Unmasking Local Fiscal Responses to Federal Tax Deductibility

Working Paper

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Abstract

This paper analyzes how changes to the deductibility of state and local taxes under the federal personal income tax affect local fiscal outcomes. Previous studies have found only small or no effects on choice of local revenue instruments and local revenue and expenditure levels following changes to tax prices when analyzed at the state-aggregated level. This paper is the first to study the impact of changing tax prices on local fiscal outcomes while allowing for local heterogeneity in tax incentives at the county level. The findings suggest that residents and local governments do, indeed, respond to changes in federal tax policy. Exploiting variation at the county level yields a more elastic relationship between tax price and local spending than using coarser units of observation. Having fewer institutional constraints, more state fiscal centralization, and a higher share of high income residents all increase the magnitude of local fiscal response. Simulations suggest that limiting the deduction for state and local taxes would neither disproportionately hurt resource-poor areas nor current federal spending targets, making such limits potentially progressive policy options.

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JEL classification: H2, H71, H77

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1 Introduction

Tax expenditure programs are tax code provisions that allow deductions, exemptions, or credits targeted to certain individuals or specific economic activities. In the presence of positive spillovers, the private market tends to provide some goods and services at lower levels than is socially optimal. Tax expenditures allow the federal government to incentivize such economic activity through the tax code, leading to potential welfare improvements. Tax expenditures have recently become the subject of policy discussions, generating a new wave of literature analyzing the treatment of tax expenditures (e.g., Saez, 2004; Leuven & Oosterbeek, 2004; Poterba & Sinai, 2008; Burman, Geissler, & Toder, 2008).

One such expenditure is the deduction for state and local income, general sales, and property taxes. This deduction was worth $66.7 billion in 2011, making it one of the largest tax expenditures directed at individuals in the U.S. tax code (Congressional Research Service, 2012). For comparison, the deductions for mortgage interest and charitable contributions were worth $77.6 billion and $36.6 billion, respectively. Due to the size of the tax expenditure, the deduction is an attractive target for federal budget makers looking to expand the federal tax base.

A commonly argued reason for having this deduction is that there are positive spillovers of state and local spending on surrounding communities. The potential merits of this argument are widely discussed in the literature (see Ladd, 1984; Case, Rosen, & Hines, 1993; Isen, 2014). For example, increasing spending on education improves the quality of the workforce available to surrounding municipalities. Therefore, subsidizing state and local spending creates efficiency gains, since municipalities will not internalize this additional benefit to surrounding communities. The deduction for property taxes on owner-occupied residences, much like the home mortgage interest deduction, also subsidizes homeownership, which has been shown to be correlated with positive externalities, such as incentivizing residents to vote for investments that increase the value of property in the community and better citizenship, at the cost of lower mobility (e.g., DiPasquale & Glaeser, 1999; Glaeser & Shapiro, 2003).

In addition, there is also a belief that the deduction avoids "double taxation" of that portion of a resident's income. One argument is that because residents already pay state and local taxes on that money, that portion of income is not available for residents to spend, and thus should not be considered part of their federal AGI. A second argument says allowing a double tax creates a sort of double marginalization problem in which both the federal government and state and local governments create efficiency losses when taxing residents' income that could be reduced by only taxing that money once. A counter-argument is that unless the benefits of state and local spending spillover into adjacent municipalities, state and local tax liability can be viewed as a benefits charge for public goods and services demanded by residents that would have otherwise been purchased privately, rendering a tax on that money permissible.

Another argument against the deduction is that deductibility tends to be regressive (e.g., Feldstein &

Metcalf, 1987; Holtz-Eakin & Rosen, 1990; Rueben, 2005; Metcalf, 2011). Because itemization rates rise with income, the deduction primarily helps wealthier taxpayers keep more of their income. For example, in 2011, the 13 percent of U.S. households making more than $100,000 in AGI accounted for 53 percent of the nation's income, but over 68 percent of the total value of state and local tax deductions. This creates a regressive component of the tax code, and so the aforementioned papers often argue that eliminating the deduction would make the federal tax system more progressive.

In response to this ongoing debate, policymakers have made several changes to the deduction for state and local taxes since its inception, including eliminating the deduction for motor fuels taxes in 1978, eliminating the deduction for general sales tax in 1986, and partially reinstating the deduction for general sales tax in 2004. The deduction has also been impacted by the expansion of the alternative minimum tax (AMT), under which state and local tax deductions are not allowed.

Some studies question how much these and other potential changes to deductibility actually impact the economy.[1] Feldstein and Metcalf (1987) argue that states would shift away from reliance on general sales tax following the Tax Reform Act of 1986, though others claim there is little empirical evidence of that occurring (see Courant & Gramlich, 1990). Metcalf (2011) finds that in the presence of deductibility, state and local governments depend more heavily on income and personal property taxes and less on non-deductible taxes and fees, which is consistent with economic theory. However, if the deduction were eliminated, reliance would shift towards other taxes, which are primarily focused on businesses and corporations. This shift in tax reliance may have a large effect on state and local economies.

Basic economic theory predicts that cutting the deduction would produce a behavioral response from individuals and state and local governments. Eliminating the deduction would increase the relative tax price of state- and locally-provided public goods and services to those individuals who would have otherwise taken the deduction on their federal taxes. Beyond this direct impact, changes in the tax price may also affect other decisions facing households, such as whether to rent or own housing, participate in the labor market, or "vote with one's feet," i.e., move to another locality or state with a different bundle of taxes and publicly provided goods and services.

Changes to the tax price will also impact the decisions of state and local policymakers. An increase in the tax price for once-deductible taxes may encourage policymakers to shift taxes away from those bases and towards other revenue sources, such as charges and fees, if possible. This could alter the competitiveness of states and municipalities and further impact state and local economies.[2] How state and local governments shift their revenue-raising strategies and expenditures is important to understanding the potential distributional impacts of eliminating the federal deduction for state and local taxes. A better

[1] Earlier papers (e.g., Hettich & Winer, 1984; Noto & Zimmerman, 1984; Inman, 1985) claim that a subnational government's choice of revenue sources does not depend on the jurisdiction's tax price.

[2] Epple and Zelenitz (1981) discuss the implications of competition among jurisdictions in a Tiebout model.

understanding of how the incidence of changes to deductibility differentially falls across local areas will allow federal policymakers to make more informed decisions regarding the deductibility of state and local taxes. As such, this paper will analyze how changes to the deductibility of state and local taxes affect the revenue composition at the county and city level.

Previous studies, including Feldstein and Metcalf (1987), Metcalf (2011), and Heim and Abbas (2015), ask how federal deductibility affects state and local revenue sources, but analyze at the state-aggregated level. While this sort of aggregation makes sense for state-level revenues, it imposes additional assumptions when studying only local-level revenues. Specifically, it assumes homogeneous incentives at the local level within a state, averaging out any variation between localities. The only other paper to consider this issue is Holtz-Eakin and Rosen (1988), which still explicitly links local tax prices to state average tax prices due to data constraints.

There are several reasons why analyzing local fiscal responses at the county level makes more sense than analyzing local fiscal responses at the state level.[3] First, linking the local tax price to some function of the state tax price imposes an assumption that residents make local fiscal choices based on the experience of residents who potentially live far away from the locality and would not otherwise influence local decision making. Although some states may limit local fiscal freedom via statewide policy, local governments still have some discretion over revenue sources and overall spending levels. Second, local governments face their own tax bases and adopt their own fiscal policies and practices that can vary widely within a state, as described in section 3.1. Averaging across an entire state only ignores this additional source of variation. From an econometric point of view, aggregating to an unweighted state-level regression implicitly assigns smaller weights to local governments in states with many local governments. The greater sample size of local data also allows for greater precision than is possible with state-level data.

This paper assigns census microdata to counties based on relative income distributions, allowing for analysis at a more local level than previously possible. It is the first paper, then, to truly exploit variation within counties to analyze the impact of changes to deductibility on local fiscal outcomes. Allowing counties to face these heterogeneous tax incentives provides the variation required to reveal a more accurate picture of how federal tax policy impacts local revenue and spending. In this regard, this paper should be viewed as complementary to past studies that analyzed the impact of deductibility on state-level revenues.

Using these local data, this paper is able to show that a one percent rise in tax price lowers the local use of deductible taxes by about 3.5 percent, while having almost no impact on the local use of non-deductible revenues. It finds an associated change in local expenditures of about -2.1 percent. Testing for heterogeneity, this paper finds that strict state regulations on local property taxes dampens the response

[3] I do not claim that the county level is the optimal level to perform the analysis, but it may be the best possible option given current data limitations.

of local governments in terms of use of deductible taxes by about 20 percent relative to localities in states not imposing strict levy limits. It also finds evidence that localities subject to a more centralized state and local fiscal structure have a stronger response to changes in tax price. Finally, it shows that potential cuts in deductibility would not disproportionately harm counties with higher proportions of lower-income residents, suggesting that limiting the deductibility of state and local taxes could potentially be a progressive policy option.

The rest of this paper is organized as follows. Section 2 will present a simple model illustrating the incentives facing residents and governments. Section 3 will discuss the deduction for state and local taxes, theoretical arguments for its existence and extinction, and recent literature studying the economic impact of the deduction. Section 4 will outline the empirical model used for analysis. Section 5 will discuss the data used for this analysis. Section 6 will discuss empirical findings of this analysis, while Section 7 will discuss the policy implications of this paper's findings. Finally, Section 8 concludes.

2 A Simple Framework

Consider possibly heterogeneous households of locality i that maximize a well-behaved utility function subject to a budget constraint:

$$\begin{aligned} & \max_{c^h} \quad U^h(c^h, G_i, G_{j\neq i}) \\ \text{subject to} & \\ Pc^h \quad & \leq \quad (1-\tau_f^h)m^h - \left(1-\theta\tau_f^h\right)\tau_i^h m^h, \end{aligned} \tag{1}$$

where c^h is household h's private consumption, G_i represents state and locally provided goods for locality i, $G_{j\neq i}$ measures state and locally provided goods for other localities (to account for potential spillovers), m^h is household income, P is the relative price of private consumption. For simplicity, I abstract from progressivity and model a linear tax system in which τ_f^h is household h's federal marginal income tax rate, while τ_i^h is the household's state plus local marginal income tax rate. The parameter $\theta \in [0,1]$ measures the degree to which households can deduct state and local taxes under the federal income tax. Households take income and government policy (spending levels, tax rates, and deductibility status) as given.

Solving the household problem yields indirect utilities $V^h(G_i, G_{j\neq i}, \tau_f^h, \tau_i^h, \theta, P, m^h)$. In this simple framework, I take an agnostic approach to political economy at the local level, assuming some welfare aggregator, f_i, that is possibly determined through a voting process. Assuming there are N households in locality i, the local government then solves:

$$\begin{aligned} & \max_{G_i, \tau_i^h} \quad f_i\left(V^1(\cdot), ..., V^N(\cdot)\right) \\ \text{subject to} & \\ G_i \quad \leq & \quad \int_h \tau_i^h m^h. \end{aligned} \tag{2}$$

Jointly solving the household and government problems yields equilibrium tax rates and provision of state and local public goods, $G_i(\tau_f, \tau_i, \theta, P, m)$.

Under standard assumptions on the utility functions of households, and assuming that state and locally provided goods are ordinary goods, it follows from the law of demand that $\partial G_i/\partial\theta \geq 0$, since raising θ lowers the price of G_i. From a federal policy point of view, notice that if spillovers are present ($\partial U^h/\partial G_{j\neq i} > 0$), then there are efficiency gains to imposing $\theta > 0$. If no spillovers exist, then no federal policy is needed for local governments to attain the social optimum.

It is less clear how the optimal level of provision changes with τ_f^h, since the federal marginal tax rate enters the equation in multiple places. A rise in τ_f^h lowers after-tax income, but also lowers the price of G_i if $\theta > 0$. If state and locally provided goods are inferior, then $\partial G_i/\partial\tau_f^h > 0$. If G_i is normal, then the sign of $\partial G_i/\partial\tau_f^h$ depends on the relative size of the income and substitution effects.

Taken together, however, if we define the tax price of state and locally provided goods and services as $q^h = (1 - \theta\tau_f^h)$, it is straightforward to show that $\partial G_i/\partial q^h < 0$. Depending on the assumptions of the political process, different moments of the tax price distribution determine the optimal provision of state and local public goods and services. Assuming f_i allocates Pareto weights proportional to changes in tax price, G_i becomes sufficiently linearized with respect to tax price, and the average tax price becomes the main parameter of interest. Under other sets of assumptions, other moments, such as the median voter's tax price, may be more appropriate parameters to consider. Previous papers (e.g., Feldstein and Metcalf (1987); Metcalf (2011); Heim and Abbas (2015)) have assumed the average tax price determines fiscal outcomes, and so the empirical analysis in this paper will relate measures of G_i to the average tax price faced by residents. The impact of a given policy change, such as an increase in θ, on the average tax price will depend on the distribution of federal marginal tax rates within the locality. Thus, changes in provision are not likely to be uniform across localities.

3 Background

3.1 State and local revenue sources

Part of the motivation for this study is the fact that state and local governments collect revenues from different sources. In FY 2013, roughly 34.2 percent of state general revenues were deductible, including 18.4 percent from individual income taxes, 15.1 percent from general sales taxes, and 0.7 percent from property taxes (see Figure 1). Similarly, about 36.6 percent of local general revenues were deductible in FY 2013. However, this measure is largely dominated by property taxes (29.7 percent of general revenues) at the local level, with general sales taxes comprising 4.9 percent and individual income taxes making up 1.9 percent. Thus studying deductible taxes at the state level largely yields predictions about the responsiveness of individual income tax and general sales tax collections, while studying at the local level largely yields predictions about the responsiveness of property tax collections.

In terms of non-deductible own-source revenues, state governments collected about 18.5 percent from charges and miscellaneous fees, 2.7 percent from corporate income taxes, and 13.4 percent from other non-deductible taxes. State governments also collected 30.5 percent of general revenues from federal transfers and 0.8 percent from local government transfers. Local governments collected about 22.8 percent of general revenues from charges and miscellaneous fees, 0.5 percent from corporate income taxes, and 3.8 percent from other taxes. Local governments also received about 31.5 percent of general revenues from state transfers and 4.8 percent from federal transfers.

Because the composition of revenues is different at the two levels of government, if revenue sources respond differently to changes in tax price, then we should expect to find differences in local elasticities relative to state elasticities. This provides additional motivation for studying this problem specifically at the local level as a complement to past research.

Furthermore, there is substantial variation in local revenues even within states. This applies to both total revenue collections and tax rates. For example, the Tax Foundation reports property tax payments as a percent of home value in 2010 for a sample of 808 counties. These data suggest that effective property tax rates vary considerably within states, such as a range of 2.47 percentage points between Wayne County and Kings County in New York (The Tax Foundation, 2012).

Similarly, as of June 2016, data from state departments of revenue suggest that 38 of 50 states observe differences in local sales tax rates. In some states these differences are very minor, such as in Mississippi, where the local rates vary between 0 and 1 percent, and only two of 82 counties actually have jurisdictions that impose a sales tax above the state rate of 7 percent. Other states have much wider ranges, such as Colorado, where local rates range from 0 to 8 percent on top of the state rate of 2.9 percent.

As of FY 2011, jurisdictions in 17 states had local income taxes (Henchman & Sapia, 2011). However, the amount of variation within those states depends on the state in question. For example, in California, only San Francisco has a local income tax (1.5 percent) while all other jurisdictions have a local rate of 0. In Kansas, counties impose an income tax of 0.75 percent, and most city and townships impose an income tax of 2.25 percent, though 36 cities/towns have lower rates as low as 0.25 percent. On the other hand, in Maryland, county rates range from 1.25 percent to 3.2 percent, while in Kentucky local rates range from 0.01 percent to 2.5 percent, and some cities even impose a flat $2 tax per week.

All three of these taxes are currently deductible under the federal income tax. However, variation at the local level is not just shifting between these three sources. The share of local own-source revenues that are deductible varies widely within states and years. In the data analyzed in this paper, state-by-year fixed effects can only explain 26 percent of the variation in share of local own-source revenues that are deductible.

These sources of variation within states all motivate studying the response of local governments to tax price incentives at a more local level than the state.

3.2 Deductibility of state and local taxes

The deductibility of state and local taxes has had a dynamic history reflecting the changing political and economic sentiments of the twentieth century. When the federal income tax was created in 1913, all state and local taxes were deductible against federal income. The rationale behind the deduction was "to avoid taxing income that was obligated to expenditures over which the taxpayer had little or no discretionary control" (Congressional Research Service, 2012) and also to raise state and local expenditures.

A number of changes have impacted deductibility in the past several decades. The Tax Reform Act of 1986 eliminated the deduction for the general sales tax. Deductibility was further limited by the Pease provision of the Omnibus Budget Reconciliation Act of 1990, which temporarily reduced the deduction for state and local taxes by 3 percent of the amount a taxpayer's AGI exceeded a threshold. This change became permanent in 1993, although it began to be phased out as part of the Economic Growth and Tax Relief Reconciliation Act of 2001. The most recent direct change to the deductibility of state and local taxes came in 2004, when general sales taxes were once again made deductible, but with an added provision. Since 2004, residents have been able to choose to deduct *either* their state and local income taxes paid *or* their state and local general sales taxes paid. The growth of the AMT also provides an indirect effect that lessens the size of the deduction for state and local taxes. Taxpayers subject to the AMT are not allowed to itemize all deductions, including state and local taxes paid, from their federal adjusted gross income (AGI).

To summarize, for those taxpayers not subject to the AMT, the taxes currently deductible under the federal tax code include state and local income taxes, real estate and personal property taxes, and general sales taxes. These taxes comprise a large share of state and local general revenues. According to the Survey of State and Local Government Finance, in FY 2013, real estate taxes comprised 17 percent of state and local general revenue, while general sales taxes made up 12 percent and individual income taxes accounted for 13 percent. Because these categories jointly define 42 percent of state and local general revenues, there is reason to believe a change to deductibility could significantly affect state and local revenues.

Taxpayers can only take advantage of the deduction if they itemize deductions on their individual tax return. As of 2012, 31.6 percent of U.S. tax returns included itemized deductions.[4] Among itemizers, virtually all returns featured some form of state and local tax deduction (30.4 percent of total tax returns). Just over 73 percent of itemizers took a deduction for state and local income taxes, while 23.2 percent took a deduction for state and local general sales taxes.

The rate of itemization varies widely across states and income levels. First, in terms of income level, the degree to which taxpayers report itemized deductions rises with income. Higher-income taxpayers are more likely to itemize, since their itemized deductions tend to be larger than the standard deduction, which is generally not true for many lower-income taxpayers. For example, over 95 percent of those earning $200,000—$500,000 itemized in 2012, while less than 55 percent of those earning $50,000—$100,000 did. Itemization rates by state in 2012 varied from 18.3 percent (West Virginia) to 46.8 percent (Maryland). When factoring in the relative size of the state (by number of tax returns filed), California accounted for 11.7 percent of all itemizers, while 22 states accounted for less than 1 percent each. Rueben (2005) explains this geographic variation in part by noting that deductions are highest in places where state and local taxes are high (e.g., California and New York).

The combination of differing income distributions and differing state and local policy yields heterogeneity in both local itemization rates and local tax prices, which I measure at the county level. County-level itemization rates ranged from 0 percent to 56.3 percent in 2009, the most recent year available in my sample. Finally, there is variation *within* counties over time, which I specifically exploit in this paper.

4 Empirical Model

The state and local tax price can be thought of as the effective cost of a dollar of state and local spending. While the tax price does not change the amount of money residents actually pay in state and local taxes, a lower tax price reflects the fact that state and local taxes paid are not counted as taxable income under the federal tax code, which lowers the federal income tax burden. Deductibility lowers the tax

[4] The overall rate of itemization has varied widely since the mid 1980s. Following the Tax Reform Act of 1986, the itemization rate fell from almost 40 percent to less than 30 percent, where it held relatively stable until the mid 1990s, when it began steadily rising through the early 2000s (see Congressional Budget Office (2008)). The rate has been more unstable since 2003, fluctuating between 31 and 35 percent.

price facing middle- and high-income taxpayers (those who itemize and are not subject to the AMT), while low-income taxpayers and AMT payers face a tax price of $\$1.00$. Specifically, the tax price facing a household h in year t can be described as:

$$\text{Tax Price}_t^h = \begin{cases} (1 - \tau_{ft}^h) & \text{if itemizer} \\ 1 & \text{if non-itemizer,} \end{cases} \tag{3}$$

where τ_{ft}^h is the federal marginal income tax rate for household h in year t. To measure the incentive level at the county level, I average all Tax Price_t^h measures within a county c, yielding the key variable for analysis, Tax Price_t^c.

Following other papers in the literature (e.g., Feldstein and Metcalf (1987); Metcalf (2011); Heim and Abbas (2015)) this analysis will estimate:

$$Y_t^c = \delta \text{Tax Price}_t^c + \beta X_t^c + \alpha^c + \lambda_t + \varepsilon_t^c, \tag{4}$$

where Y_t^c is the outcome variable for county c at year t, X_t^c are within-county time-varying control variables, the α^c terms are county fixed effects to capture the impact of time-invariant local fiscal institutions and policy, λ_t are year fixed effects to capture year-specific national macroeconomic shocks, and ε_t^c is a stochastic error term with mean 0. Standard errors are clustered by county in order to allow stochastic error terms to potentially be correlated within counties over time.

Exploiting the variation in tax incentives within counties across years will allow this model to identify the impact of changing tax prices on outcome variables free of time-invariant local institutions and time-specific macroeconomic shocks. I will conduct analysis at several levels of aggregation to highlight the advantage of studying local response at the county level. First, I will analyze local fiscal outcomes at the county level. Second, I will run the same model, but aggregate all variables to the state level to be analogous to the data used in Heim and Abbas (2015). Finally, I will look at state and local combined fiscal outcomes aggregated to the state level, and attempt to compare the results to Feldstein and Metcalf (1987) and Metcalf (2011).

4.1 Endogenous tax price and IV specifications

The Tax Price variable in equation (4) is likely endogenous to fiscal choices of residents. Consider a county with a positive shock to its preferences for public goods. This would induce a positive shock to ε_t^c that potentially raises the collection of deductible and non-deductible taxes, as well as own-source revenues. This increases the potential deduction a resident of the county could take on their federal taxes, since local taxes paid will be higher. This increases the probability that a household in county c will itemize, creating a negative correlation between Tax Price_t^c and ε_t^c and putting a downward bias on the estimate of δ. On the other hand, an increase in deductions could shift a taxpayer down in the federal AGI distribution, lowering the taxpayer's federal marginal tax rate and placing an upward bias on the estimate of δ.

Additionally, there may be a concern that changes to the population could bias the results away from zero. Suppose a change in county population drives an increase in income levels. If locally-provided public goods are normal goods, then demand for public goods in the county would rise. At the same time, due to the progressive structure of the federal tax code, the average tax price for the county would have risen (as well as the probability of itemizing)

To alleviate these problems, this analysis uses a first dollar tax price instrument, originally developed by Feldstein and Taylor (1976), while specifically holding the population constant as it was in 1979 (the first year in the analysis). To construct this instrument, I first separate individuals into national deciles of AGI values for each year. Then, based on AGI deciles and year, I calculate the probability that a household h in that decile is an itemizer, $\hat{d}_t^h$. I assume that the state and local tax deduction taken by all individuals is 0 in every year. I then determine the federal marginal tax rates for each individual, τ_{ft}^{h0}, assuming no change to their characteristics and assuming their income grows only by the inflation rate from its 1979 level. Notice that τ_{ft}^{h0} corresponds to the first dollar marginal tax rate for household h at time t. Then the first dollar tax price instrument for household h is defined as $P_t^{h0} = 1 - \hat{d}_t^h \tau_{ft}^{h0}$. I then take the county average of these individual prices in order to get a county-level measure of first-dollar tax price ($fdtp_t^c$).

Notice that this measure depends on the marginal tax rate of the first-dollar of deduction for each person as opposed to a rate they effectively choose endogenously, and it depends on the *national* probability of itemizing, not the probability determined by potentially endogenous state and local policies. Furthermore, restricting the population from changing over time excludes the possibility of population changes driving variation in tax prices within counties over time and potentially confounding the results.

Once this instrument is constructed, I use two-stage least squares (TSLS) to estimate the impact of tax price on the use of different revenue sources and the overall level of own-source revenues. In the first stage I run:

$$\text{Tax Price}_t^c = \gamma fdtp_t^c + \tilde{\beta} X_t^c + \tilde{\alpha}^c + \tilde{\lambda}_t + \eta_t^c. \tag{5}$$

This yields a prediction, $\widehat{\text{Tax Price}}_t^c$.[5] Then in the second stage, I run:

$$Y_t^c = \delta \widehat{\text{Tax Price}}_t^c + \beta X_t^c + \alpha^c + \lambda_t + \varepsilon_t^c. \tag{6}$$

[5]In the first-stage regression, I find an F-statistic on the first-dollar tax price instrument of well over 16, suggesting that the instrument is indeed relevant.

Some residents and local governments may differentially respond to changes in tax price due to statewide policies, such as not having a state income tax. Because counties in these states may rely more heavily on other sources of revenue (possibly other deductible taxes such as the sales tax or local property tax, but also possibly user charges and fees), I also interact the predicted tax price variable with a dummy variable equal to 1 if the county is located in a state with no income tax. Finally, because the general sales tax deduction was cut in 1986 and partially allowed again starting in 2004, I include a triple interaction between the predicted tax price variable, no income tax dummy, and a dummy equal to 1 for observations in years 1987-2003. This triple interaction term captures the fact that incentives are further muted in these states in periods when the sales tax is not deductible.

Finally, there may be concern that different types of geographies evolve differently over time for other reasons. As such, I introduce path dependence into the model by adding interaction terms between initial state or local economic and demographic conditions and a linear time trend to the set of regressors, X_t^c. I also include state-specific linear time trends to help account for shifting state policy over the roughly 25 years of analysis. This helps to better identify the counterfactual facing geographies that experience changes to tax price.

After partialling out these different potential confounding factors, the remaining identifying variation should come solely from changes to federal tax policy (either changes to deductibility directly, or changes to federal tax rates) and nonlinearities in the mapping from smooth changes in the income distribution and federal marginal tax rates. The δ from equation (6) should then provide an unbiased estimate of the impact of changes to tax price on the chosen revenue and expenditure outcomes.

5 Data

The outcome variables for this analysis are deductible taxes, non-deductible own-source revenues, total own-source revenues, total expenditures, and intergovernmental aid receipts.[6] Deductible taxes include property taxes, income taxes, and general sales taxes. Non-deductible sources include charges and fees, business taxes, payroll taxes, and any other own-source revenues not mentioned earlier. The relationship between revenue sources can be described:

$$\text{Own-source revenues} = \text{Deductible taxes} + \text{Non-deductible own-source revenues.} \tag{7}$$

Adding in net intergovernmental transfers yields total revenues:

$$\text{Total revenues} = \text{Own-source revenues} + \text{Federal aid} + \text{State aid.} \tag{8}$$

[6] The state-level analysis includes only federal aid, while the local analysis includes both state aid and federal aid.

Finally, although total expenditures and total revenues are closely related, a strict balanced budget identity, i.e., Total expenditures $=$ Total revenues, does not hold in these state and local data.[7] All of the fiscal outcome measures are scaled to reflect dollars per $1,000 of county personal income.

Data on state and local revenues and expenditures are available by year via the Census Bureau's Survey of State and Local Government Finance from FY 1980-2006.[8] These data are measured at the state and local combined level, the state level, and both the county and city level. From here on, when I refer to local governments or local finances, I am referring to both city and county-level governments or finances. In fact, to build a more complete picture of local finances, city-level revenues and expenditures are aggregated by county and added to county government totals.

Because some city governments do not appear in every year, I drop cities that have years of missing values from the analysis to maintain comparability across years. The cities dropped from analysis (326 of 735 cities in the database) tend to be smaller ones that account for less per capita revenues and spending than the cities that respond in every year. Likely due to these cities' relatively smaller contributions to county-level fiscal totals, I observe only minor differences in the main results whether I keep or drop these cities. Although the results are robust to the decision of whether or not to drop these cities, it is possible that the findings may not be fully generalizable to those smaller localities that choose not to respond to the survey in some years.

The main variable of interest in these regressions is the Tax Price$_t^c$ variable. Constructing this variable requires several non-trivial steps. First, household level microdata were acquired from the 1980-2000 decennial censuses (1 percent samples) and the 2008-2012 5-year American Community Survey (ACS) (a 5 percent sample) using the Minnesota Population Center's IPUMS USA project. These data contain important economic and demographic variables at the household level.[9]

The chief advantages of using Census microdata over public-use IRS tax return data is that they allow for more precise location and more demographic information. However, a caveat of using these data is that many counties are not identifiable from public-use data due to small population sizes. If residents of larger counties are inherently different from residents of smaller counties, the results would not be generalizable. To address this issue, I assign observations to counties based on the most precise location available and the income distributions of component counties of those locations. Census data from the

[7] The U.S. Census Bureau (2006) explains that any discrepancy between revenue and expenditure cannot be construed as a surplus or deficit due to these data intentionally excluding some accounting measures, such as future pension fund liability or revenue streams. The data provided by the Census program is designed to measure economic activity and not intended to be viewed as standard accounting reports.

[8] Decisions about revenues and expenditures happen at the beginning of the fiscal year, which actually occurs in the previous calendar year. As such the fiscal data is matched to the economic and demographic information of the prior year, yielding a period of analysis from 1979-2005.

[9] Although the fiscal data end in 2005, I use the 2008-2012 5-year ACS to allow for a similar 10-year interpolation of populations for 2001-2005 as I use for non-Census years in earlier decades.

1970 and 1980 surveys are coded with county groups that incorporate several smaller counties. Data from the 1990 and 2000 surveys, as well as the 2008-2012 5-year ACS uses public use microdata areas (PUMAs) to define geographies with at least 100,000 residents.

Using county-level income data from each census year, I build an income distribution for each county within each of the larger geographic areas.[10] Omitting those counties that are available in the public use individual-level data, I build a probability density that describes the probability that a randomly selected individual with a given income level resides in each remaining county represented in the larger geography.[11] Each observation is then given an independently selected value from a uniform distribution on $[0, 100]$ and matched to the corresponding county for the observation's county group and income bin. This allows analysis on all observations in the data, as opposed to only the observations from larger counties.[12]

A second difficulty is that Census observations are only available every 10 years. To deal with this issue, I linearly interpolate total family income by income decile for each county between Census years. I also interpolate income component shares for each county-decile. I can then construct an estimate of each income component for every observation based on its county and income decile for that county.[13]

Data on federal marginal tax rates and itemization rates by county are calculated using the NBER's TAXSIM program.[14] TAXSIM can provide state-specific tax simulations for tax filers from 1977 through 2014. Variables describing dependents, marital status, mortgage payments, wage income, dividend income, and other forms of income allow for accurate calculations of the federal marginal tax rate for each household in the sample.[15] TAXSIM also yields a measure of federal AGI and the amount of deductions allowed under the federal tax code based on the input data. This includes imputed state and local general sales taxes based on the IRS sales tax tables. Households are considered itemizers if they are allowed to deduct any dollar amount greater than 0 from their federal taxes, and do not have positive alternative minimum income.[16]

[10] These data include the number of residents within a county that fall into each of 12 income bins. Later years describe more income bins, up to 16 bins in 2000, due to a more refined questionnaire.

[11] Previous papers in other contexts have done such an assignment using only population data, but incorporating income data improves the matching process.

[12] The procedure to create the data is described in more detail in the Online Appendix.

[13] Categorical variables, such as marriage, homeownership, and number of dependents are held constant, while age groups are allowed to change linearly over time. The unemployment rate for each county is available from 1990-2005, and earlier years are estimated based on the actual state unemployment rate and the degree to which the county rate changes with the state rate in later years.

[14] See Feenberg and Coutts (1993) for an overview of the TAXSIM program.

[15] The data available from IPUMS does not provide enough information to allow for the estimation of other types of deductions, including medical expenses and charitable contributions. These variables were imputed using the average for each state-AGI decile available from the IRS public use files for the years of analysis.

[16] The first-dollar tax price variable was constructed using a similar methodology as outlined above, except the state and local tax deductions are manually set to zero.

From this information, I build a tax price variable for each individual. I then collapse these to the county level, yielding the average tax price facing a resident of each county in the data, reported in cents to be consistent with the literature. A visualization of how deductibility affects tax incentives at the county level over time is provided in Figure 2. Although the overall trends of the four quartiles of income are similar (though not identical), the treatment is not homogeneous among all counties. Some policy changes have a much larger impact on higher-income counties than on lower-income counties.

The control variables used are similar to those used in the literature and are calculated from the IPUMS and TAXSIM augmented data. They include economic and demographic controls. The economic control variables include estimates for the percent of households in the county having a household AGI between $25,000-$50,000, $50,000-$100,000, and greater than $100,000, the variance and skewness of AGI in the county, the county's average dividend share of AGI, and the unemployment rate for that county. The demographic variables included as controls are the percent of households that are married couples, the percent of population that are children (ages 0-17), and the percent of population that are elderly (ages 65+). These groups all have an impact on the demand for local public goods and services within a geographic area.[17]

Of the 3,146 counties for which I can estimate a tax price, 3,055 counties remain in the analysis. Of the 91 counties dropped, 35 are from Alaska and Hawaii.[18] Next, 54 counties are dropped due to insufficient local fiscal data, 32 of which are Virginia independent cities that are technically their own counties, but do not appear in the Census county finance data.[19] The remaining 2 omitted counties are dropped because they did not exist in 1979, meaning that it was impossible to calculate the tax price instrument for those counties. The final (unbalanced) panel used for analysis covers 59,347 observations from 3,055 counties from 1979-2005. Summary statistics for included variables can be seen in Table 2. The corresponding state-level panel covers the 48 contiguous states and Washington, D.C. from 1979-2005.

6 Results

The empirical models outlined in equations (4) and (6) are run with five primary dependent variables. First, I add property, general sales, and income tax revenues, which are once-deductible taxes.[20] Second,

[17] It is possible that the decision to locate in a particular area is driven by the local fiscal environment, so there could be some reverse causality regarding families with children and the elderly sorting to areas with certain revenue mixes and expenditure patterns.

[18] Counties from Alaska and Hawaii are omitted from analysis due to both states' unique fiscal characteristics and natures as states and to be consistent with past analyses.

[19] There are six other independent city-counties in Virginia that actually appear in city-level data, and hence are not dropped.

[20] Due to data limitations this group may also include some taxes that are not deductible collected by county governments. However, this amount should be small relative to property, general sales, and income taxes collected at the county level.

I calculate the difference between total own-source revenue and the aforementioned deductible taxes, giving a total for revenues from non-deductible sources. Third I consider total own-source revenues, which include all general revenues less intergovernmental transfers. Fourth I look at the effect of tax price on total local expenditures. Finally, I analyze the impact of tax price on intergovernmental transfers.

6.1 Local fiscal response to changes in tax price

The set of regressions run for the main analysis features two OLS models and four IV models. Some models include a restricted model, while others include additional controls, such as the percent of population that is married, share of income attributed to dividends, and AGI variance and skewness.

A summary of the results can be seen in Table 3. Columns (1) and (2) correspond to the OLS estimates of the model with additional control variables and the restricted model. Columns (3) and (4) show the same two models, but using an IV framework where tax price is instrumented using the first-dollar tax price instrument.

Column (5) adds interactions between a linear time trend and economic variables measured in 1979, the first year of analysis. The economic variables interacted with the linear time trend include the initial values of tax price, percent of population making $25,000-50,000, $50,000-100,000, and greater than $100,000, percent of population age 0-17, percent of population age 65 and older, and the unemployment rate. Column (6) further adds state-specific linear time trends.

The local model yields statistically significant results, providing evidence that tax price changes do indeed influence local revenues and expenditures. The preferred specification that includes state-specific and initial condition trends predicts that a 1 cent rise in county average tax price will correspond to a 25 cent reduction in deductible tax collections per $1,000 of income. The elasticity of deductible taxes with respect to tax price (measured at the national mean for tax price and deductible taxes) is about -3.5.[21] It appears as though states with no income tax may have a more dampened response to tax price, although the coefficient on the interaction with the no income tax dummy is not significant.

A rise in average tax price appears to have very little impact on the use of non-deductible revenues at the local level.[22] Although it does not appear that local governments shift towards using more non-deductible revenues as theory may predict, the fact that the relative share of non-deductible revenues to deductible taxes is rising with tax prices is reassuring. The coefficient on own-source revenues, although not significant, suggests an tax price elasticity of about -2.3.

[21] While this elasticity may seem high, it is important to note that this is measured at the average tax price, which does not necessarily correspond to any *individual's* tax incentive. As such it should not be interpreted as a typical price elasticity.

[22] In some specifications, a rise in tax price is correlated with a fall in non-deductible revenues for states with no income tax, which may reflect the relatively fewer fiscal instruments available to those states. However, in the preferred specification, there is no effect.

Interestingly, the coefficients on both federal aid and state aid are negative. At the state level, this could simply be a reflection of the state's tax price also increasing, and behavioral responses resulting in lower levels of state aid to be distributed. This appears to be especially true in states with no income tax, which may reflect that statewide consumption is more elastic with respect to tax price than statewide income. At the federal level, the negative coefficient is likely a reflection of federal matching grant programs, such as those offered through highway grants or historic place preservation or restoration.[23]

Because there is a net reduction in revenues, it should come as little surprise that the results also suggest that total expenditures drop by roughly 45 cents per $1,000 of personal income for each cent increase in tax price. This translates to an elasticity for locally-provided goods and services of -2.1 when evaluated at the means of tax price and total expenditures per $1,000 of income.

In terms of the control variables, once controlling for initial conditions and state-specific trends, it appears that counties with a higher proportion of high income residents tend to use fewer deductible taxes per $1,000 of personal income than those with fewer high income residents. This may be surprising given the fact that those residents are more likely to itemize deductions, and given the results of previous studies, such as Metcalf (2011), which suggests states with more residents with an AGI greater than $100,000 use more deductible taxes. However, because I look specifically at local tax collections, it is likely that this reflects the fact that income taxes are a much smaller proportion of local revenue collections than state revenue collections.[24] While income tax collections would scale with income based on the progressivity of the tax system, property tax collections, which comprise the bulk of local deductible revenues, depend on the equalized values of property, which may not grow at the same rate as AGI.

I find that the age distribution and unemployment rate have little impact on local fiscal outcomes. Previous papers have found that having a higher proportion of older residents (those aged 65 and higher) leads to lower revenue collections. However, this could again reflect the limited role income taxes play at the local level. Heim and Abbas (2015) found that total local revenue collections are lower in states with a higher share of population aged 65 and older, but because they do not scale by income, the results are not directly comparable.[25] Past papers do not find that unemployment rate has any impact on total own-source revenues, though Metcalf (2011) finds that a larger change in unemployment rate is associated with more use of deductible taxes and less use of non-deductible revenues at the state and local level. This result is not replicated in Heim and Abbas (2015), nor is it replicated in my own findings, suggesting that this shift in revenue sources may be at the state level as opposed to the local level.

[23]The largest federal matching grant program is Medicaid, which is run through state governments and thus should not directly impact the local results.

[24]When aggregating state and local combined revenues to the state level, I find that a larger share of high AGI earners leads to more use of deductible taxes, similar to past findings.

[25]If, however, I aggregate local revenues to the state level, then I find a significant and negative coefficient on share of population 65 and older, qualitatively similar to Heim and Abbas (2015).

6.1.1 Robustness tests

I run a number of models to ensure the results are robust to sample and model selection. First I consider the possibility that very small counties, which arguably have noisier data, may be driving the main results. I drop all counties that ever have fewer than 5,000 residents between 1979 and 2009, which turns out to be about 10 percent of all observations. I find only minor differences in the results.

The analysis is also robust to structuring the model as a log-log model or as a log of real per capita fiscal outcome. These specifications allow me to directly control for the log of personal income, the results of which reinforce the fact that changes to income are not driving the results.

Finally, while the literature chooses to base analysis on the average tax price, it is not clear that it is the correct moment to consider. I find that the results are robust to using alternative moments of the tax price distribution, including the median tax price and the 25th percentile tax price.[26]

6.1.2 Comparing results at other levels of aggregation

To compare these results to findings in the past literature, I run the preferred specification from the local government analysis on the same local fiscal outcomes aggregated to the state level and state and local combined fiscal outcomes aggregated to the state level. Table 4 provides the clearest evidence of the importance of studying fiscal responses at a more local level. When I allow for heterogeneity in tax price at the local level, seen in section A, I am able to find significant and robust responses to federal policy. However, when I aggregate fiscal responses to the state level and use a state average tax price, I am unable to show almost any impact of federal tax policy on local fiscal outcomes. For these state-level regressions (sections B-E of Table 4), the state average tax price is calculated by averaging the individual tax price across all individuals within a state.

The shift from local to state aggregation takes place in three steps. First, instead of local governments responding to changes in the average tax price facing their own residents, aggregating to the state level assumes local governments respond to changes in the average tax price facing all state residents. Second, moving to the state level combines the responses of each county to the state average tax price into a single observation per state-year. This cuts the total number of observations from 59,347 to 1,323 in my sample. Finally, aggregating all counties within a state to one observation also effectively reweights the regression, giving all states an equal weight regardless of number of county governments. The results from these steps are shown in sections B, C, and D of Table 4. To be clear, these sections feature the *same* local fiscal outcomes measured in section A, only aggregated to the state level instead of the county level in sections C and D.

[26] Full results of these robustness tests can be seen in the Online Appendix.

The differences from shifting to the state average tax price are relatively modest in terms of point estimates for some regressions, such as moving from a point estimate of -0.445 to -0.437 for total expenditures. For others, the differences are more severe, such as the estimate of -0.186 for non-deductible revenues, which more than doubles the previous model's estimate. Across the board, precision falls, as the state-average tax price provides a noisier signal of the incentives facing local governments than the county-average tax price. Only the coefficient from the deductible taxes regression remains significant (see section B). The reason that the estimated coefficients do not change very much is that changes in the state average tax price happen to be closely related to changes in county average tax prices over this period (see Figure 3a). Thus, ignoring sub-state heterogeneity is not as problematic as it might otherwise be in analyses that rely on panel variation. However, accounting for heterogeneity could still be quite important in settings where the key identifying variation comes from *levels* of tax prices instead of changes (see Figure 3b).

Even in a panel setting, some types of heterogeneity may drive a wedge between the changes in local tax prices and changes in state tax price. One possible source of heterogeneity comes from a state-level decision to centralize the fiscal structure of the state, that is, the choice of how to allocate spending responsibility and revenue bases between state and local governments. A greater degree of fiscal centralization plausibly lowers the observable policy differences between localities within the state. This would drive residents to sort less across the cities and towns that comprise that state, since the bundle of goods and services would be more comparable across those local areas. This could dampen the noise of using the state average tax price as a signal of the local average tax price. If this is the case, then using the state average tax price may do a worse job of predicting local government response for counties in states with a low degree of revenue centralization. To test this hypothesis, I regress the absolute difference of the state average tax price and county average tax price for each county in the sample on a measure of the state's fiscal centralization and the same controls used in the fiscal outcome regressions above.

To measure fiscal centralization, I use the share of state and local total revenues collected at the state level. There is substantial variation in this measure of revenue centralization both between states and within states over time. For example, Nebraska has an average state revenue share of 47 percent over the sample, while Delaware has an average of 79 percent. Michigan had a state revenue share of 61 percent in FY 1982, but it rose to over 77 percent by FY 1992.

The resulting coefficient on revenue centralization is significant at the 1 percent level and negative. The magnitude of the coefficient suggests that a 10 percentage point increase in the share of state and local revenue collected by the state decreases the average difference between the state average tax price and county average tax price by about 0.2 cents. Based on an average centralization of 0.63 and an average difference in state and county tax price of 2.57 cents, this translates to an elasticity of about -0.5. Although relatively inelastic, this essentially means that as more fiscal autonomy is allocated to local governments, the state average tax price becomes a worse predictor of the local average tax price. This provides an additional argument for the importance of studying the local response to federal policies at the local level.

The majority of the differences between the results with the data aggregated to the county level and those with the data aggregated to the state level, however, come through the second and third steps, in which each local government's response to changes in the state average tax price are combined into a single state observation per year. Maintaining the same weighting structure as section B (that is, giving a higher weight to states with more local governments), but reducing the number of observations to one per state-year reduces the precision of the estimates (see section C). The point estimates change, as well, but they are not significantly different from the results in section B given the larger standard errors. However, reweighting the regression to give each state an equal weight, regardless of its number of counties, greatly changes the point estimates and loses a great deal of precision. In doing this, we essentially ignore the fact that some states provided more information (more local government responses) than others. This change is highlighted in the difference in estimates between sections C and D.

Section D of Table 4, then, shows the final results of attributing changes in state-aggregated local fiscal outcomes to the state average tax price. The results from section A and D tell different stories. Although some of the estimated coefficients change magnitude (or even sign in the case of the deductible taxes regression), the precision of all estimators is much lower than in the county-aggregated analysis as a result of the aggregation process. It is hard to learn anything about local fiscal outcomes from the estimates reported in section D because of the size of the standard errors. As such, aggregating local outcomes to the state level might lead one to conclude that the effect of a rise in tax price on local fiscal outcomes is not statistically different from zero. This is consistent with what Heim and Abbas (2015) finds, though it is important to note their study specifically answers how the option created by the American Jobs Creation Act of 2004 to deduct either sales or income taxes impacted local revenue sources over a short time period.

Finally, in the interest of tying this analysis to past results, I also check the effect of average tax price calculated at the state level on state and local combined fiscal outcomes (section E of Table 4). Although these estimates are useful for comparison to past studies (e.g., Metcalf (2011)), the results should be interpreted cautiously due to the size of the standard errors.[27] I find a tax price elasticity of -5.8 for deductible tax collections, compared to a range of -3 to -6 in Metcalf (2011). Both analyses find no significant impact of tax price on non-deductible revenues. My elasticity for own-source revenues is higher in magnitude (-5.3) than the -1.7 to -3.2 reported in Metcalf (2011).[28]

[27] The coefficient estimates are mostly insignificant, but this is largely due to the conservative choice to cluster standard errors by state. If I instead use classical standard errors, such as those reported in Metcalf (2011), then the coefficient estimates for tax price presented in section E of Table 4 become significant at the 1 percent level for column 1, the 5 percent level for column 3, and the 10 percent level for columns 4 and 6. The coefficient for tax price in column 2 (non-deductible revenue) is still not significant.

[28] As a caution for future research, it is important to note that the reason the state and local combined elasticities are qualita-

6.2 Tests of heterogeneity

6.2.1 Property tax limits

Property taxes are the largest source of revenue for local governments. As such, they have received notable attention in the policy realm, resulting in many statewide limitations facing local governments. These limits take different forms, such as special exemptions and circuit-breaker provisions, property tax rate and/or assessment limits, overall levy limits, revenue rollbacks, expenditure limits, and tax freezes. Although these policies vary widely between states in terms of impact and scope, I attempt to control for binding property tax levy limits. To have a binding constraint on property taxes, a state must have a property tax rate limit and an assessment limit, or have a property tax levy limit. Thus I consider a state to have a property tax limit if it meets one of those two criteria in a given year.

I run the main specification and include a dummy variable indicating whether a county is subject to a binding property tax limit in a given year and an interaction term between the tax price variable and the dummy variable. The expected sign of the coefficient on the dummy variable is negative for deductible taxes, since property taxes are the main source of deductible taxes. The expected sign on the interaction term is positive (opposite of the sign on the tax price variable), since property tax limits will impede the ability of local governments to respond to federal policy changes via deductible taxes. We might expect the magnitude of the coefficients for non-deductible revenues to be relatively smaller, since counties subject to property tax limits are able to better respond to federal policy changes using their non-deductible revenues. The net effects for non-deductible revenues may still be ambiguous due to the interaction of substitution and income effects.

The results, which can be seen in Table 5, are exactly what we would expect for deductible taxes. The sign on the property tax limit dummy is negative, and the coefficient on the interaction term is positive, compared to a negative coefficient on the tax price variable. The magnitudes of the coefficients suggest that a local government subject to strict property tax limits experiences a decline in deductible taxes about 20 percent lower than it would were it not subject to strict property tax limits. For non-deductible revenues, the coefficients on both the dummy and interaction term are negative, but insignificant and relatively smaller in magnitude than those for deductible taxes. This reassuringly suggests that binding property tax limits do, indeed, limit the ability of local governments to respond to federal policy via deductible taxes, and forces them to respond via other revenue sources.[29]

tively similar to those predicted in panel A (albeit noisier) is again because changes in the state tax price closely mirror changes in the county average tax price. If changes in tax price at these two levels did not match well, then the state and local combined results would produce different estimates than the local results. It just so happens in these data and under this model specification they do produce qualitatively similar results (although the state and local combined results suggest a more elastic relationship across the board).

[29] California has a somewhat unique situation in terms of property tax rates in that local governments have no control over

6.2.2 Fiscal centralization

In addition to the role fiscal centralization has in driving variation between state and local average tax prices described above, there may also be direct heterogeneity in how local governments and residents respond to changes in federal deductibility based on state fiscal centralization. For this hypothesis, I again use the share of state and local revenues attributed to state-level governments as a measure of fiscal centralization. Because the state revenue share may be impacted by changes to deductibility during the sample, I instrument for the state share of state and local total revenue using a prediction based on the state revenue share in FY 1977, several years before the start of my sample, and the trend in state revenue share for all other states.[30]

Nationally, local public expenditures consist of a bundle of goods and services that vary in their price elasticities. For example, local public schools (about 36 percent of local direct expenditures in FY 2013) and public safety (10 percent) may be relatively inelastic, while other categories, such as environment and housing (10 percent) and transportation (5 percent) may be relatively more elastic, since road or building construction and maintenance can more easily be deferred than providing schooling. More centralized states likely shift more of the responsibility of providing education and public welfare to the state level. In this sense, we might expect that local governments subject to a more centralized fiscal system have a higher overall elasticity of providing public goods and services.

The specification for this test is largely the same as the test of institutional constraints, except instead of controlling for having a levy limit, I control for revenue centralization, and instead of using an interaction between tax price and having a levy limit, I use an interaction between tax price and revenue centralization.

The results of this model support the argument that local governments in more centralized states tend to react more strongly to changes in tax price than those in more decentralized states (see Panel B of Table 6). First, in general, a higher degree of revenue centralization tends to be associated with higher levels of deductible tax collections, state aid receipts, and expenditures. Higher state aid receipts makes sense, as a state with more centralized revenues likely has relatively more funds to distribute to local governments. Having relatively higher deductible taxes may indicate that local governments are forced to rely more heavily on property taxes to provide local goods and services when centralization is high. In terms of the interaction term between tax price and state revenue share, the results suggest that counties react more

those rates since Proposition 13 was passed in 1978. Because the level of local control over property taxes is lower than in other states, even those with rate and assessment limits, I run the same regressions as above omitting all California counties. The results move in the direction we would expect, with coefficients on tax price increasing in magnitude.

[30] Because revenue centralization is measured as a ratio of state revenue to state and local combined revenue, this also makes the interpretation of the estimated coefficients much clearer, as it removes the dependent variable (a state's current state and local revenue collections) from the right hand side of the equation. The test yields a first-stage F-statistic of over 500, leaving no concern regarding a weak instrument.

strongly when they are subject to a more centralized revenue system. This is true for the use of deductible taxes, own-source revenues, and total expenditures. Those counties also receive fewer state transfers when tax price rises, likely a result of the state losing a relatively larger amount of revenue.

6.2.3 Income distribution

I consider the possibility that counties with a larger proportion of high AGI earners observe a different marginal effect of tax price on fiscal outcomes. Table 1 shows that the national probability of itemizing with an AGI greater than $100,000 was much greater than the probability of itemizing with an AGI of less than $100,000 in 2012. A greater proportion of these high earners within an area raises chance that a voting mechanism will produce a local response to a change to deductibility. Therefore, counties with a higher percent of population earning $100,000 or more should experience a more pronounced effect than those with a lower proportion of higher earners.

Indeed, as seen in Table 7, I find this to mostly be the case. The first quartile of high AGI earners responds weakly to changes in tax price, except for a significant increase in state aid receipts, which may reflect progressive state policy more than any specific local policy. This is likely due to the fact that residents of these counties are much less likely to itemize than residents of wealthier counties, and so changes in county average tax price are driven by minority groups. The second quartile responds relatively weakly, as well, with the only significant response to tax price coming from federal transfers. This is more likely to reflect federal policy than local policy, although some matching grant programs could reflect a response of local governments. Curiously, there is also a positive effect on own-source revenues that is significant at the 10 percent level for this quartile for states with no income tax.

The third quartile actually has the strongest response in terms of deductible taxes, non-deductible revenues, own-source revenues, and total expenditures. For these counties, a one cent rise in tax price corresponds to a drop in total expenditures of $1.69 per $1,000 of personal income. The fourth quartile responds relatively weakly to changes in tax price. Interestingly, state aid drops with an increase in tax price for counties in the fourth quartile, further evidence that state governments, who are likely also faced with changes to tax price, cut aid to wealthier counties when the state is affected by federal tax policy.

It may be surprising that changes in tax price seem to bite harder in the third quartile than the fourth. A likely explanation is that the AMT affects more residents in the fourth quartile than in the other three quartiles, lowering the number of individuals who observe a change in tax price and dampening the impact of federal policy change on these counties. A second plausible explanation is that there may be a nonlinear relationship between tax price and demand for local public goods and services, with residents in wealthier counties having less elastic demand for locally-provided public goods and services than residents in less-wealthy counties.

7 Discussion and Policy Implications

The main results of this paper suggest that residents and local governments do respond to federal tax incentives. Previous papers have ignored the heterogeneity in local tax incentives due to data limitations, and have thus concluded that the impact of ending state and local tax deductibility on local finances would be minimal. These papers tend to support the notion that cutting the deduction completely would have only minor fiscal consequences.

However, when considering variation at the county level, it becomes apparent that this may not be the true story. The results presented in this paper show that residents and local governments do respond to federal tax policy, and so the final task is to see if the responses are potentially meaningful in magnitude.

To measure the magnitude by which cutting the deduction (and thus setting the tax price to 1 for every county) would impact localities across the country, I make a back-of-the-envelope calculation based on how much the tax price facing each county in 2009 (the final year of income data available in my sample) would change. I multiply this amount by the coefficient from column (6) in Table 3 (adjusted based on whether or not the state has an income tax) to estimate the predicted change in total expenditures per $1,000 of income.

The resulting change, as a percentage of total expenditures in 2005, the last year of available spending data for my sample, has a wide range. Assuming that the change in expenditures is linear, the 25th percentile of predicted fall in local expenditures is about 4 percent of local spending, while the 75th percentile is 15 percent. The median predicted change is a fall of 8 percent.

The counties that are more hurt by this type of policy adoption (those in the fourth quartile of impact on expenditures) tend to be richer, more highly-educated counties, on average. Individuals tend to fall into higher AGI brackets, and, on average, own homes about 50 percent more valuable compared to those in the first quartile of impact. These counties also feature a smaller elderly population, while having only a slightly larger population of school-aged children. Summary statistics of key socioeconomic variables by quartile of 2009 predicted impact on expenditures can be seen in Table 8. Overall, it appears that cutting, or at least limiting federal deductibility of state and local taxes, would be a progressive redistributive policy.

Aside from equity considerations, eliminating the deduction also has implications for the efficiency of federal intergovernmental transfers relative to current disbursements. Using data from the Consolidated Federal Funds Report, the federal government made transfers of about $2.18 per $1,000 income to counties, on average in 2010. If eliminating the deduction would result in larger drops in expenditures in those counties the federal government currently transfers more funding to, then cutting the deduction could essentially undo the work of other government agencies. A scatter plot and locally weighted linear regression curve depicting federal spending per $1,000 of income in 2010 against the expected loss in spending is seen in Figure 4. Although there is some undoing of current spending for a few outlier counties, it appears that, for the most part, counties that receive higher levels of transfers now would be less impacted by a complete cut to the deduction.

8 Conclusion

This research provides evidence to inform policymakers on the question of whether or not to eliminate the federal deduction for state and local taxes. It improves on a weakness in the current literature by analyzing the elasticity of demand for locally-provided goods and services at a more local level. While previous research has analyzed local impact only at the state-aggregated level, this paper looks specifically at how local revenue dependence and spending respond to changing tax incentives at the county level.

A potential limitation of this research is that the scope of local government covered includes only county and city governments. This research could be enhanced with more complete local data, including consistent data on smaller municipalities and school districts. Unfortunately these data are currently only available in five-year intervals from the Census Bureau, and thus do not provide a strong pre- and post-change picture surrounding federal tax policy changes.

Nonetheless, this paper makes a first attempt to analyze the impact of changes to federal tax policy on local governments at the local level. It reveals relationships that coarser data were previously unable to show, and provides suggestive evidence for possible distributional consequences should the federal government decide to make major changes to deductibility. According to the results of the analysis, a 1 percent rise in county average tax price is associated with a decrease in use of local deductible taxes at of about 3.5 percent. This translated into a fall in local expenditures (and thus a fall in local public good and service provision) of 2.1 percent.

However, these effects are not expected to be constant across all localities, as the analysis found evidence of heterogeneity in local response to federal deductibility based on both state-level fiscal policy and local income distributions. Local governments that are subject to stricter property tax limitations have a muted response to changes to the federal tax code, while constituent governments in states that have a highly centralized fiscal structure react more strongly to the same change in tax price.

Based on back-of-the-envelope calculations, it appears that limits to the deduction for state and local taxes may support a more progressive tax code, while not disproportionately harming current federal spending programs targeted at local governments.

Disclosures

The author has no financial arrangement that might give rise to conflicts of interest with respect to the research reported in this paper.

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Table 1: Use of the alternative minimum tax and deductions for state and local taxes

as a percent of U.S. tax returns by AGI group, 2012

		Adjusted AGI (000's)				
	All returns	< $50	$50 —$100	$100—$200	$200—$500	> $500
AMT	2.9	0.0	0.4	4.2	67.7	57.0
Itemized deductions	31.6	12.8	51.8	81.5	94.6	97.0
Taxes Paid	31.3	12.5	51.6	81.4	94.5	96.8
S&L Income	23.1	6.9	39.7	67.3	78.5	80.4
S&L General Sales	7.3	4.9	10.6	12.8	15.0	15.5

Source: IRS Statistics of Income

Notes: Taxes paid include state and local income and general sales tax, real estate tax, and personal property tax.

Table 2: Summary statistics for county-level data, 1980-2005

Variable	Mean	Std. Dev.	Min.	Max.	N
Deductible taxes per $1,000 income	6.555	7.248	0	426.309	59,347
Non-deductible revenues per $1,000 income	6.677	10.167	0	368.842	59,347
Own-source revenues per $1,000 income	13.231	13.965	0	482.597	59,347
Total expenditures per $1,000 income	19.437	17.318	0	453.541	59,347
Federal transfers per $1,000 income	0.156	1.248	0	60.03	59,347
State transfers per $1,000 income	5.577	7.060	0	474.631	59,347
Tax price	93.41	3.251	75.403	100	59,347
First dollar tax price	95.27	1.805	82.395	98.773	59,347
Percent of population with AGI $25,000-$50,000	24.247	5.244	3.571	53.134	59,347
Percent of population with AGI $50,000-$100,000	12.741	8.434	0	39.31	59,347
Percent of population with AGI > $100,000	3.499	4.34	0	40.472	59,347
Variance of AGI	4.34e+09	2.33e+11	9.01e+07	2.89e+13	59,347
Skewness of AGI	2.575	1.142	-4.37	14.469	59,347
Share of income attributed to dividends	4.459	3.292	-70.773	444.984	59,347
Percent of population that is married	62.343	5.393	29.794	84.615	59,347
Percent of population age 0-17	27.651	3.346	14.07	46	59,347
Percent of population age 65+	13.858	3.38	0.789	35.732	59,347
Unemployment rate	6.746	3.196	0.700	39.3	59,347

Table 3: Results - Coefficients on Tax Price variables for local government regressions

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
		A. Dependent variable: Deductible taxes				
Tax price	0.0479	0.0512	-0.748***	-0.718***	-0.382***	-0.247**
	(0.0295)	(0.0316)	(0.139)	(0.133)	(0.141)	(0.105)
TP × no Y tax	-0.0441	-0.0441	0.405	0.382	0.406	0.0534
	(0.0743)	(0.0744)	(0.289)	(0.289)	(0.295)	(0.113)
TP × no Y tax × 1987-2003	-0.0040*	-0.0041*	-0.0053	-0.0050	-0.0100	-0.0068
	(0.00230)	(0.00231)	(0.00815)	(0.00820)	(0.00807)	(0.00501)
		B. Dependent variable: Non-deductible revenues				
Tax price	-0.0767	-0.0818	0.334*	0.317*	0.223	-0.0752
	(0.0516)	(0.0505)	(0.195)	(0.192)	(0.186)	(0.163)
TP × no Y tax	-0.0788	-0.0772	-0.858**	-0.842**	-0.800**	0.0307
	(0.0858)	(0.0858)	(0.373)	(0.376)	(0.369)	(0.152)
TP × no Y tax × 1987-2003	-0.009***	-0.008***	0.0089	0.0087	0.0088	-0.0038
	(0.00282)	(0.00282)	(0.00902)	(0.00910)	(0.00845)	(0.00469)
		C. Dependent variable: Own-source revenues				
Tax price	-0.0288	-0.0306	-0.414*	-0.401*	-0.159	-0.322
	(0.0618)	(0.0621)	(0.241)	(0.236)	(0.230)	(0.199)
TP × no Y tax	-0.123	-0.121	-0.453	-0.459	-0.394	0.0841
	(0.116)	(0.116)	(0.491)	(0.493)	(0.493)	(0.217)
TP × no Y tax × 1987-2003	-0.0125***	-0.0125***	0.0036	0.0037	-0.0012	-0.0107
	(0.00364)	(0.00364)	(0.0124)	(0.0125)	(0.0120)	(0.00701)
Additional controls	✓		✓			
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347

Notes: Dependent variables are scaled per $1,000 personal income. All models include county and year fixed effects and basic controls: percent of population earning between $25,000 and $50,000, percent of population earning between $50,000 and $100,000, and percent of population earning above $100,000, percent of population ages 0 to 17, percent of population ages 65 and older, and unemployment rate. Additional controls include AGI variance and skewness, share of income attributed to dividends, and percent of population that is married. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 3: (continued)

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
	D. Dependent variable: Transfers from federal sources					
Tax price	0.00269	0.00350	-0.0302**	-0.0293**	-0.0276**	-0.0222**
	(0.00311)	(0.00311)	(0.0137)	(0.0135)	(0.0119)	(0.0102)
TP × no Y tax	0.0022	0.0020	0.0140	0.0119	0.0033	-0.0081
	(0.00450)	(0.00450)	(0.0168)	(0.0167)	(0.0171)	(0.0120)
TP × no Y tax × 1987-2003	-0.0002	-0.0002	-0.0000	0.0000	0.0000	0.0003
	(0.00031)	(0.00031)	(0.00049)	(0.00049)	(0.00053)	(0.00051)
	E. Dependent variable: Transfers from state sources					
Tax price	-0.060***	-0.0485**	-0.145	-0.132	-0.165	-0.212**
	(0.0192)	(0.0212)	(0.119)	(0.112)	(0.113)	(0.0852)
TP × no Y tax	-0.0069	-0.0092	-0.199*	-0.219**	-0.226	-0.145***
	(0.0341)	(0.0343)	(0.114)	(0.111)	(0.155)	(0.0475)
TP × no Y tax × 1987-2003	-0.004***	-0.004***	0.00349	0.0040	0.0045	0.0044**
	(0.00107)	(0.00105)	(0.00282)	(0.00284)	(0.00331)	(0.00187)
	F. Dependent variable: Total expenditures					
Tax price	-0.0911*	-0.0728	-0.441*	-0.409	-0.308	-0.445**
	(0.0541)	(0.0571)	(0.255)	(0.248)	(0.246)	(0.206)
TP × no Y tax	-0.0761	-0.0787	-0.780**	-0.817**	-0.780**	-0.174
	(0.0945)	(0.0947)	(0.340)	(0.340)	(0.372)	(0.155)
TP × no Y tax × 1987-2003	-0.019***	-0.019***	0.0081	0.0089	0.0064	-0.0015
	(0.00331)	(0.00330)	(0.00896)	(0.00905)	(0.00914)	(0.00588)
Additional controls	✓		✓			
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347

Notes: Dependent variables are scaled per $1,000 personal income. All models include county and year fixed effects and basic controls: percent of population earning between $25,000 and $50,000, percent of population earning between $50,000 and $100,000, and percent of population earning above $100,000, percent of population ages 0 to 17, percent of population ages 65 and older, and unemployment rate. Additional controls include AGI variance and skewness, share of income attributed to dividends, and percent of population that is married. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4: Coefficients on Tax Price variables for different aggregations of data

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expend-itures
	A. Local outcomes aggregated to the county level					
County tax price	-0.247**	-0.0752	-0.322	-0.0222**	-0.212**	-0.445**
	(0.105)	(0.163)	(0.199)	(0.0102)	(0.0852)	(0.206)
	Observations: 59,347					
	B. Local outcomes aggregated to the county level					
State tax price	-0.317**	-0.186	-0.503	-0.0263	-0.0994	-0.437
	(0.128)	(0.343)	(0.351)	(0.0187)	(0.138)	(0.397)
	Observations: 59,347					
	C. Local outcomes aggregated to the state level, weighted by number of counties in state					
State tax price	-0.169	-0.283	-0.452	0.0872	-0.314	-0.692
	(0.252)	(0.379)	(0.562)	(0.0652)	(0.232)	(0.626)
	Observations: 1,323					
	D. Local outcomes aggregated to the state level					
State tax price	0.136	-1.125	-0.990	-0.0756	0.0366	-0.0924
	(0.553)	(1.047)	(1.480)	(0.293)	(0.352)	(1.259)
	Observations: 1,323					
	E. State and local combined outcomes aggregated to the state level					
State tax price	-2.388	-2.970	-5.359	-1.235***		-2.854
	(1.907)	(3.278)	(5.078)	(0.458)		(3.127)
	Observations: 1,323					

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county (state in sections C and D) and year fixed effects, as well as basic controls, initial condition trend, and state-specific trends. Standard errors are in parentheses and are clustered by county for outcomes aggregated to the county level, and clustered by state for outcomes aggregated to the state level.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5: Coefficients on Tax Price variables when considering binding property tax limits

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expend-itures
Tax price	-0.294**	-0.106	-0.400*	-0.0129	-0.212**	-0.394*
	(0.122)	(0.188)	(0.232)	(0.0129)	(0.0872)	(0.235)
TP × no Y tax	0.163	0.0244	0.187	-0.00698	-0.117**	-0.0320
	(0.110)	(0.148)	(0.210)	(0.0110)	(0.0503)	(0.156)
TP × no Y tax × 1987-2003	-0.00474	0.00161	-0.00313	0.000480	0.00354**	0.00632
	(0.00471)	(0.00551)	(0.00738)	(0.000417)	(0.00170)	(0.00692)
TP × Levy Limit	0.0596*	0.0271	0.0867	-0.00573	0.00209	-0.00922
	(0.0328)	(0.0556)	(0.0679)	(0.00439)	(0.0232)	(0.0759)
Levy Limit	-6.509**	-2.454	-8.963	0.516	-0.382	-0.0524
	(3.148)	(5.204)	(6.399)	(0.411)	(2.152)	(7.132)
Observations	59,347	59,347	59,347	59,347	59,347	59,347

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects, as well as basic controls, initial condition trend, and state-specific trends. County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 6: The impact of state fiscal centralization

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expend-itures
Tax price	0.219	0.00562	0.225	0.0338	0.213**	0.246
	(0.136)	(0.342)	(0.359)	(0.0362)	(0.107)	(0.401)
TP × no Y tax	0.0494	-0.0223	0.0272	-0.0138	-0.247***	-0.252
	(0.134)	(0.188)	(0.263)	(0.0136)	(0.0523)	(0.174)
TP × no Y tax × 1987-2003	-0.00625	-0.00213	-0.00838	0.000393	0.00594***	0.00182
	(0.00531)	(0.00501)	(0.00754)	(0.000523)	(0.00195)	(0.00616)
TP × State Rev. Share	-0.843***	-0.243	-1.087*	-0.0921	-0.736***	-1.335**
	(0.256)	(0.537)	(0.608)	(0.0634)	(0.218)	(0.631)
State Rev. Share	71.51***	23.22	94.73	8.263	73.39***	113.6*
	(24.60)	(51.25)	(58.66)	(5.896)	(20.66)	(59.22)
Observations	56,704	56,704	56,704	56,704	56,704	56,704

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects, as well as basic controls, initial condition trend, and state-specific trends. County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Coefficients on Tax Price variables by quartile of percent of population with AGI >$100,000

	Quartile of high AGI earners			
	(1)	(2)	(3)	(4)
A. Dependent variable: Deductible taxes				
Tax price	-0.666	-0.351	-0.824***	-0.187
	(0.446)	(0.237)	(0.255)	(0.156)
TP × no Y tax	0.116	0.506	-0.379	0.167
	(0.441)	(0.341)	(0.231)	(0.111)
TP × no Y tax × 1987-2003	-0.00869	-0.0211*	0.0166**	-0.0101
	(0.0100)	(0.0126)	(0.00805)	(0.00670)
B. Dependent variable: Non-deductible revenues				
Tax price	-0.536	-0.218	-0.410	-0.0729
	(0.597)	(0.388)	(0.604)	(0.195)
TP × no Y tax	-0.604	1.205	0.129	0.287**
	(0.395)	(0.828)	(0.478)	(0.134)
TP × no Y tax × 1987-2003	0.0151	-0.0298	-0.0075	-0.0050
	(0.0114)	(0.0225)	(0.0176)	(0.00645)
C. Dependent variable: Own-source revenues				
Tax price	-1.201	-0.569	-1.234*	-0.260
	(0.739)	(0.467)	(0.691)	(0.286)
TP × no Y tax	-0.488	1.711*	-0.250	0.454**
	(0.573)	(0.914)	(0.596)	(0.182)
TP × no Y tax × 1987-2003	0.0064	-0.0509*	0.0091	-0.0151
	(0.0147)	(0.0265)	(0.0209)	(0.00995)
Observations	10,512	10,124	10,209	10,257

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects, as well as state-specific trends and the initial condition trend. County-clustered standard errors are in parentheses. Due to many observations having 0 percent of households with an AGI over $100,000 in earlier years of the sample, these regressions are limited to the period 1985-2005.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7: (continued)

	Quartile of high AGI earners			
	(1)	(2)	(3)	(4)
D. Dependent variable: Transfers from federal sources				
Tax price	0.0145	-0.0378**	-0.0289	-0.0068
	(0.0130)	(0.0191)	(0.0248)	(0.0294)
TP × no Y tax	-0.0012	-0.0162	0.0584	-0.0003
	(0.00899)	(0.0189)	(0.0435)	(0.0153)
TP × no Y tax × 1987-2003	0.0000	0.0006	-0.0024	0.0003
	(0.00018)	(0.00059)	(0.00217)	(0.00096)
E. Transfers from state sources				
Tax price	0.526*	-0.227	-0.269	-0.400*
	(0.298)	(0.156)	(0.228)	(0.208)
TP × no Y tax	-0.139	0.327	-0.175	-0.0565
	(0.129)	(0.362)	(0.167)	(0.0613)
TP × no Y tax × 1987-2003	0.0013	-0.0063	0.0041	0.0068
	(0.00292)	(0.00818)	(0.00670)	(0.00429)
F. Total expenditures				
Tax price	-0.365	-0.493	-1.726**	-0.676*
	(0.766)	(0.672)	(0.699)	(0.376)
TP × no Y tax	-0.211	0.678	-0.0553	0.424*
	(0.517)	(0.856)	(0.555)	(0.226)
TP × no Y tax × 1987-2003	-0.0030	-0.0341	0.0108	-0.0134
	(0.0137)	(0.0311)	(0.0209)	(0.0118)
Observations	10,512	10,124	10,209	10,257

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects, as well as state-specific trends and the initial condition trend. County-clustered standard errors are in parentheses. Due to many observations having 0 percent of households with an AGI over $100,000 in earlier years of the sample, these regressions are limited to the period 1985-2005.

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Mean characteristics of counties by quartile of impact of completely cutting state and local tax deduction on total expenditures, 2009

	Quartile of Impact on Expenditure			
VARIABLES	(1)	(2)	(3)	(4)
Family income	57,841.04	62,736.41	67,860.32	73,774.00
House value	112,295.40	128,531.10	156,878.70	169,383.50
Percent of population with AGI \$25,000-\$50,000	20.04	19.76	19.17	18.27
Percent of population with AGI \$50,000-\$100,000	23.59	24.97	25.51	26.53
Percent of population with AGI > \$100,000	11.11	13.28	15.68	18.42
Variance of AGI	3.29e+09	3.55e+09	4.12e+09	4.58e+09
Skewness of AGI	3.07	2.92	2.80	2.68
Percent of population age 0-17	22.37	22.53	22.81	23.41
Percent of population age 65+	18.60	18.21	17.55	15.96
Percent of population that is foreign born	6.02	6.71	7.76	7.20
Percent of population that is black	12.56	9.39	6.77	5.71
Percent of population that has less than a high school degree	19.58	17.22	15.81	14.43
Percent of population that has at least a bachelor's degree	17.19	19.00	21.52	24.30
Unemployment rate	9.56	9.29	8.54	8.49

Notes: The first quartile includes counties which have a predicted loss in total expenditures under 4.19 percent. The second quartile features counties with predicted losses between 4.19 percent to 7.69 percent. The third quartile predicted losses range from 7.69 percent to 14.78 percent. Finally, the fourth quartile includes counties with predicted losses above 14.78 percent.

Figure 1: State general revenue collections vs. local general revenue collections by source, FY 2013

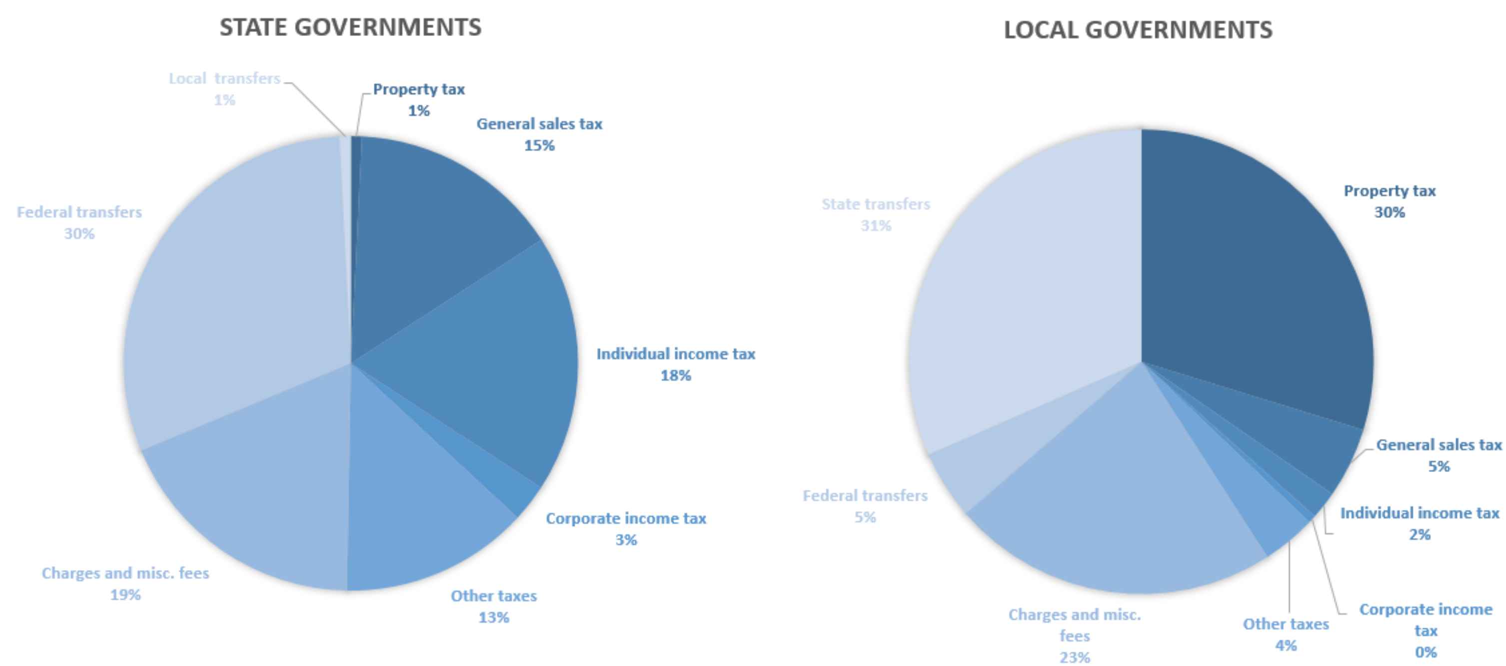


Figure 2: Average first-dollar tax price facing residents in U.S. counties by quartile of average total income

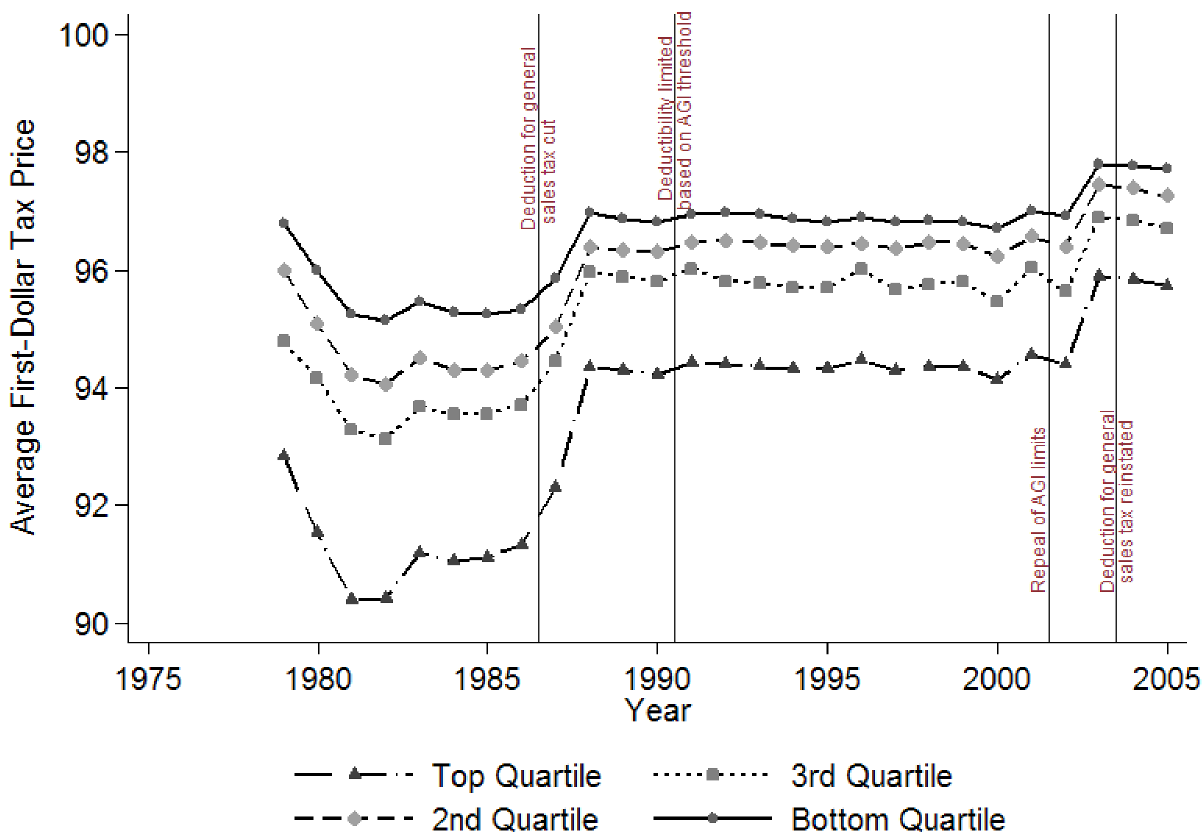
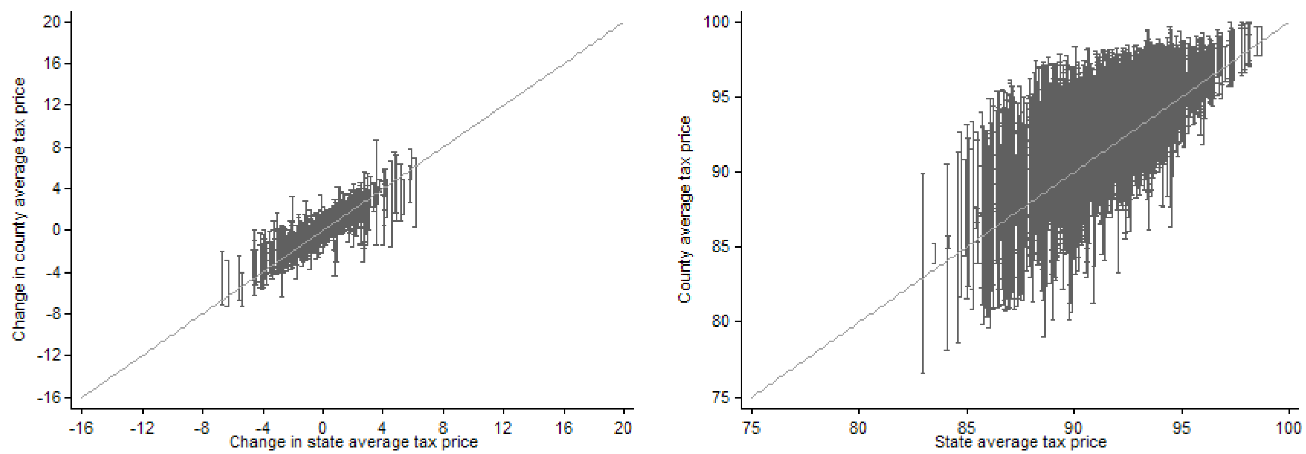


Figure 3: Relationship between county average tax prices and state average tax price

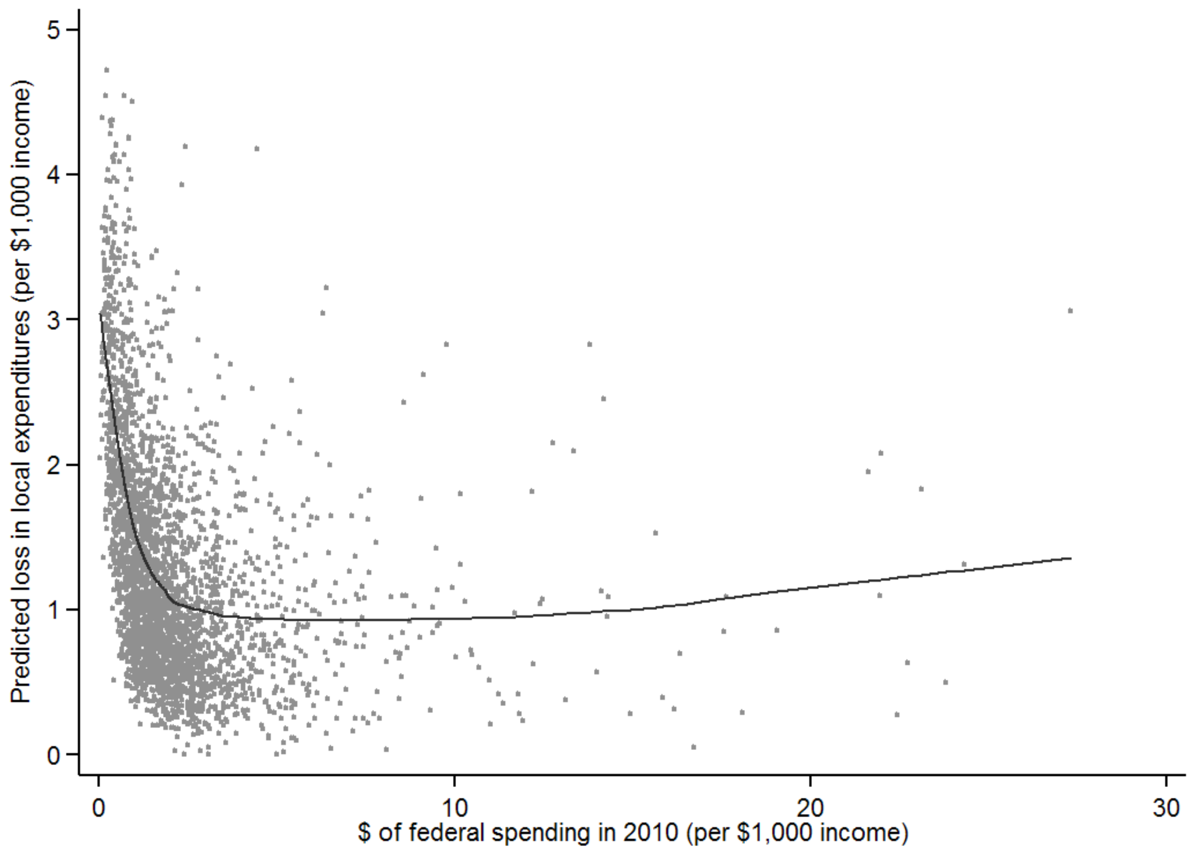


(a) Changes

(b) Levels

Notes: Vertical bars represent the 5th to 95th percentile of county average tax prices (changes) for an observed state average tax price (change). A 45 degree line is included for reference only, and indicates where a county average tax price (change) is equal to a state average tax price (change).

Figure 4: Federal transfers vs. predicted loss in spending following a complete cut in state and local tax deductibility in U.S. counties (including a LOWESS curve)



Online Appendix

Data Appendix

This appendix describes, in detail, the steps taken to build the local data used for analysis.

Data downloads

1. Data from the following samples are downloaded from IPUMS website:

   - 1970 Census 1% metro fm1
   - 1980 Census 1% metro
   - 1990 Census 1%
   - 2000 Census 1%
   - 2008-2012 5-yr ACS

   These data include county information for observations from counties with more than 100,000 residents, but county is otherwise masked. However, the data do provide some geographic information, including 1970 and 1980 county groups and 1990, 2000, and 2010 PUMAs.[31]

2. City- and county-level government finance data are downloaded via the Census Bureau's FTP page (located by navigating to /pub/outgoing/govs/special60/).

3. County-level income distribution data for 1980, 1990, 2000, and 2010 are downloaded from the USA Counties database. These data provide the total number of households with income within each of several income bins. There are 10 income bins in 1980, 15 bins in 1990, and 16 bins in 2000 and 2010. The top-coding for 1980 was at $75,000. This upper bound doubles to $150,000 in 1990 and rises again to $200,000 for 2000 and 2010. Because no data are available for 1970, I assume the income distribution in 1970 is equal to the income distribution in 1980 for each county.

Assigning counties to observations

4. For any given year t, denote set M_t as the set of counties that are masked and J_t as the set of counties in a particular county group or PUMA. For each county group or PUMA J and year t, I generate a probability density function that assigns a household observation n from income bin b living in

[31] Maps and listings of which counties are included in each county group or PUMA is available on the IPUMS website.

group J to a county c for all counties such that $c \in J \cap M$ and income bins. The probability density function assigns conditional probability:

$$P_t(n \in c|b, J) = \frac{N_{bct}}{\sum\limits_{k \in J \cap M} N_{bkt}},$$

where N_{bct} is the number of households in county c in year t that earn an income within bin b.

5. Based on each masked observation's county group/PUMA, income, and year, I take independent draws from the created probability density function to assign each masked observation to a county.

6. For any county c that is unmasked in year t, I use the available county information.

Linear interpolation between Census years

7. The data are cleaned using the following steps to prepare them for the NBER TAXSIM program.

   - Wages are replaced by wages, business income, and farm income for observations between 1960 and 2000, and wages and business income for observations from 2000 and later for all self-employed workers.
   - Dependents are set to equal the number of children living in the household.
   - The number of dependents under age 17 (for child credit) was set to the number of children if the oldest child was under age 17, 0 if the youngest child was over 17, and estimated at half the number of children (rounded) if the youngest child was under 17 and the oldest was over 17.
   - Secondary wage earner wages are set to equal total family income less total personal income.
   - Dividends are set to equal investment income.
   - Other property income is set to equal other income.
   - Pensions are set to equal retirement income.
   - Transfers are set to equal welfare receipts and supplementary security income.
   - Rent paid (for property tax rebates) is set to equal gross rent paid.
   - Mortgage interest payments are set to equal $3/5$ of total mortgage payments for those observations for which property taxes are not included in the total mortgage payments. For those which do have property taxes included, I assign 19 percent of total mortgage payments

to property tax, and 3/5 of 81 percent of total mortgage payments to mortgage interest payments.[32]

- For the 2008-2012 5-year ACS data, I convert all dollar figures to 2010 dollars to maintain consistency across the 5 year sample period.

8. Because IPUMS does not provide a panel, I assign a county decile to each observation based on total family income for every county in a given year. For each ten year period, I generate total family income and house value growth rates for each county decile. I then allow family income and house value for each observation in a given decile to grow linearly between Census years according to the decile-estimated growth rate.

9. For other variables, including mortgage payments, property tax payments, rent paid, transfers, GSSI receipts, pensions, other property income, dividends, secondary earner wages, primary earner wages, and personal income, I measure the ratio of the variable to total family income in each Census year at the county decile level. Then I allow the *ratio* to grow linearly between Census years, and multiply the interpolated ratio by the interpolated total family income value for each non-Census year for each observation.

10. I hold most demographic variables constant across non-Census years, including number of dependents (and dependents under 17), marital status, employment status, homeownership, sex, education, birthplace, and race. I also hold age constant for tax purposes (so as not to overestimate the elderly population and underestimate the young population).

Generating tax prices

11. I run each observation through the NBER's TAXSIM program via Stata. I calculate tax prices based on overall earnings (option 'w' in Stata), and output the full intermediary calculations offered by the program. (Information on charitable contributions and medical expenses are imputed by state-AGI decile using the IPUMS public use files, because these deductions can be important to itemization status, but are not reported in the Census data.)

12. I define an itemizer variable equal to 1 if each taxpayer would optimally be an itemizer according to the TAXSIM output and 0 otherwise.

[32] The 3/5 proportion is chosen because it results in a nationwide itemization rate that closely resembles the true itemization rate. The 19 percent of mortgage payments attributed to property taxes is chosen based on the relative size of mortgage payments with taxes included and mortgage payments without taxes included. These values are held constant for the entire sample period.

13. For each observation, I set the tax price such that:

$$\text{Tax Price} = 1 - \mathbb{1}\{itemizer = 1\} * \tau_f,$$

where $\mathbb{1}\{\cdot\}$ is an indicator function and τ_f is the observation's federal marginal tax rate according to the TAXSIM output.

14. I then take the household data from the first year of analysis, 1980, and allow all income and spending components to grow only by inflation in each year, preserving the 1980 income distribution across 25 years. I run these data through TAXSIM and suppress state and local tax deductions, which is performed by setting the state variable to 0 for each observation in TAXSIM. This yields $\tilde{\tau}_f$, a federal marginal tax rate on the first dollar of deductible state and local tax.

15. I then generate a national probability of itemizing variable, $pitem$, given by the weighted mean of the itemizer indicator for each national decile of the AGI distribution in a given year.

16. I then define the first-dollar tax price as:

$$fdtp = 1 - pitem * \tilde{\tau}_f.$$

Appendix Tables

Table A1: Percent of tax returns claiming deduction for state and local taxes paid by state, 2012

State	Percent	State	Percent
United States	31.6	Missouri	28.7
Alabama	28.4	Montana	29.9
Alaska	24.3	Nebraska	29.6
Arizona	30.9	Nevada	26.9
Arkansas	24.2	New Hampshire	33.9
California	35.0	New Jersey	42.4
Colorado	35.4	New Mexico	24.6
Connecticut	42.8	New York	35.6
Delaware	34.1	North Carolina	33.0
District Of Columbia	40.1	North Dakota	19.9
Florida	24.7	Ohio	29.3
Georgia	34.4	Oklahoma	25.6
Hawaii	30.6	Oregon	37.8
Idaho	30.4	Pennsylvania	30.4
Illinois	34.3	Rhode Island	34.8
Indiana	25.4	South Carolina	29.1
Iowa	31.0	South Dakota	18.6
Kansas	29.8	Tennessee	22.6
Kentucky	28.1	Texas	24.3
Louisiana	24.0	Utah	37.4
Maine	29.9	Vermont	28.8
Maryland	46.8	Virginia	38.9
Massachusetts	38.4	Washington	33.1
Michigan	29.0	West Virginia	18.3
Minnesota	37.7	Wisconsin	34.6
Mississippi	24.1	Wyoming	22.3

Source: IRS Statistics of Income

Table A2: Full Regression Results - Local fiscal outcomes

Panel A: Dependent Variable - Deductible Taxes per $1,000 Personal Income

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	0.0479	0.0512	-0.748***	-0.718***	-0.382***	-0.247**
	(0.0295)	(0.0316)	(0.139)	(0.133)	(0.141)	(0.105)
tpXnoYtax	-0.0441	-0.0441	0.405	0.382	0.406	0.0534
	(0.0743)	(0.0744)	(0.289)	(0.289)	(0.295)	(0.113)
tpXnoYtaxX_86to04	-0.00398*	-0.00405*	-0.00527	-0.00502	-0.00996	-0.00683
	(0.00230)	(0.00231)	(0.00815)	(0.00820)	(0.00807)	(0.00501)
AGI25	-0.0287*	-0.0263	-0.135***	-0.118***	-0.104***	-0.068***
	(0.0163)	(0.0163)	(0.0244)	(0.0223)	(0.0203)	(0.0181)
AGI50	-0.0307	-0.0277	-0.179***	-0.160***	-0.0871***	-0.0743***
	(0.0201)	(0.0201)	(0.0274)	(0.0249)	(0.0327)	(0.0273)
AGI100	0.00158	0.00352	-0.155***	-0.136***	-0.0490	-0.127***
	(0.0255)	(0.0266)	(0.0376)	(0.0361)	(0.0348)	(0.0288)
AGIvar	-0**		-0			
	(0)		(0)			
AGIskew	0.0682		0.0711			
	(0.0526)		(0.0547)			
divshare	0.00165		-0.00124			
	(0.00452)		(0.00548)			
married	0.0133		0.0617***			
	(0.0183)		(0.0218)			
age18	-0.0216	-0.0222	0.0173	0.0185	0.0352	-0.0113
	(0.0337)	(0.0339)	(0.0363)	(0.0366)	(0.0383)	(0.0311)
age65	-0.0205	-0.0177	0.0668	0.0735	0.0906**	0.0361
	(0.0464)	(0.0459)	(0.0460)	(0.0458)	(0.0389)	(0.0402)
urate	-0.0197	-0.0208	0.0142	0.0129	-0.0308	-0.0276
	(0.0245)	(0.0247)	(0.0239)	(0.0240)	(0.0205)	(0.0175)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.869	0.869	0.860	0.860	0.867	0.887

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Dependent Variable - Non-deductible Revenues per $1,000 Personal Income						
	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	-0.0767	-0.0818	0.334*	0.317*	0.223	-0.0752
	(0.0516)	(0.0505)	(0.195)	(0.192)	(0.186)	(0.163)
tpXnoYtax	-0.0788	-0.0772	-0.858**	-0.842**	-0.800**	0.0307
	(0.0858)	(0.0858)	(0.373)	(0.376)	(0.369)	(0.152)
tpXnoYtaxX_86to04	-0.0085***	-0.008***	0.00889	0.00871	0.00879	-0.00384
	(0.00282)	(0.00282)	(0.00902)	(0.00910)	(0.00845)	(0.00469)
AGI25	-0.00294	-0.00750	0.0400	0.0293	0.0213	0.00516
	(0.0241)	(0.0234)	(0.0318)	(0.0302)	(0.0298)	(0.0289)
AGI50	-0.0702**	-0.0751***	-0.00400	-0.0156	-0.0265	-0.0739*
	(0.0309)	(0.0290)	(0.0493)	(0.0462)	(0.0383)	(0.0391)
AGI100	-0.0190	-0.0249	0.0451	0.0316	0.0168	-0.0591
	(0.0325)	(0.0329)	(0.0526)	(0.0510)	(0.0528)	(0.0478)
AGIvar	-0		-0			
	(0)		(0)			
AGIskew	-0.0297		-0.0294			
	(0.0665)		(0.0671)			
divshare	-0.00848		-0.00909			
	(0.00883)		(0.00880)			
married	-0.0196		-0.0397			
	(0.0263)		(0.0269)			
age18	0.0215	0.0211	0.00518	0.00405	0.0156	-0.0543
	(0.0540)	(0.0539)	(0.0570)	(0.0570)	(0.0557)	(0.0514)
age65	0.0223	0.0175	-0.00931	-0.0161	0.0371	0.0418
	(0.0617)	(0.0615)	(0.0641)	(0.0640)	(0.0637)	(0.0617)
urate	0.0530	0.0538	0.0432	0.0441	0.0528	0.0572
	(0.0362)	(0.0361)	(0.0361)	(0.0361)	(0.0380)	(0.0354)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.744	0.744	0.742	0.742	0.743	0.750

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Panel C: Dependent Variable - Own-source Revenues per $1,000 Personal Income						
	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	-0.0288	-0.0306	-0.414*	-0.401*	-0.159	-0.322
	(0.0618)	(0.0621)	(0.241)	(0.236)	(0.230)	(0.199)
tpXnoYtax	-0.123	-0.121	-0.453	-0.459	-0.394	0.0841
	(0.116)	(0.116)	(0.491)	(0.493)	(0.493)	(0.217)
tpXnoYtaxX_86to04	-0.0125***	-0.0125***	0.00361	0.00369	-0.00118	-0.0107
	(0.00364)	(0.00364)	(0.0124)	(0.0125)	(0.0120)	(0.00701)
AGI25	-0.0316	-0.0338	-0.0950**	-0.0889**	-0.0827**	-0.0626*
	(0.0290)	(0.0290)	(0.0401)	(0.0381)	(0.0356)	(0.0342)
AGI50	-0.101***	-0.103***	-0.183***	-0.176***	-0.114**	-0.148***
	(0.0387)	(0.0365)	(0.0574)	(0.0534)	(0.0505)	(0.0491)
AGI100	-0.0174	-0.0214	-0.110	-0.104	-0.0322	-0.187***
	(0.0488)	(0.0508)	(0.0717)	(0.0706)	(0.0677)	(0.0595)
AGIvar	-0**		-0*			
	(0)		(0)			
AGIskew	0.0386		0.0417			
	(0.0887)		(0.0894)			
divshare	-0.00683		-0.0103			
	(0.0116)		(0.0121)			
married	-0.00630		0.0220			
	(0.0332)		(0.0352)			
age18	-4.86e-05	-0.00107	0.0225	0.0225	0.0508	-0.0655
	(0.0685)	(0.0685)	(0.0721)	(0.0723)	(0.0709)	(0.0642)
age65	0.00180	-0.000223	0.0575	0.0574	0.128*	0.0779
	(0.0789)	(0.0784)	(0.0804)	(0.0800)	(0.0747)	(0.0717)
urate	0.0333	0.0329	0.0574	0.0570	0.0220	0.0296
	(0.0425)	(0.0427)	(0.0418)	(0.0420)	(0.0442)	(0.0389)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.817	0.817	0.816	0.816	0.817	0.827

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Panel D: Dependent Variable - Transfers from Federal Sources per $1,000 Personal Income						
	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	0.00269	0.00350	-0.0302**	-0.0293**	-0.0276**	-0.0222**
	(0.00311)	(0.00311)	(0.0137)	(0.0135)	(0.0119)	(0.0102)
tpXnoYtax	0.00220	0.00204	0.0140	0.0119	0.00332	-0.00808
	(0.00450)	(0.00450)	(0.0168)	(0.0167)	(0.0171)	(0.0120)
tpXnoYtaxX_86to04	-0.000181	-0.000178	-4.39e-05	1.53e-05	2.41e-06	0.000289
	(0.000307)	(0.000307)	(0.000492)	(0.000492)	(0.000528)	(0.000509)
AGI25	0.0108***	0.0118***	0.00629***	0.00769***	0.00746***	0.00787***
	(0.00155)	(0.00159)	(0.00237)	(0.00227)	(0.00187)	(0.00195)
AGI50	0.00173	0.00257	-0.00452	-0.00321	-0.00483*	-0.00303
	(0.00226)	(0.00220)	(0.00316)	(0.00299)	(0.00255)	(0.00267)
AGI100	-0.00216	-0.00100	-0.0088**	-0.00717*	-0.00480	-0.00310
	(0.00259)	(0.00275)	(0.00440)	(0.00431)	(0.00374)	(0.00334)
AGIvar	0**		0***			
	(0)		(0)			
AGIskew	-0.0115***		-0.0114***			
	(0.00389)		(0.00391)			
divshare	-0.000370		-0.00052*			
	(0.000243)		(0.000278)			
married	0.00264***		0.00470***			
	(0.000942)		(0.00112)			
age18	-0.00510**	-0.0048**	-0.0034*	-0.0030	-0.00060	0.0027
	(0.00202)	(0.00204)	(0.00207)	(0.00210)	(0.00241)	(0.00268)
age65	0.00450	0.00452	0.00829**	0.00862**	0.0139***	0.0134***
	(0.00316)	(0.00314)	(0.00370)	(0.00372)	(0.00441)	(0.00474)
urate	0.00335**	0.00361**	0.00488***	0.00520***	0.00531***	0.00426***
	(0.00169)	(0.00167)	(0.00183)	(0.00182)	(0.00166)	(0.00147)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.916	0.916	0.915	0.915	0.916	0.918

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Panel E: Dependent Variable - Transfers from State Sources per $1,000 Personal Income						
	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	-0.060***	-0.0485**	-0.145	-0.132	-0.165	-0.212**
	(0.0192)	(0.0212)	(0.119)	(0.112)	(0.113)	(0.0852)
tpXnoYtax	-0.00691	-0.00915	-0.199*	-0.219**	-0.226	-0.145***
	(0.0341)	(0.0343)	(0.114)	(0.111)	(0.155)	(0.0475)
tpXnoYtaxX_86to04	-0.0037***	-0.0037***	0.00349	0.00399	0.00451	0.00437**
	(0.00107)	(0.00105)	(0.00282)	(0.00284)	(0.00331)	(0.00187)
AGI25	-0.069***	-0.0571***	-0.086***	-0.0721***	-0.0772***	-0.080***
	(0.0144)	(0.0109)	(0.0262)	(0.0202)	(0.0193)	(0.0144)
AGI50	-0.106***	-0.0939***	-0.126***	-0.112***	-0.105***	-0.121***
	(0.0209)	(0.0167)	(0.0370)	(0.0306)	(0.0293)	(0.0212)
AGI100	-0.111***	-0.0959***	-0.135***	-0.118***	-0.128***	-0.177***
	(0.0273)	(0.0242)	(0.0443)	(0.0381)	(0.0346)	(0.0289)
AGIvar	-0		-0			
	(0)		(0)			
AGIskew	-0.0737*		-0.0727*			
	(0.0400)		(0.0401)			
divshare	0.00142		0.000184			
	(0.00255)		(0.00274)			
married	0.0408*		0.0481*			
	(0.0222)		(0.0273)			
age18	0.0438	0.0467	0.0496	0.0530	0.0612**	0.0208
	(0.0431)	(0.0424)	(0.0393)	(0.0385)	(0.0261)	(0.0235)
age65	0.115***	0.119***	0.130***	0.135***	0.142***	0.0854*
	(0.0318)	(0.0315)	(0.0333)	(0.0338)	(0.0398)	(0.0448)
urate	-0.0176	-0.0157	-0.0106	-0.00831	-0.00131	-0.0509**
	(0.0263)	(0.0259)	(0.0229)	(0.0225)	(0.0237)	(0.0235)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.808	0.808	0.808	0.808	0.808	0.821

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Panel F: Dependent Variable - Total Expenditures per $1,000 Personal Income						
	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV	(6) IV
taxprice	-0.0911*	-0.0728	-0.441*	-0.409	-0.308	-0.445**
	(0.0541)	(0.0571)	(0.255)	(0.248)	(0.246)	(0.206)
tpXnoYtax	-0.0761	-0.0787	-0.780**	-0.817**	-0.780**	-0.174
	(0.0945)	(0.0947)	(0.340)	(0.340)	(0.372)	(0.155)
tpXnoYtaxX_86to04	-0.0188***	-0.0189***	0.00807	0.00889	0.00639	-0.00148
	(0.00331)	(0.00330)	(0.00896)	(0.00905)	(0.00914)	(0.00588)
AGI25	-0.145***	-0.127***	-0.212***	-0.185***	-0.183***	-0.149***
	(0.0290)	(0.0262)	(0.0479)	(0.0421)	(0.0386)	(0.0354)
AGI50	-0.218***	-0.200***	-0.300***	-0.273***	-0.240***	-0.268***
	(0.0434)	(0.0387)	(0.0641)	(0.0568)	(0.0580)	(0.0520)
AGI100	-0.186***	-0.165**	-0.283***	-0.252***	-0.227***	-0.388***
	(0.0640)	(0.0646)	(0.0908)	(0.0871)	(0.0788)	(0.0615)
AGIvar	-0		-0			
	(0)		(0)			
AGIskew	-0.0706		-0.0664			
	(0.0944)		(0.0956)			
divshare	-0.00330		-0.00804			
	(0.00830)		(0.00867)			
married	0.0640		0.0934**			
	(0.0411)		(0.0454)			
age18	0.0424	0.0462	0.0657	0.0708	0.110	-0.00710
	(0.0816)	(0.0812)	(0.0813)	(0.0811)	(0.0752)	(0.0694)
age65	0.0989	0.104	0.159*	0.167*	0.210**	0.129
	(0.0836)	(0.0830)	(0.0908)	(0.0909)	(0.0936)	(0.0928)
urate	0.0477	0.0501	0.0753	0.0782*	0.0598	0.0167
	(0.0468)	(0.0466)	(0.0464)	(0.0463)	(0.0466)	(0.0443)
Initial condition trend					✓	✓
State-specific trends						✓
Observations	59,347	59,347	59,347	59,347	59,347	59,347
R^2	0.870	0.870	0.869	0.869	0.870	0.881

Notes: All models include county and year fixed effects. Initial condition trend variables include a linear time trend interacted with initial values of tax price and initial values of basic control variables (measured in 1979). County-clustered standard errors are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table A3: Coefficients on Tax Price variables excluding all counties that ever have fewer than 5,000 population

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expenditures
Tax price	-0.202***	-0.146	-0.348*	-0.0264**	-0.275***	-0.555***
	(0.0731)	(0.171)	(0.191)	(0.0114)	(0.0773)	(0.208)
TP × no Y tax	-0.0809	-0.0585	-0.139	-0.00602	-0.131***	-0.187
	(0.0638)	(0.179)	(0.214)	(0.0138)	(0.0483)	(0.147)
TP × no Y tax × 1987-2003	0.0006	-0.0016	-0.0009	0.0002	0.0061***	0.0036
	(0.00188)	(0.00492)	(0.00553)	(0.000593)	(0.00156)	(0.00567)
Basic controls	✓	✓	✓	✓	✓	✓
Initial condition trend	✓	✓	✓	✓	✓	✓
State-specific trends	✓	✓	✓	✓	✓	✓
Observations	54,420	54,420	54,420	54,420	54,420	54,420

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects. County-clustered standard errors are in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A4: Coefficients on Tax Price variables for alternative model specifications

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expend-itures
			A. Income-scaled model			
Tax price	-0.247**	-0.0752	-0.322	-0.0222**	-0.212**	-0.445**
	(0.105)	(0.163)	(0.199)	(0.0102)	(0.0852)	(0.206)
TP × no Y tax	0.0534	0.0307	0.0841	-0.00808	-0.145***	-0.174
	(0.113)	(0.152)	(0.217)	(0.0120)	(0.0475)	(0.155)
TP × no Y tax × 1987-2003	-0.00683	-0.00384	-0.0107	0.000289	0.00437**	-0.00148
	(0.00501)	(0.00469)	(0.00701)	(0.000509)	(0.00187)	(0.00588)
			B. log-log model			
Tax price	-2.852***	0.179	-1.978**	6.200	0.0652	-1.676**
	(0.680)	(1.378)	(0.789)	(5.588)	(1.018)	(0.672)
TP × no Y tax	-0.00494	0.0119	0.00166	0.0572	-0.059***	-0.019***
	(0.00787)	(0.0132)	(0.00841)	(0.0368)	(0.0151)	(0.00653)
TP × no Y tax × 1987-2003	0.0002	-0.0006	0.0000	-0.0029*	0.0019***	0.0006***
	(0.000233)	(0.00046)	(0.00027)	(0.00153)	(0.00049)	(0.00022)
			C. log per capita model			
Tax price	-2.755***	0.300	-1.848**	6.547	0.291	-1.509**
	(0.654)	(1.366)	(0.771)	(6.061)	(1.027)	(0.660)
TP × no Y tax	-0.00285	0.0142	0.00435	0.0597	-0.054***	-0.0151**
	(0.00748)	(0.0130)	(0.00808)	(0.0370)	(0.0149)	(0.00615)
TP × no Y tax × 1987-2003	0.0001	-0.0007	-0.0000	-0.0030*	0.0016***	0.0004*
	(0.00023)	(0.00045)	(0.00026)	(0.00163)	(0.00049)	(0.00022)
Basic controls	✓	✓	✓	✓	✓	✓
Initial condition trend	✓	✓	✓	✓	✓	✓
State-specific trends	✓	✓	✓	✓	✓	✓

Notes: Personal income is explicitly controlled for in both the log-log and log per capita specifications. All models use an IV specification and include county and year fixed effects. County-clustered standard errors are in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A5: Coefficients on Tax Price variables when evaluated at different moments of tax price distribution

	(1) Deductible Taxes	(2) Non-deductible Revenues	(3) Own-Source Revenues	(4) Federal Transfers	(5) State Transfers	(6) Total Expend-itures
			A. County average tax price			
Tax price	-0.247**	-0.0752	-0.322	-0.0222**	-0.212**	-0.445**
	(0.105)	(0.163)	(0.199)	(0.0102)	(0.0852)	(0.206)
TP × no Y tax	0.0534	0.0307	0.0841	-0.00808	-0.145***	-0.174
	(0.113)	(0.152)	(0.217)	(0.0120)	(0.0475)	(0.155)
TP × no Y tax × 1987-2003	-0.00683	-0.00384	-0.0107	0.000289	0.00437**	-0.00148
	(0.00501)	(0.00469)	(0.00701)	(0.000509)	(0.00187)	(0.00588)
			B. County median tax price			
Tax price	-0.121***	-0.0470	-0.168**	-0.0088*	-0.0611*	-0.170**
	(0.0448)	(0.0639)	(0.0791)	(0.00453)	(0.0335)	(0.0836)
TP × no Y tax	0.143	0.00471	0.148	-0.0401	-0.619**	-0.910
	(0.469)	(0.661)	(0.920)	(0.0519)	(0.275)	(0.692)
TP × no Y tax × 1987-2003	-0.009**	-0.0039	-0.013***	-0.0000	0.00049	-0.0077*
	(0.00388)	(0.00333)	(0.00479)	(0.000389)	(0.00137)	(0.00413)
			C. County 25th percentile tax price			
Tax price	-0.172***	-0.0720	-0.244*	-0.0150**	-0.123***	-0.308**
	(0.0652)	(0.103)	(0.129)	(0.00618)	(0.0467)	(0.125)
TP × no Y tax	-0.0293	0.128**	0.0988	-0.0137**	-0.0660	-0.0726
	(0.0412)	(0.0513)	(0.0661)	(0.00547)	(0.0589)	(0.103)
TP × no Y tax × 1987-2003	0.0026	0.0028	0.0054	0.0008***	0.0067***	0.0078
	(0.00181)	(0.00386)	(0.00396)	(0.000233)	(0.00224)	(0.00511)
Basic controls	✓	✓	✓	✓	✓	✓
Initial condition trend	✓	✓	✓	✓	✓	✓
State-specific trends	✓	✓	✓	✓	✓	✓

Notes: Dependent variables are scaled per $1,000 personal income. All models use an IV specification and include county and year fixed effects. County-clustered standard errors are in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$