

Tax Interdependence in the U.S. States

Claudio A. Agostini ^{*}, [†]

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Abstract

State governments finance their expenditures with multiple tax instruments, so when collections from one source decline, they are typically compensated by greater revenues from other sources. This paper addresses the important question of the extent to which personal and corporate income taxes are used to compensate for sales tax fluctuations within the U.S. states. The results show that a one percent decrease in the sales tax revenue per capita is associated with a 3 percent or a 0.9 percent increase in the corporate and personal income tax revenue per capita respectively. On average then, an exogenous reduction of \$4.5 in the sales tax revenue per capita is compensated, *ceteris paribus*, with an increase of either \$3.4 in the collections per capita from corporate taxes or \$3.6 in the ones from personal income taxes.

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^{*}Assistant Professor of Economics at Ilades-Alberto Hurtado University and Professorial Lecturer of Economics at Georgetown University. Address: Erasmo Escala 1835, Santiago, Chile. Tel: 011-562-6920365. Fax: 011-562-6920303. Email: agostini@uahurtado.cl

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"...other taxes will more than compensate for lost sales taxes."

S. Kroes, Vice President for California Taxpayers' Association¹

1 Introduction

The main sources of tax revenue for state governments are sales taxes and personal and corporate income taxes. Nearly all states use a mix of these tax instruments to finance their expenditures and they do face some exogenous shocks that affect the collections from one of these taxes. Then, if state governments want to keep providing the same level of public goods and services as before, they must compensate the effects of these shocks changing the revenue collected from other taxes.

There are several examples of exogenous shocks that impact state tax revenues. In the case of sales taxes, concrete examples of negative shocks are the effects of internet sales and the increase in household spending on services, which are mainly not taxed.² The impact of some of these shocks might be quite significant, the estimated total state and local revenue loss due to e-commerce, for example, was \$13.3 billion for 2001 (Bruce and Fox (2001)). In the case of income taxes, most states use the federal definition of adjusted gross income as the basis for their income taxes. As a consequence, many federal tax reforms include provisions that constitute exogenous shocks that impact state tax revenues. The federal tax law enacted on May 28 of 2003, for instance, introduced several changes that will reduce state collections from income taxes. Specifically, the taxation of dividends and capital gains was reduced, the bonus depreciation tax break for corporations was extended and expanded³, and the maximum expensing benefit for small business investment was

¹Cal-Tax Digest, October 1999.

²Between 1970 and 2001, consumption of services rose from 31% to 44% of total household purchases.

³The 2002 federal tax law permitted firms to deduct up to 30% of the cost of acquiring machinery or equipment

increased⁴. Again, the impact of some of these shocks is not negligible. The estimated loss in state income tax revenue due to the changes in the bonus depreciation and the maximum expensing benefit are \$1.1 billion and \$600 million in 2004, respectively (Johnson (2003)).

Additionally, the tax mix is also influenced by states needs to increase revenue for two reasons. First, to counterbalance the declines in federal expenditures; and, second, to meet citizens demands for reductions in property taxes subsidized by higher state funding of local expenditures.

Considering that most states collect the larger part of their tax revenues from a combination of income and sales taxes, we can think that they basically choose between increased dependence on one or the other when they want to increase or compensate revenues. It is also important to recognize that the optimal mix of tax revenue sources to use is not a once in a while decision. As pointed out by Zodrow (1999) "In some sense, all states must continually choose between sales and income taxes, as they always have the option of changing the mix of the taxes utilized. Moreover, many states face this choice in a very immediate sense, as they are under considerable pressure to find additional tax revenues". As a result, all the exogenous shocks and the states pressure to compensate declines in revenues might have important effects on the tax mix over time. In fact, the states tax mix has been changing quite significantly during the last 20 years and an important and open question then, is what the degree of substitution is among these taxes.

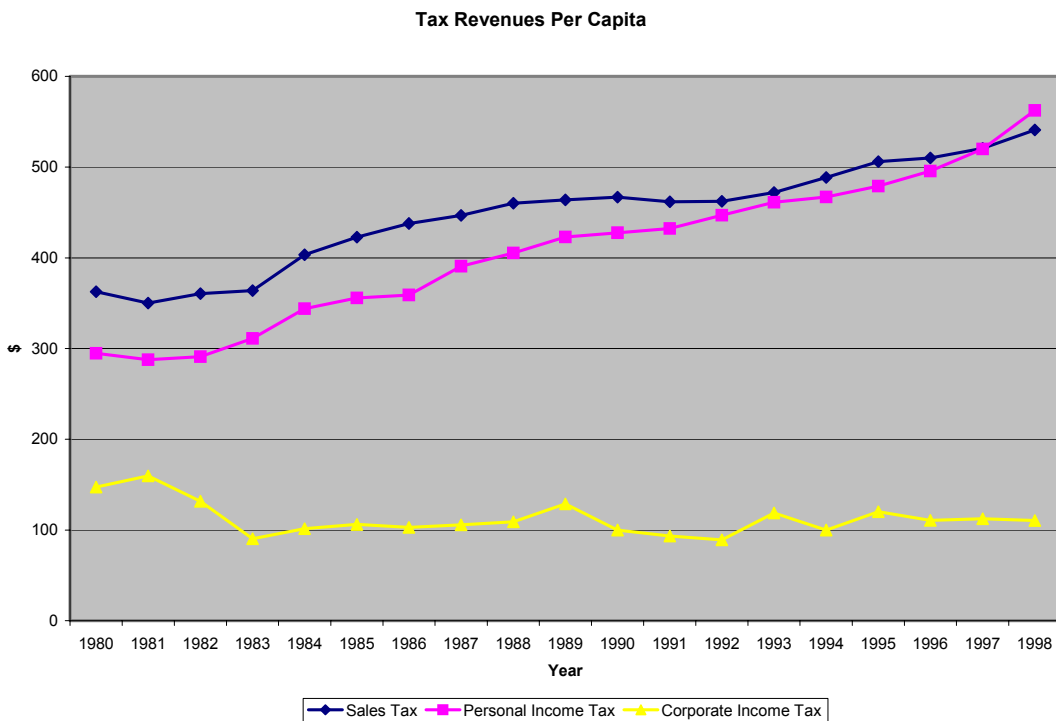
Figure 1 shows the average state tax revenues per capita, in dollars of 1998, for the period 1980-98. The revenue per capita collected from corporate income taxes decreased by around one third during the early 80s and has been almost constant since then, even if the average statutory tax rate

in the first year, as long as the item was bought between September 2001 and September 2004. The new tax law increased the percentage to 50% and extended the period to December 2004.

⁴The new law increased the maximum deduction from \$25,000 to \$100,000

has been slowly increasing. The revenue per capita collected from personal income and sales taxes has been steadily increasing during this period, the latter more than the former, even though the average personal tax rate has decreased and the sales tax rate has been steadily increasing.⁵ One significant change to notice in the tax revenue mix is that, since 1998, state personal income taxes yield more tax revenue than sales taxes do.

Figure 1:



Obviously, this figure presents just averages and not too many conclusions can be drawn from it, but it shows that the average state tax mix has been certainly changing over time and exploring

⁵The average sales tax increased from 3.5% in 1980 to 4.7% in 1998. The average top marginal corporate tax rate increased from 6% in 1980 to 7% in 1998.

the interdependence of different taxes within the tax mix is the goal of this paper. Specifically, I use panel data for the 50 U.S. states and instrumental variables to investigate the effects of a change in sales taxes on corporate and personal income taxes within a state.

2 The State Government Optimal Tax Problem

There are several models of tax setting in the literature and many of them have successfully explained why governments use multiple taxes and mix them differently.⁶ Each of these models is based on different assumptions and arrives to different conclusions about the optimal tax mix. However, there is a common and obvious lesson from these models: taxes are interrelated and an exogenous shock to any of them will affect the optimal tax mix.

I will not consider a specific tax setting model for two reasons. First, it is beyond the scope of this paper to develop a tax setting model to explain how sales, corporate income and personal income taxes are set optimally. Second, using a specific model would not provide more insight about the endogeneity of taxes and how exogenous shocks affect the optimal tax mix, but it would complicate the analysis.

Consider then, a general tax setting model in which a state government wants to maximize the welfare of its citizens and finances the provision of public goods with taxes. In an open economy several goods might be bought and consumed by people who live in a different state or country.⁷ If we introduce consumption by foreign citizens to this general tax setting model, it is now possible

⁶See for example Boadway, Marchand, and Pestieu (1994), Cremer, Pestieu, and Rochet (2001), Gentry and Ladd (1994), Gordon and MacKie-Mason (1994), Gordon and Nielsen (1997), Harmon and Mallick (1994), and White (1983).

⁷We can think of tourism or cross-border shopping as the main reason for this to happen.

for the state government to partially export the tax burden of some taxes. It might not be socially optimal, from a national point of view, to export part of the tax burden to other states.⁸ However, from the perspective of a single state, the ability to export a tax burden is a feature very attractive to have in a tax instrument. Tax exporting is not only consistent with a state government setting taxes to maximize the welfare of state residents, but it might also be necessary as a protecting mechanism, since most states try to export some of their tax burdens.

As it was already discussed, state governments mainly use sales, corporate income, and personal income taxes to finance their expenditures. Among these tax instruments, it is reasonable to think that the tax burden of sales taxes can be partially exported more easily than the tax burden of income taxes. Therefore, states with higher fractions of foreign consumption should rely more on sales taxes than on income taxes. The intuition behind this result is very simple, a fraction of the excess burden imposed by taxing goods that are also consumed by foreign citizens is borne by foreign consumers and, therefore, the government should tax those good proportionally more than goods (inputs) consumed (owned) only by state residents. Although it is clear that states have incentives to have higher sales taxes if they can export its tax burden to non-state residents, there is no general agreement about the magnitude of this effect. Zodrow (op.cit.), for example, thinks that sales tax exportation is not an important source of revenue on most states. On the other hand, Pollock (1991) argues that the potential for the exportation of state sales tax is large. According to his calculations, Connecticut is able to export roughly 22% of its total sales tax burden.

Why are tax exporting and the consumption of foreign citizens relevant? Recall that this paper

⁸State governments would oversupply public goods because the cost of those goods is partially shifted to other states.

is about tax interdependence and the main goal is to estimate the effects of a change in a state sales tax on the other taxes within the same state. However, all state taxes are set simultaneously and, therefore, endogenous. In this context, the role of foreign consumption is just the role of an instrumental variable that allows to identify and consistently estimate the coefficient of endogenous explanatory variables.

3 Data

I collected fiscal, economic and demographic data for the 50 U.S. states over the period 1980-1998. Table 1 shows the summary statistics of these data.

Table 1: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Sales Tax Rev. per capita	0.4474	0.2351	0	1.3519	950
Corp. Tax Rev. per capita	0.1125	0.1989	0	3.8388	950
Pers. Tax Rev. per capita	0.4081	0.2719	0	1.3066	950
Income Per Capita	224534	3879.25	13997.4	37338	950
Unemployment	6.4177	2.1629	2.4	18	950
Poverty	13.4932	4.1339	2.9	27.2	950
Balanced Budget	0.5315	0.4992	0	1	950
Expenditure Limit	0.3589	0.4799	0	1	950
Revenue Limit	0.1094	0.2134	0	1	950
Grants Per Capita	0.7095	0.2767	0.3196	4.005	950
Fraction GSP Hotel	0.0132	0.0236	0.00274	0.2042	950
Elder 65	12.1327	2.1861	3	18.6	950
Population	4945.42	5327.9	402	32667	950

The tax revenue per capita variables are the total revenue collected (in millions) from each tax divided by the total population of the state. The main reason for using revenues per capita instead of tax rates is that state governments can actually change not only tax rates, but also tax bases. The relevant parameter that states may consider then, when setting their tax policies, is the

fraction of revenue or the revenue per capita they collect from each different tax.

The variable Income per capita is the state personal income per capita in dollars, as calculated by the Bureau of Economic Analysis, deflated by the U.S. GDP price deflator. The variable unemployment is the state unemployment rate as percentage of the civilian labor force, estimated by the Bureau of Labor Statistics. The variables poverty, population and elder 65 are the percentage of persons in the state below the poverty level, the state population in thousands, and the percentage of the population above 65 years old respectively, all of them as estimated by the U.S. Census Bureau.

State governments face several statutory constraints when designing their budgets and the empirical literature on state budgeting has shown that these limits matter.⁹ Several states face expenditures and/or revenue limitations, which constrain the annual growth of them either to a fixed rate or to one based on one or more of the following variables: inflation rate, population growth, growth of personal income, and ratio of revenue to personal income. Many states also have statutory or constitutional requirements to balance their budgets. The two most common requirements are that the governor must submit a balanced budget and that the legislature must pass a balanced budget. Using information from the Advisory Commission on Intergovernmental Relations and the Book of the States, I constructed a set of dummy variables for capturing the effects of these budget limits. The variables Expenditure Limit and Revenue Limit are dummy variables equal to one if the state has a constitutional or statutory provision that constraints the annual growth of expenditures or revenues respectively, and zero otherwise. The variable Balanced

⁹See Alt and Lowry (1994), Crain and Miller (1990), Bohn and Inman (1996), Elder (1992), Poterba (1994), Poterba (1995), and Rueben (1997).

Budget is equal to one if the state legislature must pass a balanced budget, and zero otherwise.

The variable Grants Per Capita is the amount, in dollars, of federal grants received by each state divided by the state's population, as reported by The Council of State Governments and deflated by the U.S. GDP price deflator.

3.1 Instrumental Variables

One of the difficulties of estimating the effects of one tax on another one within the same state is that state governments set all taxes simultaneously. Therefore, the sales tax, which is a regressor in the tax setting equations of income taxes, is contemporaneously correlated with the error term of those equations. A potential solution for this problem is the use of instrumental variables. In this particular case, for identifying the effects of each tax on one another it would be necessary to have at least one instrument for each tax, which is a hard task.

In the discussion about the states' tax setting process, I considered the consumption of foreign citizens in each state as a variable that would affect the sales tax directly but not the other taxes. For the reasons already explained there, I think a reliable measure of foreign citizens consumption in each state would be a suitable instrument. Unfortunately, data on foreign citizens consumption do not exist. I used then, as a proxy for the fraction of total consumption by foreign citizens, the variable Fraction GSP Hotel, which is the fraction of the state gross product that corresponds to the hotels and lodging industry (SIC code 70), according with the Bureau of Economic Analysis.¹⁰ The use of the fraction of GSP that comes from lodging as an instrumental variable for the sales

¹⁰There exist some alternatives proxies for the state sales to foreign citizens that I could not use. The Travel Industry Association of America, for example, calculates the impact of international visitor spending on state economies, but it is available for only few years. The Census Bureau reports the number of visitors each state receives, but is available only for some states and also for few years.

tax allows to identify the effects of the sales tax on personal and corporate income taxes.

One potential concern with the use of the fraction of GSP from hotels and lodging as instrument is that this variable can be capturing several things non related at all with the actual number of visitors or the expenditures of foreign citizens in each state. As a way to explore this possibility I ran a regression using the fraction of GSP from lodging as a dependent variable and the other measures described in the previous footnote (international travel expenditures and number of international visitors) for which I have few observations. The results show that the fraction of GSP from hotels is not only strongly and positively correlated with these alternative measures, but it also explains around 45% of the variation.¹¹

4 Results

4.1 Corporate Income Taxes

Table 2 presents the results of estimating the relationship between the tax revenue per capita from corporate taxes and the tax revenue per capita from sales taxes.¹² The first column presents the results when OLS state fixed-effects are used for the estimation. The coefficient of the sales tax revenue per capita is negative but not significant. The second column shows the results of estimating the same equation using instrumental variables to correct for the endogeneity of the sales tax.¹³ The coefficient of the sales tax revenue per capita is again negative, but statistically

¹¹The results of these regressions are shown in the Appendix.

¹²I also estimated the same regressions using the fractions of total state tax revenues collected from each tax. The results are qualitatively not different from the ones presented here and they are available from the author upon request.

¹³A Hausman test rejects the exogeneity of the sales tax revenue per capita.

significant and almost twenty times bigger in absolute value.

The elasticity, at mean values, between the corporate tax revenue per capita and the sales tax revenue per capita is -3.01 . Hence, a one percent decrease in the sales tax revenue per capita is associated with a 3% increase in the corporate tax revenue per capita. The mean values of corporate income and sales tax revenues per capita in the sample are \$113 and \$448 respectively. Therefore, a \$4.5 decrease in the sales tax revenue per capita is associated, on average, with a \$3.4 increase in the corporate income tax revenue per capita, everything else constant.

Table 2: Corporate Tax Revenue Per Capita

Corporate Tax Revenue per capita	OLS	IV
Sales Tax Revenue per capita	-0.0348 (0.0836)	-0.7568 (0.3601)
Income per capita	0.00005 (5.21e-06)	0.00006 (8.67e-06)
Unemployment	-0.0034 (0.0014)	-0.0045 (0.0016)
Poverty	-0.0027 (0.0027)	-0.0038 (0.0029)
Balanced Budget	0.007 (0.0146)	0.0026 (0.0154)
Expenditure Limit	-0.0757 (0.0213)	-0.0602 (0.0234)
Revenue Limit	-0.0202 (0.0276)	-0.0312 (0.0292)
Elder 65	0.0307 (0.0132)	0.0247 (0.015)
Population	0.00001 (9.75e-06)	0.00003 (0.00001)
Grants per capita	-0.0684 (0.0412)	-0.0716 (0.0448)
Constant	-1.0787 (0.2149)	-1.0668 (0.2239)
N	950	950
Wald Chi ²		752.31
F	5.07	
R ²	0.1356	0.1293

The coefficient for income per capita is positive and significant, showing that states where the population is richer collect more revenue per capita from corporate income taxes. The elasticity with respect to income per capita, at mean values, is 11.98. Hence, a one percent increase in the income per capita is associated with almost a 12% increase in the revenue per capita collected from corporate income taxes. The mean income per capita in the sample is \$22,454 and the mean revenue per capita from corporate taxes is \$113. Therefore, an increase of \$225 in the income per capita of a state is associated, on average, with a \$13.6 increase in the corporate taxes revenue per capita.

The unemployment rate has a negative and statistically significant impact. States with higher unemployment rates are more willing to reduce corporate income taxes to attract new firms or investment to create more jobs. A 1% increase in the unemployment rate is associated, on average, with a 2.6% decrease in the revenue per capita collected from state corporate taxes. In terms of money collected, an increase of 0.6 percentage points in the average unemployment rate would decrease in \$2.9 the average revenue per capita. The poverty rate is also negative, but statistically insignificant. Probably the effects of the poverty rate are partially captured by the unemployment rate, which would explain why this variable is not significant.

The budget limit dummies have the expected sign, even though not all of them were significant. The revenue limit dummy is negative as expected, but statistically not significant. The variable expenditure limit has a negative and significant effect, showing that states facing a constraint in the rate of growth of their expenditures collect lower revenue per capita from corporate taxes. The variable Balanced Budget, even though not significant, has a positive coefficient as I expected. If the legislature of a state must pass a balanced budget, it has to either increase taxes or reduce

expenditures, which implies a non-negative correlation with tax rates.

The fraction of elder people living in a state has a positive effect on the revenue per capita collected from corporate taxes and it is statistically significant at the 10% level. A 1% increase in the fraction of the population above 65 years old would increase, *ceteris paribus*, the corporate tax revenue per capita in 2.7%. Therefore, a one percent increase in the fraction of elder people would imply an increase of \$3 in the average corporate tax revenue per capita. The intuition for this result is that elder people finance their consumption mainly with their savings, therefore, they do prefer a tax mix of low taxes on consumption (sales taxes)¹⁴ and high taxes on personal and corporate income.

The population size of the states has a positive and significant effect, even though the magnitude of the impact is somewhat small. Population is usually associated with the level of business activity and, therefore, one would expect that a higher level of activity would increase the corporate taxes revenue per capita. A one percent increase in the population of a state is associated, at mean values, with a 1.3% decrease in the revenue per capita that is collected using corporate taxes. Then, an increase of 49,500 people in the average population of the states would increase in \$1.5 the average state revenue per capita collected from corporate taxes.

The effect of federal grants per capita is negative and significant at 10%. States consider federal transfers as a substitute for tax revenue. Then if federal grants decline the states need to increase revenue from other sources. On average, a 1% reduction in the federal grants per capita received by the states is associated to a 0.45% increase in the corporate tax revenue per capita. In other words, a reduction of \$7 in grants per capita would imply, on average, an increase of \$5 in tax

¹⁴See Conway and Houteville (2001).

revenue per capita from corporate taxes.

Finally, it is important to mention that the regression also includes time dummies and state fixed effects. As usual, time dummies control for all the variables that affect all the states in a given year (federal tax reforms, business cycle conditions, etc.) and state fixed effects control for unobserved state characteristics that are constant over time.

4.2 Personal Income Taxes

Table 3 presents the results of estimating the relationship between the revenues per capita collected from personal income taxes and sales taxes. The first column shows the results when OLS are used for the estimation. As can be seen from the table, the coefficient of the sales tax revenue per capita is negative but insignificant. The second column shows the results when instrumental variables are used in the estimation to control for the endogeneity of the sales tax. The coefficient on the sales tax revenue per capita is again negative, but now is significant and almost twenty times bigger in magnitude.

The elasticity of personal tax revenue with respect to sales tax revenue, calculated at mean values, is -0.89 . Hence, a one percent decrease in the revenue per capita collected from sales taxes is associated with a 0.9% percent increase in the revenue per capita collected from personal taxes. The mean values of the sales and personal income tax revenues per capita are \$448 and \$408 respectively. Therefore, a \$4.5 increase in the sales tax revenue per capita is related to a \$3.63 decrease in the personal income tax revenue per capita, *ceteris paribus*.

The variable income per capita is positive and significant, showing that wealthier states collect larger revenues per capita from personal income taxes. A one percent increase in the income per

Table 3: Personal Tax Revenue Per Capita

Personal Tax Revenue per capita	OLS	IV
Sales Tax Revenue per capita	-0.0473 (0.0403)	-0.8184 (0.1985)
Income per capita	0.00003 (2.51e-06)	0.00005 (4.78e-06)
Unemployment	0.0037 (0.0021)	0.0025 (0.0025)
Poverty	0.0046 (0.0064)	0.0034 (0.0016)
Balanced Budget	0.0004 (0.0070)	0.0043 (0.0085)
Expenditure Limit	-0.0267 (0.0103)	-0.0432 (0.0129)
Revenue Limit	-0.0412 (0.0133)	-0.02939 (0.01613)
Elder 65	0.0048 (0.0064)	0.00165 (0.0077)
Population	-0.00002 (4.7e-06)	-5.39e-06 (6.77e-06)
Grants per capita	-0.0398 (0.0196)	-0.0422 (0.0238)
Constant	-0.3563 (0.1036)	-0.3436 (0.1234)
N	950	950
Wald Chi ²		28127.04
F	61.2	
R ²	0.6543	0.5093

capita of a state is related, at mean values, to a 2.8 percent increase in the state tax revenue per capita that comes from personal taxes. An increase of \$225 in the average income per capita of the states is related to a \$11.4 increase in the personal tax revenue per capita.

The coefficient for unemployment is positive but non statistically significant. The coefficient for poverty is also positive, but significant. The positive relationship between poverty rate and the amount of revenue per capita collected from personal taxes might be due to redistributive purposes,

even though the effect is somewhat small. A one percent increase in the poverty rate is associated with a 0.11 percent increase in the revenue per capita collected through personal income taxes.

The balanced budget dummy is positive and non significant. The expenditure and revenue limit dummies are both negative and significant at 5% and 10% respectively. States that face constraints on the growth of their expenditures and/or revenues in their budgets collect less tax revenue per capita from personal taxes than states that do not face those constraints.

The variable Elder 65 is negative but, contrary to what I expected, not significant. As it was discussed before, elder people would prefer a tax mix with low consumption taxes and high income taxes. The sign of the coefficient is consistent with this explanation, but maybe elder voters concentrate their efforts in pressing only for lower sales taxes and that explains why the variable is not significant.

The coefficient for population is negative but also statistically not different from zero. An increase in the population has two effects on the personal income tax revenues per capita. On one the hand, it increases total tax revenue because the base of the tax increases. On the other hand, for a given tax revenue the tax revenues per capita decrease. A non significant coefficient for population might just reflect that these two effects offset each other.

The federal grants per capita have a negative effect and the variable is significant at 10%. Federal grants are somehow substitutes for tax revenue and, therefore, states governments would need to increase taxes for compensating a decline in federal transfers. The negative sign is then the expected one, although the impact is quite small. A 1% decrease in grants per capita is associated to a 0.07% increase in personal tax revenue per capita.

The regression also includes time dummies, which are statistically significant for almost every

year in the sample, and state fixed effects.

4.3 First-Stage Regression

Table 4 shows the first-stage regression of the instrumental variables regressions.¹⁵

Table 4: First-Stage Regression	
Sales Tax Revenue per capita	OLS
Income Per Capita	0.00002 (1.94e-06)
Unemployment	-0.0021 (0.0017)
Poverty	-0.0018 (0.0010)
Balanced Budget	0.0087 (0.0057)
Expenditure Limit	-0.0246 (0.0083)
Revenue Limit	-0.0125 (0.0108)
Fraction GSP Hotel	6.243 (0.8477)
Elder 65	-0.0184 (0.0053)
Population	0.00002 (3.78e-06)
Grants per capita	-0.0541 (0.0141)
Constant	0.0799 (0.0848)
N	950
F	47.84
R ²	0.5967

The variable Fraction GSP Hotel is positive, as expected, and significant, showing that a higher fraction of the GSP corresponding to hotels and lodging is highly correlated with higher sales tax

¹⁵The first-stage regression is the same for the two IV regressions previously shown.

revenues per capita. A one percent increase in the fraction of the GSP from hotels and lodging is associated with a 0.15 percent increase in the revenue per capita collected from sales tax. On average, this would represent an increase of \$0.67.

It is important to notice that the coefficient for the variable Elder 65 is negative and significant. The intuition for this sign is that Elder people are mainly retired and they have preferences for low sales taxes. This result confirms that intuition¹⁶ and shows that the revenue per capita collected from sales taxes is lower in states with a higher proportion of elder people in the population. A one percent increase in the fraction of the population older than 65 years old is associated, at mean values, with a 0.5 percent decrease in the revenue per capita that comes from sales taxes.

All the other explanatory variables have the expected signs, even though some of them are not statistically significant. The regression also includes state fixed effects and year dummies.

5 Conclusions

The empirical evidence in the literature has shown that the fiscal policy of U.S. states is influenced by the fiscal policies of their neighbors. In the same way, it is natural to think that decisions regarding one instrument of fiscal policy influence the decisions regarding other available instruments within each state. Specifically, I think that state governments do not set taxes considering one tax at a time or each different tax based only on its own effects, but rather consider a full tax package, setting all taxes simultaneously. An important question then, is how one specific tax affects the other taxes within the same state. This paper attempts to address this question empir-

¹⁶See Rork (forthcoming) for a similar result.

ically. Using instrumental variables I estimate the effect of sales taxes on personal and corporate income taxes within a state. The results show that a one percent decrease in the revenue per capita collected from sales taxes is associated with a 3 and 0.9 percent increase in the revenue per capita collected from corporate and personal income taxes respectively. At mean values, the revenue results imply that an exogenous reduction of \$4.5 in the sales tax revenue per capita is associated with an increase of \$3.4 in the corporate income tax revenue per capita or a \$3.63 increase in the personal income revenue per capita.

The importance of these results is that they show not only that taxes are in fact interdependent within one jurisdiction, but also that if state governments try to keep their expenditures constant they compensate the decline in revenues from one tax increasing the revenues from other taxes. A natural extension of this paper is to estimate the effects of all the three taxes among themselves, finding for this purpose suitable instruments for the corporate and personal income taxes. Even more interesting it would be to also include excise taxes, which represent a non negligible fraction of state tax revenues.

6 Appendix

Table 5 shows the regressions of the fraction of GSP from lodging on the other potential proxies for foreign citizens consumption (international travel expenditures and number of international visitors).

The variable Expenditures p.c. is the amount (in millions) of international visitor expenditures per capita and contains data for 50 states for the years 1980, 1990, 1994, 1996 and 1997.

Table 5: Fraction of GSP from Hotels and Accomodations

	(1)	(2)	(3)	(4)	(5)
Visitors p.c.	0.00607 (0.0025)		0.0074 (0.0018)		0.0066 (0.0032)
Expenditures. p.c.		0.00056 (0.00014)		0.0037 (0.0010)	0.0013 (0.0016)
R ²	0.4524	0.1080	0.4580	0.2283	0.3946
F	1.49	7.63	15.43	4.46	4.49
n	174	250	129	129	129

The variable Visitors per capita contains data for 46 states for the years 1980, 1996, and 1998 (not all years for each state).

The models (3) and (4) are identical to models (1) and (2) respectively, but they are estimated using the same observations of model (5) to make the regressions comparable.

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