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BASE MOBILITY AND STATE PERSONAL INCOME TAXES

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In the spirit of the elasticity of taxable income literature, which has primarily considered federal taxes using individual data, we estimate panel regressions of state personal income tax bases on state tax rates, structures, and other controls. We consider actual tax base data gathered directly from revenue officials, a calculated tax base defined as collections divided by the top tax rate, and total AGI on federal returns. Results indicate that higher marginal tax rates have no impact on actual bases reported by the states, small negative effects on federal AGI, and larger negative effects on calculated bases.

Keywords: state income tax base, elasticity of taxable income, personal income taxes

JEL Codes: H24, H71, H73

I. INTRODUCTION

The effects of state and local taxes — particularly property and corporate income taxes — on behavior have been broadly studied over the past several decades. Much of the research has focused on the effects of those taxes on the location of economic activity, though other dimensions have also been analyzed.[1] State and local personal income taxes have been studied much less extensively despite the fact that personal income taxes are the predominant state tax.[2] Further, anecdotal evidence suggesting that high income taxes harm economic growth has been a factor in proposed (and sometimes enacted) tax reforms in states such as Ohio, South Carolina, and Kentucky.

[1] For example, see Wasylenko (1997) for a summary of the research on location effects and Bruce, Deskins, and Fox (2007) for the broader effects of corporate taxes.

[2] Wasylenko and McGuire (1985) is an exception that finds that higher personal income tax rates reduce employment growth.

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State income tax policy decisions are made with little information on how tax bases actually respond to rate and base structures at the state level. The extent to which the base responds to rate changes has a wide range of implications for policymakers, encompassing the resulting changes in expected tax revenue, the level and location of state economic activity (including workers and businesses), and others. This paper seeks to help fill the void by expanding the very limited research on how personal income tax structure affects the levels of state personal income tax bases. The responsiveness of state tax bases to tax rates reflects the aggregation of all behavioral responses rather than a single response, such as work effort. In this sense, our work represents an aggregate-level companion to the growing literature on the elasticity of taxable income, most of which has focused on federal taxes and has relied on analysis of individual-level data.

We examine the relationship between state tax rates and state personal income tax bases. Three different tax base measures are used because of the difficulty of obtaining a national panel of actual tax base data and because differences in the results across our base measures can be used to draw inferences on how taxes affect location of tax base. Based on our regression results, decreases in marginal tax rates on wages and capital income (which have generally occurred since the 1980s) increase federal AGI. Tax rate reductions have even larger effects on our calculated state tax bases, but have no influence on actual state personal income tax (PIT) bases for a sample of states. The differences between the federal AGI and calculated tax base results are consistent with tax planning where people live in one state and shift part of their tax base to a lower tax rate state. The tax rate on pension income is not statistically significant. This may indicate that people take their pension income where they want to live regardless of the tax rate, but the tax rate may still influence where they receive other forms of income, such as capital income. Further, public expenditures for education and health care are positively linked to tax bases.

Following a very brief review of state personal income taxes, we characterize many of the ways in which individuals respond to personal income taxes. We then discuss several relevant strands of the previous literature and alternatives for measuring state personal income tax bases before discussing our estimation approach and data sources. Following a presentation of our empirical results, we conclude with a summary and discussion of possible avenues for further work in this area.

II. STATE PERSONAL INCOME TAXES

Currently 41 states impose a broad-based personal income tax, and two others, Tennessee and New Hampshire, impose a tax only on certain forms of capital income. Although general sales taxes are more common (45 states), the personal income tax is the largest state tax instrument, raising 35.7 percent of tax revenues (or $278.2 billion in 2008 compared with $240.4 billion raised from state sales taxes).[3] The share

[3] For comparison, the general sales tax raises 30.8 percent of revenue. For more details see http://www.taxadmin.org/fta/rate/08taxdis.html.

of revenue contributed by income taxes has generally been rising, having increased from 31.4 percent in 1994. The average national share raised by the tax provides little insight into the behavior of individual states, which differ radically in their reliance on the tax. Five states generate more than 50 percent of revenue from the income tax, led by Oregon (72.4 percent). Seven states raise no revenue from the tax.

While 34 states use progressive rates, the other seven states, with personal income taxes, impose flat-rate taxes. Maximum state marginal rates vary from a low of 3.0 percent in Illinois (a flat-rate structure) to a high of 9.5 percent in Vermont (which has rates ranging up from 3.6 percent). California has a maximum 9.3 percent rate, but imposes a 1.0 percent surcharge on taxpayers with income above $1.0 million.[4] The maximum marginal tax rate in progressive rate states is often, though not always, reached at relatively low levels of taxable income. For example, 13 states reach the maximum rate by $20,000 of taxable income and only seven states reach the maximum rate at taxable incomes above $100,000.

State marginal rates have generally been declining over the past several decades, though exceptions can be found. These rate declines are sometimes associated with a base expansion, such as when Minnesota lowered its rate and eliminated deduction of federal taxes paid, so they do not necessarily imply lower revenues. Now 23 states impose lower maximum rates than in 1985, with decreases of over 5.0 percentage points in Minnesota and New York. Marginal rates have been raised in 10 states, led by New Jersey where the rate has been increased by 5.47 percentage points, but five of these states increased the marginal rate by 0.5 percentage points or less. Also, Connecticut added an individual income tax in 1991. On average, the highest marginal tax rate has been lowered by just over 1 percentage point since 1985. The growing share of revenue provided by the income tax is consistent with the tax's high income elasticity since the rates have generally been trending downward (Bruce, Fox, and Tuttle, 2006). That is, rapid underlying natural revenue growth, as evidenced by a high income elasticity, is necessary if the share of tax revenues is to grow while tax rates are lowered.

States often calculate taxable income after beginning with a federal definition of income and then making certain adjustments. For example, 27 states begin with federal AGI and nine start with federal taxable income.[5] Exemption for interest earned on federal bonds is an adjustment made by all states. States also differ in the breadth of their base, depending on how they handle such issues as taxation of pension income, ability to use itemized and standard deductions, and other aspects of the tax structure.

III. BASE MOBILITY AND PERSONAL INCOME TAXES

At least three sets of potentially overlapping taxpayers or income earners might be responding to state personal income tax structures: wage earners, capital income earners, and pension recipients. The tax base associated with each set of taxpayers may be

[4] For details see http://www.taxadmin.org/fta/rate/ind_inc.html.

[5] For more details, see http://www.taxadmin.org/fta/rate/inc_stp.html.

mobile, but potentially through different avenues. Wage earners may alter their work experience in ways that have generally been considered in analyses of the federal income tax, such as by reducing hours worked, leaving the labor force, changing positions, and shifting between the receipt of taxable and nontaxable (or tax-deferred) compensation. State tax structures also may create incentives for wage earners to change where they earn taxable income. Thus, wage earners may relocate to lower tax jurisdictions, whether by choosing to live and work on the low-tax side of state borders within a single labor market or by moving across wider geographic areas.[6] Wage earners may change their behavior by working in multiple states and by evading taxes through misreporting more of their income to lower tax rate states. It is not clear whether reciprocity agreements between states, which are intended to simplify tax compliance and reduce or eliminate double-taxation of earnings, increase or decrease the degree of base mobility among wage earners. That said, reciprocity agreements reduce the tax consequences of living in one state and working in another.

Recipients of employer-based pensions or tax-deferred pensions may choose to receive pension benefits in low-rate jurisdictions after earning the associated income in higher rate jurisdictions. Capital income earners may choose to shift where they take receipt of capital income, by for example, establishing residence in a low tax jurisdiction, or by using alternative business structures to shift receipt of income. They also may engage in tax avoidance by placing part of their portfolio in non-taxable assets, such as federal securities.

The sensitivity of the base is likely to differ according to the demographics of taxpayers. Upper-income taxpayers may face higher marginal tax rates, and thus have a greater incentive to respond to tax rates. They often earn relatively more capital income, and the capital income is likely more mobile than labor income because it is generally not as constrained by geography as labor income.[7] These differentials across taxpayers cannot be fully addressed in this paper, but an effort is made to examine some aspects of demographic details across states.

Individual taxpayers may belong to more than one broad taxpayer group, and the effects of such ambiguity on the aggregate taxable income elasticities are difficult to discern. The result can be mixed incentives that attenuate measured responsiveness. For example, individuals who earn most of their income from work effort may nonetheless choose to work in a high-rate jurisdiction because of broader job related characteristics, but they will also receive their capital income in the state unless they are able to establish

[6] After-tax wages could be equalized across the country by the movement of workers so that, at the margin, state tax rates do not affect the geographic distribution of after-tax wages (Feldstein and Wrobel, 1998). One measure of the extent to which this is happening is movement of the wage tax base in response to tax rate changes. On the other hand, tax planning may substitute for physical relocation and allow personal income taxpayers to avoid the effects of higher tax rates, thereby resulting in a lower tax base without requiring the efficiency losses arising from movement of real resources (Bruce, Deskins, and Fox, 2007).

[7] Of course, technology allowing remote work to be undertaken more easily could be making labor more mobile to tax structures as well.

locations in multiple states. This could make capital income less mobile and therefore less responsive to rate differentials than would be the case if all income was earned in this manner.[8] On the other hand, high tax rates provide reinforcing incentives to receive both capital and labor income in low-rate states. For example, an individual may not move to avoid high taxes on labor income alone, but may reach a sufficient threshold to relocate when capital income is also subject to the higher tax rates. The result could be that the mobility of several combined tax bases (such as labor and capital income) is greater than the mobility for any single form of income.

IV. PREVIOUS LITERATURE

Our goal in this paper is to analyze the responsiveness of the aggregate personal income tax base to tax rate differentials, in the spirit of the taxable income elasticity literature. The taxable base elasticity approach is appropriate because the intent is to investigate the net effect of all tax responses to personal income tax rates. As summarized by Feldstein (1995), the overall elasticity of taxable income provides a much more inclusive sense of the excess burden of the tax. According to Giertz's (2007) useful overview of the empirical literature and issues in this area, recent estimates place the overall elasticity of taxable income between 0.1 and 0.4. In other words, taxable income tends to rise by 1–4 percent as the net-of-tax rate (1 minus the marginal tax rate) rises by 10 percent. Of course, estimates vary both across taxpayers and across time for a variety of reasons. Indeed, the combination of better data, better methods, and a generally narrower tax base have contributed to a slight decline in the estimates in recent years.

Most of the prior work in this area has focused on federal taxes using individual data. Long (1999) has undertaken the only state level estimate of taxable income elasticities for the personal income tax.[9] His estimates of the elasticity of taxable income with respect to the net-of-tax rate, which ranged from about 0.2 to 0.8, were slightly higher than more recent estimates. Long's use of cross sectional data for 1991 might limit the representativeness of his results, however, due to the recession that occurred at that time.

Many other related studies have been undertaken, though they generally focus on selected aspects of personal income taxes rather than taxable income as a whole, as done by Feldstein and others. Limited work has been done on the effects of state and local taxes, and specifically personal income taxes, on migration. Fox, Herzog, and Schlottmann (1989) examined how fiscal variables affect the propensity to move within a metropolitan area, away from a metropolitan area, and into a metropolitan area. They found that high state and local income taxes discouraged people from moving into a metropolitan area, but found no effects on the other decisions. Knapp, White, and Clark

[8] Tax base mobility can occur through physical relocation, but also through tax planning, such as occurs with a 401(k).

[9] Also, Gruber and Saez (2002) and Giertz (2007) provide taxable income elasticity estimates using variation in the state net-of-tax rate.

(2001) estimated a nested logit model and found what they describe as an anomalous result: higher state income tax liabilities encourage people to stay. They posit that the income tax is a proxy for public services.

Several studies have also looked at how the personal income tax affects economic activity, whether measured by employment or Gross State Product (GSP). Wasylenko and McGuire (1985) found evidence that higher personal income tax rates discourage employment growth in certain industries. Carroll and Wasylenko (1994) extended this earlier research by examining the effects of fiscal variables on total and manufacturing employment for two separate time periods, including the one examined by Wasylenko and McGuire. High personal income tax rates were found to reduce total employment in the latter time period but had no effect on manufacturing employment during either period. Their overriding observation is that the measured effects of fiscal variables are unstable across time and cannot be regarded as definitive.

Bruce, Deskins, and Fox (2007) used instrumental variable regressions to investigate corporate tax base fluctuations from 1985 through 2001. The maximum personal income tax rate was included in both the first stage regression of GSP on exogenous variables and instruments, and in the second stage regression of the corporate tax base on a variety of determinants. Given that approximately 80 percent of businesses pay their income taxes through the PIT, it is perhaps unsurprising that differences between corporate and personal income tax rates are found to affect reporting between the two taxes.[10] The top personal income tax rate was found to have a relatively strong negative effect in both equations.

V. MEASURING STATE PERSONAL INCOME TAX BASES

While the ideal data set for such an analysis might be taxable base data taken from a panel of state tax returns for individual taxpayers from multiple states, such data are not available. Instead, we consider three aggregate data sources for measuring the effects of the state personal income tax structure on state tax bases: data on actual state tax bases gathered from official state sources, data compiled from individual federal tax returns and aggregated by state, and proxies for state tax bases that are calculated from available sources. The panel spans from 1989 to 2006 for each tax base measure, though the actual state bases are only available for 23 states and not always for the entire time series. The tax base measures are highly correlated on a pairwise basis, with pairwise correlation coefficients on the order of 0.95 to 0.99. In addition, comparison of the actual base data with the calculated base data among states for which both are available shows that these two measures track reasonably closely, as within-state correlation coefficients generally range from 0.82 to 0.99.

Each of the three data sources offers advantages and disadvantages. We note that all of our aggregate tax base options share the common disadvantage relative to individual

[10] See for example, Gordon and Slemrod (1998) who find that an increase in corporate tax rates relative to personal rates increases reported personal income and reduces reported corporate income.

data in that we are unable to allow for individual-specific tax bases (e.g., taxable income) and marginal tax rates. The aggregate sources provide more information than might be immediately apparent, however. As one example, aggregate data smooth out effects of life cycle responses that might be difficult to account for within individual data.[11] People might respond differently when they have either unusually high or low income levels or are at different stages in their life. We compare results across each of these data sets in the empirical section.

Both individual and aggregated data on taxable income or AGI drawn from individual federal tax return data potentially reflect some responses to state personal income taxes such as changing work effort or changes in residence. That said, federal tax return data are based on the state from which people file their federal returns. These data essentially presume that people work and receive all income within a single state and do not allow for the examination of many types of cross-state reactions. The largest effects of state taxes on behavior may be the ways in which people choose to receive income across states, and the federal data will not recognize that people earn income in more than one state. In fact, many people file state income tax returns in more than one state, and they may be doing so in order to evade or avoid paying taxes. The most common forms of tax evasion and avoidance are believed to involve exploiting differences in tax rates and structures across states.

Recognizing this issue and similar problems with other available aggregate data sources (see below), we have directly gathered data on actual state income tax bases from a large number of states. We recognize that non-resident income tax bases may be more mobile than resident bases so we made every effort to collect the entire tax base from every state when possible. These data show that residents' tax returns on average represent only 77.2 percent of the total tax base for all returns in the state.[12] Among the states for which we have sufficient data for analysis, we find that the residential share varies from 66.7 percent in Utah to 95.4 percent in Hawaii. The key advantage of aggregated state data is that they permit an analysis of the full range of responses to taxes, including cross-state choices. We examine the full range of effects by looking at actual state tax bases, and we compare these findings with those arising when we examine federal returns.

Unfortunately, while actual (as opposed to computed or proxied) state tax base data are preferred, state tax return data are not available consistently from any general source across states. Our extensive efforts to contact every state with a personal income tax to request actual tax base data were met with some success. We were able to collect actual base data (state adjusted gross income) based on all tax returns for 14 states over vary-

[11] Life cycle effects can be accounted for in models relying on individual data but require detailed demographic information. The estimates reported here use aggregate data and thus average the responses of people at different stages of life and allow us to avoid accounting explicitly for life cycle effects.

[12] We note that while some states provided non-resident data only for the portion of non-resident income that is taxable in the state, several others provided the entire income earned by non-residents. Because the definition used by any one state is constant over time, our inclusion of state fixed effects will account for any issues raised by this difference.

ing periods of time, yielding a total of 175 state-year observations, compared with the 900 observations available using the other two base measures (50 states over 18 years). We were also able to gather similar data, but from tax returns for residents only, for 19 states over varying periods of time, yielding a total of 260 state-year observations. However, given our primary interest in base mobility among all filers in a state and not just that state's residents, we focus on the all-returns panel in this paper.

We also make use of a third broad measure of aggregate state personal income tax bases, which is a proxy calculated as tax collections divided by the maximum tax rate.[13] Most states levy flat-rate personal income taxes and many others with progressive rates only have progressivity over a small range of income (e.g., the maximum tax bracket is reached by $31,000 of taxable income for 25 of the 41 income taxing states), so this calculated tax base measure should closely approximate actual bases.[14] Key advantages of this calculated state tax base measure include the fact that it is available for all income-taxing states and it more closely resembles the actual state tax base than measures gleaned from federal tax returns. As mentioned above, the calculated tax base measure generally tracks the actual state bases for those states where actual tax base data are available. The computed tax base is always lower, at least in part because it does not include some non-resident income that is reported on actual state tax returns but is often excluded from taxation when income is separated between states.

Data constraints preclude us from adjusting the state tax base measures for changes in base definitions. In lieu of a systematic adjustment for changes in base definitions, we rely on several included control variables as well as state fixed effects to at least partially account for base changes. We return to this issue in our discussion of control variables below.

While we only have actual state base data for those states that provided it in response to our request, we have the base data from federal tax returns for all states. We obviously only have the calculated base data for states with income taxes. In order to enhance our ability to make comparisons across the federal and calculated base data, we supplement the calculated base data with federal taxable income for the states that do not impose a personal income tax or only tax capital income.

State AGI differs from federal AGI because of definitional differences, such as taxation of federal versus state/local interest, and because of non-resident income. On average, state AGI exceeds the federal AGI by 15.9 percent in our sample. This is expected since the state base will generally include all income for residents (even if they earned income out of state) and will also include income earned in the state by non-residents.

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[13] This approach does not raise the problem of division bias since the tax rates used as regressors are drawn from TAXSIM and are not the maximum tax rate imposed by states.

[14] No estimate of the average tax rate exists to develop a more accurate measure of the calculated tax base. The average rate could be calculated for specific taxpayers (such as one with median income), but this is not likely to be more useful because of the skewed distribution of taxable income and the taxpayer-specific information necessary to calculate average taxes for particular groups.

But states differ dramatically, with four states having state AGI more than 40 percent above federal AGI, and three states having state AGI lower than federal AGI.[15]

In sum, we are able to explore three broad measures of state income tax bases: the total base (AGI) from federal returns filed from each state, the actual total state base (AGI) gathered directly from state revenue officials, and the calculated base (a measure of taxable income calculated as collections divided by the top rate). Comparisons of our analyses across these sources provide different and interesting insights. The various sources of data can reflect different perspectives regarding the deadweight losses associated with estimated base-rate elasticities. For example, the actual and calculated state tax base measures allow us to take the perspective of an individual state, which is concerned not only with changes in the level of real activity, but also with changes in the state in which real activity takes place and changes in the state where income is reported (perhaps as a result of tax planning). For example, people may choose to live in high tax rate states and work in low rate states where reciprocity agreements have not been reached. Or, people may live slightly less than half of the year in a high rate state and live slightly more than one-half in a state, such as Florida or Texas, where no income tax is imposed. The high-rate state will see these activities as a loss of economic activity, and does not care that the low rate state sees it as a gain. These two measures also allow us to include the effects of individuals who work or receive income in multiple states.

Elasticities calculated using the federal data are more akin to taking a national view because many responses that shift activity from one state to another when the taxpayer is not required to change residence, either through tax planning or by engaging in some work outside of a state, are included in the taxpayer's federal tax return but may not be included in the state tax return filed in the taxpayer's state of residence. There may be an excess burden associated with the tax planning, but this cost is not included in our analysis. Thus, much of the response observed with federal data represents real reductions in economic activity because reduced income is reported for national tax purposes, but the federal data also include responses when workers relocate to another state or engage in international tax planning.

Yet another important difference to keep in mind throughout our analysis is that two of our proxies for the tax base are measures of AGI, while the third (the calculated tax base) is a surrogate for taxable income. The literature generally finds that broader income measures are less responsive to tax variables (Saez, Slemrod, and Giertz, 2009). We estimate elasticities below using all three of our tax base measures, and use the comparison to provide a measure of the distinction between cross-state and other effects that represent losses in real national economic activity and those that do not represent such losses.

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[15] We note that some states with state AGI more than 40 percent above federal AGI are among those states that include all non-resident income in the state tax base data that were reported to us. To be sure, this could result in double counting in some states but to undercounting in others. In any event, it is not clear that this would generate systematic bias in the regression results.

VI. ESTIMATION APPROACH AND DATA SOURCES

Our principal goal is to investigate how tax structure characteristics influence state tax bases. Our baseline model, where *i* indexes state and *t* indexes year, is

$$(1) \quad TB_{it} = a_i + b_t + cT_{it} + dX_{it} + e_{it},$$

where TB_{it} is state *i*'s personal income tax base in year *t*, a_i is a vector of state fixed effects, b_t is a vector of year fixed effects, *c*, and *d* are vectors of estimable coefficients, e_{it} is a disturbance, T_{it} is a vector of tax rates, and X_{it} is a vector of other control variables. We discuss specific details pertaining to each component of this baseline approach in turn below.

A. Tax Variables

We include four tax rate variables in our estimation models. The first three are the state's average marginal tax rates on wage income, capital income, and pension income, and the fourth — analyzed separately from the first three — is the state's top marginal personal income tax rate.[16] The first three tax rates, drawn from the NBER TAXSIM Model, are used in the baseline estimates because they are a better measure of the marginal tax rates actually confronted by taxpayers.[17] The rates are calculated using the same nationally representative sample from 1995 with proper adjustment for inflation for each state and year, which allows for comparisons of law without confusing changes in income and deductions with changes in law. Another advantage of these rates is that they are perhaps less susceptible to division bias in our analysis of the calculated tax base described above.[18] The TAXSIM rates are the "marginal tax rate on an additional dollar of income, distributed in proportion to distribution of income across factors and persons."[19]

In the interest of isolating the true effect of tax rates on tax bases, we also control for other relevant features of state personal income tax systems and tax filing populations. We account for differing base mobility by type of income by including the percentage of total income that is represented by dividends, interest and rent. We enter this in index form, with each state's value expressed relative to the national average in each year.

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[16] Results based on the top marginal PIT rate are provided in Appendix Table C1.

[17] See http://www.nber.org/~taxsim/state-marginal/. Note that TAXSIM does not directly provide the tax rates on capital income but it provides the tax rates on dividends, interest and long-term capital gains. We use the national share of each type of income as a weight to calculate the average marginal rate on capital income.

[18] Recognizing the possibility that contemporaneous tax rates might be endogenous in our tax base regressions, we experiment with lagged tax rates in alternative specifications below.

[19] This description was provided by Daniel Feenberg at NBER. For more details, see http://www.nber.org/~taxsim/state-marginal/.

This index variable is interacted with tax rates on capital income to allow the effects of those tax rates to vary with the level of the index.

Almost every state uses federal AGI or federal taxable income as a starting point for determining state taxable AGI and taxable income. Since some states changed their starting point during the period of our analysis, we include a dummy variable to account for any impacts of a change in the starting point on our base measures. We also include the corporate income tax rate to account for the possibility that our estimated elasticities reflect shifts between corporate and non-corporate activity rather than changes in the underlying behavior (Slemrod, 1998; Saez, 2004).

Our next tax-related variable is an indicator of the extent to which states have entered into reciprocity agreements with other states. The reciprocity agreements allow labor income earned in a non-resident state to be taxable in the home state (with the work state withholding for tax purposes). For example, in 2008 people may have wanted to live in Illinois with a 3.0 percent PIT rate and work in Iowa with an 8.98 percent rate since a reciprocity agreement exists between the two states. Reciprocity agreements are almost always between bordering states. Our measure of reciprocity for each state is calculated as the sum of personal income for the states that have reciprocity agreements with that state divided by the state's own personal income. This provides a measure of the external income that could be subject to home state taxation. We interact this variable with the tax rate on wage income in order to allow the tax rate effect to vary with reciprocity status. We further allow for the possibility of cross-border effects of wage income taxation by including the average wage income tax rate in neighboring states (defined as those states sharing a border).

To take a step beyond tax rates in an effort to get at other potentially important features of state personal income tax systems, we include the level of the personal exemption for a married couple filing jointly as one measure of the breadth of state PIT bases.[20] The exemption amount does not affect AGI, but could influence how taxpayers respond to the tax system. We also include a common measure of the overall progressivity of state revenue systems, defined as the share of total state tax revenues that is derived from personal and corporate income taxes (Bahl, Martinez-Vazquez, and Wallace, 2002).

B. Other Control Variables

We include a series of control variables to allow us to isolate the effects of income tax rates on income tax bases. The research on state taxable income elasticities and tax base mobility is scant so there are few parallels to draw from in developing our estimating equation. Further, the most relevant paper (Long, 1999) relies on individual level returns and includes a number of personal characteristics such as age, marital

[20] Other measures of base breadth, such as the ability to itemize deductions, might also be good to include, but we do not have the necessary data.

status, and number of dependents. Since personal income tax bases are expected to be larger in larger states and to fluctuate with state economic conditions, we include state population and the state-level unemployment rate in our models.[21] As shown in Appendix B, state tax bases vary quite widely within our data. We account for the possibility that income tax base mobility may be related to state expenditures by including two variables that represent the two largest categories of state government spending. The first is per-pupil education spending (elementary and secondary only), and the second is spending on public health care. Our expectation is that higher tax rates can push people away from states, but expenditures on demanded public services could attract people.[22] Mobile taxpayers may also have preferences for the tax structure adopted by states. To address the possible effects of tax portfolios on base mobility, we include the share of state tax revenues that are generated by all sources except personal income taxes. Presumably taxpayers are concerned about local income taxes as well as state income taxes. Therefore, we also include local personal income tax collections as a percentage of state personal income tax collections in order to control for the existence of local personal income taxes.

We include two separate indicators for whether the state house and senate are controlled by a majority from the Democratic Party. These variables are used to proxy for differences in tastes for taxes and public services that are not accounted for with the tax structure and expenditure variables. Finally, we include fixed effects for state and year in order to account for other factors of the time-invariant or state-invariant variety.

Summary statistics for the variables are reported in Appendix B. A few observations about the tax rates are useful. The maximum nominal marginal PIT rate ranges from 0–14.0 percent, with a simple average of 5.79 percent. The TAXSIM estimated marginal rate is highest on average for capital income and lowest for pension income. The TAXSIM rates are lower on average than the top marginal tax rate. The corporate income tax rate is on average higher than the personal income tax rate by about one percentage point.

VII. RESULTS

Results from three separate versions of our baseline model, each using a different measure of the personal income tax base, are shown in Table 1. Column 1 uses the aggregate actual tax base collected from individual states, Column 2 uses the calculated state tax base (together with federal taxable income for the states that do not have a broad-based personal income tax), and Column 3 uses aggregate AGI from federal individual income tax returns. The maximum time period is 1989 to 2006 for the 14 states for which we have actual base data for all returns. We have full data for 1989

[21] The baseline model was also estimated using per capita values of the tax base without inclusion of the population variables. The results were qualitatively the same.

[22] For example, see Wasylenko and McGuire (1985), who find that greater state and local spending on education increases employment, and Helms (1985), who finds that increasing taxes to finance local or higher education raises state personal income, but raising taxes to finance transfers reduces state personal income.

Table 1

Baseline Fixed Effects Regression Estimates

	State AGI	Calculated Base	Federal AGI
Tax rate on wage income	–0.237	–0.232**	0.028
	(0.211)	(0.077)	(0.025)
Tax rate on capital income	1.849	0.781**	0.326**
	(4.285)	(0.341)	(0.111)
Tax rate on pension income	0.017	–0.010	0.002
	(0.063)	(0.021)	(0.007)
Capital income index	0.668	0.259**	0.153***
	(1.815)	(0.125)	(0.041)
Capital income index*Tax rate on capital income	–0.319	–0.185**	–0.080***
	(0.917)	(0.074)	(0.024)
Top corporate income tax rate	0.040	–0.111**	–0.017
	(0.078)	(0.036)	(0.012)
Reciprocity	0.652	0.047	0.117**
	(0.678)	(0.160)	(0.052)
Reciprocity*Tax rate on wage income	–0.029	0.004	–0.078**
	(0.184)	(0.084)	(0.028)
Expenditure per pupil	0.202	0.590***	0.076**
	(0.200)	(0.075)	(0.024)
Public health expenditure	0.102**	0.048**	0.014**
	(0.035)	(0.018)	(0.006)
Average neighbors' tax rate on wage income	0.507	–0.495***	–0.034
	(0.365)	(0.099)	(0.032)
Non-PIT share of state tax revenue	0.336	–1.002***	–0.217***
	(0.220)	(0.115)	(0.037)
Local income tax	0.150**	–0.093**	0.022
	(0.064)	(0.041)	(0.013)
Personal exemption	–0.088**	–0.013	–0.005
	(0.043)	(0.027)	(0.009)
Progressivity	0.617**	0.033	–0.047***
	(0.200)	(0.043)	(0.014)
Population	1.571***	0.814***	1.001***
	(0.249)	(0.081)	(0.026)
Change in starting point	–0.114**	–0.005	0.012
	(0.049)	(0.056)	(0.018)
Unemployment rate	0.009	–0.150***	–0.120***
	(0.042)	(0.023)	(0.008)
Democratic majority in Senate (dummy)	–0.001	0.007	0.006*
	(0.019)	(0.012)	(0.004)
Democratic majority in House (dummy)	0.009	–0.008	–0.004
	(0.028)	(0.011)	(0.004)
No state personal income tax (dummy)		0.038	0.012
		(0.298)	(0.097)
Constant	–9.396	11.105***	9.910***
	(9.248)	(1.726)	(0.562)
N	175	900	900
Adjusted R–squared	0.946	0.924	0.989

Notes: Entries are regression coefficients followed by standard errors in parentheses. All models include fixed effects for state and year. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

to 2006 for the other two base measures. Except for dummy variables, all regression variables are entered in natural log form.[23]

Effects of the tax rates must be viewed in terms of the combination of their direct effects and any interaction effects.[24] Only the tax rate on wage income has a statistically significant (and negative) effect on the calculated base, although a negative combined effect is found in the federal AGI model as a result of a significant negative interaction with our reciprocity variable. This suggests that reciprocity makes workers more responsive to tax rate differences because workers can work in a high-tax state and live and be taxed at the rates imposed in a low-tax state. Our estimated base elasticity with respect to the tax rate on wage income is –0.232 in the calculated base model and –0.046 in the federal AGI model (at the average value of the interacted reciprocity variable).[25] The failure to find any effect of tax rates on actual state tax bases is somewhat surprising, but may be attributable in part to the small sample size that is only available from a select set of states. We await future research with a larger and broader sample and more precisely measured tax bases.

While the direct effect of the tax rate on capital income is unexpectedly positive in two of our specifications, our results show that the effect becomes less positive (or more negative) as the capital share of income rises relative to the national average. Indeed, the combined effect is negative at the mean level of the capital income index in both specifications, with combined elasticities of –0.072 in the calculated base model and –0.043 in the federal AGI model. The tax rate on pension income is not found to have statistically significant effects on any of our three PIT base measures. This result suggests that retirees who rely primarily on pension income might make location decisions on factors other than state income taxes as a result of widespread state exemptions of pension income from taxation.[26] Further, the lower taxable income often earned at retirement might mean that tax rates become a less important consideration. Finally, it could also be the case that multi-domiciled pensioners with high capital income may choose to receive some or all of their capital income in lower tax states while not choosing where to receive pension income based on taxes.

In general, state personal income tax bases tend to rise with the capital income index, but the effect falls with the tax rate on capital income. The combined elasticity at the mean capital income tax rate is negative but very small in the calculated base model

[23] Note that we add 1 to all tax rates in order to be able to take natural logs of the complete distribution, including zero values. Additionally, our estimates are not directly comparable to earlier elasticity-of-taxable-income estimates, which typically include the net-of-tax price rather than the tax rate itself. We prefer the use of tax rates themselves since the tax rates are the policy variables in question.

[24] A series of joint significance tests for the base and interaction effects of interacted variables revealed combined statistical significance in the cases of calculated base and federal AGI base.

[25] Combined elasticity estimates are calculated by summing base effects with interaction effects, evaluated at the natural log of the means of interacted variables. We only use statistically significant coefficients in our combined elasticity calculations; insignificant values are effectively entered as zeros because they are not statistically different from zero.

[26] For more details on the state tax treatment of pension income, see Baer (2007).

(–0.030), and positive but very small in the federal AGI model (0.028). The generally positive relationship between the capital income index and the tax base may simply be evidence that tax bases tend to be larger in states where residents have significant amounts of capital income because those residents might have higher levels of total income.

Turning to the other control variables in the models, we find that the top corporate income tax rate only has a statistically significant effect on the personal income tax base in the calculated base model (Column 2). While that effect is negative, it is quite small in magnitude. In the federal AGI model (Column 3), we find that states with a higher reciprocity index (i.e., that have more personal income in states with which they have agreements, relative to their own personal income) tend to have more federal AGI, but that effect erodes rather quickly as the tax rate on wage income rises. As we expected, the combined effect of reciprocity (at the average wage tax rate) is negative in the federal AGI model.

More per pupil spending on education and more spending on health care have the expected positive effect on PIT bases, with the sole exception being the insignificant education spending effect on state AGI. The expenditure variables are more consistently significant than the tax rates. Put together, our results echo Helm (1985) by providing evidence that tax rates and public expenditures have somewhat offsetting effects on the tax base. Surprisingly, we find that states facing higher increases in wage tax rates in neighboring states tend to have lower values of our calculated PIT base. When combined with the insignificant coefficient in the federal AGI equation, this may suggest a propensity for the most tax-sensitive workers to live on the low-tax side of state borders but be willing to work on the high-tax side of the border. This arrangement results in these individuals paying state taxes on their labor income in the state of work (unless there is a reciprocity agreement) but paying taxes on other forms of income in their lower-tax-rate home state and filing for federal purposes from the lower-tax-rate state. States that rely more heavily on the PIT (and thus have lower non-PIT revenue shares) tend to have higher values of the calculated PIT base and federal AGI. This may suggest a tax portfolio selection strategy as states with high PIT bases choose to rely more on the PIT. Finally, we observe an unsurprising negative effect of the unemployment rate on the calculated PIT base and federal AGI.

A comparison of the results across the three models in Table 1 provides several interesting pieces of information. We find that the tax rates on wage and capital income have no significant impact on the actual tax base. However, when considering the combined influence of direct and interactive effects, we find small negative effects of tax rates on wage and capital income on federal AGI and larger negative effects on the calculated base. That the wage and capital income tax rates have larger negative effects on the calculated base than on federal AGI is consistent with individuals filing their federal returns from higher-tax-rate states but not necessarily reporting the same income to those states for state tax purposes. In other words, these results suggest that taxpayers might respond to a tax rate increase by engaging in tax planning in order to move some

of their taxable income into lower-tax-rate states (for example, by owning a vacation home in a low-tax-rate state and receiving capital income in that state), which would be reflected in the calculated base data but would leave federal AGI unchanged.

A. Robustness Checks

The results in Column 1 of Table 1 might not be directly comparable to those in Columns 2 and 3 due to differences in sample size. To investigate the extent to which differences in samples drive the differences in the results, we re-estimated Columns 2 and 3 with the same sample of 175 state-years that were used in Column 1. If the results from these smaller-sample specifications align more closely with our baseline results in Column 1 of Table 1, we can attribute the differences between Column 1 and Columns 2 and 3 to the differences in the samples used. Alternatively, if the new results align more closely with those in Columns 2 and 3 of Table 1, we can attribute the differences to differences in the tax base measures used. Interestingly, the results from this experiment suggest that both sample composition and tax base definition contribute to the differences across the models.[27]

We performed several additional checks in order to gauge the sensitivity of our results to matters of specification. First, we re-estimated the models in Columns 1 and 3 of Table 1 after replacing the three marginal tax rates (on wage, capital, and pension income) with the top marginal personal income tax rate. We did not do this for the model in Column 2 since the calculated base for that model is tax collections divided by the top rate. The results of this exercise are provided in Appendix C. For both models, results are broadly similar to those in Table 1, especially as related to the combined elasticities that account for direct and interaction effects. It is interesting to note that the effects of the top marginal tax rate in Appendix C almost directly parallel results for the capital income tax rate in Table 1, suggesting that capital income is driving the result.

We next considered the possibility that our tax rates might be endogenous in our tax base regressions. While tax rates in our data are typically driven by policy changes in a prior year, there remains some chance that regulations pertaining to the tax base could have been co-determined with regulations pertaining to tax rates. We explored this possibility by lagging all tax rates by one period. This had little to no effect on the basic results in Table 1. Along a similar vein, we next included second lags of all tax rates alongside the first lags in the first version of this robustness check. This was intended to allow for a longer lag between a tax rate change and a subsequent base change in response. The lags may also help account for differences between short-run and long-run effects of tax structures. Without exception, the second lags were not statistically significant and the effects of the first lags again mirrored those of the contemporaneous tax rate variables in Table 1.

[27] Full results of all regression models are available from the authors upon request.

VIII. CONCLUSIONS

We estimate panel regressions of state data for 1989 through 2006 to assess the effects of tax rates, tax structure characteristics, and other controls on state personal income tax bases. We compare results across three broad measures of state PIT bases: actual state AGI as reported to us directly by revenue officials in several states, a measure calculated as total PIT collections divided by the top PIT rate (which we call the calculated base), and total AGI on federal returns filed from each state (federal AGI).

Results generally indicate that tax rates on wage and capital income have no significant impact on the actual PIT bases reported by the states, small negative effects on federal AGI, and larger negative effects on the calculated base. This is at least suggestive evidence of tax planning. Specifically, our finding that the wage and capital income tax rates have larger negative effects on the calculated base than on federal AGI suggests that individuals file their federal returns from higher-tax-rate states but do not necessarily report the same income to those states for state tax purposes. Further, they may engage in tax planning in order to move their taxable income into lower-tax-rate states, thus yielding the larger negative effect on the calculated base. It will be important to conduct further research on the issue of state income tax reciprocity agreements, which might actually be facilitating some tax planning activity. Moreover, public expenditures are consistently positively linked with the tax base, so that expenditures tend to offset the effect of tax rates on tax bases.

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APPENDIX A

Table A1

States with Actual AGI Data

Arizona*	Georgia*	Kansas	Nebraska	North Dakota**	Vermont
California*	Hawaii	Massachusetts*	New Jersey	Ohio**	Virginia**
Colorado*	Indiana*	Michigan*	New Mexico*	Oregon	Wisconsin**
Connecticut	Iowa	Montana*	New York	Utah	

Notes: Seven states have no state personal income tax: Alaska, Florida, Nevada, South Dakota, Texas, Washington and Wyoming. Two states, New Hampshire and Tennessee tax only investment income. Asterisks denote states where AGI data are only available for residents (*) or states where AGI data are available for the sum of resident and nonresident income, but not separately (**).

APPENDIX B

Table B1

Summary Statistics

Variables	Definition	Data Resources	Units	Mean	Min	Max
State AGI	Actual state AGI	Provided directly by individual states	Millions of Dollars	115,284	6,413	622,244
Calculated base	State calculated base	U.S. Census Bureau; IRS	Millions of Dollars	64,157	854	550,751
Federal AGI	Federal definition of tax base	IRS	Millions of Dollars	102,215	5,220	1,035,152
Tax rate on wage income	Average marginal state income tax rate on wage income	http://www.nber.org/~taxsim/state-marginal/	Percentage Point	4.65	0.00	8.95
Tax rate on capital income	Average marginal state income tax rate on capital income	http://www.nber.org/~taxsim/state-marginal/ ; IRS	Percentage Point	4.77	0.00	10.66
Tax rate on pension income	Average marginal state income tax rate on pension income	http://www.nber.org/~taxsim/state-marginal/	Percentage Point	3.61	-0.46	8.65
Capital income index	Index of Dividends, interest, and rents as share of personal income	Bureau of Economic Analysis	Percentage Point	100.81	58.89	156.30
Top corporate income tax rate	State top marginal corporate income tax rate	OTPR, Tax Policy Center	Percentage Point	6.80	0.00	12.00
Top personal income tax rate	State top marginal individual income tax rate	State Tax Handbook, Tax Policy Center	Percentage Point	5.79	0.00	14.00
Reciprocity	State average reciprocity index	Jon Rork, BEA	Percentage Point	1.80	0.00	29.98
Local income tax	Local PIT revenue as a share of state PIT revenue	U.S. Census Bureau	Percentage Point	4.67	0.00	62.49
Personal exemption	Personal exemptions for married couples filing jointly	State Tax Handbook	Dollars	3,018	0.00	24,500
Progressivity	Income tax revenue (PIT+CIT) as a share of total state tax revenue, known as revenue distribution index (Bahl, Martinez-Vazquez, and Wallace, 2002)	U.S. Census Bureau	Percentage Point	35.93	0.00	79.87

Expenditure per pupil	Current expenditure per pupil in public elementary and secondary schools	U.S. Department of Education, National Center for Education Statistics,	Dollars	6,347	2,421	15,340
Public health expenditure	State expenditure on public health	U.S. Census Bureau; OTPR	Thousands of Dollars	714,377	21,087	9,789,186
Non-PIT share of state tax revenue	The share of Non personal income tax revenue in total tax revenue	U.S. Census Bureau	Percentage Point	70.15	25.60	100
Population	State population	U.S. Census Bureau	1 person	5,461,287	453,690	36,249,870
Change in starting point	Dummy variable if state PIT starting point changes to federal taxable income	Federation of Tax Administrators; The Book of the States	Dummy	0.003	0	1
Unemployment rate	State unemployment rate	Bureau of Labor Statistics	Percentage Point	5.16	2.20	11.30
Democratic majority in Senate	Democratic dominance in the Senate	Statistical Abstract of the United States	Dummy	0.50	0	1
Democratic majority in House	Democratic dominance in the House	Statistical Abstract of the United States	Dummy	0.55	0	1

APPENDIX C

Table C1

Regression Results Using the Top PIT Rate

	State AGI	Federal AGI
Top personal income tax rate	–4.391	0.279**
	(4.038)	(0.092)
Capital income index	–2.152	0.134***
	(1.902)	(0.038)
Capital income index*Top PIT	0.979	–0.062**
	(0.882)	(0.020)
Top corporate income tax rate	0.009	–0.015
	(0.090)	(0.012)
Reciprocity	0.425	0.015
	(0.421)	(0.030)
Reciprocity*Top PIT	–0.091	–0.021*
	(0.079)	(0.012)
Expenditure per pupil	0.207	0.061**
	(0.223)	(0.024)
Public health expenditure	0.097**	0.011*
	(0.036)	(0.006)
Average neighbors' top PIT rate	0.067	–0.062**
	(0.241)	(0.021)
Non-PIT share of state tax revenue	0.287	–0.192***
	(0.234)	(0.036)
Local income tax	0.174**	0.017
	(0.055)	(0.013)
Personal exemption	–0.067	–0.002
	(0.044)	(0.009)
Progressivity	0.676**	–0.049***
	(0.202)	(0.014)
Population	1.477***	1.013***
	(0.269)	(0.026)
Change in starting point	–0.080	0.015
	(0.052)	(0.018)
Unemployment rate	–0.002	–0.118***
	(0.042)	(0.007)
Democratic majority in Senate (dummy)	–0.002	0.008**
	(0.020)	(0.004)
Democratic majority in House (dummy)	0.013	–0.003
	(0.029)	(0.004)
No state personal income tax (dummy)		–0.050
		(0.095)
Constant	5.971	9.922***
	(10.174)	(0.557)
N	175	900
Adjusted R-squared	0.943	0.989

Notes: Entries are regression coefficients followed by standard errors in parentheses. All models include fixed effects for state and year. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.