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PROMISES, PROMISES: THE STATES' EXPERIENCE WITH INCOME TAX INDEXING

Daniel R. Feenberg

Harvey S. Rosen

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ABSTRACT

Prior to 1985, ten states adopted some kind of indexing provisions for their personal income tax systems. Seven of these states subsequently suspended their indexing laws for one or more years. In this paper we examine the states' experience with income tax indexing and see what lessons can be drawn from it. We describe the indexing statutes, and estimate simple econometric models of both the decisions to adopt indexing and to renege on a promise to index.

Daniel R. Feenberg
N.B.E.R.
1050 Massachusetts Avenue
Cambridge, MA 02138

Harvey S. Rosen
Department of Economics
Princeton University
Princeton, NJ 08544

I. Introduction

When an income tax is based upon nominal income, then in general, the real burden of taxation depends upon the rate of inflation. The most popularly understood way in which inflation affects taxes is "bracket creep." As nominal income increases, the individual is pushed into brackets with higher marginal tax rates. Hence, the proportion of income that is taxed increases despite the fact that real income stays the same. Another effect of inflation occurs because exemptions and the standard deduction are set in nominal terms. Increases in the price level decrease their real value, again increasing the effective tax rate.[1]

Inflation, then, leads to unlegislated increases in the real burden of the income tax. Aaron [1976, p. 10] points out that for the federal income tax, historically these effects have been mitigated by a series of ad hoc reductions in statutory rates. Such cuts in the federal income tax were enacted in 1969, 1971, 1975, 1976, 1977, and 1981. An alternative to such ad hoc arrangements is to index the tax system, i.e., to legislate a formula which automatically removes the influence of inflation from real tax liabilities.

Why should it matter whether the effects of inflation are mitigated by ad hoc measures or by an indexing formula? The key distinction is that indexing is supposed to represent a serious commitment by the government to a given real tax schedule, i.e., a relationship between real income and real tax burdens. Although the tax schedule might change in the future, it would be a consequence of explicit legislative changes, and not the vagaries of the inflation rate. Ex ante, a series of ad hoc adjustments does not provide the same kind of certainty.[2]

With legislation passed in 1981, the federal government made its first move toward indexing--bracket widths, the personal exemption, and the

standard deduction are now adjusted annually by the rate of change in the consumer price index. As is well known, these provisions went into effect in 1985.[3] Somewhat less well known is that prior to 1985, ten states adopted some kind of indexing provisions for their own personal income tax systems. And even less well known is that of these ten states, seven suspended their indexing laws for one or more years. So much for commitment.

The purpose of this paper is to examine the states' experience with income tax indexing and see what lessons can be drawn from it. Section II provides a description of the relevant statutes. Section III examines the circumstances that led some states to adopt indexing, and why some of them subsequently reneged on their promises. Section IV concludes with a summary, suggestions for future research, and discussion of possible implications for federal tax reform.

II. State Indexing Laws

This section provides summaries of the various state indexing laws. We begin with descriptions of the relevant statutes, and then provide a quantitative summary. The information was culled from various editions of the State Tax Review, published by Commerce Clearing House; the state income tax forms; and, in some cases, direct communication with the various state revenue offices.

A. The Indexing Statutes.

State tax systems differ widely with respect to the items that are indexed, and how these items are adjusted in response to changes in the price level. Generally, indexing statutes apply to one or more of the following items: bracket widths, personal exemptions, standard deductions, and the ranges over which vanishing deductions and credits are phased out. Before discussing the specifics of the various statutes, we should note one

important feature that they have in common--no attempt at all is made to index capital income. Thus, the important distortions due to the inclusion of inflationary gains and losses in the computation of the tax base are ignored.

Arizona's income taxes were first indexed in 1978 on a temporary basis; the arrangement was made permanent in 1980. Indexing is quite thorough--the tax brackets, standard deduction, personal exemptions, a property tax credit and a rent credit are all included. (However, a ceiling on the deduction for child care allowances is unindexed.) The price index used is the Phoenix Consumer Price Index (CPI) for the fiscal year ending in the tax year. The implied changes in bracket widths, etc., are rounded down to the nearest $10.

One peculiarity of the Arizona law is that the standard deduction is over-indexed. In 1978, the standard deduction was 10 percent of Adjusted Gross Income, with a minimum of $500 and a maximum of $1000. The Arizona statute indexes not only the minimum and maximum amounts, but also the percentage rate used in the calculation. By 1985, the percentage rate was 18.3 percent, with a minimum of $917, and a maximum of $1834. When we contacted the Arizona tax authorities to confirm our understanding of their law, apparently no one realized what was happening. At the time of this writing, a modification of the statute is under consideration.

California began indexing income brackets in 1978. The same law prescribed indexing of the personal exemptions, dependent deductions and low income credit beginning in 1979. The limit on capital losses, the child care credit, and the rent credit remained unindexed. For 1978 and 1979, the adjustment factor was the California CPI minus three percent (but not less than zero). For 1980 on, the factor was the change in the California CPI for the 12 months ending in June of the tax year. Bracket widths are rounded

to the nearest $10, and other items to the nearest $1. This brings us to a feature of California's law that is shared by a number of other states--rounding errors are not carried forward. Suppose, for example, that according to the change in the CPI, bracket widths should be increased by $9. Then no change in the bracket widths occur. Now suppose that the next year's experience also implies a $9 increase. Again there is no change. In short, the cumulative effect of several years of low inflation can lead to substantial increases in real tax burdens.

Colorado's indexing statute went into effect in 1978. Personal exemptions, income brackets and the standard deduction were covered; food, fuel and property tax credits were not. The index amount was to be set annually by the legislature. If the legislature failed to take action, the law specified a default amount: 6 percent for the period 1978-85, and 3 percent starting in 1986.

Does Colorado's law represent true indexing? Clearly, if the legislature can set the adjustment factor without reference to any external standard, the commitment to keeping the real tax function unchanged is weakened. On the other hand, the law does embody a commitment to review the inflation situation annually, a commitment that is backed up by the presence of the default option. In any case, in 1983 these considerations became moot for the citizens of Colorado when the law was suspended for each of the years 1983, 1984 and 1985.

Iowa adopted indexation temporarily for 1979 and 1980, and made it permanent in 1980. Only the income brackets and an annuity exclusion were indexed; the standard deduction, personal exemption and general credit were not. The adjustment factor used for 1979 was 25 percent of the change in the CPI for the entire U.S. For 1980 and subsequent years, 50 percent of

the change in the GNP deflator was specified. Interestingly, indexation was made conditional on the presence of an unobligated general fund surplus of sixty million dollars at the close of the fiscal year. This event has not occurred since 1978. In effect, then, Iowa built reneging right into its statute. One should note, however, that the law indicating the size of the surplus is also subject to change.

Maine adopted an indexation law for 1981 and subsequent years via a referendum held in 1982. The years specified in the preceding sentence are not typographical errors. Indexing was passed in a voter initiative held early in 1982, and the initiative stipulated that indexing would apply to taxes on 1981 income due in 1982. The initiative was challenged in court on the basis of its retroactivity. The Supreme Court of Maine ruled that the initiative was legal, but meanwhile the legislature managed to postpone application of the law until 1983. The personal exemption and the standard deduction were indexed, but only for those in income brackets below $15,000 for single individuals and separate returns, $22,500 for heads of households, and $30,000 for joint returns. These limits were also indexed. The property tax credit was not indexed. The adjustment factor was 50 percent of the increase in the U.S. CPI during the twelve months ending in June of the tax year, but not more than 7 percent. Values were rounded to the nearest $10, and roundoff errors were not carried forward.

Minnesota adopted indexing for 1979. Brackets were to be indexed for 1979 onward; and the low income deduction, standard deduction and general credit for 1981 onward. In 1980, indexing was repealed for the low income deduction, a slightly curious move for a state with a reputation for being liberal. At the same time, brackets were to be adjusted by a different factor than other amounts: the bracket adjustment was 85 percent of the change in

the Twin Cities CPI of the 12 months ending in August of the tax year; other items were adjusted by 100 percent of that change. The standard deduction was rounded to the nearest $100; the rounding error was not to be carried forward. Other items were rounded to the nearest one dollar.

A number of important changes were made in Minnesota's law in 1981; i) Each year, every taxpayer's taxable income is multiplied by a "Taxable Net Income Adjustment Factor" (TNIAF), a number which, when multiplied by each taxpayer's taxable income, ensures that average taxable income will grow at the same rate as average gross income. The TNIAF is bounded below by one. This factor was introduced to meet concerns that the 1979 law was leading to a reduction in the real value of the tax base. (The main element in this erosion was the fact that (unindexed) federal tax payments are deductible on Minnesota tax returns, so as federal tax liabilities grew, Minnesota tax collections fell.) ii) The adjustment factor was based on the change in the CPI for urban consumers (CPI-U) for the 12 months ending in September of the tax year. However, the adjustment factor could not exceed the rate of increase in Minnesota gross income. iii) Brackets were to be indexed at 100 percent of the adjustment factor, not the previous figure of 85 percent. iv) Brackets were to be rounded to the nearest $10, with rounding errors not carried forward. Taking items i) through iv) together, we can infer that making the system comprehensible was not a major consideration in the design of the Minnesota indexing law.

Another feature of the 1981 law was a provision for automatic suspension of indexing in periods of financial stringency. However, this section was repealed in 1985 when it became apparent that it might actually go into effect. A new rate schedule was introduced at that time.

Montana adopted indexing for 1981 onward via a referendum held in

1980. Bracket widths, the personal exemption and the maximum standard deduction were to be adjusted each year by the change in the U.S. CPI-U for the months ending in June of the tax year. Brackets were rounded to the nearest $100, and other items to the nearest $10. Rounding errors were carried forward.

Oregon adopted indexation in 1979 for tax years 1981 onward. Only the personal exemption was indexed. In 1982, the law was suspended retroactively to 1981. Moreover, during the years 1983-1985, the personal exemption itself was temporarily removed, and replaced by a general credit, which was not indexed. In effect, then, indexing was removed. In 1985, the change from an exemption to a credit was made permanent, and the credit was indexed to the Portland CPI, beginning in 1986.

South Carolina adopted indexing in 1980, effective in 1982. Only bracket widths were affected. However, in 1983, before 1982 taxes were paid, the effective date was postponed to 1984 and the adjustment factor reduced to 25 percent of the CPI. For 1985, the adjustment factor used was twenty-five percent of that in the federal tax law for bracket widths, and 100 percent for the standard deduction and personal exemptions.

Wisconsin adopted an indexing statute in 1979, effective for 1980. Only income brackets were indexed; the personal exemption, standard deduction, rent, property, and general credits were not. The adjustment factor was the June to June change in the CPI for the entire U.S. minus 3 percent. Indexing was suspended in 1983.

B. Summary.

Table 2.1 summarizes some of the information from this discussion. For the period 1978-1985, it shows for each state the adjustment factor applied to whatever items were indexed. Thus, for example, Arizona's figure of 16.0 for

1980 means that the 1980 tax parameters were determined by applying a 16 percent adjustment factor to their 1979 values. For purposes of reference, the last line records the percentage change in the U.S. CPI as a whole. An asterisk (*) indicates that indexing was promised for that year, but was then suspended.

Table 2.1 does not do justice to the heterogeneity of the various indexing statutes across states; however, a tabular representation of all the provisions would be unwieldy. In any case, if we seek to assess the impact of a given state's indexing statute, we must view it in the context of the rest of that state's tax code. However, the tax codes themselves differ dramatically from state to state, both with respect to the tax base and tax schedule. (See Feenberg and Rosen [1986].) These considerations suggest that a sensible characterization of the extent of indexing must embody some sort of comparison between the revenue yield of the actual (indexed) tax system, and what the yield would have been in the absence of indexing. Specifically, let R_b be a state's revenue during a given year. Now suppose that prices and incomes increase at rate π. Let R_i be the associated revenues given that year's indexing law, and R_u the revenues that would have been generated without indexing. Thus, under the indexing law, real revenues increase from R_b to $R_i/(1+\pi)$, while without indexing, they would have increased from R_b to $R_u/(1+\pi)$. Our measure for the extent of indexing is

$$I = 1 - \frac{R_i/(1+\pi) - R_b}{R_u/(1+\pi) - R_b} .$$

Thus, I measures the proportion of the inflationary increase in real taxes that is returned to the taxpayer by the indexing law. Note that with a perfectly indexed tax, real tax burdens are unchanged by inflation, i.e., $R_i/(1+\pi) = R_b$. In this case, $I = 1$.

Because the tax schedules are nonlinear, a state's value of I in a given year will in general depend upon π. If one wants to examine the evolution of the various indexing statutes over time, it makes sense to compute I using the same value of π for each year. In this way, one does not confound changes induced by statutory modifications with changes induced by inflation. On the other hand, if one is interested in how a state's statute actually operated in a given year, π should be the actual inflation rate. The figures in Table 2.2 show values of I for 1978-84 calculated both ways. The figures without brackets are computed conditional on $\pi = 0.06$; the figures within brackets are based on the actual inflation experience of that year.

As expected from our earlier description of the statutes, there are considerable differences across states. A striking and unexpected result is that a number of state income taxes are over-indexed--$I > 1$. This phenomenon is explainable by the facts that: a) federal income taxes paid are deductible on some state income tax returns, and b) during the time period under consideration in the table, the federal tax system had no indexing. Hence, when nominal income goes up, nominal state income tax payments decrease due to indexing and a greater federal tax deduction. Both effects taken together can result in a lower real state income tax burden.

III. To Index or Not to Index?

A. The Characteristics of Indexing vs. Non-Indexing Sates

This section examines the factors that influence a state's indexing status. Our first goal is to see if there are any obvious differences between the states which at any time chose to index and those that did not. A glance at Table 2.1 suggests that geography is not a major factor. Each major

region is represented by at least one state. Similarly, states with varying political traditions are included in the table--Minnesota and Oregon, for example, are generally considered to be liberal, while Arizona and South Carolina are conservative.

Table 3.1 shows the differences between states that ever voted for indexing and those that did not with respect to the 1982 values of a number of important fiscal and demographic variables.[4] (Data sources are documented in the Appendix.) The table indicates that with respect to population, personal income per capita, general expenditures per capita, per capita debt, and deficits per capita, the differences between indexing and non-indexing states are not very great. The income and deficit figures are virtually identical. Indexing states have somewhat larger populations and per capita government expenditures, and smaller per capita debts, but these differences are not statistically significant.[5]

On the other hand, the revenue structures of the indexing and non-indexing states are quite different. First, indexing states raised 36 percent of tax revenues from the personal income tax; the comparable figure for non-indexers was 27 prcent. The difference is statistically significant Are the income tax systems themselves different? As is well-known, for complicated non-proportional tax schedules, in general there is no single number that can characterize the entire schedule. Table 3.1 therefore presents several different measures: the elasticity of revenues with respect to income; and the marginal tax rates on individuals with $10,000, $20,000, and $40,000 incomes. On average, the elasticity is higher in indexing than non-indexing states, as are the marginal tax rates at each income level.

The last entry in the table is a dichotomous variable which indicates whether the state had a tax or expenditure limitation (TEL) statute in place

in 1982. (See Kenyon and Benker [1984].) Sixty percent of indexing states had TEL's; the comparable figure for the non-indexers was 27.2 percent. This perhaps suggests that states which sought to curtail the size of the public sector were using several instruments.

Of course, the figures in Table 3.1 reflect only the status of the various states as of 1982. They reveal little about the states' situations at the time that indexation was adopted. What factors might affect this decision? In particular, what effect might a state's tax structure have on its indexing status? There is no standard theoretical framework to rely upon for generating hypotheses on how various variables influence the indexing decision. This is because, as Atkinson and Stiglitz [1980, Chap. 10] and others have noted, there is no generally accepted theory of how public sector decisions are made.

We have found it useful to think of indexing in the context of an informal model in which legislators seek to maximize the likelihood of staying in office over a given time horizon. Since voters like tax reductions (ceteris paribus), a legislator can enhance the probability of wining his next election by supporting indexing.[6] However, once indexing is passed, it reduces the scope for tax reductions in future years. And if voters are myopic as suggested by Fair [1982], Feldstein [1980] and others, then legislators cannot expect to be rewarded in the relatively distant future for earlier support of indexing. Hence, the legislator's choice between indexing and a series of ad hoc reductions in the future depends upon, inter alia: i) the legislator's discount rate and time horizon; ii) the extent to which voters in the next election will be influenced by support for indexing; iii) the extent to which voters in future elections will reward legislators who voted for indexing in the past; and iv) the extent to which votes in future elections are influenced

by a series of ad hoc tax decreases.

Thus, as a state's income tax structure becomes more progressive,[7] there are two effects that work in opposite directions. First, as progressivity increases, so does the cost of indexation in terms of lost opportunities for future tax reductions. This tends to reduce support for indexing. The second effect of increased progressivity is to increase the present value of the stream of tax reductions implicit in the indexing law. This tends to increase support for indexing. In short, the tradeoffs inherent in the decision to index are made more dramatic when progressivity increases. Whether this tends to increase or decrease the probability of indexing cannot be known a priori.

Another variable that might affect the indexation decision is the importance of the personal income tax in the state's revenue system. Suppose that the costs to legislators of enacting a tax indexing statute do not vary proportionately with the size of the income tax. In particular, there might be fixed costs in terms of time spent organizing a coalition, putting the statute through the legislative process, etc. If such is the case, then it would be less worthwhile to enact an indexing statute when the income tax is relatively unimportant. In short, we expect that as the proportion of state tax revenue attributable to the personal income tax increases, so does the probability of indexing, ceteris paribus.

The state's financial environment might also affect the indexing decision. One expects that when a state is under financial stress, its legislators will be unlikely to abandon a potentially important source of revenue, ceteris paribus. Hence, we expect states with large debt burdens to be less likely to adopt indexing.

We consider next variables that might be reflective of a state's "tastes"

for indexing. Income levels might affect the political views of voters and their elected representatives; hence we will examine the impact of per capita income on the indexing decision. As suggested earlier, another indicator of the political environment is the presence of a tax or expenditure limitation (TEL) statute. Perhaps a TEL is indicative of an underlying desire to curtail government, in which case the presence of a TEL would increase the probability of indexing. Alternatively, it could be that if a state has adopted a TEL , its citizens require no additional instruments to control the size of the public sector. In this case, the presence of a TEL would reduce the probability of indexing. In any case, however, care must be taken in assessing the relationship between TEL's and indexing, because the decisions to adopt them may be made jointly.

A final variable that might affect the indexing decision is the inflation rate itself. Indexing would not be an issue at all if inflation were always zero. Perhaps the "correct" model is simply that states adopt indexing when the inflation rate is high, and then drop it when the inflation rate is low.

With respect to the reneging decision, we expect the same variables to operate as in the decision to index. Nevertheless, we note in passing that in a number of conversations with state government officials, we were told that the main reason for reneging was to deal with a financial crisis. Issues of tax structure never came up in these discussions.

B. An Econometric Model of Indexing Status

In this section we construct a Markov model of states' indexing and reneging decisions. In any given year, a state's income tax system can be characterized by one of three conditions: it is indexed; it is not indexed and has never been indexed; or it is not indexed, but the state has reneged on an earlier promise to index. The probabilities of moving from one

condition to another (transition probabilities) are defined in Figure 3.1. Thus, the first row indicates that if a state fails to index initially, the probability that it will stay non-indexed is $(1-p)$; with probability p , then, it will join the ranks of the indexing states. The third cell in the first row is zero because by definition, a state that has never promised to index cannot renege. Similarly, from the second row, the probability that an indexing state retains indexing is $(1-q)$; the probability that it reneges is q . The third row implies that reneging is an absorbing condition--once a state reneges, it never goes back to indexing. Obviously, from a theoretical point of view this need not be the case, and indeed, there are several counterexamples in Table 2.1. As a practical matter, however, so few reneging states have actually returned to indexing that it would be infeasible to estimate the probability of that event.

We assume that transitions from period t to $t + 1$ depend on variables dated period t . While we could make p and q functions of different variables, in practice we could think of no basis for including some variables in one decision and not the other. Hence, $p_t = p(x_t)$ and $q_t = q(x_t)$, where x is a row vector. Assuming the convenient logit specification we can write

$$(3.1) \quad p_t = \frac{e^{x_t b}}{1 + e^{x_t b}} = F(x_t b) \text{ , and}$$

$$(3.2) \quad q_t = \frac{e^{x_t g}}{1 + e^{x_t g}} = F(x_t g) \text{ ,}$$

Figure 3.1

		Period t + 1		
		no indexing	indexing	renege
Period t	no indexing	(1-p)	p	0
	indexing	0	(1-q)	q
	renege	0	0	1

where b and g are parameter vectors.

Let d_1 be an indicator variable which takes the value 1 if a state has no indexing in period t and remains unindexed in period t + 1, and zero otherwise; and $d_2 = 1$ if a state starts out being indexed and stays that way, and zero otherwise. Then the likelihood function associated with Figure 3.1 is

$$(3.3)\quad L = \prod_{t=1}^{T-1} \left\{ \prod_{\substack{\text{no indexing} \\ \text{in t}}} [F(x_t b)]^{d_1} [1 - F(x_t b)]^{1-d_1} \times \prod_{\substack{\text{indexing} \\ \text{in t}}} [F(x_t g)]^{d_2} [1 - F(x_t g)]^{1-d_2} \right\}$$

where T is the number of years in the sample.[8]

At first glance the maximization of (3.3) appears to be a messy nonlinear problem. However, due to the Markov independence assumption, L separates into two conventional logit equations, so that standard software routines can be used. Logit 1 selects observations which are not indexed in period t, and computes the probability that they become indexed in period t + 1. A state that becomes indexed is assigned a one; a state that remains non-indexed receives a zero. Logit 2 selects all observations which are indexed in period t, and computes the probability that they renege in period t + 1. A state that reneges is assigned a one; a state that remains indexed receives a zero.[9]

Implementing the statistical model requires that the x_t vector be specified. As noted earlier, we use debt per capita to represent "fiscal stress;" per capita income and a TEL dichotomous variable to represent "political tastes;" and the share of the income tax in total

revenues to measure the importance of income taxation. As also observed above, the income tax structure itself can be characterized by several different variables, e.g., the elasticity of revenue with respect to income, or the marginal tax rate at each of several income levels.[10] Ideally, one would want to include all of the tax structure variables simultaneously in x_t, and so determine their relative importance. However, due to multicollinearity among the various measures and the small number of transitions into indexing, this strategy proved to be infeasible. Instead, we estimate the equations several times, each with an alternative measure. Finally, in order to estimate the impact of the inflation rate on the indexing decision, in some variants we include it in x_t.

All equations are estimated using data from 1977 to 1984. That is, the first transition is from 1977 to 1978, and the last from 1983 to 1984. The indexing equation has observations on 258 transitions; the reneging equation has 32.

C. Results

1. The Indexing Decision. To begin, we estimate models with only tax structure and fiscal stress variables. The first column of Table 3.2 shows the results when the probability of indexing is a function of the elasticity of the income tax system (e), the ratio of income tax revenue to total revenue (s), and per capita debt (DEBT). The positive coefficient on s indicates that the more important the income tax is in a state's tax structure, the higher the probability that it will adopt indexing. This is consistent with our earlier argument that there are fixed costs to enacting indexing statutes, and hence indexation is less likely to be adopted when the income tax is a relatively unimportant component of

the state's revenue system.

The positive coefficient on e shows that more elastic tax systems have a higher probability of being indexed. The coefficient on s exceeds its standard error by a factor of 2.1; for e the t-ratio is 1.93. In terms of our earlier discussion of the two effects that increasing progressivity can have on the probability of indexing, apparently the second is dominant. That is, the increased likelihood of a success in the next election more than outweighs the costs of diminished chances for success in future elections. The state's financial position as measured by DEBT also has an impact--the larger its per capita debt, the less likely that a state will adopt indexing. This coefficient, moreover, is significant at conventional levels (t = -2.14). We defer to later a discussion of the quantitative significance of the coefficients.

We conjectured earlier that the impact of the form of the income tax structure should depend on the relative importance of the income tax in the state's revenue system. This conjecture is examined in column (2) of Table (3.2), which shows the outcome when s is omitted from the indexing logit. As expected, failure to control for the relative importance of income taxation renders the income tax structure insignificant as a determinant of the indexing decision. Omission of s is a serious specification error. Note also that the coefficient on DEBT falls both in absolute terms and relative to its standard error when s is omitted from the equation.

In order to assess the robustness of the results in column (1), we re-estimated the logit equation entering the "taste" variables mentioned above, i.e., TEL and Y . The results, shown in column (3) of Table 3.2, indicate the following: 1) Neither TEL[11] nor Y adds significantly to the explanatory power of the equation (although Y is "close" with a t-statistic

of 1.83). However, the point estimates suggest that the probability of indexing varies positively with each variable. 2) The coefficients on the tax structure and debt variables are fairly robust with respect to the inclusion of TEL and Y . Compared to their counterparts in column (1), the coefficients on e and DEBT are larger in absolute value, and the coefficient on s is smaller. But the basic story is unchanged.

Thus far, our main substantive conclusion is that the more progressive the income tax structure, the greater the probability of indexing, ceteris paribus. We now investigate whether this conclusion holds up under several alternative notions of "progressive". Specifically, we characterize the states' income tax structures by their marginal tax rates at the $10,000, $20,000 and $40,000 income levels. In each case, we include s and DEBT in the equation, but omit TEL and Y .[12]

The outcomes with t_{10} , t_{20} , and t_{40} are reported in columns (4), (5) and (6) of Table 3.2, respectively. The point estimates suggest that income tax systems with high marginal tax rates at any given income level are more likely to index, ceteris paribus. However, the coefficients are imprecisely estimated: t_{10} is only 1.08 times its standard error, t_{20} has a t-ratio of 1.72, and t_{40} a t-ratio of 1.81.

In short, the results from Table 3.2 indicate that whether we use marginal tax rates or elasticities as measures of tax structure, the main qualitative result is the same. Namely, tax systems that are more prone to produce increasing real tax rates in the presence of inflation are more likely to be indexed. This effect shows up most strongly when the income tax system is characterized by its overall income elasticity.

We also experimented with an alternative measure of fiscal stress, the state's deficit in the year prior to which indexing was adopted. In all cases, DEFICIT did "worse" than DEBT in the sense of having smaller t-statistics. (These results are available upon request.) Apparently, one particular year's fiscal experience looms less important in the indexing decision than the cumulative effect of all past fiscal decisions as measured by the debt.

Next, in order to investigate the possibility that the inflation rate affects the indexing decision, each of the equations in Table 3.2 was re-estimated including the inflation rate as a right hand side variable. The results, reported in Table 3.3, suggest that: a) the inflation rate is not statistically significant; and b) its inclusion does not affect the qualitative results in the rest of the table very much. Of course, it would be silly to interpret Table 3.3 as saying that inflation has nothing to do with indexing decisions. What the Table does say is that during our sample period, variations in the inflation rate do not do a very good job of explaining when states chose to index.

So far we have confined our discussion to the qualitative aspects of the results. To obtain a sense of their quantitative significance, we assumed that the indexing decision was governed by the parameters in column 1 of Table 3.2, and simulated the response of the probability of indexing in a given year, p , to changes in the various right hand side variables. To begin we evaluated equation (3.1) at the mean values of the x_t's and found p = 0.00636.[13] We then re-computed (3.1) several times, each time increasing a single right hand side variable by one standard deviation, and leaving all others at their means.

The simulations are reported in Table 3.4. The tax structure variables have very powerful effects on p. A change in the elasticity from 1.59 to 2.03 almost doubles the probability of indexing. An increase in the share of income taxes in total revenues from 0.26 to 0.39 more than triples the probability of indexing. The effect of fiscal stress is also important. Increasing per capita debt from $500 to $885 cuts the probability that a state will index by a factor of about 7.

2. The Reneging Decision. We next turn to states' decisions to renege given that they have adopted indexing. As noted above, to be included in the sample for this equation, a state must commit itself to indexing. Consequently, the number of observations is much smaller than that for the indexing equation. Mechanically, the dependent variable for each observation is determined as follows: After the time the indexing commitment is made, a state is assigned a value of zero for each year the state continues to index, and a one if it reneges. Once a state reneges, it is out of the sample.

The estimates are presented in Table 3.5. As one would hope, they tend to mirror the results for the indexing equations in Table 3.2. Consider first columns (1), (2), and (3), where the income tax structure is characterized by e, the elasticity of revenues with respect to income. In each equation, the coefficient on e is negative, suggesting that the more elastic the tax structure, the less likely is the state to abandon indexing. As progressivity increases, the short run "punishment" from abandoning indexing exceeds the series of future "rewards" generated by the ability to grant more ad hoc tax decreases. However, unlike their counterparts in Table 3.2, these coefficients are not statistically significant. We conjecture that there are two reasons for this. First, as just noted, the sample size is quite small, which tends to make it difficult to estimate parameters precisely.

Second, the sample consists of states that have chosen to index, and we already know from Tables 3.1 and 3.2 that such states have higher than average elasticites. Within this group there may simply not be enough variation in e to pin down its coefficient.[14]

The coefficients on the debt variables in columns (1), (2) and (3) indicate that the larger a state's per capita debt, the more likely it is to renege on its promise to index. In the reneging decision, fiscal stress is more "important" than tax structure in the sense that its coefficient has a higher t-ratio. Even here, however, it falls a bit below conventional levels for statistical significance.

The results from column (3) indicate that states with TEL's are less likely to renege than states without them, ceteris paribus. Also, the higher is per capita income, the less likely is reneging to occur. As is the case with the indexing decision, however, these variables are not statistically significant, and they do not have much of an impact on the estimates of the other parameters.

Columns (4), (5) and (6), indicate that the higher are marginal tax rates at any given income level, the less likely the state is to renege on its promise to index. However, like the elasticity variable in column (1), the coefficients on the marginal tax rates are statistically insignificant. Also as in column (1), greater levels of debt increase the probability that a state will renege on its promise. In these equations, the t-statistics on the debt variables are borderline significant by conventional criteria.

Table 3.6 shows the results when the various specifications in Table 3.5 are augmented with the inflation rate. As was the case for the indexing equation, the inflation rate is insignificant, and does not have much of an effect on the coefficients of the other variables.

To assess the quantitative significance of the estimates of the reneging logit estimates, we follow a procedure analogous to that used to generate Table 3.4. We assume that behavior is governed by the coefficients in the first column of Table 3.5; evaluate q of equation (3.2) at the mean values of the right hand side variables; and observe how q changes when each of the variables is allowed to vary by one standard deviation. The results are reported in Table 3.7. A change in the elasticity from 1.85 to 2.20 reduces the probability of reneging in a given year from 0.14 to 0.07, a very strong effect. On the other hand, changing the proportion of revenue collections attributable to the personal income tax has a negligible effect on the probability of reneging. Relatively high levels of debt per capita have a substantial impact on the likelihood of reneging; increasing per capita debt from $288 to $534 would increase the probability of reneging to almost 44 percent.

To summarize the discussion surrounding Tables 3.5 through 3.7: A small sample size plus insufficient variation in the right hand side variables make it impossible for us to obtain precise estimates of the determinants of reneging. On the basis of the point estimates, however, the two main conclusions are: (1) The more sensitive that real tax burdens are to increases in nominal income, the less likely is a state to renege on a promise to index; and (2) Debt burdens play an important role in states' decisions to abandon indexing.

IV. Conclusions

This paper has examined the states' experience with the indexing of their personal income taxes. The main findings are:

1. Most of the states that committed themselves to indexing reneged on their promises.

2. Among indexing states, there is considerable heterogeneity with respect to the items that are indexed, and the adjustment factor used to change these items when the price level increases.

3. In the period 1978-1984, several states were over-indexed. That is, when nominal incomes rose, real tax revenues fell. This phenomenon was due to the deductibility of (unindexed) federal tax liabilities on state returns.

4. A state's indexing status depends on its tax structure, inter alia. The more that real tax burdens increase with income, the more likely is a state to index, and the less likely it is to renege.

5. States with high levels of per capita debt are less likely to index, and more likely to renege on a promise to index.

Do these results tell us anything about the prospects for continued federal income tax indexing? Clearly, it is not necessarily true that federal and state decision-making are governed by the same process. Suppose, however, that similar considerations do come into play. If so, the current high levels of federal debt together with the decrease in marginal tax rates associated with the Tax Reform Act of 1986 suggest a strong possibility that indexing will be repealed. In this context, it is interesting to note that at various times, Sweden, the Netherlands, France, the United Kingdom, and Canada adopted some form of ". . . automatic adjustment of individual income tax rate brackets and exemptions for inflation. Yet the adjustments were either omitted or reduced frequently to avoid the revenue reductions that would otherwise take place." (Pechman [1986, pp. 2-3]) Apparently, reneging on promises to index is not a practice confined to sub-national levels of government.

Finally, our paper has discussed the response of states' indexing decisions to the structures of their tax systems, but it has not attempted to

account for differences in the tax structures themselves. Recently, several papers have examined cross sectional differences in the choice of tax instruments.[15] Such papers attempt to explain why, for example, some jurisdictions rely more heavily on income taxation than others. They pay little attention to the fact that the tax instruments themselves vary substantially with respect to their progressivity. Investigating the sources of tax structure heterogeneity is an important topic for future research.

Table 2.1

Indexing of State Income Taxes[a]

1978-1985

State	1978	1979	1980	1981	1982	1983	1984	1985
Arizona	10.1	11.4	16.0	11.7	8.8	1.7	4.3	5.8
California	5.2	6.9	17.3	8.3	9.3	-1.2	4.6	4.6
Colorado	6.0	7.0	9.0	8.0	6.0	*	*	*
Iowa		2.3	*	*	*	*	*	*
Maine				*	*	2.2	1.8	2.0
Minnesota		10.1	8.6	9.2	2.0	.8	2.7	n.a.[b]
Montana				10.0	7.3	2.1	4.2	3.8
Oregon				*	*	*	*	*
South Carolina					*	*	1.0	4.0
Wisconsin			10	9.6	7.1	*	*	*
Change in CPI	7.7	11.3	13.5	10.4	6.1	3.2	4.3	3.6

Source: Commerce Clearing House, State Tax Review, various issues; tax return forms for the states; and direct communication with several state revenue offices. CPI figures are from Economic Report of the President, 1986.

[a]The figure for each year is the adjustment factor applied to the indexed items in the state's tax system. An asterisk (*) indicates that indexing was promised for that year, but then suspended.

[b] Minnesota adopted a new rate schedule in 1985. This schedule is indexed. Thus, while Minnesota never reneged on its promise to index, its 1985 schedule was not determined by applying an adjustment factor to the 1984 schedule.

Table 2.2

The Thoroughness of Indexing*
1978-1984

State	1978	1979	1980	1981	1982	1983	1984
Arizona	1.44 [1.44]	1.47 [1.45]	1.14 [1.15]	1.07 [1.07]	1.10 [1.10]	1.09 [1.11]	1.08 [1.07]
California	0.47 [0.56]	0.47 [0.64]	0.87 [0.87]	0.87 [0.87]	0.87 [0.86]	0.88 [0.89]	0.87 [0.87]
Colorado	1.58 [1.54]	1.53 [1.46]	1.48 [1.49]	1.59 [1.52]	1.44 [1.43]	–	–
Iowa	–	0.27 [0.29]	–	–	–	–	–
Maine	–	–	–	–	–	0.47 [0.47]	0.46 [0.46]
Minnesota	–	1.21 [1.24]	1.31 [1.33]	0.63 [0.67]	0.53 [0.52]	0.52 [0.51]	0.50 [0.49]
Montana	–	–	–	1.50 [1.41]	1.34 [1.34]	1.28 [1.29]	1.23 [1.23]
South Carolina	–	–	–	–	–	–	0.23 [0.23]
Wisconsin	–	–	0.58 [0.55]	0.56 [0.57]	0.63 [0.63]	–	–

*The figures without brackets represent the share of inflation-induced increases in real revenue returned to the taxayer assuming 6 percent inflation. The figures surrounded by brackets represent the share of inflation-induced increases in real income returned to the taxpayer given the actual inflation experience.

Table 3.1

Means of the Variables (1982)*

	Indexing States	Non-Indexing States
P (population)	5028 (2217)	4494 (685.8)
Y (personal income per capita)	6718 (245.0)	6787 (177.6)
EXP (state general expenditure per capita)	895.4 (37.27)	865.3 (32.59)
DEFICIT (state deficit per capita)	-48.14 (14.08)	-51.04 (10.57)
DEBT (state debt per capita)	424.4 (129.77)	503.5 (66.95)
s (share of personal income tax in total revenue)	0.361 (0.0345)	0.267 (0.0240)
e (elasticity of personal income tax revenue with respect to income)	1.80 (0.0966)	1.53 (0.0692)
t_{10} (marginal personal income tax rate on a household with taxable income of $10,000)	5.49 (1.17)	3.64 (0.343)
t_{20} (marginal personal income tax rate on a household with taxable income of $20,000)	6.29 (0.637)	4.52 (0.476)
t_{40} (marginal personal income tax rate on a household with taxable income of $40,000)	7.23 (0.696)	4.89 (0.480)
TEL (= 1 if there is a tax and/or expenditure limitation statute, and zero otherwise)	0.600 (0.163)	0.272 (0.0787)

*Numbers in parentheses are standard deviations of the means. All dollar amounts are expressed in 1977 dollars.

Table 3.2

Logit Results For the Decision to Index*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-8.461	-3.301	-17.20	-4.999	-4.927	-5.926
	(2.818)	(1.238)	(6.524)	(1.784)	(1.675)	(1.899)
s	12.18	-	8.920	4.116	2.826	4.482
	(5.700)	-	(5.847)	(7.371)	6.789	(5.995)
e	1.740	0.6306	1.753	-	-	-
	(0.9007)	(0.6146)	(0.9877)	-	-	-
DEBT	-0.5144	-0.4032	-0.6178	-0.4305	-0.5348	-0.5182
	(0.2404)	(0.2369)	(0.2568)	(0.2371)	(0.2582)	(0.2359)
TEL	-	-	0.1708	-	-	-
	-	-	(1.213)	-	-	-
Y	-	-	1.416	-	-	-
	-	-	(0.775)	-	-	-
t_{10}	-	-	-	0.4008	-	-
	-	-	-	(0.3697)	-	-
t_{20}	-	-	-	-	0.4188	-
	-	-	-	-	(0.2427)	
t_{40}	-	-	-	-	-	0.4573
	-	-	-	-	-	(0.2521)
lnL	-26.16	-29.06	-23.49	-27.12	-26.22	-25.95

* Numbers in parentheses are standard errors. The debt variable is scaled so that it is measured in hundreds of dollars

Table 3.3

Logit Results for the Decision to Index*
(Inflation Rate Included)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-9.532	-4.069	-6.069	-6.054	-5.874	-7.166
	(3.186)	(1.764)	(4.831)	(2.315)	(2.260)	(2.476)
s	12.52	-	2.156	4.513	2.231	4.777
	(5.760)	-	4.993)	(7.574)	(7.020)	(6.252)
e	1.760	0.6370	0.4928	-	-	-
	(0.9073)	(0.6124)	(0.9474)	-	-	-
DEBT	-0.5260	-0.4037	-0.3853	-0.4337	-0.5502	-0.5265
	(0.2422)	(0.2394)	(0.2378)	(0.2395)	(0.2673)	(0.2375)
TEL	-	-	0.05759	-	-	-
	-	-	(1.200)	-	-	-
Y	-	-	0.3205	-	-	-
	-	-	(0.6126)	-	-	-
t_{10}	-	-	-	0.4105	-	-
	-	-	-	(0.3742)	-	-
t_{20}	-	-	-	-	0.4555	-
	-	-	-	-	(0.2509)	-
t_{40}	-	-	-	-	-	0.4771
	-	-	-	-	-	(0.2575)
π	10.73	8.430	3.373	10.01	10.51	11.66
	(13.71)	(13.22)	(14.60)	(12.84)	(13.45)	(13.44)
ℓnL	-25.85	-28.85	-26.93	-26.81	-25.86	-25.57

*Numbers in parentheses are standard errors. The debt variable is scaled so that it is measured in hundreds of dollars.

Table 3.4

Response of p to Changes in Right Hand Side Variables

Variable	Mean value	Mean value plus one s.d.	p changes from 0.00636 to:
e	1.59	2.03	0.0135
s	0.264	0.388	0.0282
DEBT	5.00	8.85	0.000882

Table 3.5

Logit Results for the Decision to Renege*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.5881	0.5968	7.161	-2.647	-2.185	-1.689
	(3.150)	(2.797)	(6.771)	(3.179)	(3.041)	(2.523)
s	0.04891	-	-1.875	4.936	9.293	3.153
	(8.106)	-	(10.33)	(9.061)	(11.47)	(9.223
e	-2.270	-2.267	-2.987	-	-	-
	(1.745)	(1.673)	(2.407)	-	-	-
DEBT	0.6294	0.6302	0.5377	0.5480	1.271	0.9922
	(0.3893)	(0.3676)	(0.3976)	(1.627)	(0.7008)	(0.5419)
TEL	-	-	-1.705	-	-	-
	-	-	(1.472)	-	-	-
Y	-	-	-0.5082	-	-	-
	-	-	(1.028)	-	-	-
t_{10}	-	-	-	-0.6648	-	-
	-	-	-	(0.8016)	-	-
t_{20}	-	-	-	-	-1.019	-
	-	-	-	-	(0.7423)	-
t_{40}	-	-	-	-	-	-0.5512
	-	-	-	-	-	(0.3923)
lnL	-11.82	-11.82	-10.89	-10.95	-10.53	-11.53

*Numbers in parentheses are standard errors. The debt variable is scaled so that it is measured in hundreds of dollars.

Table 3.6
Logit Results for the Decision to Renege*
(Inflation Rate Included)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.1696	0.1900	7.099	-2.814	-2.588	-2.017
	(3.599)	(3.249)	(6.888)	(3.560)	(3.446)	(2.982)
s	0.1068	-	-1.731	4.946	9.898	1.968
	(8.083)	-	(10.72)	(9.062)	(11.55)	(8.945)
e	-2.253	-2.248	-2.950	-	-	-
	(1.738)	(1.673)	(2.497)	-	-	-
DEBT	0.6301	0.6317	0.5287	0.8858	1.303	0.9256
	(0.3928)	(0.3728)	(0.4340)	(0.5459)	(0.7198)	(0.5291)
TEL	-	-	-1.681	-	-	-
	-	-	(1.539)	-	-	-
Y	-	-	-0.5258	-	-	-
	-	-	(1.086)	-	-	-
t_{10}	-	-	-	-0.6607	-	-
	-	-	-	(0.7879)	-	-
t_{20}	-	-	-	-	-1.056	-
	-	-	-	-	(0.7612)	-
t_{40}	-	-	-	-	-	-0.4985
	-	-	-	-	-	(0.3838)
π	3.829	3.824	0.9281	1.729	3.491	5.475
	(15.84)	(15.84)	(17.77)	(16.65)	(16.82)	(16.61)
ℓnL	-11.79	-11.79	-10.88	-10.95	-10.49	-11.46

*Numbers in parentheses are standard errors. The debt variable is scaled so that it is measured in hundreds of dollars.

Table 3.7

Response of q to Changes in Right Hand Side Variables

Variable	Mean value	Mean value plus one s.d.	q changes from 0.144 to:
e	1.85	2.20	0.0706
s	0.327	0.420	0.145
DEBT	2.88	5.34	0.442

NOTES

1. Less well understood, but also important, is the fact that even with a simple proportional tax, inflation changes the effective tax rate on capital income. This is because the inflationary components of capital gains and interest income are subject to tax. We do not deal with this issue in the present paper.

2. For a discussion of the macroeconomic consequences of tax indexing, see Pierce and Enzler [1976].

3. Six states (Idaho, Nebraska, New Mexico, North Dakota, South Carolina, and Utah) base their taxes, in part, on indexed portions of the federal law, thus indirectly imparting an element of indexation into their own statutes. However, these changes become relevant only after the time period under consideration in this paper.

4. Since the question of indexing vs. non-indexing is relevant only for states with a personal income tax, those seven states without one are excluded. (Alaska, which abandoned its income tax in 1979, is excluded from the sample.)

5. Statistical significance is determined on the basis of the usual t-test for the hypothesis that the difference between two means is zero. Because the number of indexing states is small, the test is only approximately correct.

6. The "other things" include the level and composition of state expenditure. Although explicit consideration of the spending side would complicate our discussion, we do not think that it would change its tenor.

7. As suggested above, "progressivity" can be measured in several ways. For present purposes, it is sufficient to think of progressivity loosely as the extent to which real tax burdens increase in response to changes in nominal income.

8. As an alternative to equation (3.3), one might consider employing a hazard model, which explicitly considers the length of time required for some event to occur. However, specification of a hazard model requires that the initial condition of the process be known. For the indexing decision, however, there is no obvious birth date. For the reneging decision, the date that indexation was adopted might be used as the starting point. But given the small number of observations, it is unlikely that the parameters of a reneging hazard function could be estimated with any precision. Note that it is necessary to include all states in the sample, not just those with tax legislation in a given year. The decision to modify the tax law is endogenous, and selecting on an endogenous variables renders the coefficients inconsistent.

9. Recall from our discussion of Table 2.1 that some states reneged on their promise to index even before indexing was implemented. In this context, we view the vote for indexing rather than its implementation as the crucial event. Hence, these states are assigned a value of 1

in each logit equation. However, our substantive results are not sensitive to these observations being omitted.

10. One might argue that the progressivity of the tax structure is determined jointly with the decision to index. However, our earlier calculations (see Feenberg and Rosen [1986]) indicate that the states' tax structures change very little over time; hence, we regard the possibility that progressivity is endogenous to the indexing decision as a remote one.

11. However, given the possible endogeneity of TEL , this result must be viewed cautiously.

12. When analogues to the specifications in columns (2) and (3) of Table 3.2 were estimated with the various marginal tax rates instead of e , the results were qualitatively similar: omitting s renders the tax structure variable insignificant; and Y and TEL are statistically insignificant.

13. Means are taken only over the observations used to estimate the indexing logit. Hence, they differ from those presented in Table 3.1. One might wonder why the value of p evaluated at the means is so small (0.00636) in light of the fact that 10 states chose to index. In effect, p measures the probability that any given transition is from non-indexing into indexing. In the indexing logit, there are many more observations in which states remain non-indexed than those in which they choose to index.

14. In the sample used to estimate the indexing equation, the coefficients of variation for e and s are 0.280 and 0.472, respectively. In the reneging equation, the corresponding figures are 0.191 and 0.287. The comparison indicates that there is less variation in the sample used to estimate the reneging equation.

15. See, e.g., Feldstein and Metcalf [1987] and Holtz-Eakin and Rosen [forthcoming].

REFERENCES

Aaron, Henry J., "Inflation and the Income Tax: An Introduction," in Henry J. Aaron (ed.), Inflation and the Income Tax, The Brookings Institution: Washington, DC, 1976, 1-32.

Atkinson, Anthony B. and Joseph E. Stiglitz, Lectures on Public Economics, McGraw Hill: New York, 1980.

Fair, Ray C., "The Effect of Economic Events on Votes for President: 1980 Results," Review of Economics and Statistics, vol. LXIV, No. 2, May, 1982, 322-324.

Feenberg, Daniel R. and Harvey S. Rosen, "State Personal Income and Sales Taxes: 1977-1983," in Harvey S. Rosen (ed.), Studies in State and Local Public Finance, Chicago: University of Chicago Press, 1986.

Feldstein, Martin, "The American Economy in Transition: Introduction," in Martin Feldstein (ed.), The American Economy in Transition, University of Chicago Press: Chicago, 1980, 1-8.

Feldstein, Martin and Gilbert Metcalf, "The Effect of Federal Tax Deductibility on State and Local Taxes and Spending," Journal of Political Economy 95, August 1987, 710-736.

Holtz-Eakin, Douglas and Harvey S. Rosen, "Tax Deductibility and Municipal Budget Structure," Journal of Urban Economics, forthcoming.

Kenyon, Daphne A. and Karen M. Benker, "Fiscal Discipline: Lessons from the State Experience," National Tax Journal, XXXVII, No. 3, 1984, 433-46.

Pechman, Joseph A., "Recent Tax Developments in Europe and Canada," Brookings Discussion Papers in Economics, The Brookings Institution: Washington, D.C., October 1986.

Pierce, James L. and Jared J. Enzler, "The Implication for Economic Stability of Indexing the Individual Income Tax," in Henry J. Aaron (ed.), Inflation and the Income Tax, The Brookings Institution: Washington, D.C., 1976, 173-194.

APPENDIX

This Appendix documents the sources of data employed in the statistical analysis.

All figures on state public finance (expenditures, revenues, deficits, and debts) are from various editions of U.S. Department of Commerce, State Government Finances. Data for 1977 are found in the 1978 edition, 1978 data in the 1979 edition, etc. Population data for 1977 through 1979 are in the 1979 through 1981 editions of U.S. Department of Commerce, State Government Tax Collections. The 1980 through 1983 population figures are from Current Population Report, Series P-25. #944, "Estimates of the Population of States 1980-1983," January 1984.

Total personal income by states for 1977-83 is from Department of Commerce, Survey of Current Business, August 1984.

The marginal tax rates and elasticities of the income tax structures are updated versions of the figures in Feenberg and Rosen [1986]. They are calculated using individual income and deduction data from a stratified random sample of actual income tax returns. Marginal tax rates are found by incrementing the wage income of each household in the sample by $100, and calculating the associated change in tax liabilities. Similarly, elasticities are calculated by examining the consequences of a one percent increase in income. Nominal dollar values for income were converted into 1977 terms by use of regional price deflators found in various editions of the Statistical Abstract of the United States. The price deflator for state and local public goods is from various editions of the U.S. Department of Commerce, Survey of Current Business. (September 1981, July 1983 and July 1984.)