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# School Finance Reform and the Progressivity of State Taxes

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## Abstract

One of the most important exogenous shocks to state government finances over the last 40 years has been court-ordered school finance reform (SFR). Previous studies have found that state expenditures on education becamemore redistributive in states with SFR. Theory would seem to indicate that this shock to the distribution of state expenditures across income groups should lead to a change in the redistributive nature of state tax systems. We investigate whether states subject to SFR altered their tax systems to be more or less progressive. We find that SFR is associated with an increase in the progressivity of individual income taxes but no change in the progressivity of general sales taxes



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# 1 Introduction

One of the most important exogenous shocks to state government finances over the last 40 years has been court-ordered school finance reform. Murray, Evans and Schwab (1998) document no fewer than 90 suits brought forth in 43 states from 1971 to 1996. They and other authors have examined the effect of these court cases on the distribution of spending across school districts and on revenues and non-education spending of state and local governments.[1] These earlier studies conclude that court-ordered school finance reform has significantly altered the distribution of state expenditures on K-12 education, making state aid more redistributive.

As state spending becomes more redistributive, state governments might choose to alter the distribution of their revenues as well, but in what direction? One theory that might shed light on this question is the Tiebout model (Tiebout, 1956). A key assumption of the Tiebout model is that there are numerous jurisdictions offering a wide array of tax-expenditure packages. In a Tiebout world, jurisdictions compete with one another for residents and the result is that tax prices for public goods and services are competed down to where the taxes paid equal the benefits of the goods and services provided, i.e., jurisdictions practice benefit taxation. If one set of resident taxpayers benefits more than another set from a shock to expenditures, we would expect to see a commensurate change in taxes that keeps benefits in line with taxes, else the state would expect to lose residents to other states.

As states try to align benefits with taxes, a shock, such as school finance reform, that causes a change in the distribution of state expenditures should also cause a change in the distribution of state taxes. As noted above, others have documented that school finance reform results in a more progressive distribution of state expenditures on education, i.e., more generous state aid to poorer school districts. In response, states might make their tax systems less progressive, in order to compensate residents living in richer school districts for their losses in state aid.

[1] In addition to Murray, Evans, and Schwab (1998), see Card and Payne (2002) and Baicker and Gordon (2006).

Alternatively, they might make their tax systems more progressive, if the more redistributive state aid results in an improvement in schools in the poorer districts and there are spillover benefits to households living in the richer districts. In any event, a significant shock to the distribution of state expenditures should result in a corresponding change in the distribution of state revenues.

Optimal tax theory may also shed light on our question. Mirrlees (1971) suggests that state governments may respond to the exogenous shock in expenditures (transfers) by adjusting the distribution of both taxes and transfers to return to the optimal degree of progressivity. Baicker and Gordon (2006) find that states adjust the distribution of expenditures on other goods and services in response to school finance reform. The focus of our paper is to examine the nature of the changes in the distribution of state tax revenues in response to an equalizing change in state expenditures brought about by school finance reform.[2]

# 2 Method

Our entities of interest are state governments, as opposed to the combined state and local sector. We have several reasons for this focus. First, by focusing on state-government-only revenues we are able to examine the taxing behavior of a political entity (a taxing jurisdiction). Since a state has only limited influence over the decisions of its local governments, it is difficult for a state to control the tax liabilities arising from the combined state and local sector. Related, while school finance reform has large implications for local school districts, it is the state government – not the combined state and local sector – that is responsible for responding to state supreme court decisions. Second, while it would be interesting to examine the implications of school finance reform for property taxes, the level and progressivity of property taxes result from decisions by both the state and its local governments. The state can set limits and requirements affecting the property tax in general, but each local taxing jurisdiction ultimately determines the tax. Even in

[2]The school finance reforms of the last 40 years occurred during a period when the federal tax structure was becoming substantially less progressive (Piketty and Saez (2007)).

California, where the constitution limits the local property tax rate to one percent statewide, local governments have devised means of subverting the constraint.[3] Third, because they are local taxes, effective property tax rates vary from one local jurisdiction to the next within the same state and can change from year to year. Thus, even if we wanted to examine the implications of statewide school finance reform on local property taxes, changes in average property taxes are not the result of state policy decisions but instead reflect the independent decisions of thousands of local governments.

States rely on a multitude of different revenue sources, but they raise nearly 50 percent of total general own-source revenues from two sources: the general sales tax and the individual income tax. In 2007, in aggregate in the U.S., states raised 23 percent of own-source revenues from the general sales tax and 26 percent from the individual income tax.[4] We focus our attention on changes in the progressivity of these two revenue sources, in part because they represent the lion's share of state revenues, in part because it is relatively straightforward to calculate average tax rates for these two taxes, and in part because the other revenue sources employed by the states are numerous and individually contribute very small shares to total own-source revenues.

Our proposed approach to address the question of the tax progressivity implications of an equalizing shock to the distribution of state expenditures relies heavily on the idea that court-ordered school finance reform is an exogenous shock to the distribution of state expenditures, rendering state expenditures more progressive (pro-poor). This statement has several ideas that require documentation. First, when a state is ordered by the court to reform its school finance system, its primary tool is state aid to local school districts. Because state aid to schools comprises a large share of state expenditures (16% of total state expenditures in the 48 continental states in 2007, which is down from 21% in 1980), state expenditures overall become more pro-poor when state aid to schools becomes more equalizing.

[3] See Brunner and Sonstelie (2003) who analyze the phenomenon of voluntary contributions by parents to their public schools.

[4] These shares were nearly exactly switched in 1980 with the general sales tax contributing 26 percent and the individual income tax contributing 22 percent of total own-source revenue in that year.

Several authors, including Card and Payne (2002) and Murray, Evans, and Schwab (1998), have documented that court-ordered school finance reforms do indeed make state spending on education (state aid) more equalizing. For example, Murray, Evans and Schwab examine four different measures of inequality in spending across school districts in a state and find that, in each case, inequality declines after a state's education financing system is overturned in a court decision. Card and Payne find that state support per student became more equalizing (i.e., became more negatively associated with district family income) over the 1980s and that the shift was most pronounced in those states whose systems were declared unconstitutional. Further, they conclude that "equalization of spending leads to a narrowing of test score outcomes across family background groups" (page 49), thus providing evidence that equalization has real effects on outcomes for poorer families.

Finally, we follow Card and Payne (2002) and Baicker and Gordon (2006) in arguing that court-ordered school finance reforms can be taken as exogenous to state fiscal decisions. Baicker and Gordon estimate a regression of court-ordered school finance reforms on a set of variables characterizing provisions in states' constitutions and state demographic variables and conclude that their results corroborate "the findings of previous research that SFEs [school finance equalizations] are largely unpredictable." (page 1522)

# 3 Institutional setting

In Table 1 we list 19 states where, according to our sources (listed in the notes to the table), the state supreme court overturned the school finance system at least once between 1980 and 2007. The 19 states represent every region in the country and the timing of the decisions varies over our 27 year period. We use this cross-state and cross-time variation in our empirical strategy.

Table 2 displays figures on state intergovernmental expenditures for education (essentially, state aid to school districts for K-12 education) in the years 1980, 1992, 2000 and 2007. The first

row displays figures for the 48 continental states. In per-capita terms, state aid to school districts increased steadily over the period. State aid to school districts as a share of total state general expenditures bounced between 15 and 19 percent. As a share of local expenditures on education, state aid represented between 60 and 67 percent, depending on the year.

In the remaining rows we examine the same variables for four subsets of the 48 states: the states that experienced their first (in the period of our study) court-ordered school finance reform (SFR) between 1982 and 1992; the states that experienced their first SFR between 1993 and 2000; the states that experienced their first SFR between 2001 and 2007; and the states that did not experience SFR during the period of our study. Looking across the rows one can see that trends in the variables vary across the groups of states defined by their SFR status. For example, state education spending per capita increased by 56 percent (from $541 to $844) between 1980 and 1992 for the eight states that experienced SFR in that decade, but increased by 41 percent or less for the three sets of states that did not experience SFR between 1980 and 1992. This finding that state education spending went up by more in states with SFR than in those without is also true for the 1992-2000 period, but it does not hold for the 2000-2007 period. Similar patterns can be seen for the other two variables displayed in the table.

These descriptive figures are suggestive of a relationship between school finance reform and increased state aid for education, findings reminiscent of Murray, Evans, and Schwab (1998) and Card and Payne (2002). In the remainder of the paper, we pursue our investigation of a possible effect of school finance reform on the progressivity of state individual income taxes and state general sales taxes.

# 4 Data and variable construction

We begin by calculating average tax rates of households of varying incomes for both the individual income tax and the general sales tax. We use these average tax rates to measure the degree of

progressivity of each tax.

Average tax rates and therefore progressivity will vary across states at any one time because of (1) differences in the states' tax structures (i.e., tax rates, exemptions, deductions, credits) and (2) differences in taxpayers' attributes (e.g., children, non-wage income, owning vs. renting).[5] Taxpayer attributes include both income and non-income determinants of tax liability. For example, two households with identical incomes facing the same income tax rates and tax base definition may have different tax liabilities and thus different average tax rates if one household has dependent children and the other does not. Households with identical total expenditures facing identical sales tax rates and sales tax base definitions can have different average general sales tax rates if one household devotes a larger share of its expenditure to non-taxable goods and services. Thus, cross-state differences in taxpayer attributes can cause two states with identical tax rates and tax base definitions to have different distributions of average tax rates and thus different degrees of tax progressivity.

Average tax rates and progressivity will differ within a given state over time for two reasons: (1) changes in the state's tax structure over time, and (2) changes in the underlying economy and taxpayer attributes, importantly, changes in the income distribution and consumption patterns over time. Changes in the tax structure have a straightforward link to changes in progressivity; the link between changes in the distribution of taxpayer attributes and progressivity is a bit more indirect. A few illustrations are helpful. If the income distribution shifts right (and the state does not adjust its standard deduction and tax-rate brackets), a state's income tax system will become less progressive. Similarly, assuming households with higher incomes spend more on services, the shift over time in consumption from goods to services will cause the sales tax to become less progressive in those states that do not tax services under the sales tax. In essence, the inertia of tax structures in the face of underlying changes over time in the economy can be as significant a policy choice as an increase or decrease in tax rates or tax base exemptions.

[5] See Hayes, Lambert, and Slottje (1995) on the importance of taxpayer attributes in measuring progressivity.

We employ data on the national distribution, rather than state distributions, of taxpayer attributes in measuring the degree of progressivity of each state's income and sales taxes. Using the national distribution ensures that measured cross-state variation in tax progressivity is caused by cross-state variation in tax structure rather than differences in the states' underlying economies.

We measure the degree of progressivity of states' individual income tax and general sales tax at four points in time: 1980, 1992, 2000, and 2007. We selected these four years because of data availability and the desire to examine long differences in tax progressivity. We prefer to examine long differences in progressivity because annual differences in tax progressivity are small and noisy, making identification of small effects difficult. Longer differences in progressivity tend to be larger and reflect purposeful action or inaction on the part of state government.[6]

## 4.1 Individual income tax liabilities

Our national measure of taxpayer attributes for the state individual income tax is derived from the 1980, 1992, 2000, and 2007 Current Population Survey (CPS), March Supplements. The CPS provides a nationally representative sample of the national population and an estimate of the U.S. income distribution.[7] We use NBER's State TAXSIM program to simulate each household's state individual income tax liability in every state. For each household we calculate 164 (= 4 years x 41 states within individual income taxes) different (non-zero) average income tax rates by dividing the generated TAXSIM state income tax liability by household income. To calculate income tax liability TAXSIM requires information on taxpayer attributes such as the number of children, owner or renter, marital status, and the composition of household income.[8]

Some of the taxpayer attributes requested by TAXSIM must be imputed as they are not available in the CPS. The CPS did not begin separately reporting necessary information such as divi-

[6]Prior research on the implications of school finance reform also uses long differences. See, for example, Baicker and Gordon (2006) and Card and Payne (2002).

[7]Our final estimating sample in each year exceeds 50,000 observations.

[8]For more information on TAXSIM see Feenberg and Coutts (1993).

dend income, capital gains income, and property taxes paid until 1992. The availability of more detailed income data is why we choose 1992 rather than 1990 for our long differences. Further, the CPS does not contain information on mortgage interest paid, child care expenditures or rent paid, all of which can affect state income tax liability. We use the Consumer Expenditure Survey (CES) Interview data to impute these values for CPS households. Details on our imputation methods are available in the appendix. Table 3 provides details on the average attributes of CPS households by income decile in 1980 and 2007.

## 4.2 General sales tax liabilities

Cross-state differences in general sales taxes are caused by differences in tax rates and the exclusion or inclusion of different types of expenditures in the sales tax base. We compiled data on states' definitions of sales tax bases and sales tax rates for 1980, 1992, 2000, and 2007. State differences in the exemption of food for home consumption and services from taxation drive most of the cross-state variation in tax base definitions. Although there have been few substantive changes in state taxation of services during the period 1980-2007, six states have elected to remove food for home consumption from the sales tax base.[9] In all, 35 states increased their general sales tax rate during the period.

We use another nationally representative survey, the Consumer Expenditure Survey Interview data, to measure taxpayer attributes for the state general sales tax for 1980, 1992, 2000, and 2007.[10] We use the CES to divide household expenditures into four mutually exclusive categories: core, food at home, taxable services, and non-taxable expenditures. Taxable services are a subset of all services in the CES that in the authors' judgement are typically taxed under state general sales taxes. Non-taxed expenditures are all categories within CES that the authors' judged as not generally being taxable under state general sales taxes. We assume core expendi-

[9] These six states are GA, NC, NE, NM, SC, and WY.

[10] Our final sample in each year includes over 3,000 observations.

tures are taxable in all states with a general sales tax. States differ in whether they include food at home and taxable services in their tax bases, and we assume that no states tax the category non-taxable expenditures. We define 22 states as taxing all expenditures on services in the category taxable services.[11] Since we have found no substantial changes in taxation of services, we assume that these 22 states tax services in all four years and that the remaining 22 states never tax services. In reality, there are substantive cross-state differences in which services are and are not taxed. Unfortunately, even if we described exactly the services that each state taxed, we would be unable to match these services to categories of expenditures in the CES. Thus, we rely on these four uniform categories to define state sales tax bases.

For all CES households we estimate their sales tax liability in every state and calculate 176 ($4 \times 44$) different (non-zero) average tax rates for each household. Sales tax liability for a particular state is estimated by multiplying a household's taxable expenditures in that state by that state's sales tax rate. In states where food is taxed at a lower rate, we multiply expenditures for food at home by the different tax rate. Table 4 provides details on the average attributes of CES households by income decile for 1980 and 2007. See the appendix for more details.

## 4.3 School finance reform

We create a binary variable to capture the timing of a court's overturning a state's school finance system. This variable, called school finance reform (SFR), takes on a value of 0 in the years before a court finds a state's system to be unconstitutional and a value of 1 for years after the state's system is overturned by the courts. So, for example, California first had its system overturned in 1971 and thus SFR equals 1 for California in all four years in our study (1980, 1992, 2000, and 2007). As another example, Texas first had its system overturned in 1989 and thus its SFR equals 0 in 1980 and 1 in 1992, 2000, and 2007.

[11] We define these states as taxing services: AR AZ CT FL IA KS LA MN MS NJ NM NY OH PA SD TN TX UT WA WI WV WY.

Our method of defining the SFR variable as turning on and staying on once a decision is handed down is identical to the school finance indicator variables used by Murray, Evans, and Schwab (1998) and Baicker and Gordon (2006). During the period 1980-2007, 13 of the 19 states with overturned systems had their systems over turned more than once. Like these other papers, our SFR variable uses only the first instance of the overturning of a school finance system.

A few of our SFR dates differ from the dates used most recently by Baicker and Gordon (2006). Our sources for SFR dates are the Educational Statistics for 1970-1999 and the National Access Network, Teachers College, Columbia University for 2000-2009. Table A.1 in the appendix describes the differences in SFR dates between our paper and Baicker and Gordon (2006). In only four states—NC, KS, NJ, RI—do these differences in dates result in substantive changes in the SFR variable.[12]

We use Figure 1 to examine the validity of our SFR dates. The figure shows per-capita state aid for education for eight states. Six of these states experienced a court-ordered school finance reform, whose date is represented by the solid vertical lines in the figure. In four of the six SFR states, the date of reform produced a large discrete jump in state aid to local school districts. In the other two of these six states, there is no obvious alternative date that produces a large discrete jump. Two states—MN and MI—in the figure did not experience a court-ordered school finance reform. Of course, increases in state aid for education can occur in the absence of court orders, as is the case with Michigan.

# 5 Results

Our aim is to explore whether changes in the progressivity of state tax systems are systematically related to a state supreme court finding that the system of funding schools is unconstitutional.

[12]To be sure that these date differences do not affect our results, we re-estimated our model using the Baicker and Gordon (2006) dates through 1997 (as far as they go) and our dates from 1998-2007. Our conclusions do not change.

If states attempt to align benefits with taxes, we would expect states with court-ordered school finance reform to adjust the redistributive nature of their taxes.

## 5.1 Estimation of income tax and sales tax progressivity

We first measure the degree of progressivity of state taxes. We proceed by estimating the following regression equation separately for both the individual income tax and the general sales tax.

$$ATR_{h,s,t} = \alpha_{s,t} + \beta_{s,t} I_{h,t} + u_{h,s,t} \tag{1}$$

where $h$ indexes households, $s$ indexes states, and $t$ indicates the year.

The dependent variable ($ATR$) is the average tax rate (tax liability divided by income) and the regressors are a constant and household income in thousands of real dollars ($I$).[13] For each tax for each state, we estimate four $\beta$s, one for each of the four years in our data. $\beta_{s,t}$ represents the increase in the average tax rate due to a $1,000 increase in real household income. A negative value for $\beta$ indicates that the tax system is regressive, i.e., that average tax rates fall with income. If $\beta$ is positive, the tax system is progressive, and the higher is $\beta$ the more progressive is the tax.[14]

Table 5 presents the estimated income tax $\beta$s for the 41 mainland states with individual income taxes. The results suggest that states' income tax systems, although progressive, have become less progressive during the period 1980-2007. On average (see the last row), state progressivity declined by $41\%$. Only $9$ states increased the progressivity of their income tax. In 1980, Minnesota's average income tax rate increased by $0.0473$ percentage points for every

[13] Income equals income from all sources except capital gains. We consider capital gains when determining tax liability but do not include it in the denominator of $ATR$ because large negative values for capital gains do not reflect taxpayer income.

[14] This is a standard method of measuring progressivity. Card and Payne (2002), for example, use a similar regression to estimate the redistributive character of school finance systems.

$1,000 of additional real household income. By 2007, the $\beta$ coefficient suggests that the average tax rate increased by $0.0192$ percentage points for every $1,000 of additional household income; representing a 59% reduction in the degree of progressivity of Minnesota's individual income tax.

As discussed above, changes in the states' individual-income-tax $\beta$s from 1980 to 2007 could be caused by changes in the states' income tax structures or changes in the underlying economy (i.e., taxpayer attributes). To isolate the contribution of changes in tax structure, we re-estimate the $\beta$-regressions holding taxpayer attributes constant over time. In the final column of Table 5 we display $\beta$-regression results estimated holding taxpayer attributes constant at their 1980 level. For all but two states we find that income tax progressivity increased. These results demonstrate that, although state governments altered their tax structures to make them more progressive, changes in the underlying economy more than fully counteracted these alterations and produced less progressive individual income tax systems.

Table 6 presents the estimated income tax $\beta$s for the 44 mainland states with general sales taxes. The results suggest that the general sales tax became less regressive in all $44$ states during the period 1980-2007 and on average, state general sales tax regressivity declined by $60\%$. Note that since all general-sales-tax $\beta$s are negative, a negative percentage change represents a decrease in regressivity. In 1980, Illinois's average sales tax rate decreased by $0.0341$ for every $1,000 of additional real household income. By 2007, the $\beta$ coefficient suggests that the average sales tax rate decreased by $0.0135$ for every $1,000 of real household income; representing a $60\%$ decrease in sales tax regressivity.

As with the income tax, changes in the states' general-sales-tax $\beta$s from 1980 to 2007 could be caused by changes in the states' sales tax structures (i.e., changes in tax rates or the taxation of food) or changes in the underlying economy (i.e., taxpayer attributes). To isolate the contribution of changes in tax structure, we re-estimate the $\beta$-regressions holding taxpayer attributes (expenditure patterns) constant over time and present the results in the final column of Table 6. These

results suggest that, holding constant taxpayer attributes at their 1980 levels, sales tax regressivity declined in only nine states rather than all $44$. Six of the nine states with less regressive sales taxes are states that began exempting food from taxation during the period. One can infer that for most states increases in states' general sales tax rates made the sales taxes more regressive but that changes in the underlying economy more than fully counteracted these tax structure effects. An example of a change in taxpayer attributes that would make the sales tax less regressive would be a relatively large shift among high income groups away from consuming food at home and towards consuming food at restaurants. This shift to eating outside the home causes a relatively higher share of high-income households' expenditures to be taxable and increases their average tax rates relative to those of low-income households.

## 5.2 The effect of school finance reform on individual income tax progressivity

We use the estimated individual-income-tax $\beta$ coefficients as our dependent variable and include as our key explanatory variable the binary variable for school finance reform defined above. We estimate the following regression equation with weighted least squares. Since the dependent variable, $\beta$, is an estimate, we use the inverse standard errors from the beta regression as weights.[15]

$$\beta_{s,t} = a + bSFR_{s,t} + \gamma \cdot X_{s,t} + \eta_t \cdot DYEAR_t + \delta_s \cdot \theta_s + \omega_s \cdot (\theta_s \times YEAR_t) + \epsilon_{s,t}. \quad (2)$$

In addition to the school finance reform variable each regression includes a vector of three year dummies ($DYEAR_t$), a constant, a vector of state fixed effects ($\theta_s$), and a vector of several control variables ($X$). Our control variables are the state unemployment rate, the percentage

[15]This is the approach used by Card and Krueger (1992) and Card and Payne (2002).

of a state's population over age 65, and the percentage of a state's households in poverty. The unemployment rate controls for cyclical economic trends that could affect states' income tax structures. The percentage of households over the age of 65 controls for the political power of the retired, who might prefer a more progressive income tax system as their income declines in retirement. The percentage of state households below the poverty line controls for the possibility that a higher percentage of households in poverty may necessitate a more progressive tax system to provide benefits to the poor. The interaction $\theta_s \times YEAR_t$ controls for state-specific linear time trends in income tax progressivity that may be correlated with school finance reform.

Table 7 divides states into four groups according to when and whether or not a state experienced a school finance reform. This table demonstrates that 1980 income tax progressivity was lower in states that experienced school reform relatively early (between 1980 and 1992). The difference in the 1980 individual-income-tax $\beta$ between this early SFR group and the no SFR group is statistically significant. Differences in $\beta$ across the other groups are not statistically significant at 10%. If these initial across-group differences in the income-tax $\beta$s are correlated with persistent differences or trends in progressivity, our regression results will be unbiased only if they control for state fixed effects and time trends.

The primary results of interest are presented in Table 8. We find a positive association between state income tax progressivity and court-ordered school finance reform. Column 1 presents the baseline results with only the three year dummies and state fixed effects as control variables. The coefficient on SFR is equal to $0.00365$, implying that school finance reform is associated with a $0.00365$ increase in a state's income-tax beta. This represents more than a 50% increase over the mean income-tax $\beta$ in 2007 and more than a 30% increase over the mean $\beta$ from 1980. The coefficient is statistically different from zero. The regression in column 2 contains the control variables but not the linear time trends and produces a similar SFR coefficient. Column 3 incorporates the state-specific linear time trend and the coefficient falls to $0.0030$; however, the variable remains both economically and statistically significant.

Column 4 presents results from estimating the equation while holding taxpayer attributes constant at their 1980 levels. This regression continues to control for state-specific linear time trends. The results suggest that changes in states tax structures, not changes in taxpayer attributes, drive these results. If taxpayer attributes explained the increase in income tax progressivity, we would expect this coefficient to be zero. Instead it is $0.00806$, which is larger than our other estimate and statistically different from zero.

Column 5 restricts the sample to fewer years to estimate the regressions on samples similar to those used by Card and Payne (2002) and Baicker and Gordon (2006). Both of those studies find that school finance reforms during the periods of their analyses produced substantial redistribution of state expenditures towards poorer communities. Baicker and Gordon (2006) analyzed the period from 1982 to 1997 and Card and Payne (2006) analyze the period from 1977 to 1992, so in column 5 we examine the period 1980 to 1992. The results echo the results in the previous four columns and the SFR coefficient is still large and statistically significant.

Across the regressions, of the control variables, the unemployment rate is consistently positive but not significantly different from zero. The coefficients on percentage of the population older than 65 and the percentage of households in poverty are largely statistically indistinguishable from zero, but generally of the anticipated sign. A higher percentage of households in poverty is associated with a more progressive tax system. Although the sign of the estimated coefficient is different in column 4, the estimates in columns 2, 3, and 4 suggest that increases in the percent of the population over age 65 is associated with progressive changes in tax structure.

## 5.3 The effect of school finance reform on general sales tax progressivity

We use the estimated general-sales-tax $\beta$ coefficients as our dependent variable and include as our key explanatory variable the binary variable for school finance reform. We again estimate equation 2 with weighted least squares. Table 9 divides states into four groups according to when and whether or not a state experienced a school finance reform. Unlike the income tax, sales tax

progressivity in 1980 is virtually identical across the four groups. This fact suggests that the sales tax results will not be sensitive to the inclusion of state-specific time trends.

The results in Table 10 suggest no association between state sales tax progressivity and court-ordered school finance reform. All five specifications produce coefficients close to zero and the null hypothesis that the true coefficients are zero cannot be rejected. The lack of response of sales taxes to school finance reform suggests that state policymakers find it easier to adjust aspects of income taxation (e.g., new or expanded credits and exemptions) than to adjust aspects of sales taxation.

# 6 Discussion

We set out to investigate whether court-ordered school finance reform had an impact on the progressivity of state individual income and general sales taxes. We have uncovered a number of interesting facts. Among states that have individual income taxes, the distribution of the burden across households of differing incomes is progressive in every state in each of the four years we examine. However, in all but nine states the degree of progressivity of states' individual income tax systems declined between 1980 and 2007. The general sales tax became less regressive in all 44 states with general sales taxes between 1980 and 2007.

Are the changes in state tax progressivity related to school finance reform and the resulting change in the redistributive nature of state spending on schools? We find that, relative to states without SFR, the distribution of individual income tax burdens became more progressive in states with SFR in the period of our analysis.

There appears to be no response on the part of states subject to SFR with respect to the progressivity of their general sales taxes. Our different findings with respect to the two major taxes is likely attributable in part to the relative difficulty of adjusting general sales taxes to affect a change in progressivity.

Are all state income taxes progressive because the rich have a higher ability-to-pay or because the rich enjoy relatively more of the benefits from government services such as education and infrastructure? The simultaneous determination of states' expenditures and taxes along with the impossibility of measuring each citizen's benefits from public expenditures limits knowledge of the relationship between the benefits from public expenditures and the taxes that finance those benefits. Court-ordered school finance reform is an interesting "experiment" in this context because it affords the opportunity to understand state governments' responses to an exogenous equalization of state expenditures and presumably the benefits derived from state expenditures. Our primary finding is that in response to the equalization of state expenditures imposed by court-ordered school finance reform, states made their individual income tax structures more progressive. In the absence of substantive spillovers or other externalities, the increase in progressivity appears inconsistent with benefit taxation and the optimal tax framework and consistent with the ability-to-pay principle.

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Table 1: State Supreme Court rulings overturning school finance systems (1980 - 2007)

| **State** | **Year(s) of ruling** |
|---|---|
| Alabama | 1993, 1997 |
| Arizona | 1994, 1997, 1998 |
| Arkansas | 1985, 1996, 2002 |
| Connecticut | 1985, 1998 |
| Idaho | 2005 |
| Kansas | 2003 |
| Kentucky | 1989 |
| Massachusetts | 1993 |
| Montana | 1989, 1990, 2005 |
| New Hampshire | 1993, 1997, 1998, 2002 |
| New Jersey | 1985, 1990, 1994, 1997, 1998, 2000 |
| New York | 2003, 2006 |
| North Carolina | 2004 |
| Ohio | 1997, 2002 |
| Tennessee | 1993, 1995, 2002 |
| Texas | 1989, 1991, 1995, 2005 |
| Vermont | 1997 |
| West Virginia | 1984, 1988, 1997 |
| Wyoming | 1980, 1995, 2001 |

Sources: National Center for Educational Statistics for 1970-1999; National Access Network, Teachers College, Columbia University for 2000-2009.

Table 2: State Intergovernmental Expenditures on Education (State Aid to Education)

| | Per-Capita Expenditures | | | | % of Total State Expenditures | | | | Share of Local Expenditures | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State Groups | 1980 | 1992 | 2000 | 2007 | 1980 | 1992 | 2000 | 2007 | 1980 | 1992 | 2000 | 2007 |
| *All States* | | | | | | | | | | | | |
| $n = 48$ | $547 | $699 | $885 | $985 | 19% | 18% | 19% | 15% | 60% | 61% | 67% | 66% |
| *SFR 1980-1992* | | | | | | | | | | | | |
| $n = 8$ | **$541** | **$844** | $895 | $1005 | **19%** | **19%** | 18% | 15% | **59%** | **68%** | 66% | 64% |
| *SFR 1993-2000* | | | | | | | | | | | | |
| $n = 7$ | $438 | **$496** | **$881** | $1058 | 17% | **13%** | **19%** | 16% | 52% | **48%** | **67%** | 69% |
| *SFR 2001-2007* | | | | | | | | | | | | |
| $n = 4$ | $602 | $847 | **$994** | **$1155** | 22% | 22% | **22%** | **18%** | 68% | 72% | **76%** | **78%** |
| *No SFR 1980-2007* | | | | | | | | | | | | |
| $n = 29$ | $567 | $688 | $868 | $939 | 20% | 18% | 19% | 15% | 62% | 61% | 67% | 65% |

Sources: Authors tabulations from U.S. Census Bureau data. Per-capita state government intergovernmental expenditures on education are in real 2007 dollars. Share of local expenditure is state intergovernmental education expenditure as a percentage of local current K-12 expenditures. SFR XXXX-YYYY includes states where court-ordered school finance reform (SFR) first occurred between the years XXXX and YYYY. *SFR 1980-1992* includes AK, CT, KY, MT, NJ, TX, WV, WY. *SFR 1993-2000* includes AL, AZ, MA, NH, OH, TN, VT. *SFR 2001-2007* includes ID, KS, NY, NC.

Table 3: Income Distribution and Taxpayer Attributes, Average Values by Decile 1980 and 2007

| | Wage Income | | % with kids | | % homeowners | | % with non-wage income | |
|---|---|---|---|---|---|---|---|---|
| Income Decile | 1980 | 2007 | 1980 | 2007 | 1980 | 2007 | 1980 | 2007 |
| 1 | $ 2,300 | $3,842 | 3.20% | 2.23% | 18.29% | 15.83% | 62.62% | 42.48% |
| 2 | $7,797 | $11,481 | 4.54% | 4.82% | 20.95% | 19.73% | 60.01% | 35.51% |
| 3 | $14,726 | $18,588 | 9.66% | 8.25% | 25.03% | 22.78% | 54.00% | 34.57% |
| 4 | $22,043 | $26,209 | 15.42% | 11.84% | 29.76% | 31.51% | 57.56% | 41.27% |
| 5 | $28,844 | $34,418 | 24.58% | 17.82% | 40.72% | 42.42% | 64.70% | 52.89% |
| 6 | $36,495 | $44,566 | 31.98% | 22.18% | 51.43% | 52.52% | 70.84% | 57.65% |
| 7 | $46,106 | $56,898 | 43.05% | 30.37% | 64.15% | 67.50% | 76.28% | 70.41% |
| 8 | $56,233 | $72,481 | 51.91% | 38.21% | 76.55% | 77.04% | 82.97% | 75.59% |
| 9 | $69,700 | $97,250 | 54.65% | 42.27% | 84.62% | 85.11% | 86.45% | 82.71% |
| 10 | $105,293 | $198,589 | 53.24% | 45.60% | 90.15% | 89.70% | 92.54% | 90.51% |
| All | $38,755 | $55,757 | 29.03% | 22.03% | 49.92% | 49.87% | 70.65% | 57.92% |

Sources: Authors tabulations from CPS. Wage income is in real 2007 dollars. For 1980 and 2007 $N = 65,592$. Table entries represent within decile means.

Table 4: Expenditure Distribution and Taxpayer Attributes, Average Values by Decile, 1980 and 2007

| | *Percentage of Total Expenditure on*: | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Core | | Food | | Taxable Services | | Non-Taxable | |
| Income Decile | 1980 | 2007 | 1980 | 2007 | 1980 | 2007 | 1980 | 2007 |
| 1 | 34.13% | 28.75% | 18.73% | 13.18% | 15.00% | 12.27% | 32.16% | 45.80% |
| 2 | 31.09% | 26.31% | 18.92% | 14.53% | 14.17% | 14.74% | 35.82% | 44.42% |
| 3 | 32.14% | 26.53% | 18.19% | 13.03% | 13.15% | 13.88% | 36.52% | 46.56% |
| 4 | 31.22% | 25.66% | 17.62% | 11.58% | 13.59% | 13.50% | 37.62% | 49.26% |
| 5 | 31.84% | 25.07% | 16.34% | 11.30% | 14.10% | 13.60% | 37.72% | 50.03% |
| 6 | 32.30% | 25.61% | 16.42% | 10.09% | 13.64% | 12.20% | 37.64% | 52.10% |
| 7 | 32.70% | 25.00% | 16.76% | 9.72% | 14.00% | 12.75% | 36.57% | 52.53% |
| 8 | 33.60% | 26.43% | 14.75% | 9.41% | 13.86% | 12.40% | 37.79% | 51.76% |
| 9 | 30.81% | 26.71% | 14.02% | 8.57% | 14.10% | 11.89% | 41.07% | 52.83% |
| 10 | 33.00% | 24.14% | 12.65% | 7.39% | 12.95% | 12.13% | 41.42% | 56.33% |
| All | 32.28% | 26.03% | 16.46% | 10.88% | 13.85% | 12.92% | 37.42% | 50.16% |

Sources: Authors tabulations from Consumer Expenditure Survey Interview Data. Table entries represent within-decile means. See appendix for details.

Table 5: Measures of State Income Tax Progressivity

| | Current Year Income Distribution | | | | | 1980 Income Dist |
|---|---|---|---|---|---|---|
| state | 1980 | 1992 | 2000 | 2007 | $\%\Delta_{1980-2007}$ | $\%\Delta_{1980-2007}$ |
| AL | .0039 | .0051 | .0033 | .0019 | -52% | 448% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| AZ | .021 | .0095 | .0061 | .0038 | -82% | 9% |
| | (.0005) | (.0001) | (.0001) | (.0001) | | |
| AR | .0097 | .0137 | .0118 | .0061 | -38% | 185% |
| | (.0001) | (.0001) | (.0002) | (.0001) | | |
| CA | .0136 | .0149 | .0131 | .0082 | -40% | -67% |
| | (.0001) | (.0001) | (.0001) | (.0001) | | |
| CO | .0057 | .0098 | .0128 | .0041 | -28% | 123% |
| | (.0004) | (.0001) | (.0002) | (.0001) | | |
| CT | -.0003 | .0118 | .0086 | .0059 | 1,887% | 1,038% |
| | (.0001) | (.0001) | (.0001) | (.0001) | | |
| DE | .0163 | .0132 | .0088 | .0053 | -68% | -12% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| GA | .0151 | .0125 | .0091 | .005 | -67% | 161% |
| | (.0003) | (.0001) | (.0001) | (.0001) | | |
| ID | .0188 | .0167 | .0129 | .0076 | -59% | 56% |
| | (.0002) | (.0001) | (.0002) | (.0002) | | |
| IL | .0006 | .0028 | .0031 | .0015 | 171% | 1,584% |
| | (.0004) | (0) | (.0001) | (0) | | |
| IN | .0018 | .0047 | .0036 | .0019 | 10% | 642% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| IA | .01 | .0121 | .0084 | .0051 | -49% | 190% |
| | (.0003) | (.0001) | (.0001) | (.0001) | | |
| KS | .0398 | .0183 | .0192 | .0104 | -74% | 244% |
| | (.0009) | (.0003) | (.0003) | (.0002) | | |
| KY | .0042 | .0114 | .0084 | .0047 | 12% | 661% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| LA | .0001 | .006 | .0049 | .0037 | 3,515% | 11,513% |
| | (.0004) | (0) | (.0001) | (.0001) | | |
| ME | .0144 | .0175 | .0134 | .0082 | -43% | 13% |
| | (.0001) | (.0001) | (.0002) | (.0002) | | |
| MD | .0101 | .0085 | .0069 | .0039 | -61% | 122% |
| | (.0003) | (.0001) | (.0001) | (.0001) | | |
| MA | .0095 | .0126 | .0084 | .0053 | -45% | 253% |
| | (.0001) | (.0001) | (.0001) | (.0001) | | |
| MI | .0492 | .0371 | .022 | .0113 | -77% | 138% |
| | (.0009) | (.0008) | (.0005) | (.0003) | | |
| MN | .0473 | .0415 | .0313 | .0192 | -59% | 220% |
| | (.0007) | (.0006) | (.0006) | (.0004) | | |
| MS | .0058 | .0095 | .0073 | .0042 | -28% | 121% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| MO | .0069 | .009 | .0083 | .0049 | -29% | 218% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| MT | .0097 | .0122 | .0097 | .0059 | -40% | 56% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |

Continued on Next Page...

Table 5 – Continued

| | Current Year Income Distribution | | | | | 1980 Income Dist |
|---|---|---|---|---|---|---|
| state | 1980 | 1992 | 2000 | 2007 | $\%\Delta_{1980-2007}$ | $\%\Delta_{1980-2007}$ |
| NE | .0085 | .0117 | .0105 | .0071 | -17% | 98% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| NJ | .0022 | .0085 | .009 | .0077 | 244% | 2,522% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| NM | .0293 | .0173 | .0149 | .0073 | -75% | 130% |
| | (.0005) | (.0001) | (.0002) | (.0002) | | |
| NY | .0247 | .0166 | .0128 | .0083 | -66% | 63% |
| | (.0002) | (.0001) | (.0002) | (.0002) | | |
| NC | .0135 | .0131 | .0105 | .006 | -56% | 82% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| ND | .0048 | .0064 | .006 | .0036 | -24% | -33% |
| | (.0004) | (0) | (.0001) | (.0001) | | |
| OH | .0034 | .0108 | .0089 | .0053 | 56% | 283% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| OK | .0104 | .0157 | .0111 | .0054 | -48% | 388% |
| | (.0002) | (.0001) | (.0002) | (.0001) | | |
| OR | .0141 | .0157 | .0123 | .0068 | -51% | 181% |
| | (.0002) | (.0001) | (.0002) | (.0001) | | |
| PA | .001 | .0049 | .0036 | .0018 | 84% | 1,074% |
| | (.0004) | (.0001) | (.0001) | (.0001) | | |
| RI | .0113 | .0122 | .0107 | .0066 | -42% | 22% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| SC | .0123 | .0141 | .0111 | .0069 | -44% | 8% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| TN | 0 | .0001 | .0002 | .0001 | 736% | -63% |
| | (0) | (0) | (0) | (0) | | |
| UT | .0089 | .0131 | .0095 | .0053 | -40% | 121% |
| | (.0003) | (.0001) | (.0001) | (.0001) | | |
| VT | .0163 | .0151 | .0162 | .0107 | -34% | 508% |
| | (.0002) | (.0001) | (.0002) | (.0002) | | |
| VA | .0104 | .0109 | .0084 | .0049 | -53% | 112% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| WV | .0059 | .0098 | .0095 | .0057 | -3% | 295% |
| | (.0002) | (.0001) | (.0001) | (.0001) | | |
| WI | .0639 | .0453 | .0291 | .0155 | -76% | 125% |
| | (.001) | (.0007) | (.0006) | (.0004) | | |
| US w/income tax | .0099 | .0122 | .0093 | .0054 | -41% | 134% |
| | [.0141] | [.0091] | [.0063] | [.0036] | [674] | [1,797] |

Authors tabulations via state Taxsim (NBER). States' progressivity measures are coefficients along with robust standard errors from a state-year regression of average tax rate on real taxpayer income ($1,000). The last column shows the change in $\beta_{s,t}$ if the real income distribution and characteristics are held at 1980 levels. The last row presents medians with standard deviations in brackets and excludes the six states without an individual income tax and New Hampshire.

Table 6: Measures of State Sales Tax Progressivity

| | Current Year Distribution | | | | | 1980 Distribution |
|---|---|---|---|---|---|---|
| state | 1980 | 1992 | 2000 | 2007 | $\%\Delta_{1980-2007}$ | $\%\Delta_{1980-2007}$ |
| AL | -.0395 | -.0302 | -.0167 | -.014 | -65% | 0% |
| | (.0023) | (.0018) | (.0012) | (.001) | | |
| AZ | -.0363 | -.0303 | -.018 | -.0155 | -57% | 6% |
| | (.0023) | (.0018) | (.0013) | (.0011) | | |
| AR | -.0384 | -.0357 | -.0211 | -.0179 | -53% | 15% |
| | (.0022) | (.0019) | (.0015) | (.0013) | | |
| CA | -.0325 | -.0239 | -.0146 | -.0124 | -62% | 4% |
| | (.0022) | (.0015) | (.0011) | (.001) | | |
| CO | -.0273 | -.0185 | -.0101 | -.0086 | -69% | -2% |
| | (.0018) | (.0013) | (.0008) | (.0007) | | |
| CT | -.0409 | -.0305 | -.0189 | -.0158 | -61% | -3% |
| | (.0026) | (.0017) | (.0014) | (.0012) | | |
| FL | -.0363 | -.0305 | -.0189 | -.0158 | -56% | 9% |
| | (.0023) | (.0017) | (.0014) | (.0012) | | |
| GA | -.0349 | -.0302 | -.0118 | -.0102 | -71% | -11% |
| | (.0021) | (.0018) | (.0009) | (.0008) | | |
| ID | -.0349 | -.0314 | -.019 | -.0167 | -52% | 29% |
| | (.0021) | (.0017) | (.0014) | (.0012) | | |
| IL | -.0341 | -.0269 | -.0159 | -.0135 | -60% | 8% |
| | (.0021) | (.0016) | (.0012) | (.001) | | |
| IN | -.031 | -.0241 | -.0132 | -.0124 | -60% | 8% |
| | (.0021) | (.0017) | (.001) | (.001) | | |
| IA | -.0319 | -.0277 | -.018 | -.0147 | -54% | 22% |
| | (.002) | (.0016) | (.0013) | (.0011) | | |
| KS | -.0384 | -.0352 | -.0215 | -.0187 | -51% | 22% |
| | (.0022) | (.0019) | (.0015) | (.0013) | | |
| KY | -.0326 | -.0239 | -.0146 | -.0124 | -62% | 2% |
| | (.0022) | (.0015) | (.0011) | (.001) | | |
| LA | -.0319 | -.0277 | -.0159 | -.013 | -59% | 14% |
| | (.002) | (.0016) | (.0012) | (.001) | | |
| ME | -.0326 | -.0239 | -.014 | -.0113 | -65% | 0% |
| | (.0022) | (.0015) | (.0011) | (.0009) | | |
| MD | -.0326 | -.0241 | -.0132 | -.0113 | -65% | 0% |
| | (.0022) | (.0017) | (.001) | (.0009) | | |
| MA | -.0326 | -.0241 | -.0132 | -.0113 | -65% | 0% |
| | (.0022) | (.0017) | (.001) | (.0009) | | |
| MI | -.031 | -.0226 | -.0146 | -.0124 | -60% | 8% |
| | (.0021) | (.0016) | (.0011) | (.001) | | |
| MN | -.0363 | -.0305 | -.0195 | -.0165 | -55% | 11% |
| | (.0023) | (.0017) | (.0014) | (.0012) | | |
| MS | -.0465 | -.0389 | -.0241 | -.0208 | -55% | 7% |
| | (.0025) | (.002) | (.0017) | (.0014) | | |
| MO | -.0361 | -.0302 | -.0139 | -.0119 | -67% | -9% |
| | (.0021) | (.0018) | (.0011) | (.0009) | | |
| NE | -.0349 | -.0241 | -.0132 | -.012 | -66% | -7% |
| | (.0021) | (.0017) | (.001) | (.0009) | | |

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Table 6 – Continued

| | Current Year Distribution | | | | | 1980 Distribution |
|---|---|---|---|---|---|---|
| state | 1980 | 1992 | 2000 | 2007 | $\%\Delta_{1980-2007}$ | $\%\Delta_{1980-2007}$ |
| NV | -.0273 | -.0251 | -.0153 | -.0124 | -55% | 26% |
| | (.0018) | (.0016) | (.0012) | (.001) | | |
| NJ | -.0388 | -.0328 | -.0189 | -.017 | -56% | 5% |
| | (.0024) | (.0018) | (.0014) | (.0012) | | |
| NM | -.0429 | -.0356 | -.0216 | -.0147 | -66% | -9% |
| | (.0024) | (.0018) | (.0015) | (.0011) | | |
| NY | -.0363 | -.0277 | -.0159 | -.013 | -64% | 0% |
| | (.0023) | (.0016) | (.0012) | (.001) | | |
| NC | -.0349 | -.0302 | -.0145 | -.0105 | -70% | -11% |
| | (.0021) | (.0018) | (.0011) | (.0008) | | |
| ND | -.0273 | -.0241 | -.0132 | -.0113 | -59% | 19% |
| | (.0018) | (.0017) | (.001) | (.0009) | | |
| OH | -.0363 | -.0303 | -.018 | -.0155 | -57% | 6% |
| | (.0023) | (.0018) | (.0013) | (.0011) | | |
| OK | -.0304 | -.0307 | -.0178 | -.0147 | -52% | 36% |
| | (.0018) | (.0017) | (.0013) | (.0011) | | |
| PA | -.0398 | -.0305 | -.0189 | -.0158 | -60% | 0% |
| | (.0025) | (.0017) | (.0014) | (.0012) | | |
| RI | -.0334 | -.0255 | -.0154 | -.0127 | -62% | 7% |
| | (.0023) | (.0015) | (.0012) | (.001) | | |
| SC | -.0395 | -.0314 | -.019 | -.0113 | -71% | -17% |
| | (.0023) | (.0017) | (.0014) | (.0009) | | |
| SD | -.0465 | -.0344 | -.0198 | -.0165 | -64% | -6% |
| | (.0025) | (.0019) | (.0014) | (.0012) | | |
| TN | -.0447 | -.037 | -.0231 | -.02 | -55% | 7% |
| | (.0024) | (.0019) | (.0016) | (.0014) | | |
| TX | -.0363 | -.0315 | -.0192 | -.0161 | -56% | 10% |
| | (.0023) | (.0017) | (.0014) | (.0012) | | |
| UT | -.0439 | -.0356 | -.0213 | -.0156 | -64% | -8% |
| | (.0024) | (.0018) | (.0015) | (.0011) | | |
| VT | -.0273 | -.0241 | -.0132 | -.0124 | -55% | 22% |
| | (.0018) | (.0017) | (.001) | (.001) | | |
| VA | -.0349 | -.0287 | -.0158 | -.0125 | -64% | 2% |
| | (.0021) | (.0017) | (.0012) | (.0009) | | |
| WA | -.0374 | -.0319 | -.0195 | -.0165 | -56% | 8% |
| | (.0023) | (.0018) | (.0014) | (.0012) | | |
| WV | -.0384 | -.0389 | -.0231 | -.0186 | -52% | 20% |
| | (.0022) | (.002) | (.0016) | (.0013) | | |
| WI | -.0363 | -.0303 | -.018 | -.0147 | -59% | 7% |
| | (.0023) | (.0018) | (.0013) | (.0011) | | |
| WY | -.0384 | -.0299 | -.0198 | -.013 | -66% | -5% |
| | (.0022) | (.0017) | (.0014) | (.001) | | |
| US w/sales tax | -.0362 | -.0302 | -.0179 | -.0137 | -60% | 6% |
| | [.0048] | [.0046] | [.0033] | [.0027] | [6] | [12] |

Authors tabulations. States' progressivity measures are coefficients along with robust standard errors from a state-year regression of average tax rate on real taxpayer income ($1,000). The last column shows the change in $\beta_{s,t}$ if the distribution of income and expenditures are held at 1980 levels. The last row presents medians with standard deviations in brackets and excludes states without a general sales tax.

Table 7: Court-induced School Finance Reform and State Income Tax Progressivity

| | $\beta$ Income Tax | | | |
|---|---|---|---|---|
| State Groups | 1980 | 1992 | 2000 | 2007 |
| *All States* | | | | |
| $n = 41$ | .0135 | .0135 | .0106 | .0062 |
| *SFR 1980-1992* | | | | |
| $n = 6$ | **.0052** | **.0112** | .0095 | .006 |
| *SFR 1993-2000* | | | | |
| $n = 6$ | .009 | **.0089** | **.0072** | .0045 |
| *SFR 2001-2007* | | | | |
| $n = 4$ | .0242 | .0162 | **.0138** | **.0081** |
| *No SFR 1980-2007* | | | | |
| $n = 25$ | .0149 | .0146 | .0112 | .0063 |

Sources: Authors tabulations from U.S. Census Bureau data. SFR XXXX-YYYY includes states where court-ordered school finance reform (SFR) first occurred between the years XXXX and YYYY. *SFR 1980-1992* includes AK, CT, KY, MT, NJ, TX, WV. *SFR 1993-2000* includes AL, AZ, MA, OH, TN, VT. *SFR 2001-2007* includes ID, KS, NY, NC.

Table 8: The Effect of School Finance Reform on Income Tax Progressivity

| dependent variable $= \beta_{s,t}$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| SFR | .00365 | .00368 | .0030 | .00806 | .00684 |
| | (.0009) | (.00109) | (.00111) | (.00324) | (.00168) |
| Unemployment Rate | | .00035 | .00023 | .00005 | .00067 |
| | | (.00028) | (.00031) | (.00122) | (.0007) |
| % age $> 65$ | | .0223 | .0241 | .02237 | -.07071 |
| | | (.02179) | (.01733) | (.05467) | (.08825) |
| % households in poverty | | .00976 | .0307 | .14773 | .00451 |
| | | (.01469) | (.01502) | (.05267) | (.02821) |
| Constant | .00761 | .00153 | .08526 | 1.18807 | .01571 |
| | (.0004) | (.00434) | (.07072) | (.27201) | (.01052) |
| d1992 [$= 1$ if $year = 1992$] | .00046 | .00034 | .00109 | .01206 | .00004 |
| | (.00049) | (.00064) | (.00079) | (.00302) | (.00185) |
| d2000 [$= 1$ if $year = 2000$] | -.00277 | -.0014 | .00053 | .01792 | |
| | (.00085) | (.00122) | (.00178) | (.00758) | |
| d2007 [$= 1$ if $year = 2007$] | -.0058 | -.00509 | -.00322 | .01524 | |
| | (.00094) | (.00121) | (.00205) | (.00817) | |
| $R^2$ | .37 | .38 | .90 | .73 | .18 |
| N | 164 | 164 | 164 | 164 | 82 |
| Excluded Years | None | None | None | None | 2000,2007 |
| Taxpayer Attributes | Varies | Varies | Varies | 1980 | Varies |
| State Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| State Linear Time Trend | No | No | Yes | Yes | No |

Statistically significant, ***1%, **5%, *10% two-sided test. The dependent variable in all regressions is the estimated income tax $\beta$. Robust standard errors, clustered at state level, are in parentheses. Regressions use the inverse standard errors from the $\beta$ regressions as weights. Regressions in columns 1, 2, 3, and 4 contain four years (1980, 1992, 2000, 2007) of state-level observations for 41 states. Excluded states are the six states with no income tax (FL, NV, SD, TX, WA, WY) and New Hampshire. Column 4 uses $\beta$ estimates holding the taxpayer attributes constant at the 1980 values. Column 5 excludes 2000 and 2007 from the sample.

Table 9: Court-induced School Finance Reform and State Sales Tax Progressivity

| | $\beta$ Sales Tax | | | |
|---|---|---|---|---|
| State Groups | 1980 | 1992 | 2000 | 2007 |
| *All States* $n = 44$ | -.0358 | -.0293 | -.0172 | -.0142 |
| *SFR 1980-1992* $n = 7$ | **-.0377** | **-.0319** | -.0194 | -.0158 |
| *SFR 1993-2000* $n = 6$ | -.0361 | **-.0293** | **-.0171** | -.0148 |
| *SFR 2001-2007* $n = 4$ | -.0361 | -.0311 | **-.0177** | **-.0147** |
| *No SFR 1980-2007* $n = 27$ | -.0352 | -.0284 | -.0165 | -.0135 |

Sources: Authors tabulations from U.S. Census Bureau data. SFR XXXX-YYYY includes states where court-ordered school finance reform (SFR) first occurred between the years XXXX and YYYY. *SFR 1980-1992* includes AK, CT, KY, MT, NJ, WV. *SFR 1993-2000* includes AL, AZ, MA, OH, TN, VT. *SFR 2001-2007* includes ID, KS, NY, NC.

Table 10: The Effect of School Finance Reform on Sales Tax Progressivity

| dependent variable $= \beta_{s,t}$ | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| SFR | -.00015 | -.0003 | -.00032 | -.00123 | -.00123 |
| | (.00072) | (.00075) | (.00094) | (.00216) | (.00155) |
| Unemployment Rate | | -.00008 | -.00023 | -.00099 | -.00023 |
| | | (.00017) | (.00024) | (.00053) | (.0003) |
| % age $> 65$ | | .00541 | .00534 | -.02384 | .01782 |
| | | (.01658) | (.01493) | (.04433) | (.03479) |
| % households in poverty | | -.02038 | -.00571 | -.00511 | -.00378 |
| | | (.01121) | (.01159) | (.04183) | (.0177) |
| Constant | -.03542 | -.03288 | .26253 | .19657 | -.03523 |
| | (.00033) | (.00268) | (.0481) | (.15365) | (.00468) |
| d1992 [$= 1$ if $year = 1992$] | .00634 | .00632 | .00809 | -.00512 | .00622 |
| | (.00043) | (.00049) | (.0005) | (.00148) | (.00074) |
| d2000 [$= 1$ if $year = 2000$] | .01847 | .01749 | .02051 | -.00665 | |
| | (.00054) | (.00092) | (.00116) | (.00382) | |
| d2007 [$= 1$ if $year = 2007$] | .02143 | .02074 | .02472 | -.003 | |
| | (.00066) | (.00087) | (.00117) | (.00368) | |
| $R^2$ | .97 | .97 | .99 | .75 | .85 |
| N | 176 | 176 | 176 | 176 | 88 |
| Exclude Years | No | No | No | No | 2000,2007 |
| Distribution | Varies | Varies | Varies | 1980 | Varies |
| State Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| State Linear Time Trend | No | No | Yes | Yes | No |

Statistically significant, ***1%, **5%, *10% two-sided test. The dependent variable in all regressions is the estimated sales tax $\beta$. Robust standard errors, clustered at state level, are in parentheses. Regressions use the inverse standard errors from the $\beta$ regressions as weights. Regressions in columns 1, 2, 3, and 4 contain four years (1980, 1992, 2000, 2007) of state-level observations for 44 states. Excluded states are the five states with no sales tax. Column 3 uses $\beta$ estimates holding the expenditure distribution constant at the 1980 distribution. Column 5 excludes 2000 and 2007 from the sample.

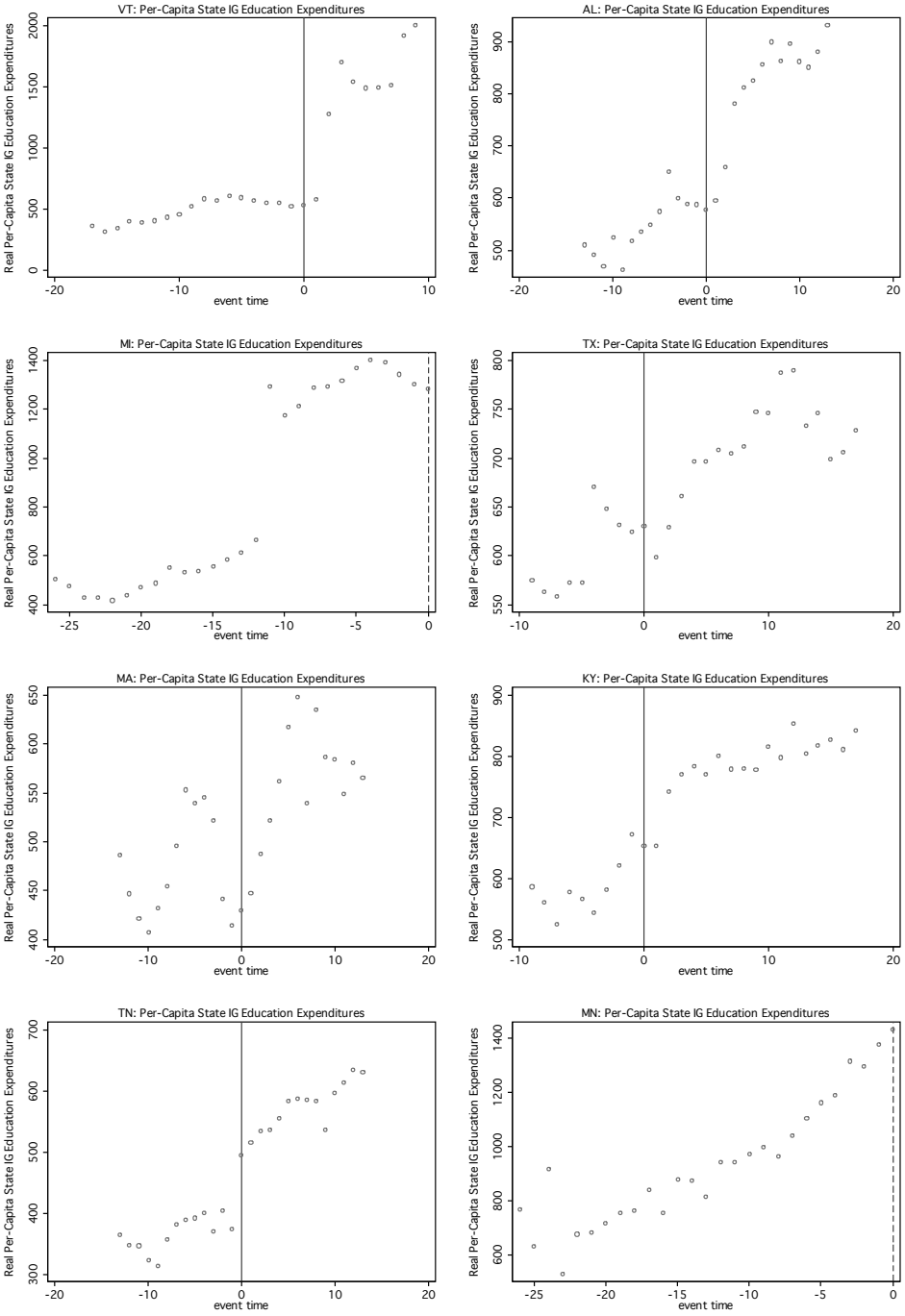


Figure 1: **Select States: SFR and State IG Education Expenditure** Figure displays, for 8 states, state governments' per capita intergovernmental expenditure for education (y-axis) in event time (x-axis) during the period 1980-2007. Event time equals 0 at the first school finance reform (SFR). Event time is negative prior to the first SFR and positive after the first SFR. For states that never have a SFR (i.e., MI and MN) event time is always negative.

# 7 APPENDIX

## 1.1 Individual Income Tax

We use NBER's Internet TAXSIM v9 to estimate state individual income tax liability for observations in the Current Population Survey (CPS) March Supplement for the years 1980, 1992, 2000, and 2007. We exclude from our sample all observations where the respondent is under 17 years old, is a dependent taxpayer, does not file taxes, or earns no wage income.[16]

TAXSIM requests 22 variables when estimating state income tax liability. Many of these variables, e.g., wages, marital status, age of taxpayer, and number of children in the household are observable in the CPS for all four years. Other variables, however, are not observable in the CPS. There are two types of unobservable data. First, there are variables that are not observable in the CPS prior to 1992. Second, other variables are never observable in the CPS. For variables observable in 1992, but not in 1980, we use 1992 values to impute 1980 values. For variables never available, we use the Consumer Expenditure Survey Interview Data to impute values for CPS taxpayers.

The TAXSIM variables available in CPS in 1992 but not in 1980 are local property taxes paid, long term capital gains, dividend income, other property income (e.g., interest, alimony), unemployment compensation, gross social security, and transfer income (e.g., welfare, child support).[17] Less than $10\%$ of the 1992 CPS sample reports non-zero values for unemployment compensation, gross social security, and transfer income. We set these values equal to 0 for all taxpayers in 1980. Since more than $10\%$ of the 1992 CPS sample reports non-zero values for local property taxes paid, capital gains, dividends, and other property income, we impute these values for 1980.

Property taxes and capital gains are not reported in the CPS in any form prior to 1992. We estimate regressions using 1992 data to impute 1980 values. The dependent variable in our regressions is either property taxes paid as a share of wage income or capital gains reported as a share of wage income. These regressions are separately estimated for each decile of the 1992 wage-income distribution. In each decile the estimating sample includes only those $\rho_{decile,i}\%$ of taxpayers who report non-zero values for property taxes or capital gains.

With $Y$ equal to property taxes paid as a share of income we estimate the following regression for each decile of the wage distribution,

$$Y_{i,92} = a + b \cdot W_{i,92} + c\dot{A}GE65_{i,92} + d \cdot KIDS_{i,92} + e \cdot COLLEGE_{i,92} + f \cdot MARRIED_{i,92} + u_{i,92}.$$

where the right-hand side variables are a constant, total wages, a dummy equal to 1 if household contains anyone over age 65, a dummy equal to 1 if the household contains children under 17 years old, a dummy equal to 1 if the anyone in the household completed college, and a dummy equal to 1 if the householder is married. All households in this regression are homeowners.

[16] Information on tax-filing status is only available after 1992.

[17] Property taxes, unemployment compensation, and capital gains are first reported in 1992. Dividends, other property income, transfer income, gross social security are available in 1988. Some of these variables are reported prior to 1988 but only as components of larger categories. Thus they cannot be observed directly.

When $Y$ equals capital gains income as a share of wage income we estimate the following regression for each decile of the wage distribution,

$$\begin{aligned} Y_{i,92} =& a + b \cdot W_{i,92} + c\dot{A}GE65_{i,92} + d \cdot KIDS_{i,92} + e \cdot COLLEGE_{i,92} \\ &+ f \cdot MARRIED_{i,92} + g \cdot OWNER_{i,92} + u_{i,92}. \end{aligned}$$

This equation is identical to the property tax equation except for the addition of dummy variable equal to 1 if the household owns their home and 0 if not.

We use the results from these regressions to impute values for property taxes and capital gains in 1980. We assume that in each decile in 1980 the percentage of taxpayers reporting non-zero values for property taxes or capital gains is equal to that same percentage in the decile in 1992. In each 1980 decile we randomly select $\rho\%$ of taxpayers for which to impute values for property taxes and capital gains and set all other observations property taxes and capital gains to zero.

Dividends and other property income are not observable in 1980 but are included as components of aggregate variables. To impute their values for 1980 we create these aggregate variables, to the extent possible, within the 1992 data. We then calculate, for each 1992 decile, the average share of these 1992 aggregate variables that is derived from dividends and the share that is derived from other property income. To impute 1980 values, we multiply the 1980 aggregate values by the average 1992 shares.

TAXSIM also requests information on childcare expenses, rent paid, and mortgage interest. These data are never in the CPS but are available in the CES in 1980, 1992, 2000, and 2007. We use the same method as used for property taxes and capital gains to estimate regressions with CES data. We estimate three separate regressions, with the dependent variable equal to alternatively, child care expenses, rent paid, and mortgage interest, all as a share of wage income. To impute values for 1980, 1992, 2000, and 2007 we estimate the regression using CES data only from that same year. For example, to impute 1980 values for the first decile we use only 1980 CES data from the first decile. We restrict the estimating samples as follows. For child care expenses we include only those observations with children who report non-zero values. For rent paid we include only those observation that are not homeowners and report non-zero values. For mortgage interest we include only those observations that are homeowners are report non-zero values. In some deciles this leaves fewer than 100 observations. When a decile has fewer than 30 observations we combined it with its nearest (lower) neighbor.

## 1.2 Sales Tax

We used a variety of sources to find information on general sales tax rates and sales tax bases. Our sources include Dye and McGuire (1992), Dye and McGuire (2005), Advisory Commission on Intergovernmental Relations (1984), Advisory Commission on Intergovernmental Relations (1980), Advisory Commission on Intergovernmental Relations (1990), CCH (2000), and the Federation of Tax Administrators website. As noted above, there is little correspondence between state sales tax bases and CES expenditure types. In many cases it is not straightforward to determine in what category to place a CES expenditure type. Table A.2 displays our categorization of CES expenditure types into the four expenditure categories: CORE, FOOD AT HOME,

TAXABLE SERVICES, and NON-TAXABLE.

We use the family, member, and detailed expenditure files from the Consumer Expenditure Survey Interview data in 1980, 1992, 2000, and 2007. We exclude from our sample observations with zero total expenditure. We use information on expenditures in the last quarter of each year and multiply this amount by four to estimate annual expenditures.

To estimate a CES household's general sales tax liability in a particular state we estimate the sales tax liability from each expenditure category and calculate total liability. Sales tax liability from CORE expenditures equals CORE expenditures multiplied by the state's general sales tax rate. When state taxes food we multiply FOOD AT HOME expenditures by the state's tax rate on food. In 2007, seven states taxed FOOD AT HOME at a lower rate than the CORE.[18] Expenditures on TAXABLE SERVICES are multiplied by the general sales tax rate. We do this for all 44 states for the years 1980, 1992, 2000, and 2007.

[18]These states are AR, IL, MO, TN, UT, VA, WV.

Table A.1: School Finance Reform: Comparing NBA-TJM to B-G

| **State** | **Year(s) of ruling** |
|---|---|
| Alabama* | 1993, 1997 |
| Arizona* | 1994, 1997, 1998 (1998 is beyond B-G's timeframe) |
| Arkansas | 1985, 1996, 2002 (B-G list 1983 only) |
| Connecticut | 1985, 1998 (B-G list 1977, 1996 only) |
| Idaho* | 2005 (not in B-G because post-1997) |
| Kansas | 2003 (B-G list 1976 only) |
| Kentucky* | 1989 |
| Massachusetts* | 1993 |
| Montana | 1989, 1990, 2005 (B-G list 1989 only) |
| New Hampshire* | 1993, 1997, 1998, 2002 |
| New Jersey | 1985, 1990, 1994, 1997, 1998, 2000 (B-G do not list 1985) |
| New York* | 2003, 2006 (not in B-G because post-1997) |
| North Carolina | 2004 (B-G list 1997) |
| Ohio* | 1997, 2002 |
| Tennessee* | 1993, 1995, 2002 |
| Texas | 1989, 1991, 1995, 2005 (B-G do not list 1995) |
| Vermont* | 1997 |
| West Virginia | 1984, 1988, 1997 (B-G do not list 1984 or 1997) |
| Wyoming* | 1980, 1995, 2001 |
| **States listed below are in B-G's table but not in NBA-TJM's table** | **Year(s) of ruling (according to B-G)** |
| California | 1971, 1977 (NBA-TJM have CA in a background data set, but do not list it in their table because its rulings are pre-1980) |
| Missouri | 1996 |
| Rhode Island | 1994 |
| Washington | 1978, 1991 (NBA-TJM have WA but with pre-1980 rulings in 1974 and 1978 and nothing after that) |
| Wisconsin | 1976 (NBA-TJM background data show WI as never having an overturn ruling) |

Source: Authors' tabulations comparing Table 2 in Baicker and Gordon, 2006, denoted B-G, which asks: Did the court overturn your school funding system by 1997?, to Table 1 in the present paper which asks: Did the court overturn your school funding system for the first time between 1980 and 2007?
*An asterisk indicates that NBA-TJM's dates are the same as B-G's dates, as far as they go. In other words, for the years of overlap between the two sources (1980 to 1997), the two sources are in agreement.

Table A.2: Creating Expenditure Categories from the CES

| TOTAL EXPEND | | | | | CORE | TAX SERV | FOOD HOME | NON-TAX | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | Food | | | | | | | | FOOD |
| | | Food at home | | | | | X | | |
| | | Food not at home | | | X | | | | |
| | Alcohol | | | | X | | | | ALCBEV |
| | Housing | | | | | | | | HOUS |
| | | Shelter | | | | | | | |
| | | | mortgage interest | | | | | X | |
| | | | property taxes | | | | | X | |
| | | | maintenance, repairs, insurance | | | X | | | |
| | | | Rent Paid | | | | | X | |
| | | | Other Shelter | | | | | | |
| | | | | hotels | X | | | | 210210 |
| | | | | non-hotels | | | | X | C |
| | | Utilities, fuels, public services | | | | | | | |
| | | | natural gas | | | X | | | |
| | | | electricity | | | X | | | |
| | | | fuel oil | | | X | | | |
| | | | telephone services | | | X | | | |
| | | | water and other public services | | | X | | | |
| | | Household Operations | | | | | | | |
| | | | Domestic Services | | | | | | |
| | | | | child care | | | | X | |
| | | | | non-child care | | | | X | |
| | | | Other Expenses | | | | | X | |
| | | House Furnishings and Equip | | | | | | | |

Continued on Next Page...

Table A.2 – Continued

| TOTAL EXPEND | | | CORE | TAX SER-VICES | FOOD HOME | NON-TAX | NOTES |
|---|---|---|---|---|---|---|---|
| | | textiles | X | | | | |
| | | furniture | X | | | | |
| | | floor coverings | X | | | | |
| | | major appliances | X | | | | |
| | | small appliances | X | | | | |
| | | misc. household equipment | X | | | | |
| | Apparel and Services | | | | | | APPAR |
| | clothing men and boys | | X | | | | |
| | clothing women and girls | | X | | | | |
| | clothing children under 2 | | X | | | | |
| | footwear | | X | | | | |
| | other prods and servs | | | | | | |
| | | watches, jewelry, etc. | X | | | | A |
| | | tailoring, dry cleaning, etc. | | X | | | B |
| | Transportation | | | | | | TRANS |
| | new cars and trucks | | X | | | | |
| | used cars and trucks | | X | | | | |
| | other vehicles | | X | | | | |
| | gasoline motor oil | | X | | | | |
| | vehicle finance charges | | | | | X | |
| | maintenance repair | | | X | | | |
| | vehicle insurance | | | | | X | |
| | rental leases, licenses, charges | | | | | X | |
| | public transportation | | | | | X | |
| | Health Care | | | | | | HEALTH |
| | health insurance | | | | | X | |
| | medical services | | | | | X | |
| | prescription drugs | | | | | X | |
| | medical supplies | | | | | X | |
| | Entertainment | | | | | | ENTER |

Continued on Next Page...

Table A.2 – Continued

| TOTAL EXPEND | | | CORE | TAX SERVICES | FOOD HOME | NON-TAX | NOTES |
|---|---|---|---|---|---|---|---|
| | fees and admissions | | | X | | | |
| | TVs,radio and sound equipment | | X | | | | |
| | other equipment and services | | | | | | |
| | | pets, toys, and playground equip | X | | | | |
| | | other entertainment | X | | | | |
| Personal Care | | | | | | | PERSCA |
| | wigs and hairdryers | | X | | | | 640130+640420 |
| | haircuts | | | | | X | 650310 |
| Reading | | | | | | X | READ |
| Education | | | | | | X | EDUCA |
| Tobacco and Smoking | | | X | | | | TOBACC |
| Miscellaneous | | | | | | X | MISC |
| Cash Contributions | | | | | | X | CASH |
| Personal Insurance and Pensions | | | | | | | PERINS |
| | life and other personal insurance | | | | | X | |
| | retirement pensions, social security | | | | | X | |

X is the category to which the authors judged a CES expenditure type belonged. The notes columns describes CES summary level expenditure variable names and when necessary UCC codes that comprise an expenditure type. A: 420110,420120,430110,430120. B: 440110,440120,440130,440140,440150,440210,440900. C: all OTHLOD except 210210