The Relationship Between State Income Taxes and Local Property Taxes: Education Finance in New Jersey

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THE RELATIONSHIP BETWEEN STATE INCOME TAXES AND LOCAL PROPERTY TAXES: EDUCATION FINANCE IN NEW JERSEY

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Abstract - *New Jersey enacted an income tax in 1976 in response to a State Supreme Court ruling that held that local taxation alone violated the requirement of the State Constitution that all children receive a "thorough and efficient" education. The law required that revenues from the income tax be dedicated solely to relief of local property taxes. Most of the relief is given as aid to local school districts. This paper offers both a theoretical and an empirical analysis of the effect on local property taxes of changes in aid resulting from the 1990 increase in the income tax enacted under Governor Jim Florio and the beginning of the 1994 decrease in income taxes enacted under Governor Christine Whitman. The theoretical analysis is based on general equilibrium models developed over the previous two decades. The results indicate (1) a flypaper effect for both increases and decreases in aid, which may be more pronounced for decreases, and (2) that higher income districts choose to increase property taxes more than other districts when the income tax is reduced.*

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INTRODUCTION

The state of New Jersey has undergone several recent changes in its income tax system. These changes, and the history of the New Jersey income tax, are linked to court decisions that have mandated that the state provide aid to local school districts. After the New Jersey Supreme Court ruled in *Robinson v. Cahill* (1973) that local taxation alone violated the requirement of the State Constitution that all children receive a "thorough and efficient" education, then Governor Brendan Byrne responded by proposing a statewide income tax in 1976 to raise funds for aid to local school districts. The income tax proposed by Governor Byrne became law only after the New Jersey Supreme Court closed public schools in response to the Legislature's initial failure to approve the tax. The state aid system has since undergone a

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

series of changes reflecting the back and forth debate between elected officials and the State Supreme Court. The most recent changes include a large increase in the income tax and a restructuring of aid to local school districts by then Governor Jim Florio in 1990, again in response to a court mandate. Governor Christine Whitman was elected in 1994 in part on a platform of cutting taxes, and Governor Whitman instituted a series of cuts in the state income tax beginning in 1994.

The law creating an income tax in New Jersey required that revenues from the New Jersey income tax be dedicated solely to relief of local property taxes; no income tax revenues in New Jersey are general revenue funds. Income tax revenues provide property tax relief in three major ways: aid to local school districts, aid to municipalities, and a homestead rebate. (In New Jersey, local school districts and municipalities are separate entities.) Of these, by far the most important is aid to local school districts. Typically, about 80 percent of income tax revenues are given as aid to local school districts, 10 percent as aid to municipalities, and 10 percent in the form of homestead rebates.[1]

Changes in the income tax therefore have direct implications for local financing decisions; indeed, the implications of a cut in the income tax for local property taxes was a primary focus of the 1994 gubernatorial campaign. The fear on the part of some is that the state income tax cuts will simply lead to dollar for dollar increases in local property taxes. A tremendous amount of political attention has been paid to this public policy issue, and the economics literature on local public finance is extremely relevant to this question.

In particular, three strands of literature are particularly important. First, since most of the income tax revenue in New Jersey is returned to school districts in the form of grants, the empirical literature that studies the response of lower levels of government to grants from higher levels of government is relevant. Second, a recent offshoot of the grants literature examines whether increases and decreases in aid have symmetric effects. Third, since changes in New Jersey have been mandated by the State Supreme Court, the argument advanced by Fischel (1989), that the interaction between voters' decisions and court mandates is important in understanding school district financing issues, is relevant.

Consider first the literature that studies the response of lower levels of government to grants from higher levels of government. A typical finding in the empirical literature on this subject is that lump-sum grants from higher levels of government lead to higher levels of local spending than if the funds were collected locally. This empirical result is known as the "flypaper effect."[2] The term flypaper effect arose partly because the empirical result did not correspond with the economic theory of grants developed in Bradford and Oates (1971). Their theoretical work suggested a correspondence between lump-sum grants and income; essentially, lump-sum grants can be viewed as income changes and should have about the same impact as a change in income. For instance, if a local government spends about five cents of an extra dollar of income on schools, one would expect that about five cents of an additional dollar of grant money received by that government would be used for schools, and the other $0.95 would be returned to taxpayers in the form of lower property taxes. A typical result of the

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

empirical studies is that about $0.40 of the grant is used for local services, $0.60 being returned to taxpayers in the form of lower taxes.

Explanations for the flypaper effect are many and varied and depend on such factors as the public choice model by which public decisions are made and the price of education faced by voters. Several reviews are available for the reader (the most recent being Hines and Thaler, 1995); we list some of the most common explanations below. Chernick (1979), among others, suggests that the aggregate nature of many studies may mix matching grants (which have price effects) with lump-sum grants; since we expect higher spending out of matching grants than out of income, this might explain the flypaper effect. "Fiscal illusion" models offer a second approach. For instance, Oates (1979) and Courant, Gramlich, and Rubinfeld (1979) suggest that citizens confuse average and marginal cost so that the electorate is fooled into thinking that there is a fall in the price of providing education and demands a higher level of education. Another type of fiscal illusion model emphasizes a local bureaucracy that is trying to maximize its budget. By concealing grant funds (as in Filimon, Romer, and Rosenthal, 1982), voters are again fooled into thinking that the price of education has fallen and vote to increase the size of the budget, which is the goal of local officials. Another twist is that of Romer and Rosenthal (1980), who use the idea of a reversion level discussed in Romer and Rosenthal (1979). Budget maximizing bureaucrats offer voters a bloated school budget; if defeated, the budget reverts to the previous year's budget. The voters may choose the large budget as the lesser of two evils. Further, Romer and Rosenthal (1980) argue that lump-sum grants will increase the reversion level, which, under certain conditions, leads to a higher level of spending than a simple increase in income. A third explanation, that of Fisher (1979), suggests that differing tax prices for an individual between higher and lower levels of government can lead to a flypaper effect. Since state aid in New Jersey is financed by income taxes and locally raised revenue comes from the property tax, Fisher's explanation is particularly relevant. As we will see, the tax price for a voter is likely to be different under these two types of taxes.

A second strand of literature, which examines whether increases and decreases in aid have symmetric effects, is also relevant. Given the direct tie of income taxes and school aid, increases in the income tax will result in higher levels of aid, while income tax cuts will result in lower levels of aid. Moreover, the New Jersey grant system was changed to a foundation system starting in 1991, and aid to wealthy jurisdictions was phased out progressively. Because of these changes, the period since 1991 has seen aid to some school districts increase, while other school districts have experienced decreased aid. While the flypaper effect has usually been examined for the case of increases in aid, these changes afford an opportunity to examine the possibility of a flypaper effect in reverse.

As noted in Gamkhar and Oates (1996), asymmetric responses to increased and decreased aid were first suggested in Gramlich (1987); he thought that it may be difficult for governments to cut back on programs with established clienteles when aid falls. Stine (1994) notes that an alternative type of asymmetry is fiscal retrenchment; governments may tighten their belts when aid is cut back. Empirically, Stine finds a "super" flypaper effect, which even reverses the

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

expected sign of the aid coefficient; he finds that lower aid in Pennsylvania counties led to lower local revenues. In contrast, Gamkhar and Oates find no asymmetries in state and local spending in response to changes in federal grants.

The third strand of literature that is important in analyzing the New Jersey case is the argument of Fischel (1989). He argues that the interaction between voters and courts is important in understanding changes in school district financing in California. Fischel's hypothesis in a general sense is that court decisions that attempt to change school financing, such as *Serrano v. Priest* (1971) in California, are often undone by voters. As we will see, property tax changes in New Jersey may be partly a reaction to mandated changes, which entail gains for some segments of voters and losses for others.[3]

This paper investigates the effect on local property taxes of the increase in income taxes under Governor Florio and the beginning of the decrease in income taxes under Governor Whitman. To do this, we begin by developing a simple public choice model in which both local property taxes and state income taxes are choice variables, which is based on the general equilibrium models developed in Westhoff (1977), Epple, Filimon, and Romer (1984), and Goodspeed (1989).[4] In doing so, we incorporate Fisher's explanation for the flypaper effect, and we analyze Fischel's argument. We also allow the flypaper effect to operate directly through aid, having a larger impact on the budget constraint than income.

This theoretical model is used as the basis for an estimating equation that relates school district aid and property taxes. This equation is then estimated using disaggregated data on New Jersey school districts for the fiscal years 1991–5. The years 1991 to the first half of 1994 reflect the Florio tax increases; the second half of 1994 and the 1995 data are the first years of the Whitman tax cuts. Four empirical specifications are estimated: a pooled regression, a regression with district fixed effects, a long 1991–5 first difference, and a short 1994–5 first difference.

Three results are noteworthy. First, a flypaper effect seems to be present so that property taxes fell significantly less than dollar for dollar when income taxes were raised, and are likely to rise significantly less than dollar for dollar when income taxes are cut. Second, the theory indicates and the empirical evidence tends to confirm that higher income districts will choose greater decreases in property taxes than other districts when an undesired income tax rise is imposed, and will choose to increase property taxes more than other districts when the income tax is reduced. Third, while there are mixed results concerning the effect of increases versus decreases in aid, the specification with district fixed effects, which is arguably the most complete specification, indicates that property taxes rise less when aid decreases than they fall when aid increases.

The remainder of the paper begins by developing a theoretical model in the next section. The third section presents some aggregate data on income and property taxes for New Jersey, develops an empirical model, and presents the regression results from a disaggregated data set. The fourth section provides conclusions.

A THEORETICAL MODEL

The model that is used to describe a political equilibrium and derive an

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

estimating equation is similar to that of Epple, Filimon, and Romer (1984).[5] Individuals will be assumed to derive utility from consumption of a private good, x; per-pupil spending on schooling, g; and housing, h. Funding for spending on schools comes from two sources, a local property tax and aid from the state. The budget constraint of a local school district is therefore

1

$$g = t_p P_h H^m \frac{N}{E} + A\frac{N}{E}$$

where g is per-pupil spending, H^m is the equilibrium quantity of housing per capita of the school district, P_h is the after-tax price of housing, t_p is the property tax rate, A is per-capita aid, E is the enrollment of the school district, and N is the population of the school district. State aid is derived from a state income tax; suppose that the income tax is proportional so that

2

$$t_y = \frac{A^m}{Y^m}$$

where t_y is the income tax rate, Y^m is mean state income, and A^m is mean state aid. Individual i's budget constraint is

3

$$y_i(1 - t_y) - t_p P_h h + \gamma A = x + P_h h$$

where γ reflects one avenue through which the flypaper effect may operate. If $\gamma = 0$, higher aid will impact the individual's budget constraint only through its effect on equation 1 (and hence t_p), that is, only through the shift in the school district budget constraint. If $\gamma > 0$, a change in aid will have an additional impact on the individual's budget constraint.

We can greatly simplify the presentation by assuming that an individual first chooses h to maximize utility subject to his budget constraint and given g. We denote the individual's optimal housing choice resulting from this problem as h^*. We assume that h^* does not depend on g. The problem that we will focus on is the choice of the optimal amount of g and aggregate aid, given h^* and the constraints delineated above. As we will see, finding the optimal g is equivalent to finding the optimal t_p, which will be important for our empirical specification. We will assume a majority rule voting model in which voters determine one choice variable taking the other choice variables as given. As is usual in this type of model, we assume that indifference curves have a single-crossing property; this restriction on preferences together with serial voting ensures that the solution to the voting problem can be found by examining the preferences of a decisive voter using the usual partial derivative tools.[6]

Consider first the optimal choice of g (or equivalently t_p), holding the aggregate level of aid constant, and given h^*. The preferences of the decisive voter can be found by maximizing this voter's utility subject to the constraints 1, 2, and 3:

4

$$Max\ U(x, g, h_d^*)$$

$$s.t.\ y_d(1 - t_y) - t_p P_h h_d^* + \gamma A = x + P_h h_d^*$$

$$t_p P_h H^m \frac{N}{E} + A\frac{N}{E} = g$$

$$t_y = \frac{A^m}{Y^m}$$

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

where $i = d$ denotes the decisive voter. Letting the choice variable be g, we can substitute the second constraint for t_p and the third constraint for t_y in the first constraint, and substitute the first constraint for x in the utility function to yield the following equivalent unconstrained problem:

5

$$\underset{g}{Max}\ U\left(y\left(1-\frac{A^m}{Y^m}\right)-\left(g\frac{E}{N}\frac{h_d^*}{H^m}-\frac{h_d^*}{H^m}A\right)+\gamma A-p_h h_d^*,\ g,\ h_d^*\right).$$

The first-order condition is

6

$$\frac{U_g}{U_x}=\frac{E}{N}\frac{h_d^*}{H^m}.$$

That is, the decisive voter would like to set the marginal rate of substitution between g and x equal to the "price" of enrollment over population times the ratio of the decisive voter's tax base to the mean tax base.

An alternative and equivalent formulation of the problem is to let t_p be the choice variable, substitute the third constraint for t_y in the first constraint, and substitute the first constraint for x and the second constraint for g in the utility function:

7

$$\underset{t_p}{Max}\ U\left(y\left(1-\frac{A^m}{Y^m}\right)-t_p P_h h_d^*+\gamma A-P_h h_d^*,\ t_p P_h H^m\frac{N}{E}+A\frac{N}{E},\ h_d^*\right).$$

The first-order condition is again

8

$$\frac{U_g}{U_x}=\frac{E}{N}\frac{h_d^*}{H^m}.$$

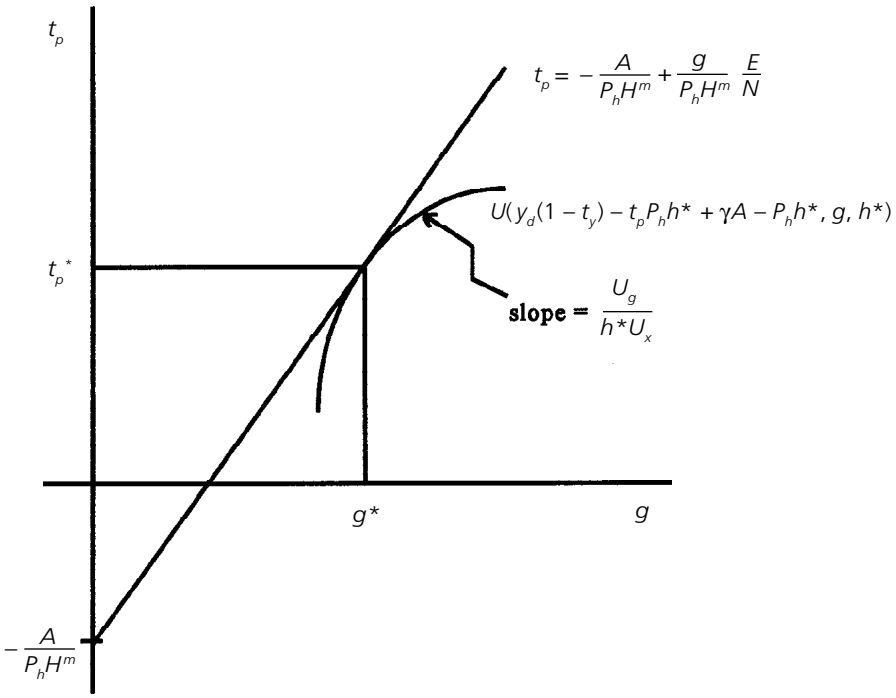
A graphical depiction of the solution is also useful and is given in Figure 1, which plots the tax rate, t_p, on the vertical axis and per-pupil spending, g, on the horizontal axis. The school district budget constraint is a straight line with intercept $-A/P_h H^m$ and slope $E/NP_h H^m$. The usual properties of indifference curves imply the concave shape shown. Higher levels of utility are associated with indifference curves farther to the southeast. (Recall that t_p is a "bad," whereas g is a "good.") The slope of an indifference curve is $U_g/U_x h^*$. Diagrams similar to this can be found in Westhoff (1977), Epple, Filimon, and Romer (1984), and Goodspeed (1989). The equilibrium of the decisive voter is shown in the diagram as the point at which the slope of the budget constraint and the slope of the indifference curve are equal.

As the analysis and the figure make clear, we could choose g and let t_p be determined by the budget constraint or choose t_p and let g be determined by the budget constraint. Either way of looking at the problem results in the same first-order condition and the same solution. Since the policy question in which we are interested is how state aid affects property taxes, it will be useful in the empirical section for us to solve the problem in terms of tax variables rather than public services.

To endogenize the aggregate amount of aid at the state level, we simply modify 7 to let the average level of aid be a

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

FIGURE 1. The Equilibrium Level of Property Taxes



second choice variable in the problem, and require $A^m \geq 0$. The first-order condition with respect to the average level of aid is

9

$$\frac{U_g}{U_x} \leq \frac{E}{N} \frac{\frac{y}{Y^m} - \gamma \frac{\partial A}{\partial A^m}}{\frac{\partial A}{\partial A^m}} \text{ if } < 0, A^m = 0.$$

To easily interpret this condition, consider a jurisdiction in which the change in per-capita aid is just equal to the change in the average level of aid for the state, so that $\partial A / \partial A^m$ is one, and suppose that there is no flypaper effect operating through γ so that γ is zero. We first note that a comparison of condition 9 (given the above suppositions) and condition 8 indicates that voters whose incomes relative to the state average are greater than their property values relative to the district average will prefer zero state aid and hence zero income tax rates. This illustrates Fisher's (1979) argument that aid and locally financed spending may have different tax prices.[7]

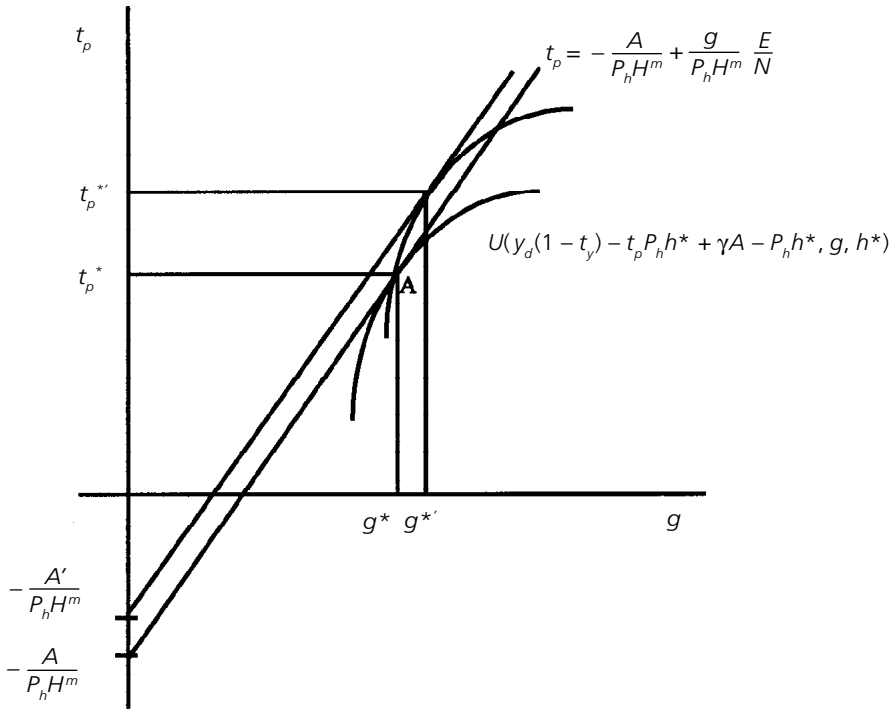
Fischel's (1989) argument, that the interaction between voters and courts is important in understanding changes in school district financing in California, also relates to condition 9. Fischel's hypothesis in a general sense is that court decisions that attempt to change school financing, such as *Serrano v. Priest* (1971) in California, are often undone by voters.

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

To see how Fischel's (1989) hypothesis can be analyzed for New Jersey in the present model, suppose that voters decide (according to condition 9 for the decisive voter of the state) to maintain zero aid, but that a court mandates that aid (and hence income tax rates) be positive. What effect does this have on the optimal choice for t_p for a school district? We can use Figure 1 to see three effects. First, note from constraint 3 that those who would have opposed aid (i.e., those whose incomes relative to the state average are greater than their property values relative to the district average) have less income left over to spend on private goods, x; since lower x implies higher U_x, the indifference curves pictured in Figure 1 will become flatter for those who would have opposed aid, which implies lower property taxes. Conversely, those who would have favored aid realize more x and hence have steeper indifference curves. Second, the school district budget constraint will shift, reflecting the different level of aid; higher aid would imply a lower property tax rate. Third, there may be an additional effect on the curvature of the indifference curves if $\gamma \neq 0$. If $\gamma > 0$ and aid rises, we again see from constraint 3 that more x is realized so that the indifference curves will be steeper than otherwise. (We also note that, if aid falls, less x is realized and indifference curves will be flatter than otherwise.)

Given this as background, we now consider how the Whitman tax cuts affect the case of two hypothetical school districts in New Jersey. Figure 2

FIGURE 2. The Effect of an Income Tax Cut on Property Taxes for a Hypothetical Wealthy School District



National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

will be used to show the change to the new equilibrium. Suppose point A represents the equilibrium (i.e., after the adjustments of the previous paragraph) prior to the Whitman tax cuts. Consider first the case of a relatively wealthy school district, which would have favored the tax cut in the sense that the income of the decisive voter of the district relative to state average income is greater than the voter's property value relative to the district average. The indifference curve of the decisive voter becomes steeper in this district, as illustrated in Figure 2, which implies a higher property tax rate. In addition, to the extent that aid is cut to the wealthy district, the budget constraint of the district will shift to the left, also implying a higher tax rate. Finally, if $\gamma > 0$, the aid cut will also decrease x, and the indifference curve will consequently become flatter, indicating a lower property tax rate. Hence, the flypaper effect operating through γ implies a lower property tax rate than otherwise would result in the event of a cut in aid. To summarize, two of the three effects are leading to a higher property tax rate, while the flypaper effect (operating through γ) is leading to a lower property tax rate.

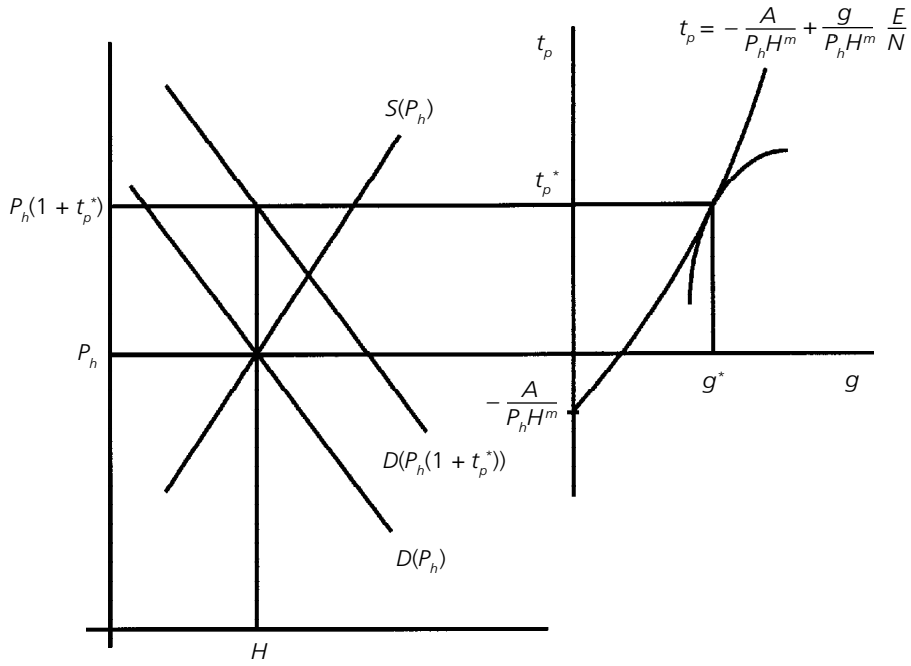
Next consider the case of a relatively poor school district, which would have opposed the tax cut in the sense that the income of the decisive voter of the district relative to state average income is less than the voter's property value relative to the district average. The indifference curve of the decisive voter becomes flatter in this district, which implies a lower property tax rate. If aid in this district falls, the budget constraint shifts to the left, which implies a higher property tax rate; the flypaper effect (operating through γ) would again make the indifference curves flatter, dampening any increase in the property tax. For the poorer district, two of the three effects are leading to lower property taxes; only the fall in aid leads to a higher property tax.

The analysis thus far takes the property tax base $P_h H^m$ as given; this is why the school district budget constraint remains unchanged in Figures 1 and 2 and the equilibrium can be easily represented in the graph. However, for this to be an equilibrium, the tax base $P_h H^m$ represented in the figures must be consistent with equilibrium in the housing market. This is illustrated in Figure 3, which adds a supply and demand diagram for the housing market to the left of the initial public sector diagram of Figure 1. As the demand curve for housing depends on the gross of tax price and supply depends on the net of tax price, an increase in the tax rate can be represented by a downward shift in the demand curve. This would affect the public sector diagram as both P_h and H would fall; as we are taking the population as fixed, $P_h H^m$ would fall as well. The slope of the public sector budget constraint would become steeper and the intercept would become greater in absolute value. If the tax base continues to fall as the tax rate is increased, each value for t_p would be associated with a slightly steeper budget constraint and the budget constraint for all t_p that are consistent with equilibrium in the housing market would become convex.[8] The final equilibrium is slightly more complicated because the indifference curves are drawn for a given P_h; to the extent that a change in P_h changes x and hence U_x, the curvature of the indifference curves will change.

Our earlier analysis also has not taken into account the consequences of migration, which has been a focus of previous general equilibrium simulations of policy questions, such as in

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

FIGURE 3. The Public Sector–Housing Market Equilibrium



Goodspeed (1989) and Epple and Romer (1991). Migration may affect the demand for housing, and thereby the equilibrium price of housing, and may change the decisive voter in a school district. As noted earlier, individual demand curves for housing, h^*, are assumed not to depend on g. However, as higher levels of g make the school district more attractive, the migration of households into the school district implies that the market demand for housing in a school district will depend on g, since it depends on the number of households and their income levels. As the market demand for housing changes in the school district, the equilibrium price of housing changes. In addition, migration could cause a change in the identity of the decisive voter, which would cause a different set of indifference curves to be relevant. As shown in Westhoff (1977) for an income tax with no housing market, Epple, Filimon, and Romer (1984) for a property tax with a housing market, and Goodspeed (1989) for an income tax with a housing market, a migration equilibrium can be established with the by now well-known restriction of single-crossing indifference curves.

EMPIRICAL SPECIFICATION AND RESULTS

Prior to statistically analyzing data on individual school districts, Figures 4 and 5 present aggregate data on the real revenue of New Jersey property and income taxes for 1985–94 and on their real growth rates, respectively. The income tax data come from various issues of the *Annual Report* of the New Jersey Division of Taxation. The property tax data was compiled by the New

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

FIGURE 4. Real Revenue of New Jersey Income and Property Tax, 1985–94

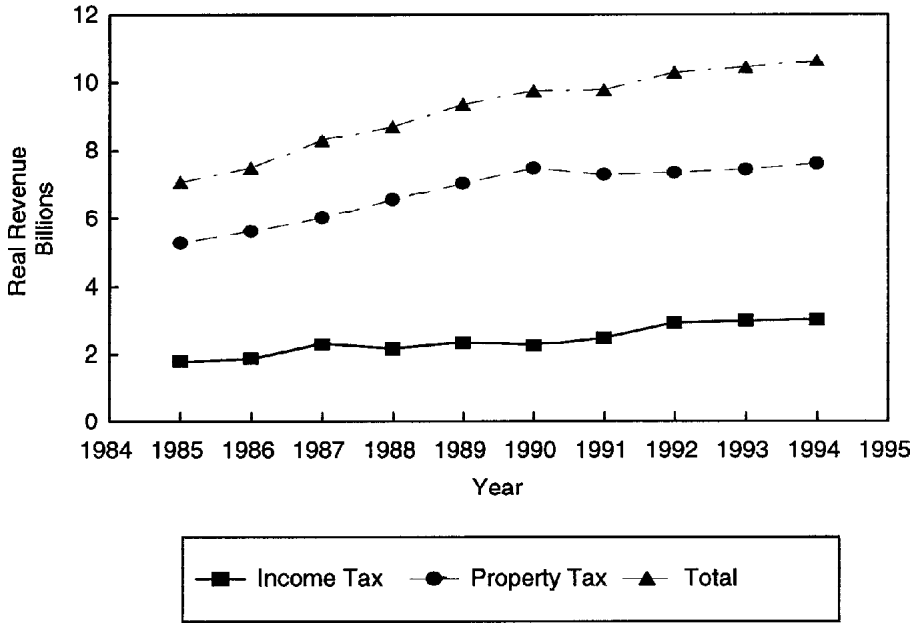
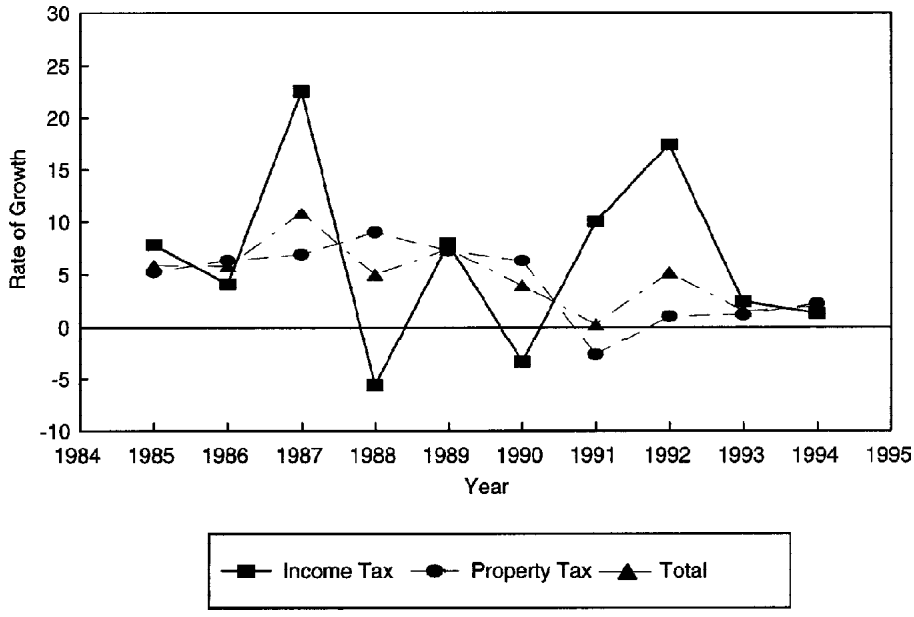


FIGURE 5. Real Growth of New Jersey Income and Property Tax, 1985–94



National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

Jersey Department of Community Affairs from the *County Abstract of Ratables* and includes the three levels of government that levy property taxes: school districts, municipal governments, and county governments. The data are deflated by the consumer price index (CPI) to obtain real dollars. From Figure 4, we see that property tax revenue is over twice that of income tax revenue. Figure 5 shows that income tax revenue was quite variable during the period. Income tax revenue for fiscal year 1987 shows a spike, which resulted from the increase in the federal tax rate on capital gains legislated in the 1986 Tax Reform Act. The second spike, in 1991 and 1992, is the result of the tax increase of Governor Florio. No obvious relationship between income taxes and property taxes is discernible from the figures (and the correlation coefficient between income tax revenues and property tax revenues is not significant). An obvious problem is the lack of data points.

To investigate the relationship with a larger number of data points, a disaggregated data set was constructed from audit worksheets filed by individual school districts with the state. The audit worksheet is essentially an income statement of the school district; the important information for this study from the audit worksheet is the information on local property tax revenues and state aid by school district, which I was able to obtain for the years 1991–95.[9] This information is supplemented by information on population, enrollment, and income. Unfortunately, these variables were not available for all years and some years had to be constructed through interpolation and extrapolation. The construction of these variables is detailed in the Appendix. From this information, a panel data set was constructed for the years 1991–5. To be included in the panel, information on a district had to be available each year. This resulted in 509 school districts over the five year period for a total sample size of 2545. Table 1 presents summary statistics for these districts by year.

As noted earlier, we can equivalently view the decisive voter as choosing g and let t_p be determined from the budget constraint or as choosing t_p and let g be determined by the budget constraint. Since we are trying to explain the effect of aid on property taxes, it makes the most sense to proceed by choosing the optimal t_p. Given the optimal t_p, t^*_p, we can multiply through by $P_h H^m$ to find the optimal per-capita property tax selected by the decisive voter, $t^*_p P_h H^m$; for notational simplicity, we relabel this as P.

We will assume throughout that the decisive voter has mean values for all relevant variables. The motivation for this is a data constraint, but it is not difficult to defend the mean rather than the median, for instance, as the

TABLE 1
AVERAGES FOR SAMPLE OF 509 NEW JERSEY SCHOOL DISTRICTS
(DOLLAR FIGURES ARE REAL 1982–4 DOLLARS)

	1991	1992	1993	1994	1995	Overall
A: per-capita state aid	236	271	255	209	200	234
P: per-capita property tax	425	422	429	480	480	447
y: per-capita income	9482[a]	9405[a]	9386	9389[a]	9372[a]	9407
E/N: enrollment/population	0.118[a]	0.119	0.121[a]	0.122[a]	0.124[a]	0.121
$(E/N)(y_d/Y^m)$: income-tax price	0.0698	0.0691	0.0723	0.0755	0.0758	0.0725

[a]See the Appendix for details on the construction of these variables.

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

appropriate statistic to use. Voting patterns in which the wealthy are more likely to vote than the poor or a model of political power in which the wealthy effectively have more voting power than the poor implies that the descriptive statistics of the decisive voter will be above the median of the population. Given this and an income distribution with mean greater than median (such as a log-normal) implies that the use of mean values may be more appropriate than median values.[10]

Given this background, the theoretical analysis suggests the following estimating equation for the optimal P:

10

$$P = f\left(y_d, \frac{E}{N}, A(1+\gamma), \frac{y_d}{Y^m}\frac{E}{N}\right) + u$$

where u is a random error term.[11] Four types of regressions will be performed on this basic model. First, the data are pooled. Second, the data are first differenced to incorporate district fixed effects. Year fixed effects are also added to these first two specifications. Third, a long first difference, 1991–5, is examined. Finally, a short first difference that incorporates primarily the Whitman change, 1994–5, is examined. A test for asymmetry is then conducted by re-estimating these specifications with the addition of a dummy variable that reflects whether a district experienced an increase or decrease in aid from the previous year and an interaction term consisting of the dummy variable multiplied by per-capita state aid.

Table 2 gives the results from estimation of the basic model. The first three columns pertain to the pooled regression, the next two to the district fixed effects specification, the sixth column to the 1991–5 first difference, and the final column to the 1994–5 first difference. The first specification of the pooled regressions includes per-capita aid, A, per-capita income, y_d, and per-capita enrollment, E/N, on the right-hand side. The second column adds the income tax price, $(E/N)(y_d/Y^m)$, as another explanatory variable. The third column adds to this year dummy variables.

The results of the first of these regressions yields a point estimate for per-capita aid of –0.84 (with an extremely significant t-statistic of –35). The point estimate falls to –0.76 with the addition of the income-tax price variable. While this is a larger impact than one would expect from a change in income, it is smaller than previous estimates of the flypaper effect.[12] Dummy variables for years, which are included in column 3, are significant for 1992 and 1994, but do not much change the point estimates of the second column.

One problem with this first specification is that it does not account for possible heterogeneity between school districts other than from income, enrollment, and population. Columns 4 and 5 give the results from a second specification that uses first differences of the data. This is a convenient method of including dummy variables for each school district, which controls for unobserved differences between school districts. Holtz-Eakin (1986) is one of the first applications of this technique in local public finance.

Several interesting changes from the pooled estimates result. First, the point estimate of the effect of per-capita aid on property taxes is lowered significantly. Without including year effects, the point estimate for per-capita aid

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

TABLE 2
BASIC REGRESSION RESULTS (*t*-STATISTICS IN PARENTHESES)
DEPENDENT VARIABLE: PER-CAPITA PROPERTY TAX

	Estimated Coefficients						
Independent Variables	Pooled			District Fixed Effects (First Differences)		1991–5 First Difference	1994–5 First Difference
Constant	21.74 (2.38)	105.97 (7.79)	94.18 (6.41)	0.13 (5.98)	–0.05 (–1.08)	0.29 (2.86)	0.00 (–0.21)
Per-capita aid	–0.84 (–35.85)	–0.76 (–29.72)	–0.76 (–28.96)	–0.48 (–10.79)	–0.28 (–5.15)	–0.66 (–4.95)	0.10 (0.78)
Per-capita income	0.02 (27.53)	0.01 (11.41)	0.01 (11.38)	0.15 (7.62)	0.14 (7.24)	0.07 (2.50)	–0.08 (–1.66)
Per-capita enrollment	3668 (38.02)	2617 (16.47)	2643 (16.41)	4971 (7.77)	6172 (9.16)	7029 (5.02)	–408 (–1.12)
$(E/N)*(y_d/Y^m)$		1199 (8.27)	1187 (8.18)	–89 (–11.85)	–107 (–12.77)	–97 (–4.96)	22 (4.50)
1992 dummy			23.24 (2.64)				
1993 dummy			8.66 (0.99)		0.34 (4.79)		
1994 dummy			17.36 (1.96)		0.46 (6.23)		
1995 dummy			5.87 (0.66)		–0.01 (–0.22)		
R^2	0.67	0.68	0.68	0.10	0.13	0.08	0.10
Number of observations	2545	2545	2545	2036	2036	509	509

drops to –0.48, which is close to previous flypaper estimates. Inclusion of year effects drops this point estimate even further, to –0.28. Second, the effect of higher per-capita income on property taxes is much greater; the coefficient rises from 0.01 to 0.15. Third, the sign of the income tax-price variable changes from positive to negative. To a large extent, these changes reflect the fact that the district fixed effects estimates are drawing their explanatory power from year to year changes within a district rather than from cross-sectional differences between districts.

However, the change in sign for the income-tax price variable may be more complex than this, as can be seen from our theoretical discussion in the previous section. The theoretical model of the previous section indicates that, apart from direct aid changes that change the district budget constraint and any flypaper effect operating through γ, the Florio tax increase would lead to relatively lower property taxes for wealthier school districts, while the Whitman tax cut would lead to relatively higher property taxes for these same districts. To see this, return to the analysis of Figures 1 and 2. Recall that those who would have opposed the Florio tax increase (i.e., those whose incomes relative to the state average are greater than their property values

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

relative to the district average) would have less income left over to spend on private goods after the tax increase, and since lower x implies higher U_x, the indifference curves pictured in Figure 1 will become flatter for a decisive voter of this type. That voter will then prefer lower property taxes. This same voter would have favored the Whitman tax cut and would have more income left after the tax cut to spend on private goods; since more x implies lower U_x, the indifference curves of this voter become steeper after the Whitman tax cut, as illustrated in Figure 2, which implies a higher property tax rate. Hence, the theoretical analysis suggests that voters with higher income-tax prices will lower property taxes in adjusting to the Florio tax increase and will raise property taxes in adjusting to the Whitman tax cuts, quite apart from changes in the budget constraint pictured in the figures.

Given this explanation, one can interpret the negative coefficient on the income-tax price in the district fixed effects regressions as reflecting primarily an adjustment to the Florio tax increase. This explanation can be further investigated by comparing two further specifications. Column 6 of Table 2 gives the results of a long first difference of 1991–5. The coefficient on the income-tax price variable is negative and similar in magnitude to that of the full first difference specification, which is consistent with the explanation that this period was primarily one of adjustment to the Florio tax increase. The coefficient of the aid variable is –0.66 and that of per-capita income is 0.07, which are in between the estimates of the pooled and full first difference approach.

The final column of Table 2 gives the results from a first difference of 1994–5, which is arguably primarily influenced by the Whitman tax cuts. The coefficient on per-capita aid has the wrong sign and is insignificant. One might interpret this as changes in aid having no effect on local property taxes, but, given the previous estimates, it is more likely that there is simply not enough variation so soon after the cuts. More interesting is that the sign of the income-tax price variable becomes significantly positive rather than negative. This is consistent with the theoretical proposition that higher income communities will choose to levy higher property taxes after the income tax cuts.

As mentioned earlier, a small empirical literature in local public finance has recently started to address the question of whether increases and decreases in aid have asymmetrical effects on spending. As discussed in Gamkhar and Oates (1996), Gramlich (1987) suggests that it may be difficult for governments to cut back on programs with established clienteles when aid falls; in this case, spending does not fall when aid is cut back. This implies a somewhat weaker than usual flypaper effect. On the other hand, Stine (1994) notes that an alternative type of asymmetry is fiscal retrenchment; governments may tighten their belts when aid is cut back. This might lead to a more powerful than usual flypaper effect. Empirically, Stine finds a super flypaper effect that even reverses the expected sign of the aid coefficient; he finds that lower aid in Pennsylvania counties was accompanied by lower local revenues. In contrast, Gamkhar and Oates find no asymmetries in state and local spending in response to changes in federal grants.

Table 3 adds to the specifications of Table 2 two additional right-hand-side

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

TABLE 3
ASYMMETRY EFFECTS (t-STATISTICS IN PARENTHESES)
DEPENDENT VARIABLE: PER-CAPITA PROPERTY TAX

Independent Variables	Estimated Coefficients					
	Pooled		District Fixed Effects (First Differences)		1991–5 First Difference	1994–5 First Difference
Constant	101.61	103.83	10.29	–13.06	45.59	–0.40
	(5.93)	(5.38)	(2.95)	(–1.50)	(2.54)	(–0.21)
Per-capita aid	–0.79	–0.80	–0.49	–0.14	–0.43	0.10
	(–21.85)	(–21.15)	(–6.33)	(–1.57)	(–1.69)	(0.74)
Per-capita income	0.01	0.01	0.15	0.14	0.07	–0.08
	(10.99)	(10.95)	(7.83)	(7.29)	(2.50)	(–1.67)
Per-capita enrollment	2639	2663	4943	6176	7090	–412
	(14.09)	(14.07)	(7.73)	(9.19)	(5.05)	(–1.13)
$(E/N)^*(y/Y^m)$	1059	1050	–8919	–10805	–9653	2207
	(6.22)	(6.16)	(–11.89)	(–12.90)	(–4.92)	(4.50)
Dummy (Δ aid ≥0)	–7.68	–7.32	12.46	18.29	–35.27	–2.89
	(–0.71)	(–0.61)	(2.28)	(2.41)	(–1.15)	(–0.32)
Dummy (Δ aid ≥0) *Per-capita aid	0.08	0.08	–0.15	–0.42	–0.11	0.53
	(2.08)	(2.13)	(–1.29)	(–3.48)	(–0.26)	(0.40)
1993 dummy		–5.66		40.80		
		(–0.55)		(5.19)		
1994 dummy		4.93		59.70		
		(0.42)		(6.79)		
1995 dummy		–11.85		7.65		
		(–1.13)		(0.85)		
R^2	0.66	0.67	0.10	0.14	0.07	0.10
Number of observations	2036	2036	2036	2036	509	509

variables to test for an asymmetrical response: a dummy variable for positive aid and the interaction of this dummy variable with per-capita aid. The results indicate that the specification is important in identifying asymmetric responses; at least one specification is supportive of each of the three possibilities suggested above.

The results of the pooled regression indicate a significant positive coefficient for the interaction term, although it is small in magnitude. The change in per-capita property taxes for a one unit change in per-capita aid is –0.80 for decreases in aid and –0.72 for increases in aid. This is consistent with Gramlich's hypothesis. The district fixed effects specification leads to some interesting changes. First, the sign of the interaction coefficient is reversed. Although the coefficient of the interaction term in the specification without year fixed effects is insignificant, it is significant when year dummies are included. Moreover, the magnitude of the coefficient is high; the change in per-capita property taxes for a one unit change in per-capita aid is –0.14 for decreases in aid and –0.56 for

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

increases in aid. This is consistent with the direction of Stine's finding, although it is not supportive of the notion that cuts in aid lead to reductions in local revenue. The final two first difference specifications (for 1991–5 and 1994–5) yield insignificant coefficients on the interaction term. These specifications as well as the district fixed effects specification without year fixed effects indicate no significant asymmetric response.

Conclusions

New Jersey enacted an income tax in 1976 in response to a State Supreme Court ruling that local taxation alone violated the requirement of the State Constitution that all children receive a thorough and efficient education. The law creating an income tax in New Jersey required that revenues from the New Jersey income tax be dedicated solely to relief of local property taxes; most of the relief is given as aid to local school districts. The state aid and income tax system has since undergone a series of changes reflecting the back and forth debate between elected officials and the State Supreme Court. The most recent changes include a large increase in the income tax and a restructuring of aid to local school districts by then Governor Florio in 1990 and Governor Whitman's cuts in the state income tax beginning in 1994. Governor Whitman's cuts have led to some fear that local property taxes would simply rise dollar for dollar in response to the state income tax cuts.

This paper investigates the effect on local property taxes of changes in aid resulting from the income tax increase under Governor Florio and the beginning of the decrease in income taxes under Governor Whitman. We begin by developing a simple public choice model, based on the general equilibrium models developed in Westhoff (1977), Epple, Filimon, and Romer (1984), and Goodspeed (1989), in which both local property taxes and state income taxes are choice variables. The model incorporates two avenues for a flypaper response: a direct effect of aid on the budget constraint and Fisher's (1979) explanation that income and property taxes present voters with different tax prices. The model is also used to analyze Fischel's (1989) argument that the interaction between voters' decisions and court mandates is important in understanding school district financing issues

This theoretical model is used as the basis for an estimating equation that relates school district aid and property taxes. This equation is then estimated using disaggregated data on New Jersey school districts for the fiscal years 1991–5 for four empirical specifications. The specifications are a pooled regression, a regression with district fixed effects, a long 1991–5 first difference, and a short 1994–5 first difference. Since the data include both increases and decreases in aid, we can also test for asymmetry in the reaction of governments, as suggested in the work of Gramlich (1987), Stine (1994), and Gamkhar and Oates (1996).

The results suggest that a flypaper effect seems to be present so that property taxes did not fall dollar for dollar when income taxes were raised, and are likely to rise significantly less than dollar for dollar when income taxes are cut. Second, the theory indicates and the empirical evidence tends to confirm that higher income districts will choose greater decreases in property taxes than other districts when an undesired income tax rise is imposed, and will

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

choose to increase property taxes more than other districts when the income tax is reduced. The asymmetry results are mixed: the specification with district and year fixed effects (arguably the most complete specification) indicates that property taxes rise less when aid decreases than they fall when aid increases, but the pooled specification suggests the opposite, and the other specifications yield insignificant results.

One avenue for further research is a more detailed investigation of some of the fiscal illusion explanations in New Jersey. Two institutional details of New Jersey school districts may lead to some interesting fiscal illusion tests. The first is the already mentioned budget cap, which can be overridden with a vote; we have assumed in this paper that voters are rational and hence reveal their preferences by voting to override if they so desire. However, it might be interesting to investigate the reversion hypothesis in this context since a defeated budget would normally revert to the previous year's budget. A second institutional detail is that New Jersey school districts can elect (by referendum) to have their budgets decided by representative democracy rather than by referendum; this creates two types of districts commonly referred to as "type one" and "type two" districts. It might be interesting to see if fiscal illusion types of explanations are more powerful in one type or the other.

ENDNOTES

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[1] For fiscal year 1994, for instance, total revenue collected from the New Jersey individual income tax amounted to $4,494 million. This amount was transferred to the Property Tax Relief Fund, which, along with a small surplus from previous years, had a balance of $4,597 million. Of this amount, $3,828 million, or about 83 percent of the Property Tax Relief Fund, was given to local school districts for educational spending. Of the remaining amount, $330 million was refunded to individuals in the form of homestead rebates, and $440 million was given as aid to municipalities.

[2] One of the earliest empirical studies is that of Gramlich and Galper (1973). Reviews of the literature can be found in Fisher (1982) and Hines and Thaler (1995) (see also the interesting discussion in Oates, 1994).

[3] See Bogart, Bradford, and Williams (1992) for an examination of the incidence of the Florio tax increase.

[4] See also Fernandez and Rogerson (1997) for a dynamic version of this model. Nechyba (1997) uses a different model that essentially restricts the property tax to be a tax on a fixed factor. The property tax in his model is therefore equivalent to a head tax and, not surprisingly, his simulation results comparing income and property tax equilibria are very similar to those of Goodspeed (1989), who compares income and head tax equilibria. Unfortunately, Nechyba was unaware of this earlier work and consequently does not compare the results.

[5] An interesting survey by Ross and Yinger (1995) indicates that urban bid-price models are in many ways equivalent to the structure of Epple, Filimon, and Romer (1984).

[6] This is the approach taken in Goodspeed (1995). See also de Bartolome (1997), who uses a serial voting procedure to analyze the structure of state aid formulas. An interesting alternative approach is Leyden (1992), who uses an expected vote maximization model.

[7] It is also similar to the analysis in Goodspeed (1995), who uses a serial voting procedure to show that an asymmetric distribution of income (which implies differing income and head tax prices for the median voter) may lead local governments to choose income over head taxation, in spite of the migration inefficiency that such a choice entails. See also Silva and Sonstelie (1995), who argue that different deductibility rules of taxes used by the state and taxes used by local governments led to different tax prices in California.

[8] This illustrates a point made in Hoxby (1996, 1997) that even lump-sum grants can have price effects if one takes into account the effect of such grants on the housing market. It is also interesting to note the similarity to the analysis of Epple and Romano

National Tax Journal
Vol 51 no. 2 (June1998) pp. 219-38

(1996), who analyze the effect of vouchers when schools are financed by an income tax. In their model, it is the exit of people from consumption of public schools (who must continue to pay taxes to support the public school system) that creates a nonlinear budget constraint.

[9] Federal aid to New Jersey school districts is extremely small for these years.

[10] If part of the tax base is commercial and industrial property, Ladd's (1975) point, that the composition of the property tax base may be important for the political economy of the property tax, may be relevant. If commerce and industry have a large amount of political power and generally push for positions favored by relatively wealthy individuals, the justification for using mean rather than median values may be strengthened. An alternative view is Fischel's (1975) argument that property taxes on businesses compensate the decisive voter for disamenities associated with business location.

[11] New Jersey school districts are subject to a budget cap that attempts to prohibit increases beyond the increase in per-capita income. However, a school district may obtain a cap waiver if the voters of the district approve a budget increase. A cap waiver may also be obtained (without a vote) for increased enrollment, increases in special education costs, and tuition paid to special needs districts (see New Jersey Department of Education, 1995). Since the budget cap is waived by a vote, voters reveal their preferences, and the cap is not considered a binding constraint in the econometric model that follows. Merriman (1987) examines a sample of New Jersey municipalities and finds that a budget cap had little effect.

[12] One possible explanation for the smaller than expected flypaper effect is that lower aid is simultaneously accompanied by higher after-tax income; since the two variables are negatively correlated, we might observe a smaller flypaper effect than otherwise.

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APPENDIX

As mentioned in the text, the audit worksheet provides information on local property tax revenues and state aid by school district, which I was able to obtain for the years 1991–5. However, information on population, enrollment, and income was not available for all years and some years had to be constructed through interpolation and extrapolation.

The data provided by the New Jersey Department of Education includes school district population for 1990 and 1992, enrollment for 1991, 1992, 1993, and 1994, and income per capita for 1993. District enrollment was projected to 1995 from the growth of the district's enrollment during 1993–4.

Population for 1991 was taken as the average of the district's population in 1990 and 1992. For 1993, 1994, and 1995, a state population growth rate was constructed from New Jersey state level data. These growth rates were then used to project a district's population in 1993, 1994, and 1995. Similarly, state income growth rates were constructed for 1991, 1992, 1994, and 1995 from state level data. These growth rates were used to project figures for income for years other than 1993.

Nominal dollar values were converted to real dollar values by deflating by the CPI for the appropriate period; fiscal year CPI values were constructed from the commonly available annual index.