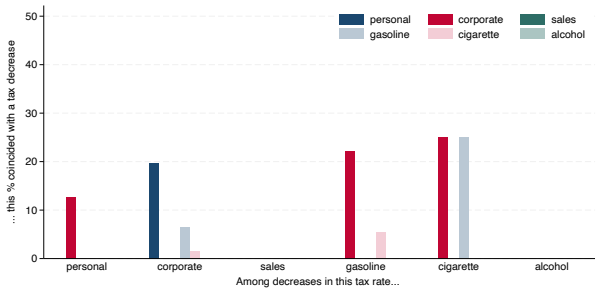
Notes: These figures show, separately by decade, the percent of increases (or decreases) in one tax that coincide with increases (or decreases) in another tax. Panel A focuses on top personal and corporate income tax rates, and Panel B additionally considers sales taxes. Throughout, only intensive margin tax changes are included; tax adoptions and cancellations are excluded.

Figure D.22: Simultaneity of Large Tax Changes: All Years

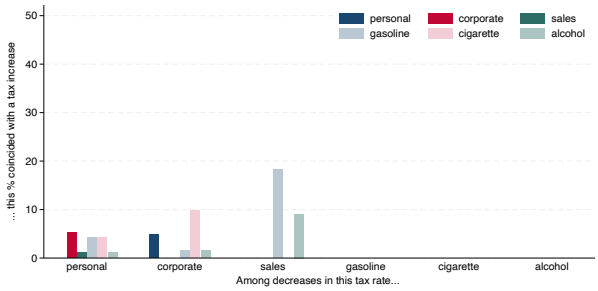
(a) % of Increases Coinciding with Increases



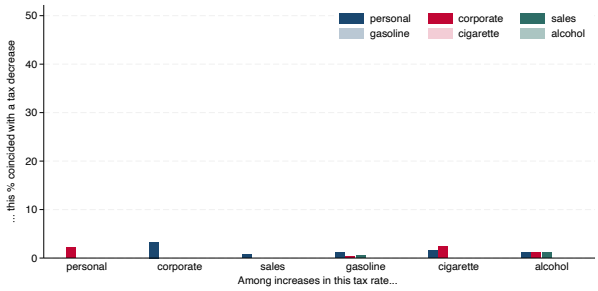
(b) % of Decreases Coinciding with Decreases



(c) % of Decreases Coinciding with Increases



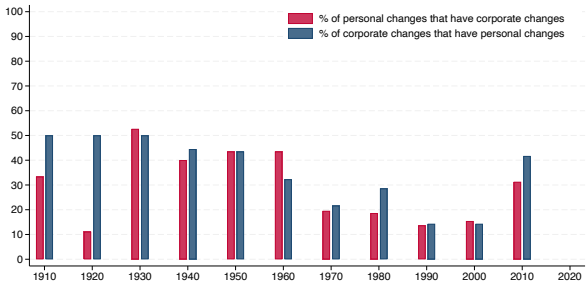
(d) % of Increases Coinciding with Decreases



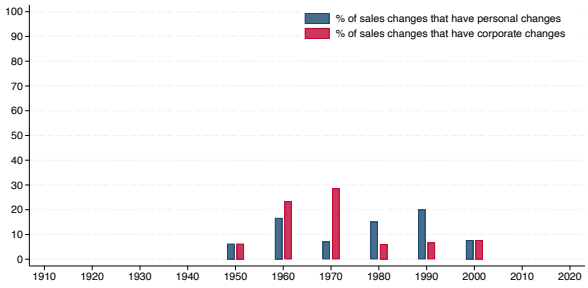
Notes: These figures explore the extent to which states change one tax rate while simultaneously changing another tax type (i.e., in the same year), focusing on large changes only (greater than the 50th percentile in magnitude). See Figure C.20 for detail on identifying large tax changes. All years in the sample are included. Among the large increases (or decreases) in each tax on the horizontal axis, the vertical bars specify the share that coincides with a large increase (or decrease) in another tax type in the same state and year. These other tax types are identified by the color of the bar (top income tax rates, top corporate tax rates, standard sales tax rates, cigarette excise tax rates, gasoline excise tax rates, or alcohol spirit excise tax rates). For example, Figure (a) shows that among all of the large increases in top personal income tax rates, 32% occurred in the same year as a large increase in the top corporate income tax rate in the same state.

Figure D.23: Simultaneity of Large Tax Changes: By Decade

(a) Income Taxes



(b) Sales & Income Taxes

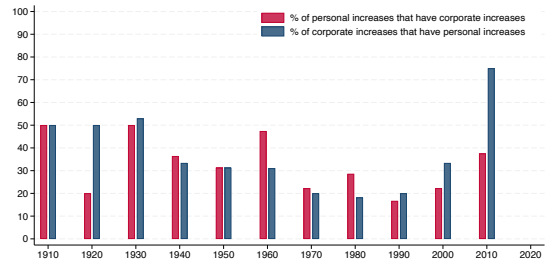


Notes: These figures explore the extent to which states change one tax rate while simultaneously changing another tax type (i.e., in the same year), focusing on large changes only (greater than the 50th percentile in magnitude). See Figure C.20 for detail on identifying large tax changes. Separately for each decade, figures show the percent of large changes in one tax that coincide with large changes in another tax (where changes may be increases or decreases). Throughout, only intensive margin tax changes are included; tax adoptions and cancellations are excluded. See Figure D.24 for analysis of large changes by decade, separately for increases & decreases.

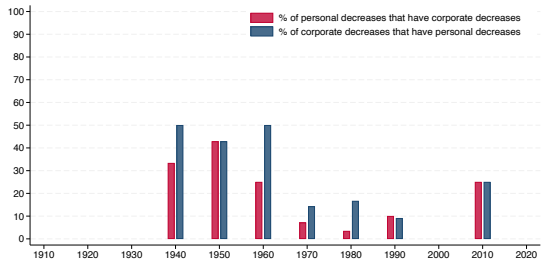
Figure D.24: Simultaneity of Large Tax Changes by Decade

Panel A: Income Taxes

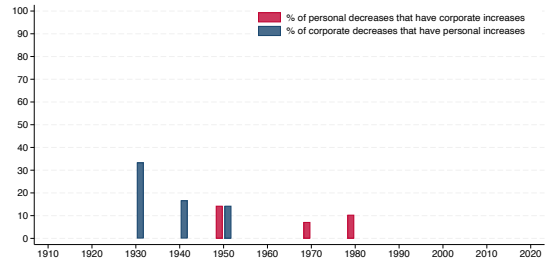
(a) % of Increases Coinciding with Increases



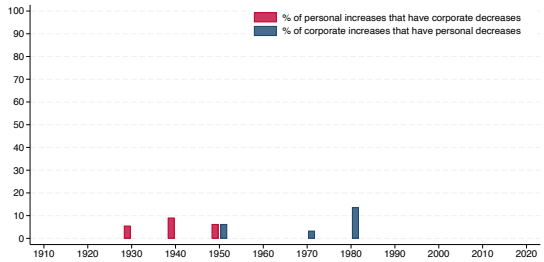
(b) % of Decreases Coinciding with Decreases



(c) % of Decreases Coinciding with Increases

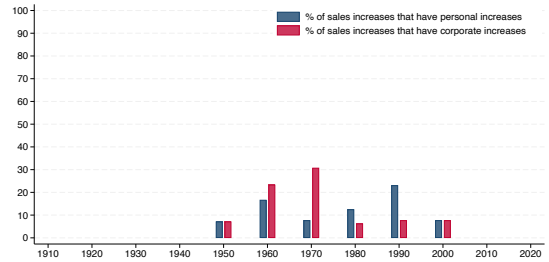


(d) % of Increases Coinciding with Decreases



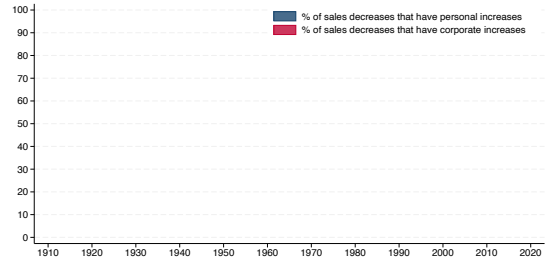
Panel B: Sales & Income Taxes

(e) % of Increases Coinciding with Increases

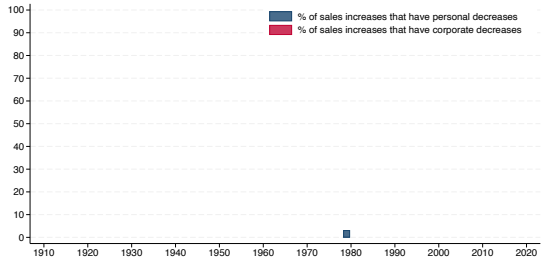


(f) % of Decreases Coinciding with Decreases

(g) % of Decreases Coinciding with Increases



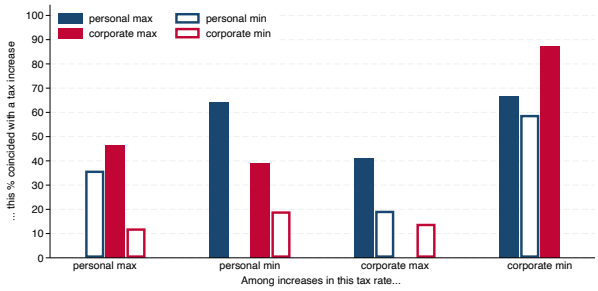
(h) % of Increases Coinciding with Decreases



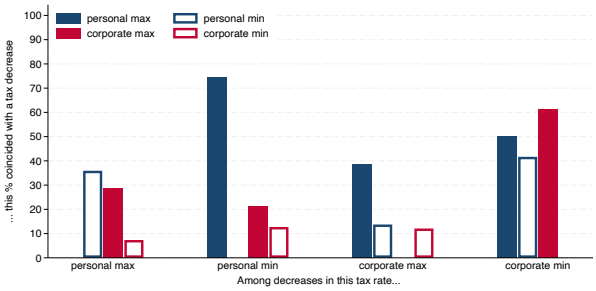
Notes: These figures show, separately by decade, the percent of increases (or decreases) in one tax that coincide with increases (or decreases) in another tax, focusing on large changes only (greater than the 50th percentile in magnitude). Panel A focuses on top personal and corporate income tax rates, and Panel B additionally considers sales taxes. Throughout, only intensive margin tax changes are included; tax adoptions and cancellations are excluded. See Appendix Figure C.20 for detail on identifying large tax changes.

Figure D.25: Simultaneity of Tax Changes: Min and Max Income Tax Rates

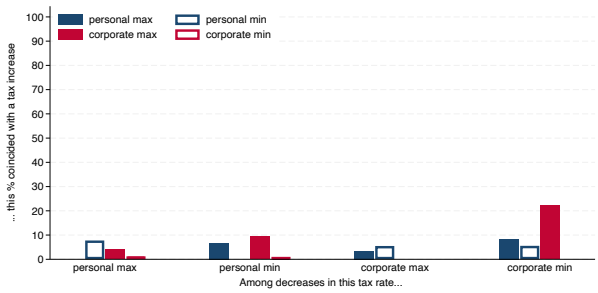
(a) % of Increases Coinciding with Increases



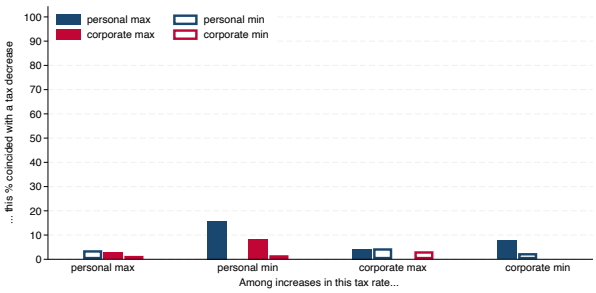
(b) % of Decreases Coinciding with Decreases



(c) % of Decreases Coinciding with Increases



(d) % of Increases Coinciding with Decreases

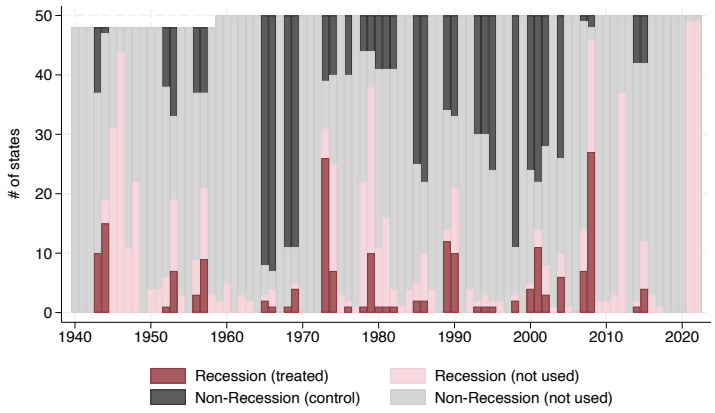


Notes: These figures explore the extent to which states change one tax rate while simultaneously changing another tax type (i.e., in the same year). Among the increases (or decreases) in each tax on the horizontal axis, the vertical bars specify the share that coincides with an increase (or decrease) in another tax type in the same state and year. These other tax types are identified by the color of the bar (top income tax rates, top corporate tax rates, minimum income tax, minimum corporate tax). Changes to a flat tax are counted only as changes to the top rate (and thus are not included as simultaneous changes). Figure 5 shows similar patterns for other tax rates.

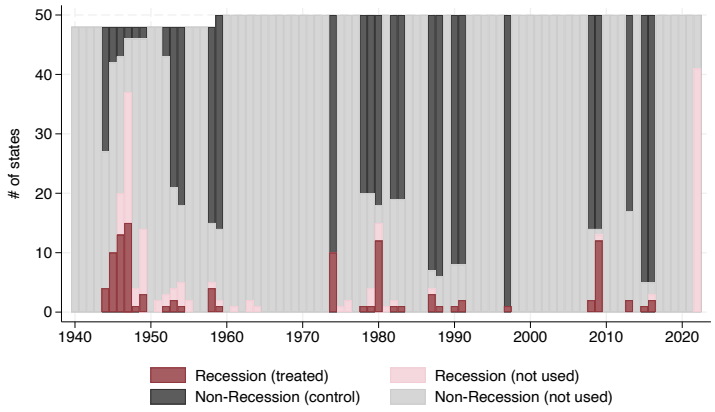
E Do Economic Conditions Drive Tax Changes?

Figure E.26: Share of States in Recession

(a) Bry-Boschan with SAINC1



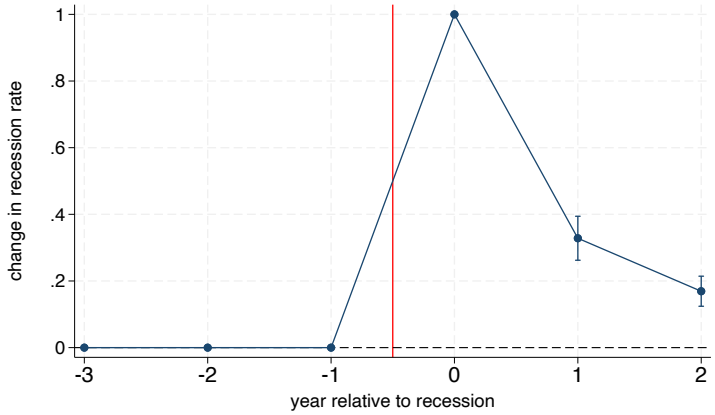
(b) SAINC1 Growth $< -3\%$



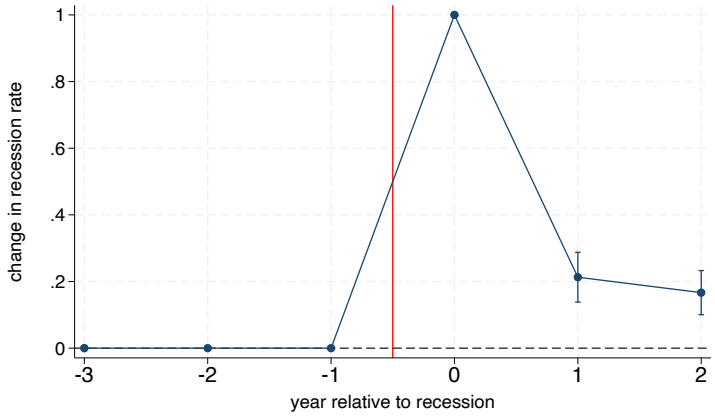
Notes: These figures summarize our state recession variation, by showing what share of states experience a recession in a given year and what share does not, and what share of these groups of states is included in the stacked event study analysis design with 3 pre- and 3 post-periods. Recessions are identified with (a) the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022, or (b) as years with real annual state total personal income growth lower than –3%. Note that the actual number of states included will be slightly lower and will vary with tax type in specifications that only include states with non-zero tax rates.

Figure E.27: Duration of Recessions

(a) Bry-Boschan with SAINC1



(b) SAINC1 Growth $< -3\%$

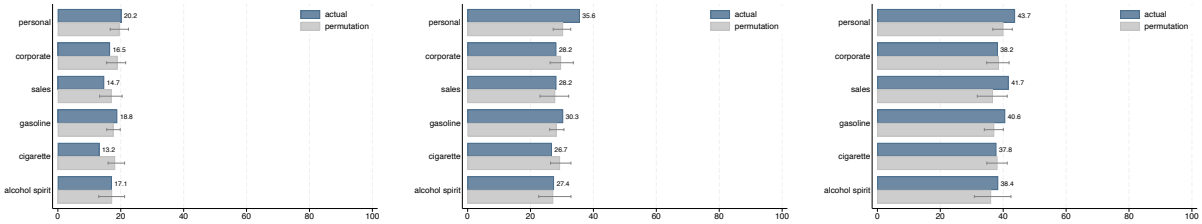


Notes: This figure summarizes the duration of recession treatment. This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variable is the recession indicator, and the excluded period –1 marks the year prior to the onset of the recession. Recessions are identified with (a) the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022, or (b) as years with real annual state total personal income growth lower than –3%. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.28: Tax Rates Changes During Recessions (Bry-Boschan Measure)

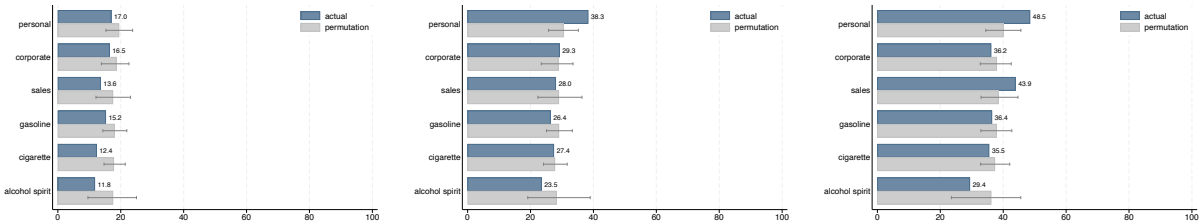
Panel A: % of Tax Changes Occurring During Recessions

(a) During (b) + 1 year (c) + 2 years



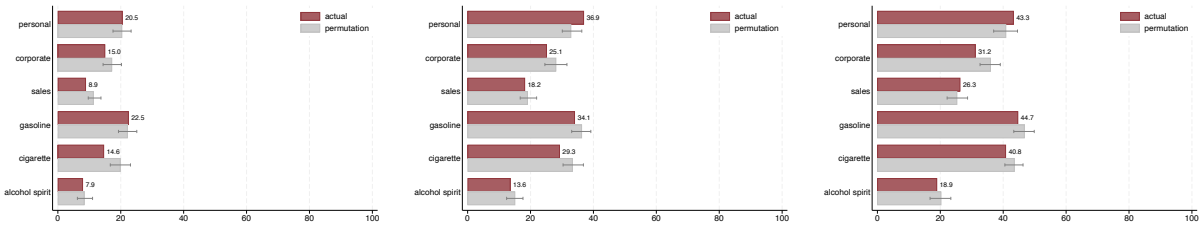
Panel B: % of Large Tax Changes Occurring During Recessions

(d) During (e) + 1 year (f) + 2 years



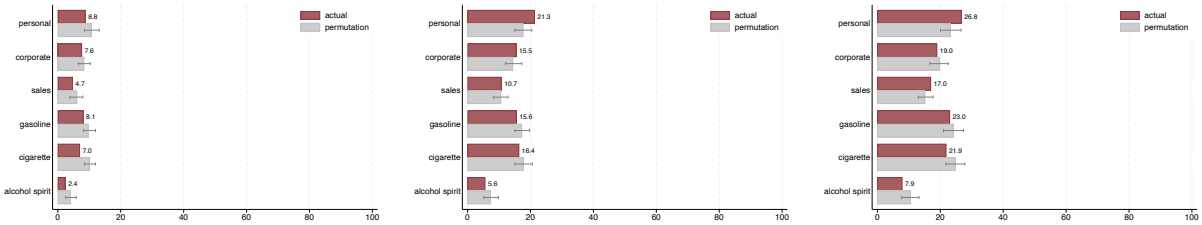
Panel C: % of Recessions with Tax Change

(g) During (h) + 1 year (i) + 2 years



Panel D: % of Recessions with Large Tax Change

(j) During (k) + 1 year (l) + 2 years

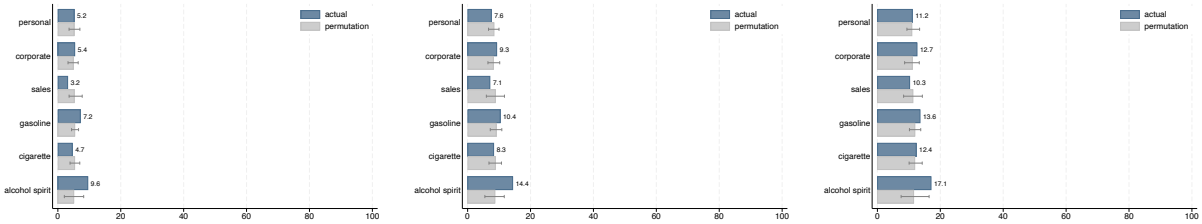


Notes: Panel A shows the percent of tax changes that occur (a) during state recessions, (b) during or 1 year after state recessions, or (c) during or 2 years after state recessions. Panel B is similar to Panel A, but restricted to large tax changes. Panels C and D show the percent of recession episodes that include at least one tax change (respectively considering all tax changes or large tax changes only). In all figures, the top blue or red bars show actual observed percentages, while the bottom grey bars show the simulated average, calculated by randomizing the timing of tax changes 100 times. The thin interval bars show the 5^{th} and 95^{th} percentiles of the simulated percentages. Only intensive margin tax changes are included (tax adoptions and cancellations are excluded); when randomizing, only years with non-zero tax rates are included. See Figure C.20 for detail on identifying large tax changes. We identify recessions with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. Figure E.29 shows results when recessions are instead defined as years with income growth $<$ –3%.

Figure E.29: Tax Rates Changes During Recessions (Income Growth < –3%)

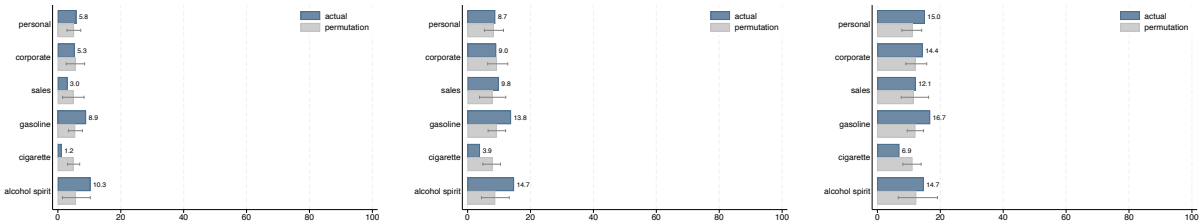
Panel A: % of Tax Changes Occurring During Recessions

(a) During (b) + 1 year (c) + 2 years



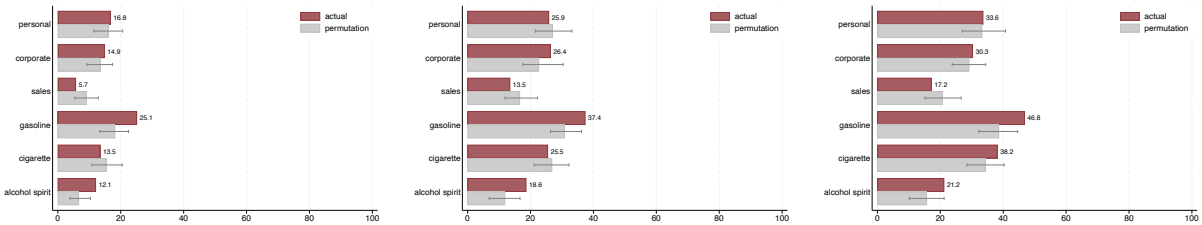
Panel B: % of Large Tax Changes Occurring During Recessions

(d) During (e) + 1 year (f) + 2 years



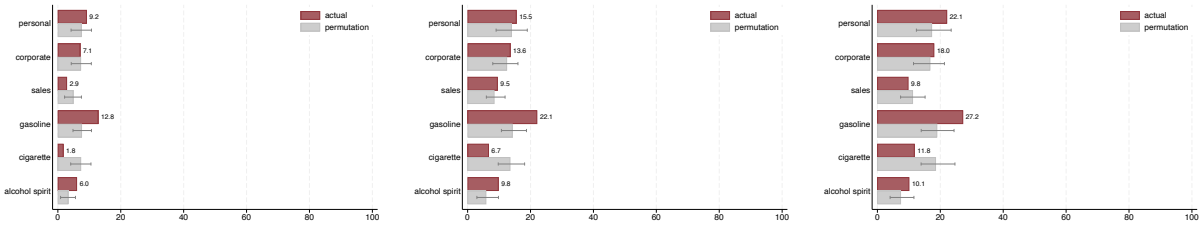
Panel C: % of Recessions with Tax Change

(g) During (h) + 1 year (i) + 2 years



Panel D: % of Recessions with Large Tax Change

(j) During (k) + 1 year (l) + 2 years

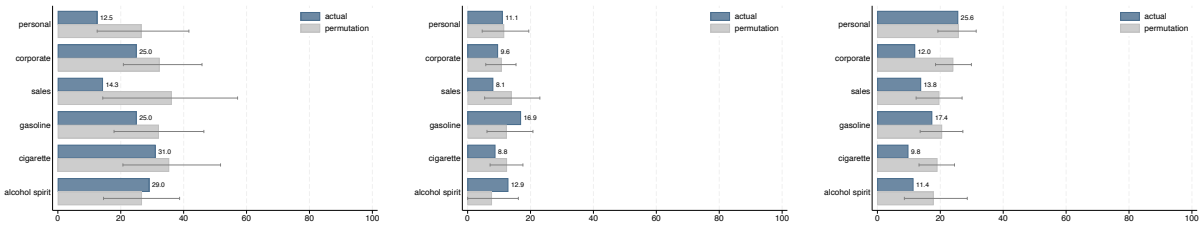


Notes: Panel A shows the percent of tax changes that occur (a) during state recessions, (b) during or 1 year after state recessions, or (c) during or 2 years after state recessions. Panel B is similar to Panel A, but restricted to large tax changes. Panels C and D show the percent of recession episodes that include at least one tax change (respectively considering all tax changes or large tax changes only). In all figures, the top blue or red bars show actual observed percentages, while the bottom grey bars show the simulated average, calculated by randomizing the timing of tax changes 100 times. The thin interval bars show the 5^{th} and 95^{th} percentiles of the simulated percentages. Only intensive margin tax changes are included (tax adoptions and cancellations are excluded); when randomizing, only years with non-zero tax rates are included. See Figure C.20 for detail on identifying large tax changes. We identify recessions as years with real annual state total personal income growth lower than –3% from 1940 to 2022.

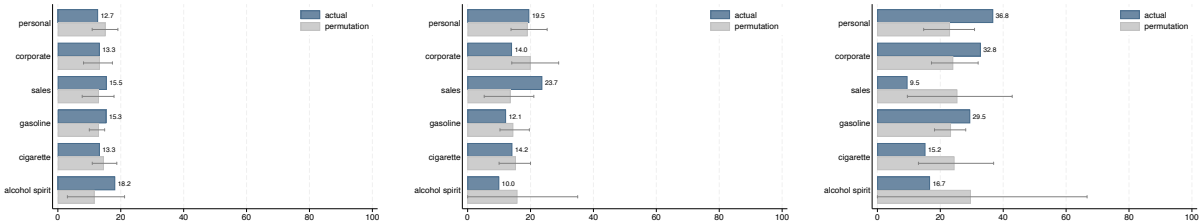
Figure E.30: Tax Rates Changes During Recessions

Panel A: % of Tax Changes Occurring During Recessions

(a) 1940-1949 (b) 1950-1964 (c) 1965-1979

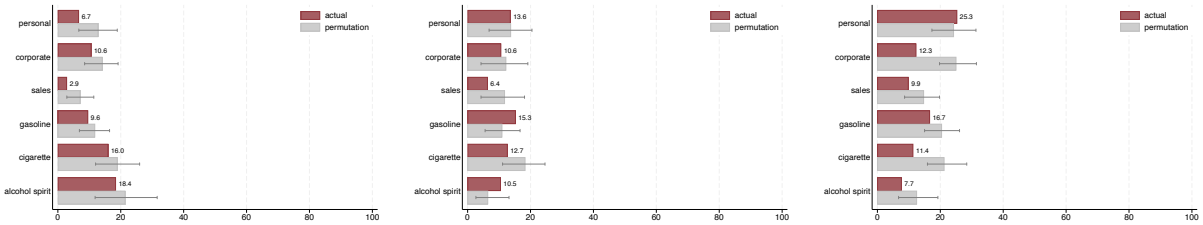


(d) 1980-1994 (e) 1995-2009 (f) 2010-2024

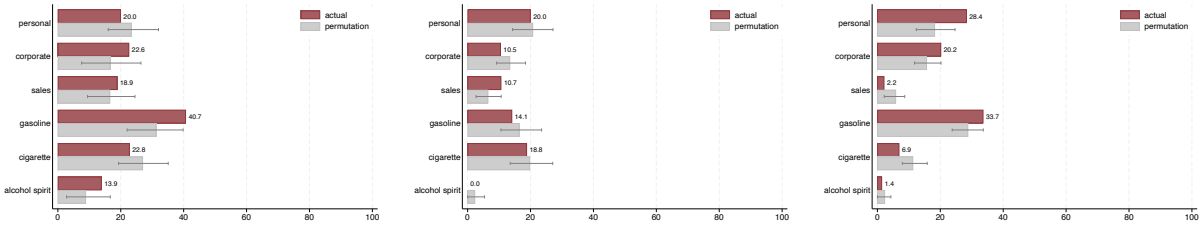


Panel C: % of Recessions with Tax Change

(g) 1940-1949 (h) 1950-1964 (i) 1965-1979



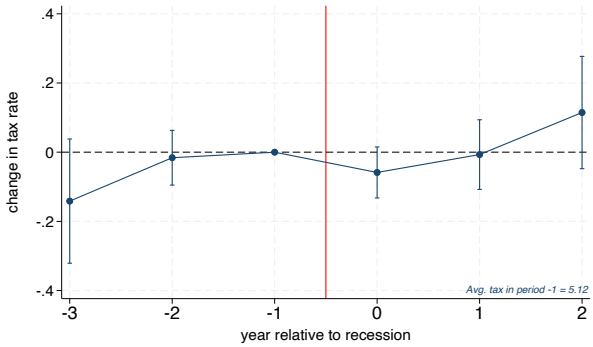
(j) 1980-1994 (k) 1995-2009 (l) 2010-2024



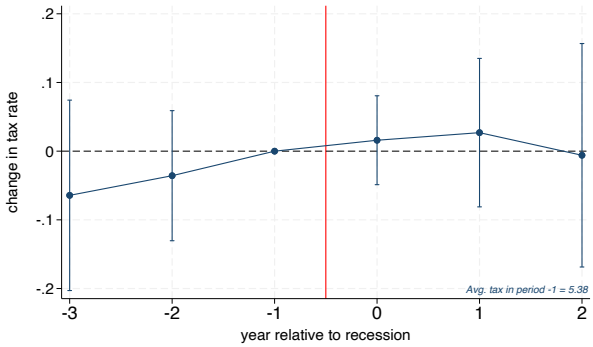
Notes: Figures (a)-(f) shows the percent of tax changes that occur during state recessions during the years listed. Figures (g)-(l) show the percent of recession episodes that include at least one tax change. In all figures, the top blue or red bars show actual observed percentages, while the bottom grey bars show the simulated average, calculated by randomizing the timing of tax changes 100 times. The thin interval bars show the 5^{th} and 95^{th} percentiles of the simulated percentages. Only intensive margin tax changes are included (tax adoptions and cancellations are excluded); when randomizing, only years with non-zero tax rates are included. We identify recessions with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022.

Figure E.31: Tax Rates Before and After Recessions (Incl. Tax Adoptions)

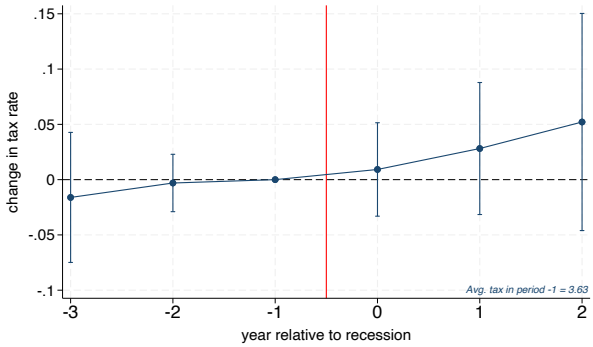
(a) Top Personal Income Tax Rate



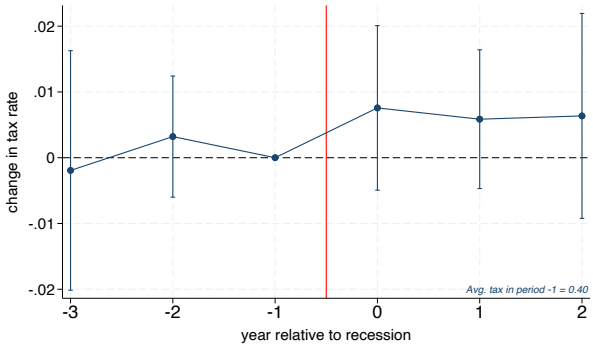
(b) Top Corporate Income Tax Rate



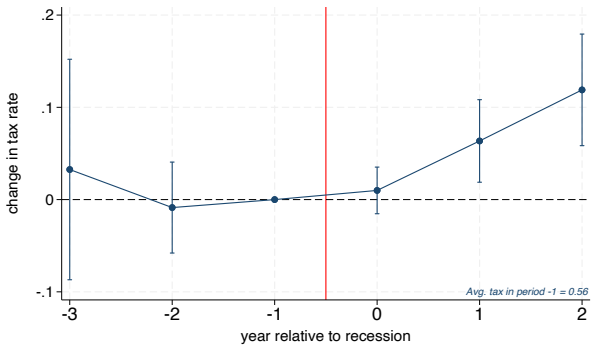
(c) Sales Tax Rate



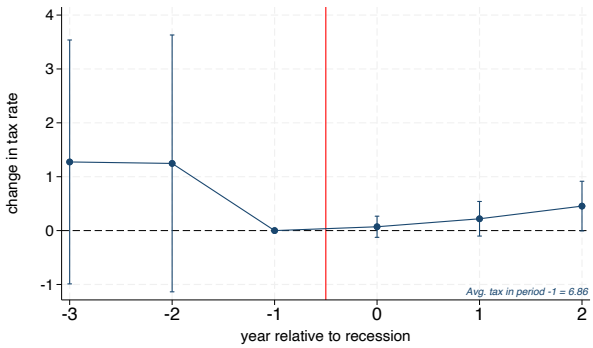
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



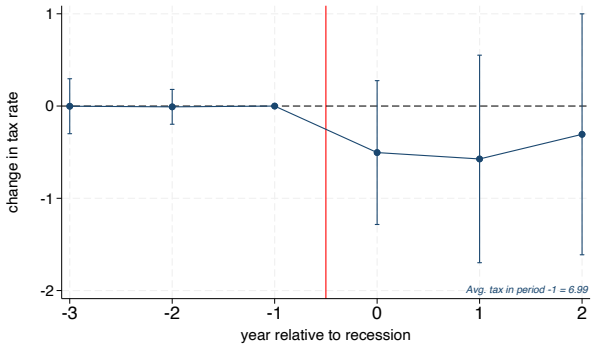
(f) Alcohol Spirit Tax Rate



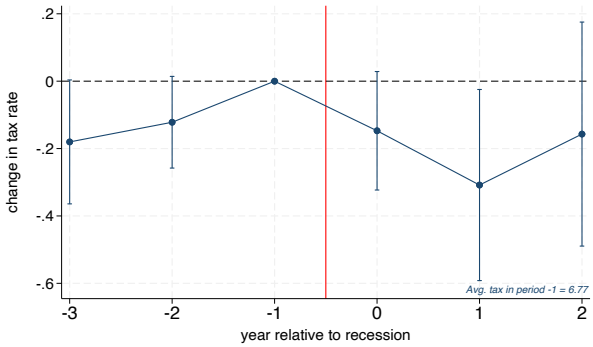
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. All states are included thus allowing for both intensive and extensive margin tax changes. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.32: Tax Rates Before and After Recessions (Income Growth < –3%)

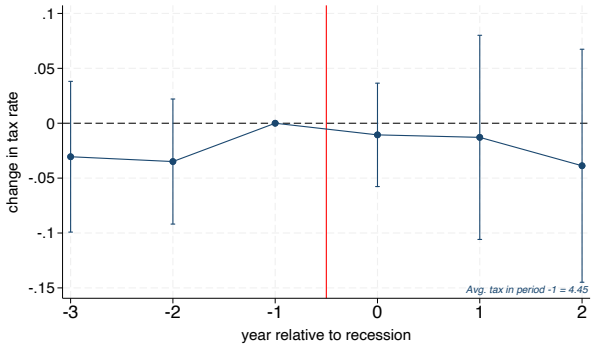
(a) Top Personal Income Tax Rate



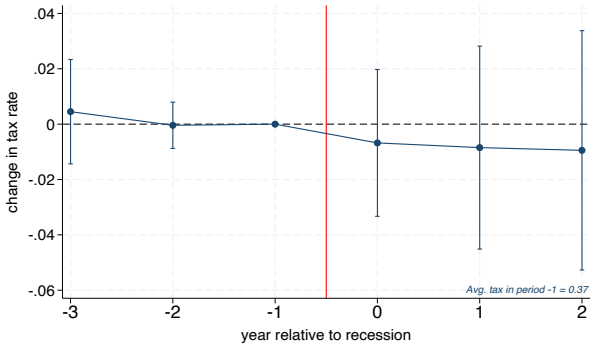
(b) Top Corporate Income Tax Rate



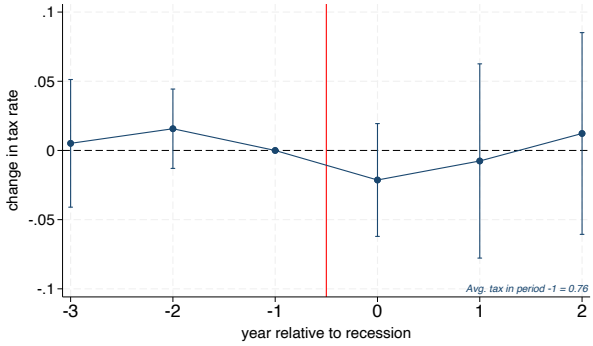
(c) Sales Tax Rate



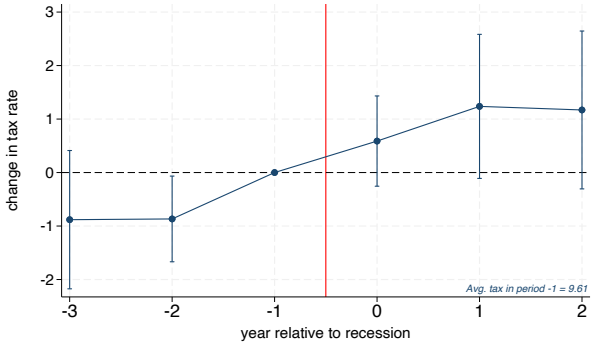
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



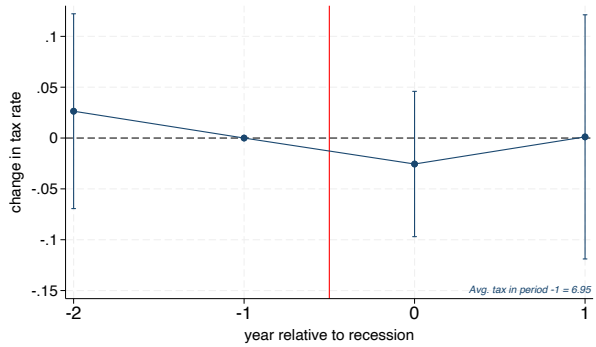
(f) Alcohol Spirit Tax Rate



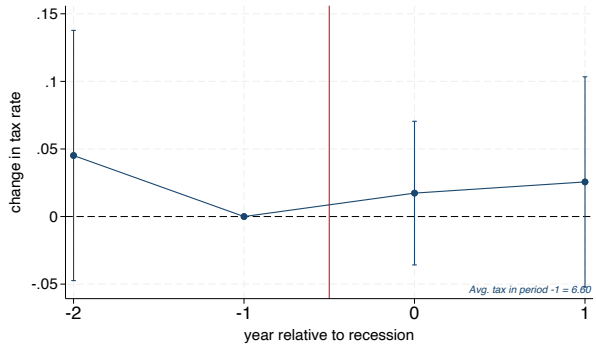
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. Recessions are identified as years with real annual state total personal income growth lower than –3% from 1940 to 2022. Only states with non-zero tax rates are included. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.33: Tax Rates Before and After Recessions (Shorter Window)

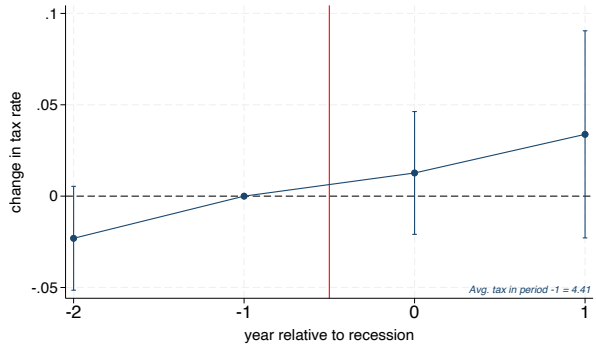
(a) Top Personal Income Tax Rate



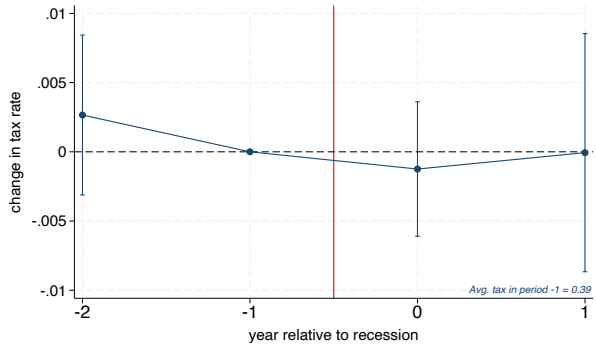
(b) Top Corporate Income Tax Rate



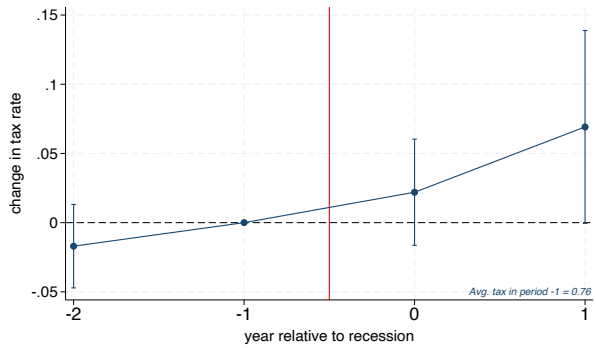
(c) Sales Tax Rate



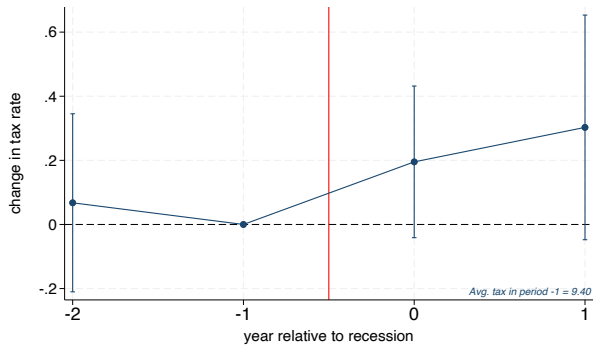
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



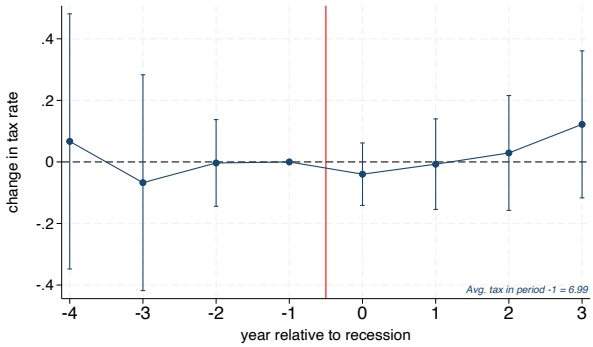
(f) Alcohol Spirit Tax Rate



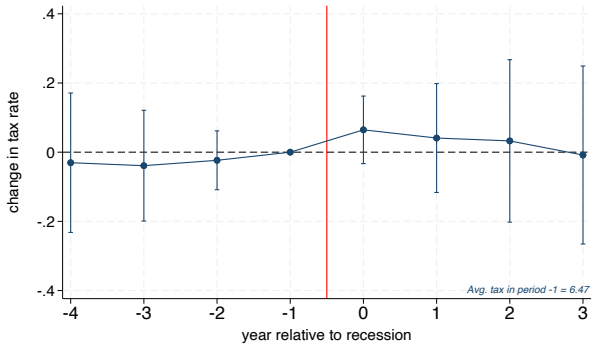
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. Only states with non-zero rates are included. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.34: Tax Rates Before and After Recessions (Longer Window)

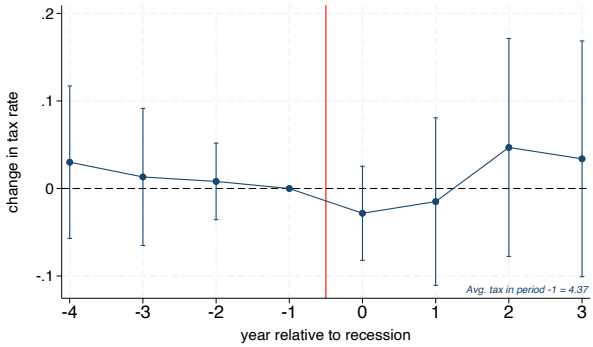
(a) Top Personal Income Tax Rate



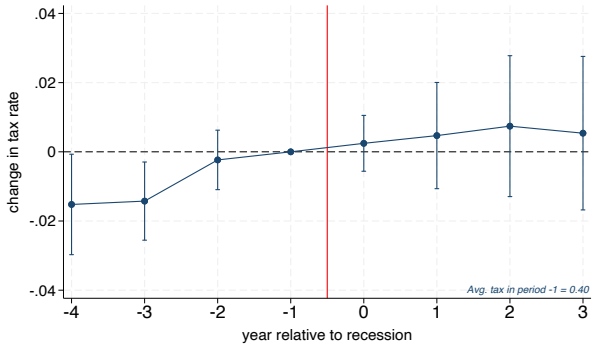
(b) Top Corporate Income Tax Rate



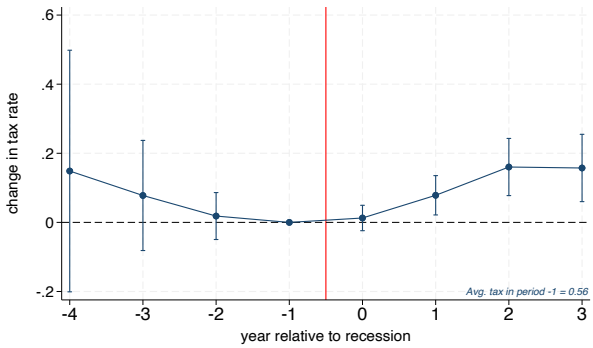
(c) Sales Tax Rate



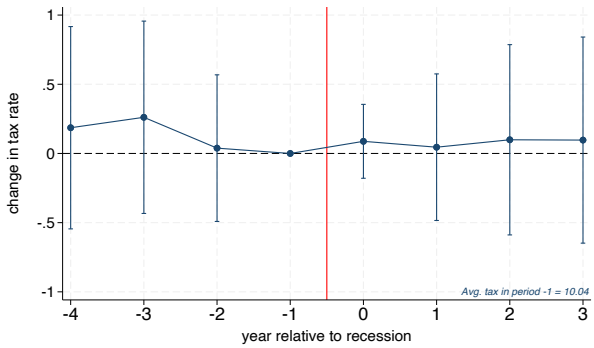
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



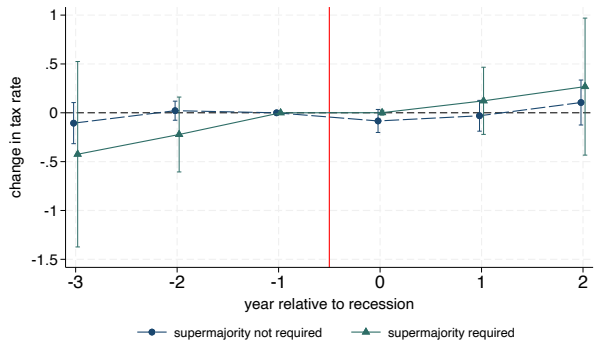
(f) Alcohol Spirit Tax Rate



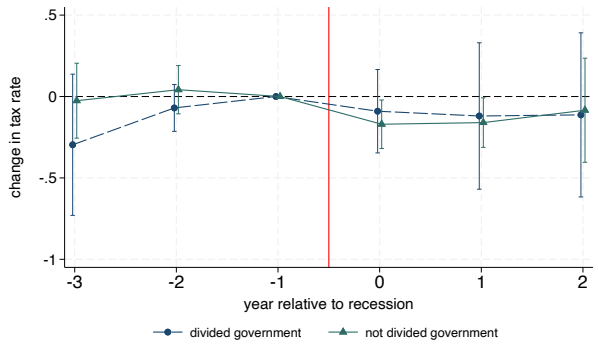
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. Only states with non-zero rates are included. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.35: Tax Rates Before and After Recessions
Heterogeneity in Top Personal Income Tax Response

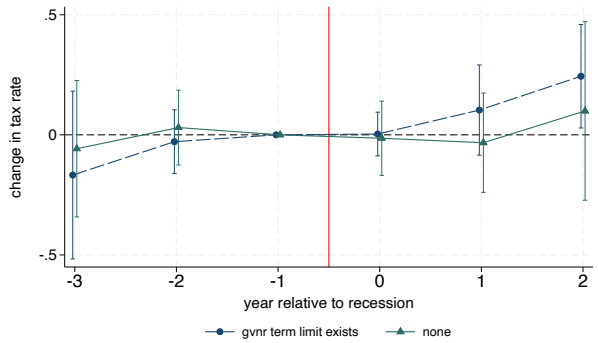
(a) Supermajority Requirements



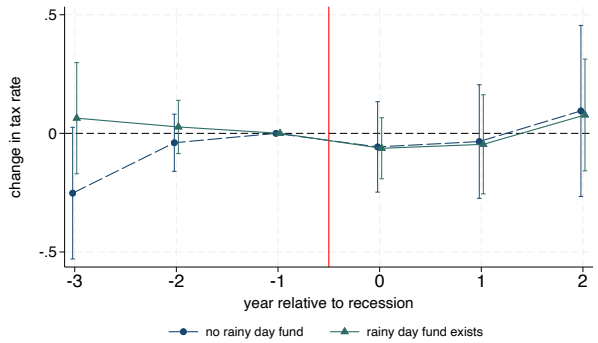
(b) Divided Government



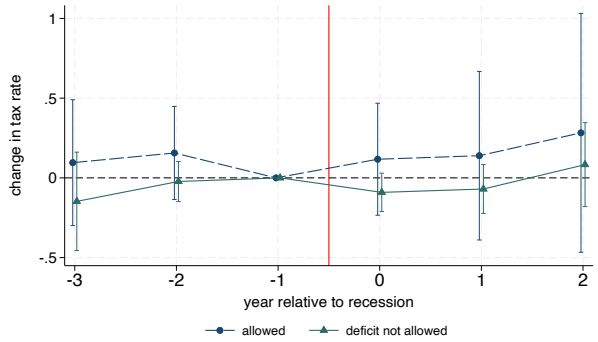
(c) Governor Term Limit



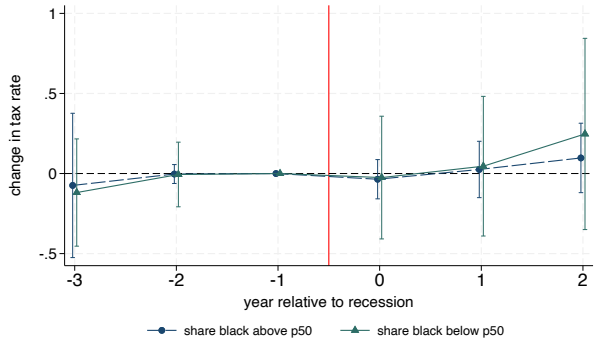
(d) Rainy Day Fund



(e) Deficit Not Allowed



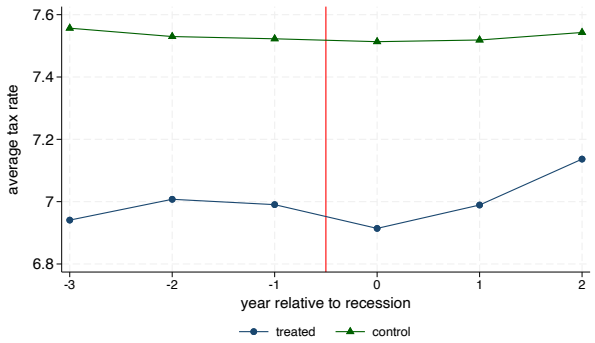
(f) Racial Composition



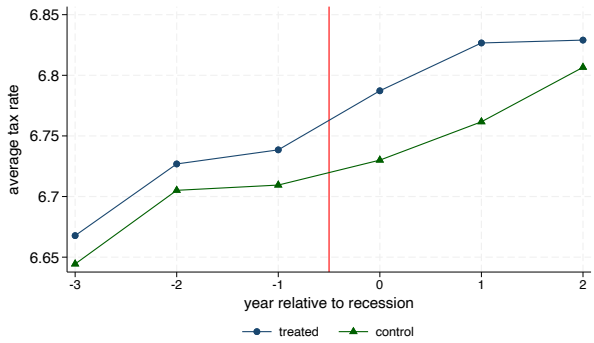
Notes: This figure shows the results of estimating the stacked event study regression (1) using sample weights (2) following Wing et al. (2024), separately for different sub-groups of states (e.g., states that do versus do not have supermajority requirements). The outcome variables are the various tax types in levels, and the excluded period –1 marks the year prior to the onset of recession. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. Only states with non-zero personal income taxes are included. Standard errors are clustered at the state level and 95% confidence intervals are reported.

Figure E.36: Simple Time Series

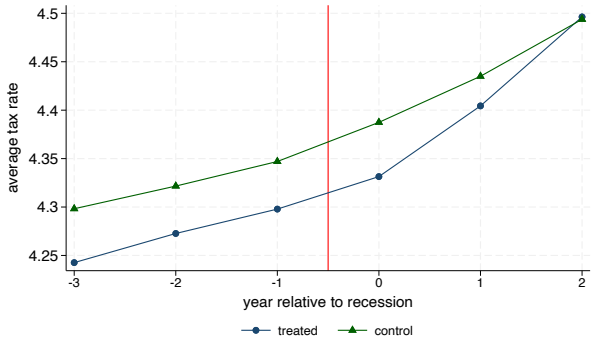
(a) Top Personal Income Tax Rate



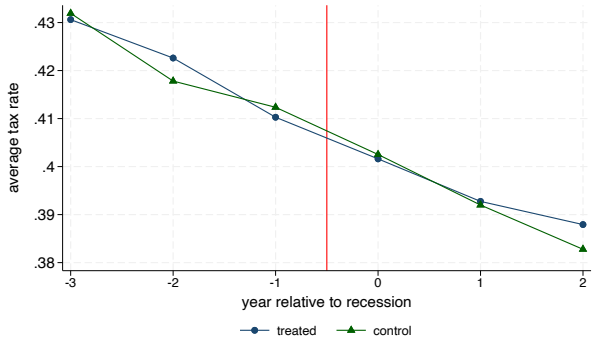
(b) Top Corporate Income Tax Rate



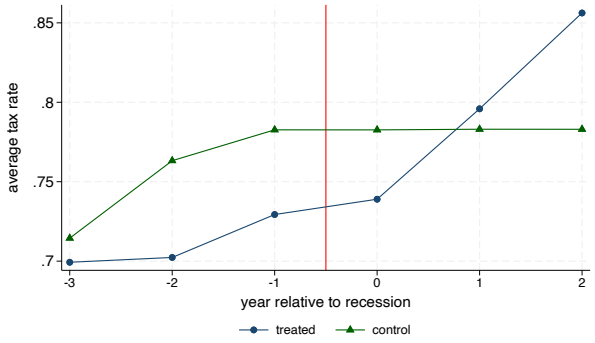
(c) Sales Tax Rate



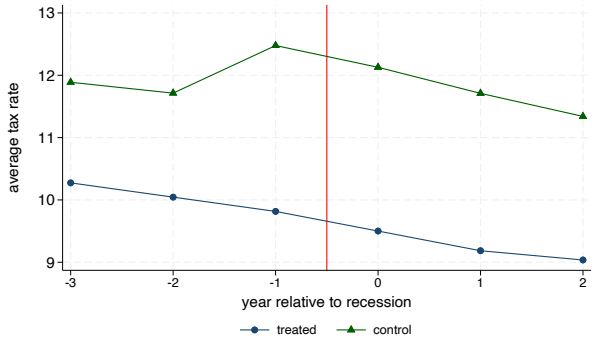
(d) Gasoline Tax Rate



(e) Cigarette Tax Rate



(f) Alcohol Spirit Tax Rate

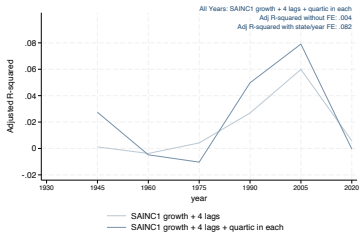


Notes: This figure shows the simple time series for the treated and control states from the stacked event study sample described in Section 3.2. The outcome variables are the various tax types in levels. Recessions are identified with the Bry-Boschan methodology using real annual state total personal income from 1940 to 2022. Only states with non-zero tax rates are included.

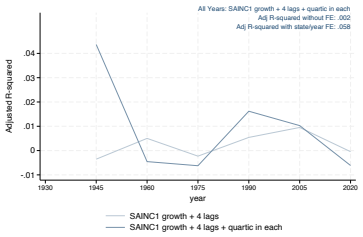
Figure E.37: Overall Explanatory Power Of Economic Conditions On Tax Changes Separately for Increases and Decreases

Panel A: Tax Increases

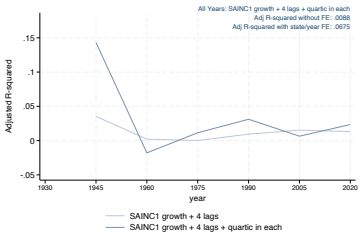
(a) Top Personal Income Tax



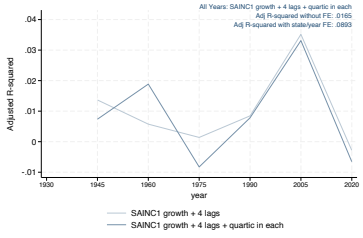
(b) Top Corporate Income Tax



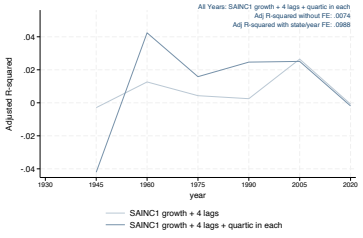
(c) Sales Tax



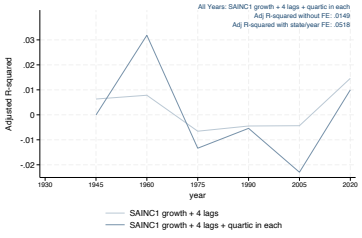
(d) Gasoline Tax



(e) Cigarette Tax

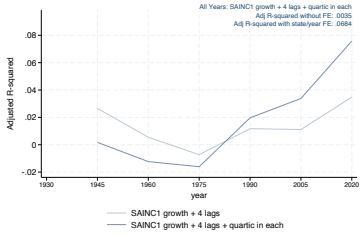


(f) Alcohol Spirit

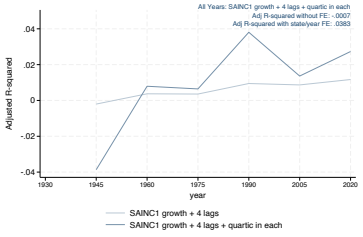


Panel B: Tax Decreases

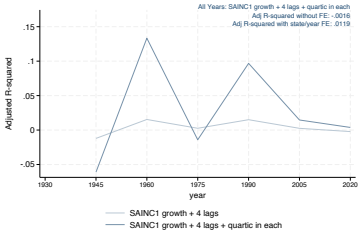
(g) Top Personal Income Tax



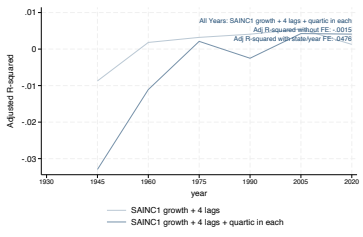
(h) Top Corporate Income Tax



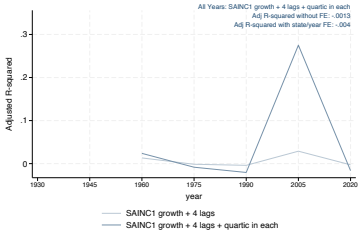
(i) Sales Tax



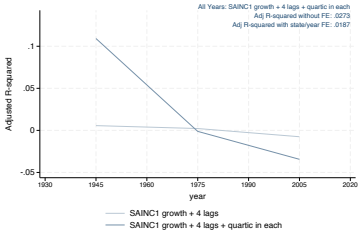
(j) Gasoline Tax



(k) Cigarette Tax



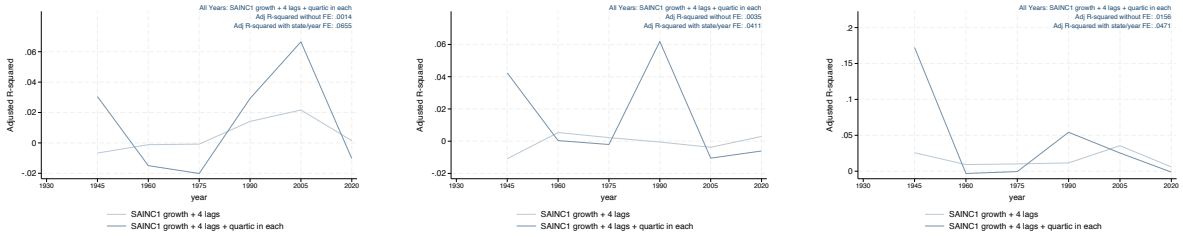
(l) Alcohol Spirit



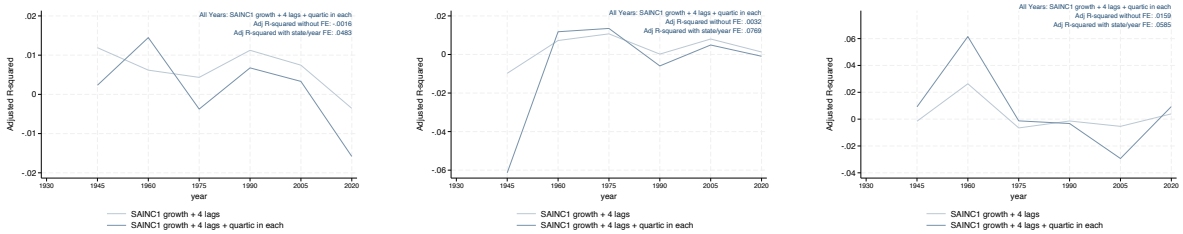
Notes: These figures show the adjusted R^2 from estimating a regression of the indicator variable of a tax increase of a given tax type (Panel A) or tax decrease (Panel B) on the yearly changes in real annual state total personal income (SAINC1) and its four lags (5 variables), a quartic in contemporaneous changes and each of its for lags (20 variables), and state and year fixed effects. Only states with non-zero rates are included.

Figure E.38: Overall Explanatory Power Of Economic Conditions On Tax Changes (Large Changes Only)

(a) Top Personal Income Tax (b) Top Corporate Income Tax (c) Sales Tax



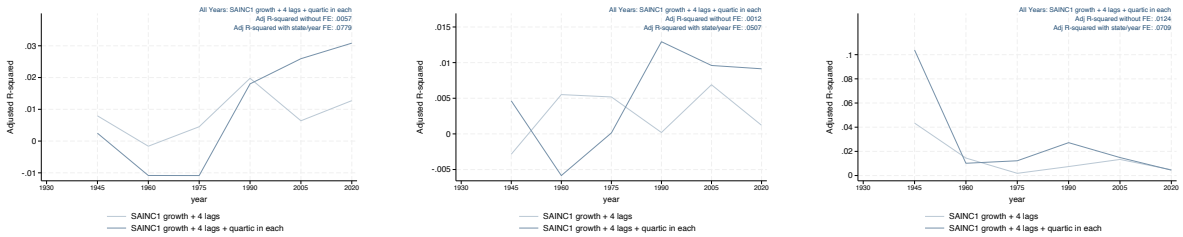
(d) Gasoline Tax (e) Cigarette Tax (f) Alcohol Spirit



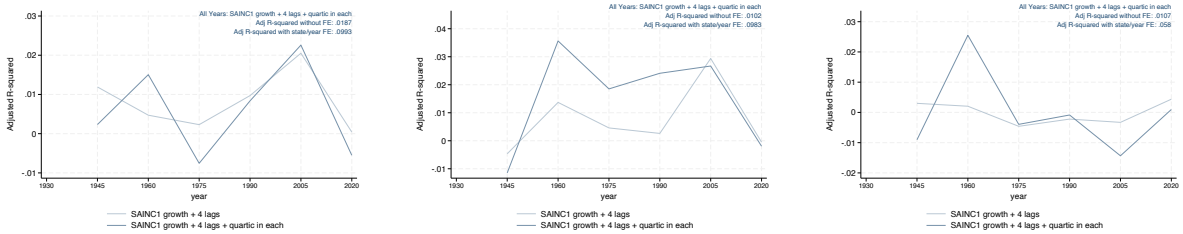
Notes: These figures show the adjusted R^2 from estimating a regression of the indicator variable of a large tax change of a given tax type on the yearly changes in real annual state total personal income (SAINC1) and its four lags (5 variables), a quartic in contemporaneous changes and each of its for lags (20 variables), and state and year fixed effects. Only states with non-zero rates are included.

Figure E.39: Overall Explanatory Power Of Economic Conditions On Tax Changes (Incl. Tax Adoptions)

(a) Top Personal Income Tax (b) Top Corporate Income Tax (c) Sales Tax



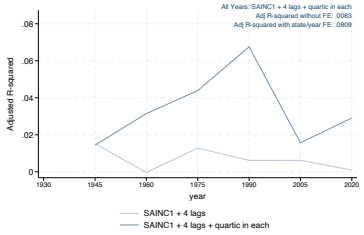
(d) Gasoline Tax (e) Cigarette Tax (f) Alcohol Spirit



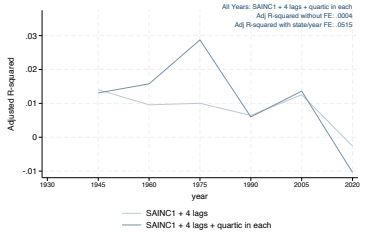
Notes: These figures show the adjusted R^2 from estimating a regression of the indicator variable of a tax change on the yearly changes in real annual state total personal income (SAINC1) and its four lags (5 variables), a quartic in contemporaneous changes and each of its for lags (20 variables), and state and year fixed effects. All states are included thus allowing for both intensive and extensive margin tax changes.

Figure E.40: Overall Explanatory Power Of Economic Conditions On Tax Changes (Income Levels)

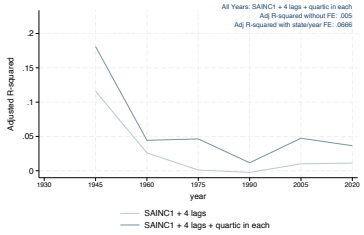
(a) Top Personal Income Tax



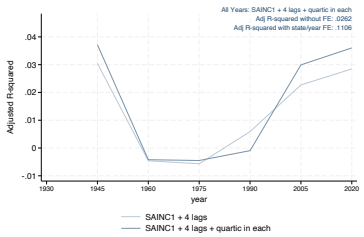
(b) Top Corporate Income Tax



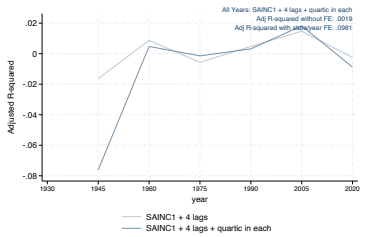
(c) Sales Tax



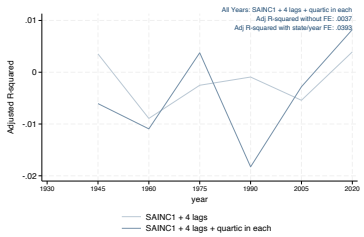
(d) Gasoline Tax



(e) Cigarette Tax



(f) Alcohol Spirit



Notes: These figures show the adjusted R^2 from estimating a regression of the indicator variable of a tax change on the level of real annual state total personal income (SAINC1) and its four lags (5 variables), a quartic in contemporaneous changes and each of its for lags (20 variables), and state and year fixed effects. Only states with non-zero rates are included.