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 since 1942. Our analysis demonstrates that, in aggregate, state tax policies are stable in many respects. They exhibit similar levels of tax rate variation, personal and corporate income tax progressivity, and tax change frequency and simultaneity over time. These aggregate patterns hold despite the fact that tax policies exhibit a large degree of variability both across states and within each state over time. Furthermore, state tax policy is not very persistent – the set of states with relatively high tax rates or large tax changes evolves rapidly. We do not observe a consistent relationship between tax rates and revenues varies by tax type and over time.

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

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U.S. state tax policies have changed dramatically over the past hundred years. At the beginning of the 20th century, no states collected personal income, corporate income, or sales taxes; yet today these taxes make up 75% of state tax revenues. Meanwhile, many states with the highest tax rate levels in the first half of the 20th century fell to the bottom of the range by the beginning of the 21st century. Throughout this period, some tax rates grew three- or four-fold, while others experienced an equally-sized decline. In this paper, we study these and other policy changes over the past 112 years, in order to deepen our understanding of the tax setting process and its implications for empirical research on taxation.

We provide a comprehensive analysis of how the key dimensions of U.S. state tax policy have evolved over the past hundred years. To do so, we construct 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 1930, and 80% of tax revenue since 1970. We supplement our tax rate data with detailed state tax revenue data from 1942 to 2022.

Our analysis of long-term trends in tax policy serves three major purposes. First, it provides insight into the plausible causes of tax policy heterogeneity, both across states and across time. Analyzing how the relative ranking of states evolves over time enables us to better understand the extent to which variation in tax policy is driven by persistent versus temporary differences in preferences or constraints. The long time horizon of study further allows for better positioning of recent trends and findings (volatility, responsiveness, etc.) within their historical frame of reference, helping understand if they are markedly different from long-term historical norms. Second, our approach allows for the evaluation of fiscal federalism and tax competition models, by documenting how state tax policies relate to each other and to federal tax policies, and how these relationships vary over time. Third, 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.

We begin our analysis by describing how tax rates and revenues changed across states over time, with particular attention to the adoption of new taxes and the degree of tax progressivity in personal and corporate income taxes. Next, we analyze patterns in tax *changes*: how frequently states change rates, whether tax changes occur simultaneously across states or across tax types, and to what extent federal changes lead (or lag) state changes. We also conduct within-state analysis to evaluate whether a state's tax rates, or magnitude of tax rate changes, persists over time (e.g., whether states with comparatively high rates or comparatively large changes remain so over time). Finally, we study the relationship between tax rates and tax revenues, including how tax rates of one type affect revenues associated with other tax types.

We find that in many ways, tax policy has remained remarkably stable in aggregate. 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. The frequency of tax rate changes does not change much over time, and we see similar levels of tax rate and tax revenue heterogeneity across states over time (measured as the coefficient of variation, i.e., standard deviation divided by the mean). We show that the average progressivity of personal and corporate income tax schedules remained stable over time, both in terms of the share of states that feature progressive versus flat schedules, and the degree of progressivity (proxied by the ratio of top to minimum tax rate). Furthermore, throughout the time period, states with progressive personal and corporate income tax schedules collected similar levels of revenue as states with flat income tax rates.

At the same time, we show that this aggregate stability masks substantial variability across states and within each state over time. Focusing on tax rate levels, we show that over the studied period, tax rates of different states largely overlap, and that a state's tax rate in the decade of adoption has no predictive power regarding that state's tax rate in 2012-2022. In other words, tax rates are not very persistent over long time horizons, e.g., over a century. Furthermore, tax changes, as proxied by the number of changes or by the coefficient of variation over 15-year intervals, are even less persistent. States actively change their tax rates in some time periods and keep their rates unchanged at other times, and these episodes differ for different states. Finally, we do not find persistent patterns between state and federal tax policies, and we do not identify systematic differences in tax rates or revenues among states with differences in the timing, duration, or order of the tax adoption process, and ultimate tax composition.

Our descriptive evidence provides several insights for policymakers and economists studying tax policy. First, the stability of tax variation across states over time is inconsistent with models of state tax competition that predict sharp convergence (e.g., some tax rate competition models) or divergence of tax rates (e.g., Tiebout-sorting models) over time (see Goodspeed, 1998; Wilson, 1999; Genschel and Schwarz, 2011, for reviews). Our results, however, 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.

Second, our results point to weak levels of vertical tax competition (e.g., Goodspeed, 1998; Keen and Kotsogiannis, 2004; Esteller-Moré et al., 2012) as we do not find a consistent relationship between state and federal tax rates, either in the direction of tax changes or their timing. For example, state and federal tax changes do not disproportionately coincide and in some years, state changes precede federal, while in other years, federal changes precede state changes. A key difference between our analysis and that of the previous work (e.g., Besley and Rosen, 1998; Devereux et al., 2007) is the fact that we are looking at a much longer time horizon. Previous work has typically examined shorter periods, e.g., 20 years, making it easier to detect a pattern. While our evidence cannot rule out vertical competition, at

minimum, it suggests that the nature of the vertical competition changes frequently.

Third, our findings are relevant for empirical researchers who rely on tax variation as a source of identification. 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). Furthermore, the lack of persistence in tax rates and tax policies over long periods of time within states implies that time-invariant state fixed effects have a limited capacity to control for other tax-related factors, as these factors are not very stable.

Fourth, our results show that, while less salient than tax rates, tax base rules play a critical role in shaping revenue outcomes. For example, we show that many of the states that do not have a personal income or a sales tax (the two largest tax revenue sources at the state level) often collect similar total tax revenues as states that have both of these taxes. They achieve this via higher tax rates for other tax types, and/or by broadening their tax bases. This implies that tax base rules should be given serious consideration when interpreting reform outcomes or when designing new policies. Our findings are thus consistent with and extend the results of Suarez Serrato and Zidar (2018), who show that variation in base rules explains a larger share of corporate tax revenue variation than corporate tax rates, and Kopczuk (2005) who shows that the elasticity of taxable income is highly dependant on the breadth of the personal income tax base.

Fifth, our results shed light on states' redistributive preferences. We show that preferences for public good provision (proxied by the tax revenue collected, adjusted for population and GDP growth) does not appear to positively correlate with overall tax system progressivity. For example, we see that states with progressive personal or corporate income taxes collect the same levels of revenue as states with flat income taxes. Similarly, states with no income taxes collect the same amount of revenues as states with no sales tax but with income taxes, and as states with personal, corporate and sales taxes. As a result, states with no income tax or with a flat income tax feature a more regressive tax system but similar level of expenditures. Our results thus generalize the findings of Chernick (2005) who documents a weak relationship between expenditures and progressivity from 1977 to 1991. We further show that tax revenue tends to increase with tax rates, suggesting that the rate-base combinations implemented so far remain on the left side of the Laffer curves.

Beyond the implications described above, this paper contributes to a small literature that documents basic facts about state tax policies. Baker et al. (2020) document how state and local taxes have changed from 2000 to 2015, while 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. We complement these studies by substantially extending the period of analysis to the beginning of the 20th century and by considering a wider range of tax types.

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 a uniform tax base 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. However, property taxes make up only a small portion of state tax revenue (less than 5% since 1950). Finally, we do not study local taxes, in part because the vast majority of local tax revenue accrues from property 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 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, CDC, 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 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 throught 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.

When specifically studying tax change events (i.e., the frequency or simultinaety 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 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 of gasoline taxes that arise from automatic adjustment rules implemented in some states.

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 omit Alaska from all figures that show corporate and total tax revenues, as these are exceptionally volatile and reach extreme highs.

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

2 Evolution of Revenues and Rates

We start by describing the evolution of tax revenues, types of taxes collected, tax rates, and levels of tax progressivity since 1910. Across all dimensions, tax policy changed rapidly at the beginning of the 20th century. While tax rates continue to be dynamic in the later years, tax revenues, tax types, and tax progressivity are all remarkably stable after 1970. Furthermore, we document substantial heterogeneity – states differ widely in their tax policy choices, and state tax policies on average evolve differently from federal taxes.

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, while state governments combined collect an equivalent of 5% of U.S. GDP.¹ The revenue growth coincides with revenue pressures from the introduction of the New Deal programs (enacted between 1933 and 1938) and the 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

 $^{^{1}}$ In contrast, local government revenues remained largely constant over 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.

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 – 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). Sales taxes are popular at the state level, while payroll taxes are the second largest category at the federal level (30% each). Corporate taxes lag behind, accounting for 10% or less at both the state and federal level. Excise taxes on motor fuel, tobacco, and alcohol together represent about 5% of state tax revenue.²

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 1930, and have consistently accounted for about 80% of tax revenue since 1970.

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, contemporaneously with implementation at the federal level.³ However, gasoline taxes were first adopted by states in 1911, and were universal by the time the federal government implemented one in 1932. Similarly, sales taxes were first implemented by states in 1930, 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 1933.⁴

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

 $^{^{2}}$ At the federal level, motor fuel, to bacco, and alcohol excise taxes were historically important but together only make up 1% share to day.

 $^{^{3}}$ The 16th Amendment, which gave the federal government the power to collect these taxes, was passed by Congress in 1909 but not ratified by the states until 1913.

⁴Berry and Berry (1992); Howe and Reeb (1997) discuss the plausible causes of state tax adoptions.

1950), personal income, corporate income tax, 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 cancelled 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 5-10 states that have not yet adopted the tax, and one-third of states do not collect an alcohol tax.

Figures B.6-B.8 show that states varied substantially in all aspects of the tax adoption process – timing, duration, and order. In contrast to Feir et al. (2023) who found evidence of geographic policy diffusion of property tax adoptions among First Nations in Canada, the adoption process across U.S. states does not appear to follow a well-defined geographic pattern. For example, Figure B.8 shows that a variety of states adopting each tax type in different waves and at different tax rate levels.

A natural question is to what extent the adoption pattern seen in Figure 2 is predictive of the future rates or revenues. Our analysis in Appendix B suggests that it is not very predictive. Panel B of Figure 2 demonstrate this for the case of personal income tax rates and revenues. These figures plot the tax rates and revenues over time for states that adopted taxes early vs late (2(a) and 2(b)), completed the adoption process quickly or slowly (2(c) and 2(f)), or introduced tax types in different order (2(c) and 2(f)). We see that states that adopted personal income tax later – in 1960s – generally show lower top personal income tax rates but similar levels of tax revenue. In contrast, states that adopted all taxes quickly or in different order show similar levels of tax rates but somewhat different levels of tax revenues. Appendix B provides equivalent figures for all other tax types.

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.

Tax Rates. Figure 3 describes the distribution of state tax rates over time, focusing on states with non-zero rates only. Tax rates vary widely over the past hundred years, and the various tax types follow different patterns: sales and cigarette taxes increased on average over time, gasoline and alcohol taxes decreased, 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, and state rates move similarly to federal ones.⁵

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. Appendix Figure A.2 shows this more 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. This pattern is inconsistent with models of state competition that predict sharp convergence

⁵Average state rates in comparison to federal rates are available in Appendix Figures A.4-A.5.

(e.g., some tax rate competition models) or divergence of tax rates (e.g., Tiebout-sorting models) over time. Our results, however, 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.

Equivalent figures describing the distributions of revenues overtime are available in Appendix Figure A.3. 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 reason for continuous increase of personal income tax revenues, is the devaluation of 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. We explore the relationship between rates and revenues in greater detail in Section 4.

Progressivity. In Figure 4, we focus on the progressivity of personal and corporate income taxes. Figure 4(a) shows the share of states with a progressive (rather than flat) tax system. While the first states to adopt a personal income tax opted for flat taxes, this pattern quickly reversed, and by 1935 more than 90% of personal income taxes were progressive. Corporate income taxes exhibit the opposite pattern: the first states chose progressive taxes, but by 1935 only 20% were progressive. Since 1935, both measures have slowly and modestly converged, with 80% of personal income taxes and 30% of corporate income taxes currently being progressive in design. These changes have been fueled by both extensive and intensive margin responses – many of the personal income taxes introduced in 1960s were flat, while at the same time some states abandoned progressive schedules and

switched to flat rates.

In Figure 4(b), we quantify the degree of progressivity in personal and corporate income taxes. We measure progressivity as the ratio of the top tax rate to the minimum tax rate, where states with a flat (non-zero) tax are counted as a ratio equal to $1.^{6}$ We see that during the 1910-1935 period, the average degree of progressivity varied for both personal and corporate income taxes (similar to the share of states with progressive taxes). However, since 1935, the degree of progressivity for both tax types has remained remarkably stable. Top personal income tax rates are consistently 4-5 times the minimum rate, and top corporate income taxes remain at approximately 1.5 times the minimum rates on average. Thus, we can see that the changes in the share of states with progressive taxes from Figure 4(a) do not tell the full story – the tax systems that are most likely to change from progressive to flat are those that are the least progressive, and vice versa. As a result, while the share of progressive taxes evolves over time, the average degree of progressivity is left relatively unchanged.

However, this stability in the progressivity of state income taxes contrasts clearly with the progressivity of federal income taxes. The federal government featured a substantially more progressive personal income tax than states (with a ratio of top to minimum rate exceeding 15) until the 1940s, and state schedules have been slightly more progressive than the federal tax schedule since then.⁷ Federal corporate income taxes were flat until the 1930s, but have been on average more progressive than states since 1960 (before again becoming flat in 2019). Overall, federal and state measures of tax progressivity appear to change

⁶We prefer the ratio (instead of the difference) to measure progressivity, as it makes comparison to federal rates possible, and also accounts for the fact that the magnitude of tax changes is likely proportional to overall tax levels. However, Figure C.17 presents similar series, instead using the difference (top tax rate minus the minimum tax rate). We also prefer to include states with flat taxes in the average, so as to measure overall tax progressivity. By doing so, changes from flat taxes to modestly progressive ones would slightly increase our measure, rather than sharply decreasing it (due to changes in the set of states that contribute to the average). However, Figure C.17 also shows results where states with flat taxes are excluded from the average, or states without the tax are included.

⁷Relatedly, Borella et al. (2023) show "significant variation in tax rates and income tax progressivity for the median decision unit across time and household types" for federal income taxes.

independently of each other.⁸ Alongside state and federal differences in tax adoptions, these patterns point against a clear relationship between state and federal tax systems, and thus presence of vertical competition. We discuss this in more detail in Section 3.

3 Patterns of Tax Policy 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 show similar levels of variation over time, and the progressivity of tax systems largely remained the same. In this section, we show that this stability prevailed despite the large number of tax changes occurring throughout the time period of study. In addition to changing their tax rates frequently, states often change more than one tax rate at a time. As a result, empirical researchers studying one type of tax in isolation should exercise caution in interpreting estimates. Furthermore, the timing and direction of state tax changes do not closely match those of federal tax changes, providing further evidence that vertical tax competition is relatively weak.

We then study patterns in how individual states change their tax rates, and explore the extent to which these patterns look similar across states, or within states over time. We find that the time pattern for a given state typically resembles the national trend. However, we show that tax levels and the magnitude of tax changes have limited persistence: the set of states with relatively high tax rates, or that are making relatively large tax changes, is not fixed over time. Our results suggest that while state-invariant time trends likely play a substantial role in explaining tax changes, time-invariant state characteristics are unlikely to explain very much variation. As a result, empirical research aiming to control for sources of unobserved heterogeneity may be better served using specifications that include state-by-decade fixed effects rather than simple state fixed effects.

Frequency of Tax Changes. Figure 5 shows the percent of states that increase or ⁸Distributions of progressivity ratios are available in Figure C.16.

decrease a given tax rate in each year, conditional on already having the tax. We see that alcohol and sales taxes are adjusted the least frequently, by 6-7% of states on average each year. Gasoline taxes are changed the most frequently, by 15% of states in an average year, while personal/corporate income and tobacco taxes are changed by 10-12% of states each year. Across all tax rates, each year saw an average of 14 states changing at least one tax rate, ranging from no changes in earliest years to 35 states in 1983.

Overall, we see periods of more frequent changes (e.g., 1980s) and less frequent changes (e.g., 1910-20s). Nonetheless, tax changes are numerous, 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.

Simultaneity of Changes. Next, we 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 6, among the increases (or decreases) in each tax on the x-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 6(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 state tax changes involve changes of two or more tax rates, and 13% 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 27% of cases. Corporate tax increases and decreases also show a high overlap with both personal and sales taxes. However, Figure 6(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). Appendix Figures D.21 and D.22 show that this pattern persisted over time, for example, both before and after 1970.

Figure 6 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 that 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.

Finally, Appendix Figure D.20 shows similar evidence but focusing on the minimum and top income tax rates among states with progressive tax schedules. Once again we see a a large degree of co-occurrences among increases and decreases, however, the coincidence rates differ: top income tax rates increase in 60% of the cases when the minimum rate increases, but the minimum rate is raised in 35% cases of top rate increases, with similar pattern for corporate rates. Put simply: top rates are changed more frequently than minimum rates.

Relationship Between State and Federal Taxes. Next, we explore the relationship between state and federal tax rates over time. Figure 7 explores the co-movement of federal and average state tax rates throughout our time period.⁹ These figures connect points in chronological order, with colors shifting from dark blue in earlier years to bright red in later years. Relatively horizontal movement implies a change in federal rate with little change in average state rates, while a relatively vertical movement implies changes in state rates without a corresponding change in federal rates. Finally, a diagonal pattern implies a simultaneous growth/decline of federal and state rates.

We see the strongest relationship in decreases of excise taxes, when periods of state and federal inaction combined with inflation lead the tax rates to decline similarly in real

⁹For an alternative presentation, see Appendix Figure A.4 which show the evolution of the average state tax rates and the corresponding federal rates over time.

terms. This pattern is particularly noticeable for alcohol taxes since 1970. We also see this relationship for gasoline taxes in certain years, though federal rates are occasionally adjusted to keep up with inflation, while state tax rates have been steadily declining. Federal personal income taxes and cigarette taxes appear to bear no relationship with state taxes. However, federal corporate tax changes appear to precede future state changes: we see a rapid increase in state taxes after the federal rate was raised in 1920 or in 1940-1950s. Similarly, we see a decrease in state rates when the federal rate decreased in the late 1980s. Appendix E shows similar relationships but for other combinations of state/federal taxes.

Overall, Figure 7 suggests that the relationship between state and federal rates is weak (with the exception of the impact of inflation). However, this figure only plots average state rates and therefore may disregard state changes that occur in opposite directions, or changes implemented by a few states only. In the appendix, we study the precise timing of tax changes to see if *some* states respond to federal tax changes. Specifically, we explore to what extent state tax changes occur in the same year or one year after a federal tax change. Figure E.23(a) shows that 39% of state income tax changes occur within 1 year of a federal personal income tax change. 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 state 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 5th and 95th percentiles. The above exercise thus provides a point of reference for the number of randomly occurring coincidences. Overall, we see that state tax changes are not disproportionately likely to occur shortly after a federal tax change of the same type (Figure E.23(a)) or of any other type (Figure E.23(b)). We show that our results are robust to the choice of time window (see Appendix Figure E.23(c)-(d)).

In Figure E.24, we investigate whether federal tax increases generally coincide with

state tax increases or with state tax decreases, and vice versa. We see that for personal and corporate income taxes, state decreases are more likely to coincide with federal decreases, but state increases more often coincide with federal decreases. For excise taxes, state changes occur nearly exclusively after federal increases and are overwhelmingly increases as well.

While we cannot rule out a possibility of a relationship between federal and state taxes, at the minimum our results suggest that this relationship is not very stable. Appendix Table E.1 demonstrates that by showing the results of a simple OLS regression of state tax rate on corresponding federal tax rate interacted with 20-year interval indicators. We see that the estimates vary dramatically over time. While this simple specification has many limitations and does not have a causal interpretation, it nonetheless suggests that the relationship is either non-stable or non-existent, and therefore point to weak levels of vertical tax competition in the U.S. (e.g., Keen, 1998; Keen and Kotsogiannis, 2004; Devereux et al., 2007; Esteller-Moré et al., 2012).

Persistence of Tax Rates and Revenues. Figures 3 and 5 show that tax rates change frequently, but do not provide information on whether these lead to changes in relative ranking of states over time. Figure 8 shows how tax rates have varied over time within each state. For each tax rate, we show the tax rate in the year that the tax was adopted, the tax rate in 2022, as well as the average, minimum, and maximum over the time period. Furthermore, we color each state based on their geographical region and order states by the average tax rate. Figure 8 thus shows how much tax rates deviated from the mean during the 100-year period, and whether tax changes generally moved in the same direction or saw a large number of fluctuations around the mean, and whether these patterns are are stable within geographic regions.

We see that overwhelmingly, the time trend for individual states mirrors the trend in the state average. For personal and corporate income taxes, we see an inverse-U shape similar to that found in Figures 3(a) and 3(b): tax rates in the year of adoption are frequently at or near the minimum, yet 2022 rates are usually below the maximum (and for some states

below the mean). For sales and cigarette taxes, each state shows the steady uni-directional increase that we observed overall in Figures 3(c) and 3(d), while alcohol taxes primarily show the uni-directional decrease similar to that in 3(f). Finally, gasoline taxes in each state mirror the pattern seen in 3(e), with increases followed by a long phase of decreases such that both the initial and current tax rates are at or close to the minimum. Taken all together, we see strong evidence that similar temporal patterns appear across many states, suggesting that state-invariant time trends (such as those that that are absorbed by year fixed effects in a regression model) play an important role in explaining tax rate variation.

However, Figure 8 also shows that there is limited persistence in tax rates over time. Some states increased their rates dramatically, others less so, and the magnitude of change is not well correlated with the starting, ending, or average rates. For all tax types but the top personal income tax, tax rates in different states largely overlap over time, suggesting that, in the long run, the ranking of "high-tax" and "low-tax" states changes dramatically. Appendix Figure F.28 makes this most evident by showing the relationship between the tax rate in the first decade after adoption against the tax rate in the most recent ten years (2013-2022). Figure F.28 shows virtually no relationship between the first and the last rate.

Among the different tax rates, the most persistence is seen for top personal income taxes. For example, ten states had rates that stayed below 6.25pp (PA, IN, IL, MA, MD, MI, AK, KY, LA, AR), and eight states that had rates that stayed above 6pp (SD, NE, WI, ME, RI, CA, HI, AK).¹⁰ Nonetheless, for the remaining states, rates overlapped. Figures F.29-F.30 show that tax rates are significantly more persistent in the short run, than over a 100+ year period: we see a steeper bar pattern and less overlap in rates across states.

Figure 8 also provides evidence of some geographical clustering. For example, during the studied period, Southern states featured the highest average gasoline taxes and low average top corporate income tax rates, while Northeastern states featured high cigarette taxes.

Finally, Appendix Figures F.31-F.33 provide similar figures for tax revenues (measured

¹⁰Note, however, that SD and AK both had short-lived personal income taxes.

per capita per U.S. GDP per capita) and Figures F.34-F.36 for tax revenue shares. Even after adjusting for population and GDP growth, we see that almost all states collect higher levels of personal income taxes (both in levels and as a share) in 2022 than in the past. The opposite is true for excise taxes. For sales and corporate income taxes the pattern varies. Similarly to tax rates, we see a large degree of overlap in tax revenues and tax shares over time. This is even true for personal income taxes that showed the strongest persistence among all tax rates.

Overall, we conclude that while rates and revenues are persistent in the short run, the relative ranking of states changes over a long run. As a result, time-invariant state characteristics (such as those that are absorbed by state fixed effects in a regression model) are unlikely to explain much variation. Researchers aiming to control for sources of unobserved heterogeneity between states in this way may prefer more flexible models such as state-by-decade fixed effects.

Persistence of Tax Policy Changes. Figure 8 explores variation of tax rate and revenue levels within each state. A related but different question is whether states consistently vary in how frequently or by how much they change tax rates. To investigate this, we perform a similar analysis to Figure 8, but instead of tax rates, we focus on the degree of tax policy change over a 15-year increments (1918-32, 1933-1947, etc). Thus, Figure 9 shows how the coefficient of variation (i.e. standard deviation divided by mean) varied within each state over 15-year intervals. In Appendix F, we consider other measures: the frequency of tax changes and the size of tax changes. The results are similar when looking at shorter or longer time intervals (e.g., decades, 20-year intervals).

Figure 9 shows that the frequency of tax changes varies substantially over time and states do not follow a well-defined pattern. For example, nearly every state kept their top personal income, top corporate income or sales tax rate constant over some 15-year period. For some states, this lull occurred at the beginning of the century, while for others, in most recent years. At the same time, in another time interval, the same state would vary tax rates substantially.

Additional results are available in the appendix. The conclusions are similar, when instead of coefficient of variation, we study the frequency of tax changes (Figure F.37) or the magnitude of tax changes (Figure F.38). Appendix Figure F.39 shows the coefficient of variation for tax revenues. Appendix Figures F.40-F.42 rank states by frequency of all types of tax changes. We see that states vary both in how frequently they adjust each tax type and how this frequency changed over time. For example, in 1910-1969, Mississippi adjusted its tax rates the most – 40 times, however, in 1970-2022, Mississippi was the 5th least likely state to make any tax rate changes. Figure F.43 shows this more directly: we see little relationship between the number of times the state changed its tax rates in pre-1970 vs in post-1970 period. Figures F.40-F.42 also show that for most periods and most tax types we see a weak negative relationship between the frequency of tax changes and the tax change size. This shows that some states prefer to make many small changes, while other states prefer infrequent but more substantial rate changes.

Overall, we conclude from Figure 9 and the related results in Appendix F that tax policy changes show even smaller degree of persistence than tax rate *levels*.

4 Relationship between Taxes and Revenues

The analysis in the previous section explored changes in state tax rates and revenues separately. Here, we focus on the relationship between the two measures and how it has evolved over time. Tax revenues are a function of tax rates, but also of the tax base that the rate applies to. As a result, variation in the tax base across states or over time can have an important effect on revenue outcomes, even if tax rates are similar. For example, in case of corporate taxes, Suarez Serrato and Zidar (2018) show that variation in base rules explain a larger share of tax revenue variation than tax rates, while Kopczuk (2005) shows that the elasticity of reported taxable income depends on the personal income tax base. We begin by showing that changes in tax rates are associated with changes in tax revenue. While the magnitude of this relationship has changed over time, we find a positive correlation across all tax types, suggesting that state tax policy remains on the left side of the Laffer curve. However, tax rates alone are not sufficient for understanding revenues. Across all six tax types, we find that rates explain only 20-40% of the variation in tax revenues. Thus, our results are consistent with prior work on personal and corporate incomes and extend them to sales and excise taxes.

We next analyze the extent to which other dimensions of tax policy affect tax revenues. We find that in both personal income and corporate income taxes, states with flat tax schedules and states with progressive tax schedules collect, on average, the same revenue from these taxes. Thus, state preferences for progressive tax rates are not correlated with state preferences for higher tax revenues.

Furthermore, we find evidence that states substitute across types of taxes for revenue generation. However, the composition of tax rates (i.e., the types of taxes a state does or doesn't levy) may affect total tax revenues, especially among states that do not collect neither personal nor sales taxes.

Tax Rates vs. Tax Revenues. Figure 10 shows the binscatter plots of tax rates against tax revenues (measured per capita per U.S. GDP per capita), separately for years 1910-1970 and 1971-2022. A 1% change in tax rate corresponds to a 0.8-1.6% increase in tax revenue for flat personal income and corporate taxes, progressive income/corporate taxes before 1970, and post-1970s gasoline and alcohol taxes. Sales, cigarette, pre-1970 gasoline and alcohol taxes, as well as post-1970 progressive income taxes show weaker relationships, whereby a 1% increase in tax rate is associated with 0.45-0.65% increase in revenue. Finally, post-1970 progressive corporate tax shows the weakest relationship, where a 1% increase in tax rate leads to a 0.14% increase in tax revenue.

The relationships shown in Figure 10 are not Laffer curves in the purest sense, as they aggregate both across states and across time, and thus capture changes in tax base definitions

in addition to changes of tax rates. However, it is striking that in all cases, including for taxes with particularly complicated base definitions (e.g., personal and corporate income taxes), we see a positive relationship between tax rates and tax revenues akin to the left side of a Laffer curve. A possible interpretation is that state tax policy largely resides at rates lower than the revenue-maximizing level. The exception is for cigarette taxes post-1970, where the relationship between rates and revenues is positive overall, but exhibits an inverse-U shape where the highest tax rates do not correspond to the highest revenues. We do not interpret this finding as causal (cigarette consumption rates may be negatively correlated with cigarette tax levels), but note that it is consistent with cigarette tax rates having substantial effects on smoking rates (e.g., DeCicca and McLeod, 2008) and the observation that states may use tax policy towards non-revenue goals (O'Donoghue and Rabin, 2006; Haavio and Kotakorpi, 2011).

In addition, we can see that the relationship between tax rates and revenues is not constant over time: it becomes stronger for some taxes (e.g., gasoline and alcohol), but weaker for others (e.g., sales, cigarette, personal and corporate taxes). Finally, as one would expect, flat income taxes show a substantially stronger relationship between top rates and revenues than progressive income taxes. Nonetheless, higher top income tax rates generally lead to higher levels of revenue collected.

Similar plots for federal taxes are available in Appendix Figure G.44. Federal income taxes show a similar relationship between rates and revenues, both in terms of magnitude and pattern over time. Excise taxes, on the other hand, show a slightly stronger relationship (elasticity-wise), which has weakened over time (especially for cigarette taxes). As with state taxes, the relationship between federal tax rates and the resulting revenues is generally upward-sloping.

Tax Revenue Variance Decomposition. Next, we measure the overall exploratory power of the tax rates on revenues. Figure 11 summarizes the results of a Shapley variance decomposition of state tax revenues in five-year increments. For each category of tax revenue, we consider three groups of explanatory variables: the corresponding tax rate(s) (including both minimum and and top rates for personal and corporate taxes); other contemporaneous tax rates in the state; and basic political and demographic characteristics (state population, percent of black residents in the state, U.S. population, U.S. GDP, region fixed effects, and 4 DW-NOMINATE scores (Lewis et al., 2023)).¹¹ Finally, we estimate an equivalent specification but with state and year fixed effects, and assign the increase in explanatory power to these fixed effects.¹² Our decomposition only includes state-year observations in which states had a non-zero tax rate.

Figure 11 shows that tax rates account for between 10-25% of revenue variation for personal income, corporate and sales taxes. The explanatory power of rates is higher for excise taxes, but never exceeds 40%. In addition, the explanatory power of tax rates shows a varying relationship over time: for some tax types it increases and decreases over time, while for motor fuel and alcohol, it generally increased. Note that for all revenue types, other tax rates explain between 10-25% of revenue variation. While this explanatory power does not have a causal interpretation, it nonetheless highlights that few tax changes occur in isolation, and that it is important to consider the tax system as a whole when evaluating policy changes.

Tax Progressivity and Tax Revenue. Next, we explore whether revenue outcomes differ in states with progressive vs. flat schedules for personal and corporate income taxes. Figures 12(a) and (b) show that states with progressive tax schedules raise nearly identical tax revenues as states with flat tax schedules, measured both in levels (revenue per capita as a percent of U.S. GDP per capita) and as shares of state overall tax revenues. Appendix Figure C.18 further shows that tax rates of other tax types (sales, cigarette, gasoline, alcohol) are

¹¹DW-NOMINATE scores, developed by Keith T. Poole and Howard Rosenthal, use choices (such as votes in Congress) to place the ideology of political actors along two numerical dimensions. We include average scores for each state's representatives in the U.S. Congress, separately by dimension and separately for the House and Senate.

¹²For the first three groups of explanatory variables, the use of a Shapley decomposition means that our results are not sensitive to the order in which we consider the groups. However, we consider state and year fixed effects last, so that they capture only the variation that is due to unobserved time-invariant or state-invariant characteristics (i.e., not due to region, U.S. GDP, or U.S. population).

similar for states with progressive versus flat corporate/income taxes, with the exception of gasoline taxes prior to 1950. Relatedly, Appendix Figure C.19 shows that the overall revenue compositions are rather similar for states with progressive/flat tax schedules, particularly in the past 40 years.

Altogether, this evidence suggests that states with progressive versus flat income tax systems do not fundamentally differ in terms of the amount of revenue they wish to collect, or in terms of the types of taxes they wish to rely on to do so. Instead, states differ in their preferences for how this tax burden should be allocated across their citizens. Furthermore, state preferences for higher tax revenues are not correlated with state preferences for progressive tax systems.

Figures 12(c) and (d) show the average tax rates for states with flat tax schedules, as well as the average top and minimum rates for states with progressive schedules. We see that while all rates have been increasing over time on average, flat rates increased the most. At the same time, we see that while flat personal income taxes were historically set closer to the minimum tax rates, the opposite is true for corporate tax rates. In particular, starting from 1980s, the flat corporate rate is within 1pp of top corporate tax rates. In contrast, in most recent years, flat rates average 4-5pp, while top rate averages around 7pp. For personal income taxes, we see substantially larger fluctuation in top rates as compared to the minimum rates. Furthermore, the increase in progressivity during the 1970s was driven by higher top rates rather than a drop in minimum rate. (For more details on the nature of top and minimum tax rate changes, see the discussion of Figure D.20 in Section 3.)

Comparing the tax revenues and tax rates in Figure 12 provides insight into the distribution of personal and corporate incomes relative to the brackets. For personal income taxes, states with flat schedules achieve the same revenues as states with progressive schedules, using flat rates that are closer to the progressive schedule minimums. Thus, in progressive states, we can see that the top rates generally apply to a small proportion of the income base. On the other hand, for corporate income taxes, the tax rate in flat schedules is quite close to the top rate in progressive schedules since 1970. In order for these two groups of states to raise similar revenues, it must be the case that in progressive states, the top rate applies to a large proportion of the tax base. Overall, we see that corporate incomes, relative to the brackets, are shifted much further to the right than personal incomes.

Tax System Composition and Revenue Outcomes. Finally, Figure 13 explores how tax rates and revenues vary with the overall composition of the tax system. We break states into five mutually exclusive groups depending on whether a given state has a personal, corporate or sales tax. Note that prior to 1975, the composition of states in each group changed as states adopted or cancelled tax types. However, starting from 1975, the composition of each group remained largely the same. We delineate this break with a faint vertical grey line.¹³

Figure 13(a) shows that prior to 1975, all states collected similar levels of revenue with the exception of states that did not have a personal or sales tax. As Figures 13(b) and (c) demonstrate, states with no sales tax collected most personal revenue while states with no personal income tax collect most sales tax revenue. States missing a certain tax type also tend to collect higher levels of excise taxes (see Appendix Figure G.45), but the overall differences in excise revenues are small and even combined cannot offset the loss of personal/sales tax revenue. Overall, we see that states with no personal and no sales taxes collect substantially less revenue than states with either of these tax types. This is consistent with the finding from Figure 1 that personal and sales taxes, across all states, generate about two-thirds of all tax reveues. Over time, i.e., after 1975 and particularly since 2010, revenue collections of these five groups increasingly diverged. However, it is unclear whether this divergence is driven by states' inability to collect larger levels of revenue because of the missing sales/personal income taxes or their unwillingness to do so in line with residents' preferences.

Figures 13(d) and (e) (also see Appendix G.46 for other tax types) shows that the

 $^{^{13}}$ In 1975 and later, the groups are as follows: no personal, no corporate and a sales tax – NV, SD, TX, WA WY; no personal, no sales and corporate tax – AK, NH; no personal and corporate and sales taxes – FL, TN; personal and corporate and no sales tax – DE, MT, OR; all three taxes – remainder. However, Alaska is omitted from total tax revenue series (Figure 13(a)) and corporate revenue series (Figure G.45(c)).

differential levels of tax revenue levels are only partially driven by differences in tax rates. Indeed, states with no sales tax have had higher personal income tax rates since 1950, but prior to that, these states collected higher levels of taxes than states with all three tax types but had similar levels of tax rates. Similarly, states with no personal and no corporate taxes show similar levels of sales tax rate as states with all three tax types, yet collect significantly higher levels of sales tax revenues. Overall, this again points out the importance of tax base rules: states may choose to compete with other states on most salient features – tax rates – and hit their revenue goals by having broader (but less salient) tax base definitions.

5 Conclusion

In this paper we examine how U.S. state tax rates and state tax revenues have evolved from 1910 until the present. We study the evolution of the composition of taxes levied, tax rates and revenues, and the degree of progressivity of personal and corporate income taxes. We further document the nature of tax changes and tax policy heterogeneity across states, as well as the relationships between state and federal rates, and between tax rates and revenues.

We show that in the first half of the 20th 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, and different levels of overall progressivity. Nonetheless, these different choices generally led to similar revenue outcomes in the long run, and with all states so far staying on the left side of the Laffer curve. And while we cannot rule out presence of horizontal and vertical tax competitions, we do not find evidence in support, either. Finally, we show that tax rates explain a small share of overall tax revenue variation.

Our work suggests two avenues for future work. First, our results point to the importance of tax base rules. More work is needed to understand how tax base rules changed over time and how they affect tax revenue outcomes, including tax responsiveness. Second, our analysis shows that while tax changes are plentiful, they do not appear to follow a systematic pattern. 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

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





Panel A: Number of States with Non-Zero Tax Rates

Panel B: Personal Income Tax Rates and Revenues by Adoption Process



Notes: Panel A shows the number of states with non-zero tax rate for each of the six tax rates of focus. The year that the tax was adopted at the federal level is marked with the diamond symbol (if applicable after 1910). Figures in Panel B demonstrate how personal income tax rates evolved over time depending on the timing of personal income tax adoption ((a) and (d)), speed of all tax adoption completions ((b) and (e)), or the order of tax adoptions ((c) and (f)). See Appendix B for similar results for other tax types.



Figure 3: State Tax Rates Over Years

Notes: These figures show the average, median, 25th and 75th percentiles, as well as the 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) cigarette excise tax rates, (e) gasoline excise tax rates, and (f) spirit excise tax rates, all in 2020 dollars. Only non-zero rates included. See Figure A.2 for coefficient of variation over time and Figure A.3 for equivalent tax revenue figures.

Figure 4: Progressivity of Income Taxes





Notes: Figure (a) shows the share of states with progressive personal/corporate income tax schedules. Figure (b) shows the level of progressivity: the ratio of the top tax rate to the minimum tax rate. In both figures, only states that have a personal/corporate income tax are included. See Figure C.17 for differences instead of ratios and for alternative sample definitions.



Figure 5: Timing of State Tax Changes

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 intensive margin changes are included. These statistics are shown for (a) top personal income tax rates, (b) top corporate income tax rates, and (c) standard sales tax rates, (d) cigarette excise tax rates, (e) gasoline excise and (f) spirit excise tax rates.


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

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 x-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, standard sales tax rates, cigarette excise tax rates, gasoline excise, or spirit excise tax). For example, Figure (c) shows that among all of the *decreases* in top corporate income tax rates, 10% occurred in the same year as an *increase* in the the cigarette tax rate in the same state. See Figure D.20 for min/top rate changes and Figures D.21 and D.22 for pre/post-1970 heterogeneity.

cigarette

gasoline

alcoho

sales

cigarette

gasoline



Figure 7: Changes in Federal vs. State Tax Rates

Notes: These figures show the relationship between the federal tax rate and the average state tax rate, where each point represents one year and points are connected in chronological order. Colors shift from dark blue for earlier years to bright red for later years. Shown are (a) top personal income tax rates, (b) top corporate income tax rates, both in percent, as well as (c) cigarette excise tax rates, (d) gasoline excise tax rates, (e) spirit excise tax rates, all in 2020 dollars. Only non-zero rates are included in the state averages. See Figures E.23-E.24 for evidence on the timing and direction of tax changes. See Figure E.25 for similar scatter plots for tax revenues, and Figures E.26-E.27 for scatter plots for other tax rate combinations.



Figure 8: Tax Rate Levels Within State

Notes: This figure shows the average tax rate, tax rate in 1910 or in the year of tax adoption, tax rate in 2022 or in the year before cancellation, as well as the range of min to max rates in 1910-2022. States are ordered by average tax rate, and only non-zero values are included. See Figure F.28 for first decade vs last decade rate comparison and Figures F.29-F.30 for breakdown before/after 1970.



Figure 9: Coefficient of Variation of Tax Rates

Notes: This figure shows the coefficient of variation by 15-year intervals. Included are the the coefficient of variation in the first 15-year interval that includes tax adoption year, in 2008-2022, as well as the minimum, maximum, and average over 1918-2022. States are ordered by the average coefficient of variation and only states with non-zero tax rates are included. See additional results in Figures F.37–F.43.



Figure 10: Relationship Between State Tax Rates and State Tax Revenues

Notes: These figures show binscatter plots of tax rate against tax revenue (measured per capita divided by U.S. GDP per capita). Alaska is omitted from Figure (b) as its corporate tax revenues are extremely volatile and large. See equivalent graphs for federal revenues in Appendix Figure G.44.



Figure 11: Variance Decomposition of State Tax Revenues

(a) Personal Income Tax Revenue

(b) Corporate Income Tax Revenue

Notes: These figures show Shapley variance decompositions of state tax revenue in 5-year periods. The outcome variable is state revenue per capita divided by U.S. GDP per capita. "State tax rate(s)" include minimum and top tax rates in (a) and (b). "Other state tax rates" include eight studied tax rates minus the 1-2 rates for the tax type in question. "Political/demographic" variables include: state population, U.S. population, percent black residents, U.S. GDP, region fixed effects, 4 DW nominate scores (for House/Senate along each dimension). Year + state f.e. are calculated as the change in the adjusted \mathbb{R}^2 as a result of adding these fixed effects.



Figure 12: Tax Revenues and Rates for Progressive vs. Flat

Notes: Figures (a) and (b) show the tax revenue per capita per U.S. GDP per capita and the tax revenues shares for states with progressive/flat individual/corporate tax rates. Figures (c) and (d) show the average top and minimum tax rates, or the average flat personal/corporate tax rates for states with progressive/flat individual/corporate taxes. Alaska is excluded from corporate revenue series. In all figures, only states that have a personal/corporate income tax are included.



Figure 13: Revenues and Rates by Tax System Composition

Notes: These figures show total tax revenue, tax revenue for personal income taxes and sales taxes, as well as average top personal income tax rate and sales tax rates for five mutually-exclusive groups, defined based on the presence of personal, corporate, and/or sales taxes. The vertical grey line at 1975 identifies the year after which group compositions remained stable. Prior to 1975, the inclusion in the group changed as states adopted new tax types. See Appendix Figure G.45 for other tax revenues, Figure G.46 for other tax rates, and Figure G.47 for revenue shares.

APPENDIX FOR ONLINE PUBLICATION

A Evolution



Figure A.1: Tax Revenue by Level of Government

Notes: Figure (a) shows, for each level of government, its share of total US tax revenues. Figure (b) shows the tax revenue as a percent of US 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 US 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: Coefficient of Variation Over Years

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) for state tax revenue per capita divided by U.S. GDP per capita. Only non-zero tax rates included. Alaska is omitted from corporate tax revenue series, as its corporate tax revenue is extremely volatile. Tax rate averages and percentiles are shown in Figure 3.



Figure A.3: State Tax Revenues Over Years

Notes: These figures show the average, median, 25th and 75th percentiles, as well as the minimum and maximum across states of (a) income tax revenue, (b) corporate tax revenue, and (c) sales tax revenue; (d) tobacco revenue, (e) motor fuel revenue, and (f) alcohol revenue. Equivalent tax rate figures are shown in Figure 3.



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

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, all in percent; (c) cigarette excise tax rates, (d) gasoline excise tax rates, and (e) spirit excise tax rates, all in 2020 dollars. Only non-zero values are included. State tax rate percentiles are shown in Figure 3.



Figure A.5: Comparing State and Federal Tax Revenues Over Time

Notes: These figures show average state and federal revenues, separately for (a) income tax, (b) corporate tax, (c) tobacco, (d) motor fuel, and (e) alcohol. Revenues are measured as tax revenue per capita divided by U.S. GDP per capita. Tax revenue percentiles are shown in Figure A.3.

B Tax Adoption Pattern

In this section we seek to understand whether the order of tax adoptions predicts future tax rate or revenue patterns. Figures B.7, B.8 and B.10 explore how the the year when each tax is first adopted affects future tax rates and tax revenue compositions. Figure B.11 explores the duration of the adoption process, i.e. how fast the state adopted all tax rates (or a subset of rates that are eventually adopted by 2022). Finally, Figures B.13 and B.15 explore the order of tax adoptions, i.e. which tax type was adopted first.

Our results consistently show no major 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 reflected state-specific characteristics.



Figure B.6: State Tax Policies: Tax Adoptions

Notes: Figure (b) shows the number of states that adopted a new tax, 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. Figure (c) 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.7: Tax Rate in the Year of New Tax Adoption

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 latter excludes states that have not yet adopted the tax as well as new adoptees. Hawaii and Alaska are excluded in all figures, as well as Washington in Figure (f).



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

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) cigarette excise tax rates, (e) gasoline excise tax rates, and (f) 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.



Figure B.9: Average Tax Revenues By Timing of Adoption

Notes: These figures show the average tax revenue for states, separately for early, middle, and late adopters, for (a) income tax, (b) corporate tax, and (c) sales tax; (d) tobacco tax, (e) motor fuel, and (f) alcohol. Note that the years of adoption categorized as "early" vs. "late" vary by tax type, and can be inferred from the figures.



Figure B.10: Tax Revenue Shares by Timing of Adoption

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.8.



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

Notes: These figures group states into three groups, based on how long it took the state to complete tax adoption process.



Figure B.12: Average Tax Revenues By Duration of Overall Tax Adoption Process

Notes: These figures group states into three groups, based on how long it took the state to complete tax adoption process.



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

Notes: These figures show average personal, corporate and sales tax rates, for states with different order of tax adoptions. For example, whether states adopted gasoline, personal income or corporate tax first, second, or third.



Figure B.14: Average Tax Revenues By Order of Tax Type Adoption

Notes: These figures show average personal, corporate and sales tax revenues, for states with different order of tax adoptions. For example, whether states adopted gasoline, personal income or corporate tax first, second, or third.



Figure B.15: Tax Revenue Share by First Tax Type

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

C Tax Progressivity



Figure C.16: Distributions of Progressivity: State vs. Federal

Notes: Figures (a) and (b) show the distributions of tax progressivity ratio – the ratio of the top tax rate to the minimum tax rate, while Figures (c) and (d) show the distributions of the differences (top rate minus minimum tax rate). For states, the distributions show variation over time and across states, for federal tax rates, the distributions show variation over time. Only states with progressive personal/corporate income tax are included. Figures 4 and C.17 show how the average ratio/difference changed over time.

Figure C.17: Progressivity of Income Taxes: Ratio vs. Difference and Alternative Samples



Notes: This figure plots the average ratio and difference between the top tax rate and the minimum tax rate for federal income and corporate taxes, and the average ratio and difference for the states. In Panel A, the ratio is set to 1, while the difference is set to 0 for states with no income tax or flat income tax. Figure (c) repeats Figure 4(b) in the main text.



Figure C.18: Other Tax Rates: Progressive vs Flat Income/Corporate Tax

Notes: These figures show average tax rates for states that have a progressive personal income and/or corporate income tax schedules. Only states with non-zero rates are included. See Figure 12 for average personal and corporate tax rates.



Figure C.19: Tax Revenue Shares: Progressive vs. Flat

Notes: This figure shows the composition of state tax revenues over time for states with flat vs progressive individual or corporate income taxes in that year.

D **Tax Changes**



Figure D.20: Simultaneity of Tax Changes: Min and Max Income Tax Rates

(b) % of Decreases that Coincide 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 x-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). Figure 6 shows similar patterns for other tax rates.



Figure D.21: Simultaneity of Tax Changes in the Same State and Year (1910-1969)

(b) % of Decreases that Coincide with

(c) % of Decreases that Coincide with Increases (d) % of Increases that Coincide 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 x-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, standard sales tax rates, cigarette excise tax rates, gasoline excise, or spirit excise tax). For example, Figure (c) shows that among all of the *decreases* in top corporate income tax rates, 10% occurred in the same year as an *increase* in the the cigarette tax rate in the same state. Only tax changes 1910-1969 are shown. See Figure 6 for all tax changes.



Figure D.22: Simultaneity of Tax Changes in the Same State and Year (1970-2022)

(b) % of Decreases that Coincide with

(c) % of Decreases that Coincide with Increases (d) % of Increases that Coincide 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 x-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, standard sales tax rates, cigarette excise tax rates, gasoline excise, or spirit excise tax). For example, Figure (c) shows that among all of the *decreases* in top corporate income tax rates, 10% occurred in the same year as an *increase* in the the cigarette tax rate in the same state. Only tax changes 1970-2022are are shown. See Figure 6 for all tax changes.

E Federal and State Tax Rates

	Top Personal	Top Corporate	Cigarette	Gasoline	Spirit
1900-1920 \times federal	-0.009	-0.145***			
	(0.015)	(0.041)			
1920-1940 \times federal	0.047^{***}	0.087^{***}	-0.015	1.955^{***}	0.195^{***}
	(0.015)	(0.023)	(0.044)	(0.039)	(0.013)
1940-1960 \times federal	0.034^{***}	0.027	-0.195***	0.860^{***}	0.073^{***}
	(0.006)	(0.027)	(0.041)	(0.028)	(0.004)
1960-1980 \times federal	0.355^{***}	0.140^{***}	0.141^{**}	0.321^{***}	0.085^{***}
	(0.026)	(0.010)	(0.061)	(0.023)	(0.006)
1980-2000 \times federal	0.051^{***}	-0.030***	-0.063	-0.271^{***}	-0.075***
	(0.005)	(0.010)	(0.092)	(0.025)	(0.016)
2000-2022 \times federal	0.070^{***}	0.062^{***}	1.053^{***}	-0.496***	-0.243***
	(0.016)	(0.007)	(0.036)	(0.028)	(0.026)
$2020 + \times \text{federal}$	0.080^{***}	0.144^{***}	1.270^{***}	-0.671^{***}	-0.388***
	(0.008)	(0.013)	(0.050)	(0.066)	(0.042)

Table E.1: State and Federal Tax Rate Relationship

Notes: This table shows the results of regressing state tax rate listed in the top row on a corresponding federal tax rate interacted with period indicators (left column). Only observations with non-zero state taxes are included. Each regression includes state fixed effects.

Figure E.23: Federal and State Changes: Timing



Panel A: Percent of state changes that occur within 1 year of federal change





Notes: Figures (a) and (b) show the percent of state tax changes that occur in the same year or 1 year after (a) a federal change in the same tax rate, and (b) a federal change in any of the included tax rates. Figures (c) and (d) show the percent of state tax changes that occur in the same year or 2 years after (c) a federal change in the same tax rate, and (d) a federal change in any of the included tax rates. The top blue bars show actual observed percentages, while the bottom grey bars show the simulated average, calculated by randomizing the timing of state tax changes 100 times. The thin interval bars show the 5th and 95th percentiles of the simulated percentages. See Figure 7 for scatter plots of federal tax rates against average state rates, and Figure A.4 for time series.



Figure E.24: Federal and State Changes: Direction

Notes: This figures show the percent of tax changes that are increases or decreases and that occur (a) in all years versus (b) in the same year or 1 year after a federal change in the same tax rate. See Figure 7 for scatter plots of federal tax rates against average state rates, and Figure A.4 for time series.



Figure E.25: Changes in Federal vs. State Tax Revenues

Notes: These figures show the relationship between the federal tax revenues and the average state tax revenues, where each point represents one year and points are connected in chronological order. Colors shift from dark blue for earlier years to bright red for later years. Shown are (a) top income tax rates, (b) top corporate tax rates, both in percent, as well as (c) cigarette excise tax rates, (d) gasoline excise tax rates, (e) spirit excise tax rates, all in 2020 dollars. Only non-zero rates are included in the state averages. See Figure 7 for scatter plots of federal tax rates against average state rates, and Figure A.5 for time series of tax revenues.



Figure E.26: Federal and State Tax Rates: Other Relationships

Notes: These figures show the relationship between the average state tax rate and the federal tax rate, where each point represents one year and points are connected in chronological order. The x and y axis specify the relevant federal and average state rates. See Figure 7 for corresponding tax rate scatter plots, and Figure E.25 for tax revenues.



Figure E.27: Federal and State Tax Rates: Other Relationships

Notes: These figures show the relationship between the average state tax rate and the federal tax rate, where each point represents one year and points are connected in chronological order. The x and y axis specify the relevant federal and average state rates. See Figure 7 for corresponding tax rate scatter plots, and Figure E.25 for tax revenues.
F Persistence of Rates, Revenues and Policies



Figure F.28: Tax Rate Levels: First vs Last Decade

Notes: These figures show the relationship between the tax rate in the first 10 years after adoption and in 2013-2022. Full range of tax rates shown in Figure 8.



Figure F.29: Persistence of Tax Rate Levels (1910-1969)

Notes: This figure shows the tax rate in 1910 or in the year of tax adoption, tax rate in 1969, as well as the average, min, and max tax rates in 1910-1969. States are ordered by average tax rate, and only non-zero values are included. See Figure 8 for all years.



Figure F.30: Persistence of Tax Rate Levels (1970-2022)

Notes: This figure shows the tax rate in 1970 or in the year of tax adoption if adopted post-1970, tax rate in 2022, as well as the average, min, and max tax rates in 1970-2022. States are ordered by average tax rate, and only non-zero values are included. See Figure 8 for all years.

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Figure F.31: Persistence of Tax Revenue

Notes: This figure shows the tax revenue (per capita, as a percent of US GDP per capita) in 1910 or in the year of tax adoption, in 2022, as well as the average, min, and max tax revenue in 1910-2022. States are ordered by the average tax revenue, and only non-zero values are included. These statistics are shown for (a) personal income tax revenue, (b) corporate income tax revenue, and (c) standard sales tax revenue, (d) tobacco tax revenue, (e) motor fuel tax revenue, and (f) alcohol tax revenue.



Figure F.32: Persistence of Tax Revenue (1910-1969)

Notes: This figure shows the tax revenue (per capita, as a percent of US GDP per capita) in 1910 or in the year of tax adoption, in 1969, as well as the average, min, and max tax revenue in 1910-1969. States are ordered by the average tax revenue, and only non-zero values are included. See Figure F.31 for all years.



Figure F.33: Persistence of Tax Revenue (1970-2022)

Notes: This figure shows the tax revenue (per capita, as a percent of US GDP per capita) in 1970 or in the year of tax adoption, in 2027, as well as the average, min, and max tax revenue in 1910-2022. States are ordered by average tax revenue, and only non-zero values are included. See Figure F.31 for all years.



Figure F.34: Persistence of Tax Revenue Shares

Notes: This figure shows the tax revenue shares in 1910 or in the year of tax adoption, in 2022, as well as the average, min, and max tax revenue shares in 1910-2022. States are ordered by average tax revenue share, and only non-zero values are included. These statistics are shown for (a) personal income tax revenue, (b) corporate income tax revenue, and (c) standard sales tax revenue, (d) tobacco tax revenue, (e) motor fuel tax revenue, and (f) alcohol tax revenue.



Figure F.35: Persistence of Tax Revenue Shares (1910-1969)

Notes: This figure shows the tax revenue shares in 1910 or in the year of tax adoption, in 1969, as well as the average, min, and max tax revenue shares in 1910-1969. States are ordered by average tax revenue share, and only non-zero values are included. See Figure F.34 for all years.



Figure F.36: Persistence of Tax Revenue Shares (1970-2022)

Notes: This figure shows the tax revenue shares in 1970 or in the year of tax adoption if post-1970, in 2022, as well as the average, min, and max tax revenue shares in 1970-2022. States are ordered by average tax revenue share, and only non-zero values are included. See Figure F.34 for all years.



Figure F.37: Percent Years with Tax Rate Changes

Notes: This figure shows the share of years in which the rate was changed by 15-year intervals. Included are the share of changes in the first 15-year interval after tax adoption, in 2008-2022, as well as the minimum, maximum, and average over 1918-2022. States are ordered by mean share. Only states with non-zero tax rates are included, and shares are calculated based on years with non-zero tax. Similar figures for coefficients of variation are shown in Figure 9.



Figure F.38: Average Tax Rate Change

Notes: This figure shows the average tax rate change (in pp or in \$) by 15-year intervals. Included are the the average change in the first 15-year interval after tax adoption, in 2008-2022, as well as the minimum, maximum, and average over 1918-2022. States are ordered by average change. Only states with non-zero tax rates are included. Similar figures for coefficients of variation are shown in Figure 9.



Figure F.39: Coefficient of Variation of Tax Revenues Over Time

Notes: This figure shows the coefficient of variation by 15-year intervals. Included are the the coefficient of variation in the first 15-year interval after tax adoption, in 2008-2022, as well as the minimum, maximum, and average over 1940-2022. States are ordered by average coefficient of variation. Only states with non-zero tax rates are included. Alaska is omitted from corporate tax revenue. Similar figures for coefficient of variation for tax rates are shown in Figure 9.



Figure F.40: Tax Changes By State

Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top income tax rates, top corporate tax rates, standard sales tax rates, cigarette excise tax rates, gasoline excise tax, and 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 F.41: Tax Changes By State (1910-1969)

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

Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top income tax rates, top corporate tax rates, standard sales tax rates, cigarette excise tax rates, gasoline excise tax, and 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.





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

Notes: Figure (a) shows the number of tax changes in each state for six tax rates (top income tax rates, top corporate tax rates, standard sales tax rates, cigarette excise tax rates, gasoline excise tax, and 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 F.43: Frequency of Tax Changes Pre-1970 vs. Post-1970

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. See also Figure 9 and Figure F.37.

G Relationship Between Rates and Revenues



Figure G.44: Relationship Between Federal Tax Rates and Federal Revenues

Notes: These figures show binscatter plots of federal tax rate against federal tax revenue measured as percent of U.S. GDP. Similar figures for state tax rates and revenues are shown in Figure 10.



Figure G.45: Revenues by Tax System Composition

Notes: These figures show tax revenue levels (as Heasured per capita per U.S. GDP per capita) for five mutually-exclusive groups of states with or without personal, corporate, and/or sales taxes. Figures (a), (c) and (d) reproduce Figures 13(a), (b) and (c).



Figure G.46: Tax Rates by Tax System Composition

Notes: These figures show tax rates for five mutually-exclusive groups of states with or without personal, corporate, and/or sales taxes. Figures (a) and (d) reproduce Figures 13(d) and (e).



Figure G.47: Revenue Shares by Tax System Composition

Notes: These figures show tax revenue shares for five mutually-exclusive groups of states with or without personal, corporate, and/or sales taxes.