REFORMING REFORMS: CHANGING INCENTIVES IN EDUCATION FINANCE IN VERMONT

Stephen J. Schmidt
(corresponding author)
Department of Economics
Union College
Schenectady, NY 12308-3107
schmidsj@union.edu
Karen Scott
Department of Economics
Union College
Schenectady, NY 12308-3107

Abstract

In 1997, Vermont passed Act 60, which reformed its education finance system to achieve greater equality of spending. The reform encouraged wealthy towns to reduce spending; it was politically unpopular and was replaced, in 2004, by Act 68. We analyze the spending incentives created by the two acts and estimate the effects the change will have on spending inequality. Act 68 reduces tax prices for education spending in all towns, but reduces them disproportionately for wealthy towns. It increases education spending in Vermont but also increases inequality of spending. Because spending is inelastic with respect to tax prices, the increase in inequality is small relative to existing inequality. Our findings demonstrate that understanding the way towns respond to financial incentives, economically and politically, is critical in designing successful reforms. They suggest that it is difficult to maintain finance systems that give wealthy towns strong incentives to spend less or subsidize poorer towns. Using state revenues to subsidize schools achieves nearly as much equality as more explicit attempts to force wealthy districts to share resources.

1. INTRODUCTION

In the last thirty years, many states have passed education finance reforms intended to decrease the extent of inequality of per pupil spending within their populations. Since education spending has traditionally been financed primarily at the local level rather than the state level, these reforms sometimes work by changing the state aid formula to provide incentives for districts to change their own local spending and/or tax rates. These incentives can produce two types of effects: leveling-up, which encourages poor districts to spend more on education, and leveling-down, which encourages wealthy districts to spend less.[1] Each type has advantages and disadvantages. Leveling-up promotes equality by increasing spending in poor districts, which is politically popular; but it increases total state spending on education, which requires either higher taxes or cuts elsewhere in the state budget. Leveling-down can be easier to afford, but it can be politically unpopular if its effect is to reduce spending on education in wealthy districts against the wishes of residents of those districts. This unpopularity can create a political backlash against the reform and has sometimes generated subsequent finance reforms designed to ameliorate the equalizing effects of the court-ordered reforms, such as California's Proposition 13.[2]

In this article, we consider the case of Vermont, which has reformed its education finance system twice in an attempt to produce a system that satisfies both its courts and its voters. In 1997, Vermont passed a court-ordered education finance reform, Act 60, which relied on an unusually transparent mixture of leveling-up and leveling-down to equalize spending. Act 60 combined a foundation grant program with a power equalization formula that required property tax rates to vary with local wealth.[3] Local spending above the foundation level was funded by a "sharing pool" that was funded entirely by local property tax revenues. Towns with high property tax values and/or high spending were required to set local property tax rates that generated revenue in excess of spending and thus were net contributors to the sharing pool.[4] Other towns with low property values and/or low spending set property tax rates that generated revenues below local spending; they were net recipients from the sharing pool. Rates were set each year so that inflows to the sharing pool

1. Hoxby (2001) discusses in detail the difference between leveling-down and leveling-up.
2. Proposition 13 and its relationship to *Serrano v. California* has generated a large literature; see, among many others, Silvia and Sonstelie 1995; Evans, Murray, and Schwab 1996; O'Sullivan, Sexton, and Sheffrin 1995; Downes 1992; and Fischel 1989. General political effects of school spending inequality are presented in Figlio, Husted, and Kenny 2004.
3. Downes (2002) discusses Vermont's pre–Act 60 finance system and analyzes of the effects of Act 60 on spending and on educational outcomes.
4. In Vermont, towns and school districts are essentially coterminous; a few towns for which this is not true are excluded from the regression analysis below.

exactly matched outflows. Thus, no state money went into the sharing pool, and wealthy towns could easily calculate the exact amount of local money that was being used to subsidize education in poorer towns. Rates were proportional to local spending: A town that increased local spending would also be forced to increase its contribution to the sharing pool for other towns in the state (or, if it was a recipient from the pool, reduce its draw). This created a substantial incentive for wealthy towns to reduce their school spending, and several of the wealthiest towns in Vermont did reduce their spending all the way down to the foundation grant amount.

Act 60 lasted only seven years before the political backlash from such a strong and explicit sharing mechanism caught up with it. In February 2004, amid a flood of discontent from wealthier towns, Vermont passed Act 68, a second reform of its education finance system. Act 68 completely eliminates the sharing pool, reduces local property tax rates in the wealthier towns in Vermont, increases the foundation grant substantially, and relies on an increase in state sales taxes to cover the resulting shortfall in the state budget. With the elimination of the sharing pool, Act 68 eliminates the incentive for wealthy towns to cut spending to avoid contributions to the sharing pool. However, it also weakens the power equalization formula and requires the state to carry a larger burden of school finance.

In this article, we analyze the effects that the change from Act 60 to Act 68 will have on education spending in Vermont. First, we calculate the marginal incentives for local spending of the two acts to measure the extent to which Act 60 provided incentives to reduce spending and the extent to which Act 68 has reduced or eliminated those incentives. Second, we use a median voter model of education spending decisions and the effects of Act 68 on the tax price of education spending to predict the change in spending caused by the new incentives offered by Act 68. Third, we assess the extent to which Act 68 will raise or lower total spending in Vermont and will change the inequality of spending across districts in Vermont.

We find that Act 68 reduces tax prices of education spending in all towns in Vermont. However, the reduction in tax prices is greater in wealthy towns, where Act 60 tax prices had been very high, than it is in poor towns. As a consequence, the result of shifting the tax burden to the state is to increase spending by more in wealthy towns than in poor towns, making inequality worse. Increased foundation aid does almost nothing to offset this increase in inequality. Because the elasticity of spending with regard to the tax price is small, the total change in inequality that arises is small compared to existing inequality. We conclude that—at least in Vermont, where district-level spending is quite inelastic—education finance reformers were able to shift from a leveling-down system to a more politically acceptable leveling-up system

without much loss of spending equalization, although at a substantial cost to the state treasury.

2. EDUCATION FINANCE REFORM

The education finance reform movement began in 1967 with the filing of *Serrano v. Priest*, which overturned California's education finance system and required California to take steps toward equalizing expenditures across school districts within the state. School financing in the United States, traditionally done through property taxes assessed by local districts, have permitted wealthy districts to spend more on schooling with lower tax rates than poor districts. These systems have been challenged as unconstitutionally inequitable in more than half the states in the United States; states in which courts have upheld such challenges have been forced to reform their systems of school finance in order to make spending on education more equal. Even states whose systems have been upheld, or have not been challenged, have changed their systems to encourage equality of spending across the state.[5]

Heise (1995) has classified court-ordered reforms into three chronological waves.[6] The first wave, from 1971 to 1973, claimed relief under federal guarantees of equality; it ended when the Supreme Court ruled, in *San Antonio Independent School District v. Rodriguez*, that the U.S. Constitution did not guarantee equality of access to education. The second wave of cases, following immediately on the heels of the Supreme Court's ruling, focused on equal protection clauses in state constitutions. In the third wave, starting in 1989, plaintiffs instead sought reform under education requirements of state constitutions, which allowed them scope to claim broader remedies. Successful challenges in the third wave have led to broader reforms than those of the first two waves.

In 1997, *Brigham v. State of Vermont* required a reform of Vermont's education finance system.[7] In its ruling, the Vermont State Supreme Court

5. Hoxby (2001) lists dates of reforms for thirty-five states and notes that most of the other fifteen states' systems do have equalization features. Murray, Evans, and Schwab (1998) find that court-ordered reform tends to increase equality by increasing spending in poorer districts while leaving spending in wealthier districts unchanged.
6. These waves are discussed at more length in Evans, Murray, and Schwab 1997, on which the present discussion is based.
7. Heise (1995) classifies second-wave reforms as those resulting from claims under equal protection clauses of state constitutions, and third-wave reforms as those resulting from claims under education clauses. The plaintiffs in *Brigham v. Young* brought claims under both the equal protection and the education clauses of the Vermont State Constitution (chapter 1 article 7 and chapter 2 article 68, respectively). The Supreme Court ruled for the plaintiff on both claims (although the trial court had ruled against the education claim). Thus *Brigham v. Young* had aspects of both third-wave and second-wave reforms, which is one reason that Act 60 used a redistributive mechanism to address the issues raised by the court's ruling.

required that Vermont provide "substantially equal access" to education for all Vermont students. Prior to Act 60, Vermont used a traditional school finance system in which the state distributed foundation aid to towns, but spending was otherwise locally determined and locally funded, resulting in higher spending in wealthier towns than poorer ones. The Vermont legislature, having anticipated the decision, responded four months later with Act 60.

Act 60 responded to the court's order in *Brigham v. State of Vermont* by mandating revenue sharing between wealthy and poor towns. Act 60 gave the state control over local property tax rates; towns retained control over local education spending, but tax rates were set according to a formula specified by Act 60. These rates resulted in wealthy and/or high-spending districts setting high tax rates that raised more money than the town spent on education. The excess money went into the sharing pool and was distributed to poor and/or low-spending districts that had tax rates insufficient to fund their spending. Tax rates were set each year to equalize total spending and total revenue statewide; the excess money raised in contributing towns exactly equaled the money required to subsidize recipient towns. Thus, no state money had to be put into the sharing pool. State aid was a fixed amount, not dependent on either district wealth or education spending.[8]

Downes (2002) finds that Act 60 did achieve the court's requirements; it significantly weakened the correlation between wealth and equality and equalized spending per student and, at least slightly, educational outcomes across districts. Act 60 was much less of a success with Vermont voters, particularly those in wealthy districts, which were required to make substantial contributions to the sharing pool. In the most extreme case, the town of Stratton, which contains a major ski resort and very few students, was required to contribute more than $30 to the sharing pool for every $1 increase in local education spending.[9] Wealthy towns, known in Vermont as "gold towns," responded by cutting their education expenditure to avoid contributing to the sharing pool. Several of them eliminated local education spending altogether, reducing public funding for schools to the state's foundation amount and relying on private fund-raising and other methods exempt from contributions to the sharing pool to fund the balance. Two towns, Wilmington and Whitingham, filed suit against the state, challenging the fairness of the Act 60

8. The amount varied from year to year; in FY2003, it was $5,566 per equalized pupil.
9. The actual tax price to Stratton voters was lower due to tax exporting (almost all of Stratton's taxable property is owned by nonresidents of the town) and the deduction of local taxes from federal income taxes. However, Act 60 also produced high voter tax prices; seven of Vermont's 254 towns had voter tax prices in excess of $1.50 for education. We return to this point below.

funding system. In a less traditional response, the town of Killington (home of another major ski resort) threatened to secede from Vermont and join the state of New Hampshire, though it is not even on the New Hampshire border. The town claimed it could save as much as $10 million per year in taxes by doing so.[10]

Responding to these pressures, in February 2004 the Vermont legislature passed Act 68, which repealed Act 60 and replaced it with a new education finance system, aimed to achieve the requirements of *Brigham v. Young* at a much lower political cost. Like Act 60, Act 68 leaves towns in control of spending levels and sets their tax rates as a function of the amount they choose to spend and property wealth. Unlike Act 60, Act 68 avoids any explicit redistribution of income through the sharing pool. It increases the foundation aid amount and reduces tax rates so that no town pays as much money in taxes as it spends on education. The balance is paid by increased state aid, funded primarily by an increase in the state sales tax. This causes a significant shift of education funding responsibility from towns to the state; it also lowers the tax price of education spending for local governments, since an increased share of expenditures (both total and marginal) is borne by the state government, not local property owners.

Manwaring and Sheffrin (1997) have studied the effects of increasing the state's share of education spending. They find that, on average, increased state financing reduces total spending, but the response differs considerably from state to state depending on the way in which the increase is implemented. They also find that changes in marginal subsidies significantly alter the course of reform. States that centralize control of spending are likely to see increases in equality but larger cuts in total spending, while those that increase aid to poor districts without restraining spending in wealthy ones avoid spending reductions but may not reduce inequality, or may even increase it.

Hoxby (2001) examines the effects of school finance equalizations on spending and equality across the United States. She finds that different equalizations have different effects depending on precisely how the reform is implemented. Some states increase equality by increasing spending in poor districts, others by lowering it in wealthy districts. Well-designed equalizations can bring about reasonable amounts of equalization at low cost; poorly designed ones can have unintended effects that make even poor districts worse off than before. Thus, it is important to carefully assess changes in a state's education finance system, such as Act 68, in order to be sure that it achieves what it is expected to achieve, and at an acceptable cost.

10. For details, see Zicconi 2004 and Curtis 2004.

3. DETERMINATION OF TAX PRICES FOR EDUCATION SPENDING IN VERMONT

To understand how the change in Vermont's education finances caused by Act 68 will change education spending, we use a median voter model of spending choice. The model is quite similar to that used by Hoxby (2001) except that, for simplicity, she assumes a representative voter instead of a median voter. The median voter model requires that voting be conducted only over a single issue and that political institutions implement the policy desired by the median voter. Vermont, like other New England states, has a strong tradition of local control over education, in part due to the rural nature of much of the state. School districts in Vermont are very small; the median district has fewer than 250 students. Thus, voters are likely to have a strong influence over decisions of school districts, and the median voter model is appropriate for addressing these questions.

If the median voter has preferences for education spending and other goods, then the level of spending selected will depend on the median voter's income and the tax price of education spending. Following Hoxby (2001), we distinguish between the tax price of education spending to the town, and the tax price to the median voter. The town tax price is the amount of money the local government must raise in taxes in order to get one more dollar of education spending. The median voter's tax price is the amount of money that the median voter must pay. The two can differ for two reasons. First, some town taxes are paid by nonresidents. Second, if the median voter itemizes his or her taxes, then some of the local tax burden that pays for increased education spending is borne by the federal government. Under both Act 60 and Act 68, the town tax price of education in a given town depends on the extent to which increases in local spending change the tax rate the state will set for the town, under the formulas required by those laws. The median voter's tax price is lower if (and only if) the median voter itemizes, and depending on what tax bracket the median voter is in if he or she does itemize. The change from Act 60 to Act 68 will alter education spending through two channels: the changes in these tax prices; and the change in income caused by the increase in the state sales tax included in Act 68.

Under Act 60, each town in Vermont selected a level of education spending for the town. If the town spent an amount per pupil equal to the foundation aid grant provided by the state ($5,566 in fiscal year 2003), then the town's tax rate was set to $1.10 per $100 of property value. If it spent more than this, then its tax rate increased in proportion to the spending increase. The $1.10 tax was known as the state share; the amount in excess of $1.10 was known as the local share. This tax was applied to the assessed value of the property, modified by an adjustment factor called the Common Level of Appraisal (CLA). The

purpose of the CLA was to prevent towns from evading the tax by lowering assessed values on houses in the town. Thus the basis for the tax was equal to V_i / C_i, where V_i is the assessed value of taxable property in the town and C_i is the common level of appraisal. The state gave low values for C_i to towns with relatively low assessed values on comparable properties, and high values for C_i to towns with relatively high assessed values, so that education taxes would be the same for comparable properties located in different towns.

Assuming that towns spent at least the amount of the foundation grant,[11] the local share tax rate was given by:

$$\mathrm{LST_i} = 0.011 \times \frac{(\mathrm{S_i} - \mathrm{G})}{\mathrm{m} * \mathrm{C_i}} \tag{1}$$

where LST_i is the local share property tax rate in town i, S_i is local education spending per student in town i, G is the foundation grant amount per student, and m, known as the equalized yield, is the factor of proportionality and is the same for every town in the state. The higher the equalized yield, the lower tax rates are set. Each year the state set the equalized yield so that the amount of tax revenue raised statewide would exactly equal total spending. Total local share tax revenues in each town, $LSTR_i$, are equal to the tax rate multiplied by property values:

$$\mathrm{LSTR_i} = 0.011 \times \frac{(\mathrm{S_i} - \mathrm{G})}{\mathrm{m}} \times \frac{\mathrm{V_i}}{\mathrm{C_i}}. \tag{2}$$

Total local share revenues are given by summing over towns. Setting this equal to total spending in excess of the foundation aid and solving for m gives the formula for the equalized yield:

$$\mathrm{m} = 0.011 \times \frac{\sum \frac{V_i}{C_i}(S_i - G)}{\sum P_i S_i} \tag{3}$$

where P_i is the number of equalized pupils in each town.[12] For FY2003 the value of the equalized yield was $42. By construction, this formula assures that, in total, local share property tax revenues exactly equal local spending above foundation aid. Towns that raise more local revenue than needed to cover their

11. Since the foundation grant is not local money and is lost if not spent, towns should always spend it entirely. We assume throughout the article that towns spend at least the amount of the foundation grant under all financing systems.

12. The value of the equalized yield depends on the amount of spending chosen by each town in the state. Accordingly, its value was not known when each town selected its amount of spending; towns had to use an estimate of its value in their calculations. This caused considerable negative comment at the time. In practice the estimated yield was not very difficult to estimate, and especially after the first year, towns could be reasonably confident, though not completely so, about the tax price of education when setting school budgets.

spending contribute to the sharing pool; those that raise less receive money from the sharing pool.

Given this formula, an increase in local school spending in a town will increase the local share tax revenues collected by the state for that town. The town's tax price, TTP_i, is given by differentiating equation 2 with respect to S_i and dividing by the number of pupils in the district:

$$\mathrm{TTP_i} = 0.011 \times \frac{\mathrm{V_i}}{\mathrm{m} * \mathrm{C_i} * P_i} \tag{4}$$

so that wealthier towns pay a higher marginal price for additional education. Also, holding C_i constant, the local cost of increased school spending is proportional to V_i / P_i, so those towns with relatively few pupils for their property values (in particular, the gold towns) pay a higher tax price.

The median voter's tax price is different from the town's tax price, for two reasons. First, the median voter may itemize deductions and thus may be able to deduct local school taxes. Second, some of the increase in taxes is exported to nonresident property owners in the town. If the median voter itemizes, then the median voter's tax price is given by

$$\mathrm{MVTP_i} = 0.011 \times \frac{\mathrm{RV_i}}{\mathrm{m} * \mathrm{C_i} * \mathrm{P_i}} \times (1 - \mathrm{FTR_i}) \tag{5}$$

where RV_i is the property owned by town residents in town i and FTR_i is the federal marginal tax rate paid by the median voter. If the median voter does not itemize, then the median voter's tax price is simply

$$\mathrm{MVTP_i} = 0.011 \times \frac{\mathrm{RV_i}}{\mathrm{m} * \mathrm{C_i} * \mathrm{P_i}}. \tag{6}$$

In practice, we do not know whether or not the median voter itemizes. Using data from the IRS, we find that the chance that an income tax filer, married filing jointly, will itemize deductions is equal to 50 percent at $51,630. We therefore assume that the median voter itemizes if median income in the town is above that amount, and we reduce the town tax price by 15 percent or 25 percent, depending on the tax bracket of the median income in the town.

Act 68 changed the formula for setting property tax rates; in doing so, it changed the implied tax price of school spending to the median voter and altered incentives to spend money on education. One effect of Act 68 is primarily political; it creates separate property tax rates for property owned by town residents and property owned by nonresidents. Only the tax rate on property owned by residents increases as school spending rises, while the tax rate on nonresident property is fixed by the state ($1.59 per $100 adjusted value of

property in FY2004). This prevents town residents from passing on the costs of higher local education spending to nonresidents, who had objected to this feature of the Act 60 taxation system. Second, the sharing pool is abandoned, and along with it the equalized yield that ensured that local share property taxes would always exactly cover spending in excess of foundation grants. Under Act 68, a town's tax rate is equal to a fixed amount (initially $1.10, adjusted annually by the legislature) if the town spends exactly the amount of the foundation grant ($6,800 in FY2004), and it increases proportionately as the town's local spending does. Thus, if a town spends $8,160 per student, which is 20 percent more than the foundation grant, then the property tax on resident property increases by 20 percent to $1.32. If, however, the town spends more than 25 percent of the state average spending per pupil, then increases above 25 percent over the state average count double in increasing its resident tax rate. This creates an incentive for towns not to spend too much more than the statewide average, reducing inequality directly. Under Act 68, the resident property tax rate RT_i is given by

$$\mathrm{RT_i} = 1.10 \times \frac{\mathrm{S_i}}{\mathrm{G} * \mathrm{C_i}}. \tag{7}$$

This tax rate is never high enough to raise revenues equal to spending; the difference is covered by money raised by an increase from 5 percent to 6 percent in the state sales tax. This, plus the increase in the foundation grant, implies a substantial shift of education revenue from the local level to the state level. Tax revenues in the town, TR_i, will then be

$$\mathrm{TR_i} = 1.10 \times \frac{\mathrm{S_i}}{\mathrm{G} * \mathrm{C_i}} \times \mathrm{RV_i} + 1.59 \times \frac{1}{\mathrm{C_i}} \times \mathrm{NRV_i}. \tag{8}$$

The town's tax price of a $1 increase in education spending is found by differentiating equation 8 with respect to S_i and dividing by P_i:

$$\mathrm{TTP_i} = 1.10 \times \frac{\mathrm{RV_i}}{\mathrm{G} * \mathrm{C_i} * P_i}. \tag{9}$$

The primary difference between this town tax price and the town tax price under Act 60 in equation 4 is that the Act 68 tax price depends on resident property value per pupil, while the Act 60 tax price depends on total property value per pupil, whether owned by residents or nonresidents. The distinction is very important in several gold towns with large amounts of nonresident property (primarily related to skiing) and small populations, hence few pupils.

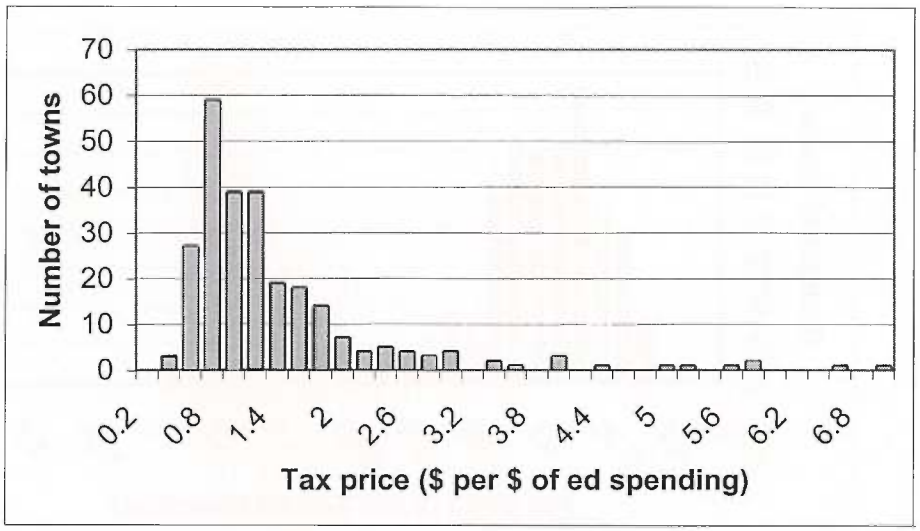

Figure 1. Town Tax Prices of Education Spending: Act 60

Under Act 68, increases in taxes caused by higher school spending are paid entirely by residents, so there is no tax exporting to nonresidents. Thus, the median voter's tax price differs from the town tax price only if the median voter itemizes. The median voter's tax price is thus given by

$$\mathrm{MVTP_i} = 1.10 \times \frac{\mathrm{RV_i}}{\mathrm{G} * \mathrm{C_i} * P_i}(1 - \mathrm{FTR_i}) \tag{10}$$

if the median voter itemizes; it is equal to the town tax price if the median voter does not itemize.

4. CHANGES IN TAX PRICES FROM ACT 60 TO ACT 68

The changes in the formula for setting local tax rates between Act 60 and Act 68 changed the tax prices of additional school spending for both the town and the median voter. In this section of the article we show how tax prices changed and discuss some of the distributional implications of the changes. Figure 1 shows the town tax prices, under Act 60, of increasing local education spending by $1. Figure 1 excludes the three observations with the highest town tax prices to avoid compressing the left side of the graph. The omitted observations have values of $8.88, $9.19, and $32.85. The average value is $1.48, though this is distorted by the high-value observations; the median value is $0.96. In the median town, marginal expenses for education spending are borne almost entirely by the town, and in 125 of the 253 towns, the town pays more than $1 to increase local education spending by $1. This is a consequence of the sharing pool; a $1 increase in spending must produce, on average, exactly $1 in

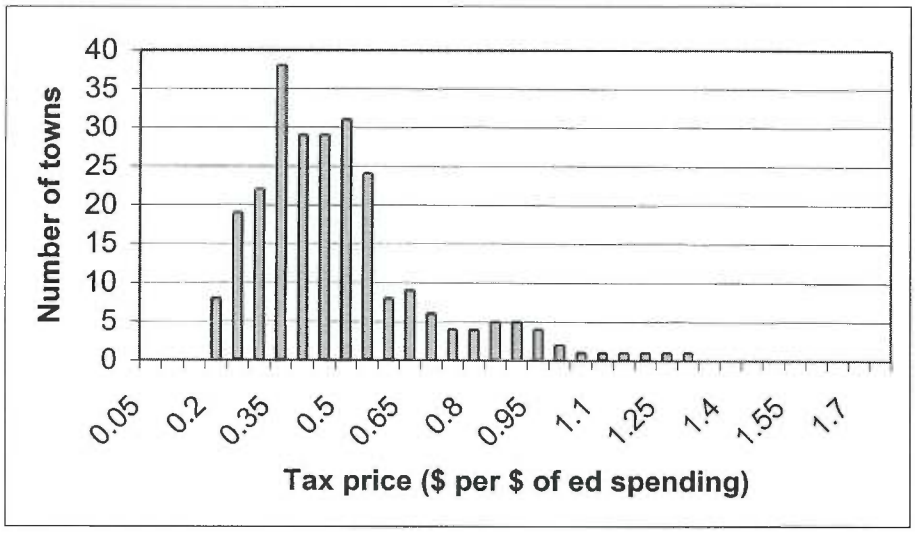

Figure 2. Town Tax Prices of Education Spending: Act 68

local tax revenue. In contributing towns it produces more; in receiving towns it produces less. The variance of town tax prices, however, is extremely wide. In 37 towns, or 14.6 percent, the town faces a tax price of $2 or more to increase local spending by $1, the balance going to the sharing pool; and there are nine towns in which the tax price exceeds $5.[13] At the low end, 21 towns have town tax prices less than 60 cents, and 74 have town tax prices less than 75 cents.

Act 68 changed the town tax price of education spending substantially. Figure 2 shows the distribution of town tax prices under Act 68. Theoretically, this cost can be higher or lower than it was under Act 60, depending on the fraction of the town's property that is owned by nonresidents; in practice it is lower for every town in the state. The average town pays 46 cents to increase local education spending by $1 under Act 68, $1.02 less than it did under Act 60; the median town pays 40.6 cents, 56 cents less than under Act 60. The highest town tax price has fallen from $32.85 to $1.27. Only six towns pay more than $1 to increase local education spending by $1 under Act 68.[14] The cost of increased education spending has fallen markedly statewide; the state has taken on not only a larger share of the total burden of education costs, but a much larger share of the marginal cost as well. By reducing town tax prices, Vermont has increased the incentive for its towns to spend money on education; because tax prices have fallen more at the top end of the distribution than at the bottom end, this incentive is particularly strong for the wealthiest towns in Vermont.

13. The nine towns paying more than $5 are Stratton, Killington, Winhall, Dover, Plymouth, Peru, Ludlow, Landgrove, and Victory.
14. The six towns are Landgrove, Stowe, Dorset, Weston, Killington, and Plymouth.

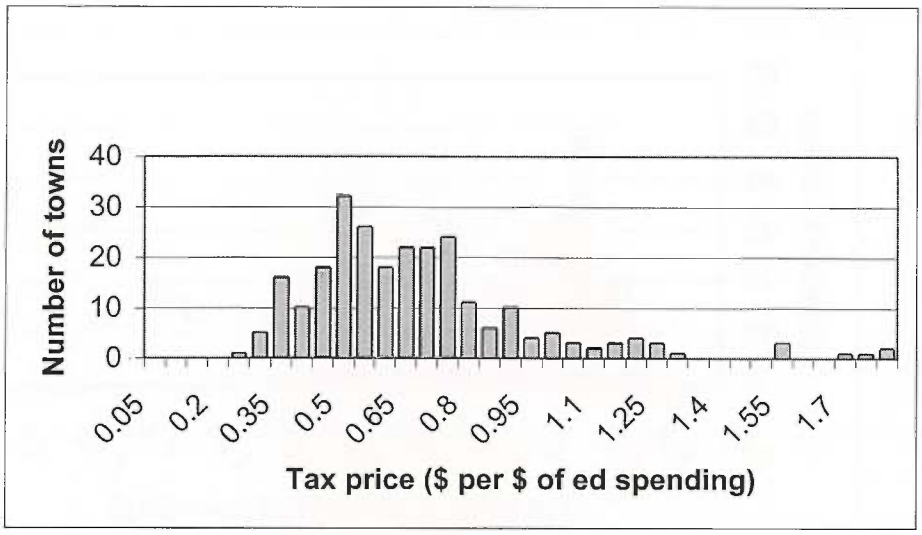

Figure 3. Voter Tax Price of Education Spending: Act 60

Figure 3 shows the tax price to the median voter of increased education spending under Act 60, which differs from the town tax price because of tax exporting and the deductibility of property tax from federal income taxes. The average value is 65 cents per dollar of education spending; this is much lower than the $1.48 cost to the local government, primarily because the towns with very high town tax prices also tend to have very high fractions of property owned by nonresidents and hence can export most of the town's cost to nonresidents.

The most extreme example is Stratton, which has a town tax price of $32.85 but in which 96.4 percent of the property is owned by nonresidents. Its median voter's tax price is $1.18. Similar effects lower the voter tax price in the other towns with extremely high local costs of education spending and thus reduce the extreme right-tailedness of the distribution of tax prices. Still, there are twenty-three towns in Vermont where, even after tax exporting and federal deductions, the voter tax price of education spending was more than $1 under Act 60.

Figure 4 shows median voter tax prices under Act 68. As with the town tax prices, the median voter's tax price is lower under Act 68 than it was under Act 60 in every one of the 253 towns in Vermont. The largest drop for a single town is 98 cents (Rupert: from $1.78 to $0.81), and the smallest is 5 cents (Stannard: from 21 cents to 16 cents). The average voter tax price under Act 68 is 42 cents per dollar of education spending, 23 cents below the average under Act 60, and the median is 39 cents, 21 cents less than the median of 60 cents under Act 60. Thus, the reduced cost of education spending to local governments created by Act 68 is passed on to the median voter in each town, providing an incentive to increase local spending at the expense of the state government.

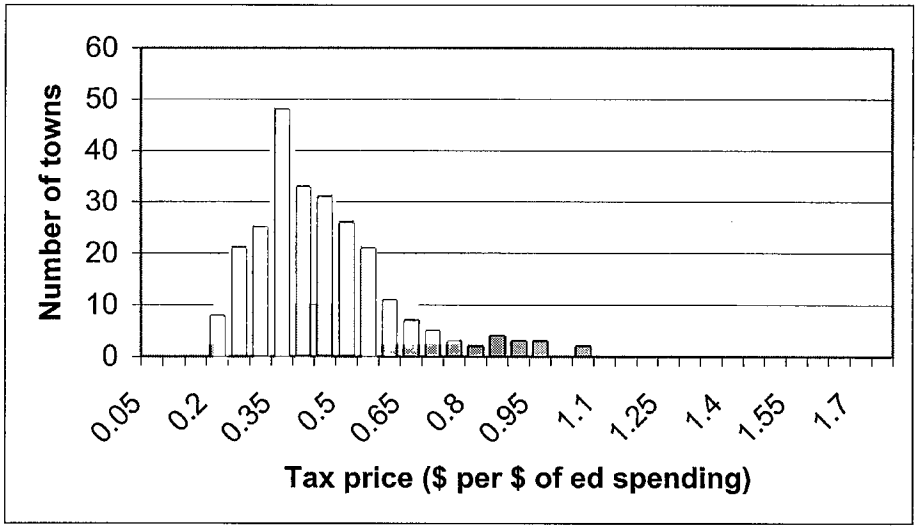

Figure 4. Voter Tax Price of Education Spending: Act 68

The change in tax prices is not distributed evenly across towns in the state. Under Act 60, towns that had tax prices greater than $1, and thus contributed to the sharing pool, had average incomes and average property values per capita that were statistically significantly higher than the averages in towns that had tax prices below $1, and thus received money from the sharing pool. Median household income was $41,101 in the contributing towns and only $38,224 in the receiving towns; the *t*-statistic for the equality of means is 3.09, rejecting equality. Median property values per capita were substantially more different, $86,713 in contributing towns and only $49,298 in receiving towns, with a *t*-statistic of 3.72 for the equality of means. However, the average population and the average number of pupils per town were not statistically significantly different between contributing and receiving towns. Thus, the change in tax prices does not substantially shift wealth from large towns to small ones. This occurs because the wealthy towns tend to be suburban, hence smaller than the poorer urban towns but larger than the poorer rural towns (the rural gold towns excepted). This made it relatively easy to gain a political majority to pass Act 68. In addition, the fact that the costs to the state of lower tax prices were funded by an increase in sales taxes meant that the wealthy towns still subsidized poor towns. Under Act 60, this subsidy had been highly visible because of the sharing pool mechanism; under Act 68, the subsidy is much less direct and thus harder to fan into a political issue.

5. RESPONSE TO CHANGES IN INCENTIVES FOR LOCAL EDUCATION SPENDING

The changes in voter tax prices caused by the passage of Act 68, along with the income effects from the increased sales tax, create incentives for local

governments to change spending on education. Lower tax prices should increase spending, but higher sales taxes for state funding should reduce it through income effects. The total effect is ambiguous, depending on which is stronger: the response to the lower tax price or the response to the sales tax increase. The effect also varies between wealthy towns and poor ones, depending on how much the tax price has changed and how much sales tax is paid by the town.

In order to measure Vermont towns' responsiveness to these changes, and hence predict the effects of Act 68 on local education spending, we estimate a model of education spending determination. Our methodology is similar to that used in McCarty and Brazer 1990 for simulation of hypothetical district power equalization formulas in three states. Our equation assumes that the median voter obtains his or her desired level of education spending based on the tax price of education spending and his or her after-tax income. In addition, demographic factors that affect the identity of the median voter cause spending to differ between towns. The initial equation we estimate is:

$$\begin{aligned}\log(\text{SPEND}_i) = \beta_0 + \beta_1 \times \log(\text{TAXPRICE}_i) + \beta_2 \times \log(\text{INCOME}_i) + \beta_3 \\ \times \text{COLLEGE}_i + \beta_4 \times \text{OVER64}_i + \beta_5 \times \text{UNDER18}_i + \beta_6 \\ \times \text{WHITE}_i + \beta_7 \times \text{GOREVOTE}_i + \beta_8 \times \text{NADERVOTE}_i + \varepsilon_i \end{aligned} \tag{11}$$

where SPEND_i is local spending per student on education in town i; INCOME_i is median household income in the town;[15] COLLEGE_i is the fraction of the town's population which is college-educated; OVER64_i, UNDER18_i, and WHITE_i are the fraction of the town's population which are over age sixty-four, under age eighteen, and identify ethnically as Caucasian, respectively; and GOREVOTE_i and NADERVOTE_i are the fraction of the town's population that voted for Al Gore and Ralph Nader, respectively, in the 2000 presidential election.[16] The equation is estimated using data from fiscal year 2004 on 249 Vermont towns (four small towns are excluded because they did not file separate election returns).[17] Spending data come from the Vermont Department of

15. This specification assumes that the median voter has the median income. This will be true if demand for spending is monotonically increasing in income. The inclusion of demographic variables similarly assumes that the chance that the median voter will be of a certain age, race, or education status is proportional to the fraction of people in the town who are of that status.
16. Patrick Buchanan received a little over 1 percent of the vote for president in Vermont in 2000; however, the fraction of voters voting for Buchanan was never statistically significant in any regression in which we included it.
17. Because of the small size of Vermont towns, some towns, especially rural ones, form unions to provide schools jointly, particularly for secondary education. Others, if they have very few students, pay tuition to send their students to schools in other towns. In the results presented below, we treat

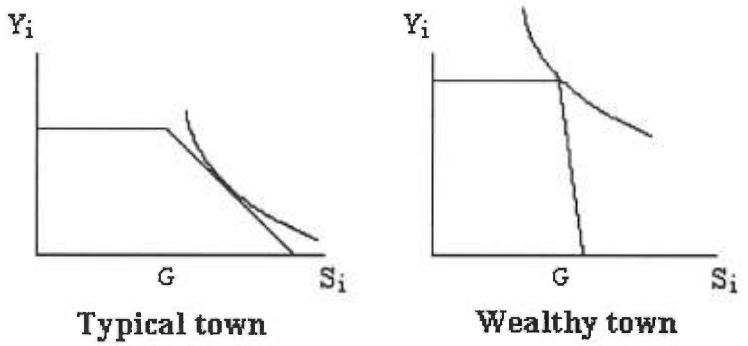

Figure 5. Optimal Budget Point: Possibility of a Corner Solution

Education; property value data from the Vermont Department of Taxes; voting data from the Vermont Secretary of State; demographic data from the U.S. Census. The double-log specification allows us to interpret the estimated parameters as spending elasticities. A 1 percent increase in tax price will increase spending by β_1 percent (or decrease spending if β_1 is negative, as we expect), and a 1 percent increase in income will increase spending by β_2 percent.

Equation 11 cannot be estimated by ordinary least squares because the tax price of education spending drops to 0 when spending is below the foundation amount. Figure 5 shows two possible cases for the budget set and preferences of the median voter. The horizontal axis is education spending, and the vertical axis is all other spending. The budget set is horizontal until education spending reaches the amount of the foundation grant; thereafter it slopes downward, with a slope equal to the voter tax price. In most towns in Vermont, the tax price is sufficiently low that the town prefers to spend more than the foundation grant; such a town is described by the graph on the left. However, if the town is wealthy and thus has a very high tax price, the optimal budget point can be to spend only the amount of the foundation grant, due to a corner solution at the point where the town begins to face the high marginal cost of additional spending. Several towns in Vermont did precisely this in 2002. For example, the town of Dorset set local education spending to $5,792, just below the foundation grant amount of $5,810. Although its median household income is $54,219, one of the highest in the state, its tax price of $1.54, more than double the state average, gives it a strong disincentive to spend any local

all towns identically. We have also performed analyses allowing for differences between towns that form union districts, towns that do not, and towns that charge students tuition. The results do not change substantially when we allow for these differences. We find that towns that charge students tuition spend slightly less per student than other towns; there is no significant difference between towns in union districts and towns outside them.

Table 1. Results of Tobit Estimation of Equation 11

Dependent variable: Local education spending		
Variable	**Full equation**	**Final equation**
Intercept	**5.740** (1.019)	**6.215** (0.568)
log(TAXPRICE)	−0.048 (0.039)	**−0.072** (0.030)
log(INCOME)	**0.217** (0.073)	**0.238** (0.030)
COLLEGE	−0.049 (0.143)	
OVER64	0.168 (0.347)	
UNDER18	0.590 (0.466)	
WHITE	0.518 (0.777)	
GOREVOTE	0.432 (0.174)	**0.374** (0.166)
NADERVOTE	**0.772** (0.357)	*0.593* (0.313)
σ_ε	**0.157** (0.08)	**0.158** (0.008)

Estimates in bold are statistically significantly different from zero at the 5% level; estimates in italics are statistically significantly different from zero at the 10% level.

money on education.[18] In order to correct for this, we estimate equation 11 using a Tobit model, with the data being left-censored at the amount of the foundation grant.[19]

Results of estimating the initial equation, and a reduced final version that drops a number of insignificant right-hand side variables, are found in table 1. The elasticity of education spending with respect to tax prices is low, at −0.071 in the final equation, but statistically significantly different from zero. The elasticity of education spending with respect to income is 0.238.[20] These elasticities imply that a 10 percent increase in tax price reduces spending by only 0.7 percent, and a 10 percent increase in income increases spending by 2.38 percent. The estimates are relatively inelastic compared to estimated values from other states; this may have to do with the small size of towns (and school districts) in Vermont, as described above. Of the demographic variables, only

18. Other wealthy towns setting education spending equal to, or slightly below, the foundation grant amount include Buels Gore, Weston, Stowe, Landgrove, Peru, Manchester, Winhall, and Warren; the average of median household income in those nine towns is $47,700, versus a statewide average of $40,135.
19. Estimates obtained using ordinary least squares (OLS) are not very different from the Tobit estimates, probably because the number of censored observations is low (less than 10 percent of the sample), and these estimates are not shown here.
20. Hoxby (2001), estimating a similar regression, finds income elasticities in the range of 0.284 to 0.310, depending on specification. The difference between her estimates and our value is not statistically significant. We cannot compare our tax price elasticity to her results because she uses inverted tax price, rather than log of tax price, in her regression (because in some states, such as California, tax prices are essentially infinite).

the political ones are statistically significant in the initial equation, and all are dropped in the final equation. The fraction of the population that is college-educated is strongly collinear with household income; the others have little variance in Vermont, where the population is relatively homogeneous. The fraction of votes cast for Gore and Nader appear to be capturing variation in political preference. A 1 percent increase in the vote for Nader increases education spending by almost double the increase caused by a 1 percent increase in the vote for Gore, which is consistent with Nader being the more liberal candidate.

Using these estimated elasticities, we calculate the effect of changing from Act 60 to Act 68 on education spending in Vermont.[21] Act 68 has two effects on spending: It changes voter tax prices; and it reduces income because of the increase in sales taxes.[22] If the town is spending above the foundation grant under both Act 60 and Act 68, then the effect of Act 68 on spending is given by the equation:

$$\%\,\Delta \text{ spending} = -0.071 \times \%\,\Delta \text{ voter tax price} + 0.238 \times \%\,\Delta \text{ income.} \quad (12)$$

Since Act 68 lowers voter tax prices but also lowers after-tax incomes, the sign of the effect of Act 68 on spending is theoretically ambiguous. The calculation of the effect of Act 68 is also complicated by the possibility that the town chooses to spend only the foundation amount under either or both of the two acts.[23] We calculate predicted changes in spending between Act 60 and Act 68, correcting for censoring at the amount of the foundation grant and using the fact that

$$E(S) = \exp(E(\log S) + \sigma^2/2) \quad (13)$$

which is necessary because of the log-linear functional form of equation 11, on which the expectations are based.

21. It would be interesting to also compare spending under these acts to spending before Act 60. Unfortunately, the required data on school expenditures were not collected until Act 60 made it necessary to collect them, so it is not possible to make this comparison. All estimates of spending changes reported below are changes from Act 60 spending to Act 68 spending.
22. Doing this requires an assumption about the distribution of the burden of the state sales tax across towns. For simplicity, we assume that the burden is proportional to income. In Vermont there are a large number of sales tax exemptions that reduce its regressivity. Because of the small effect of the sales tax on spending, due to the low estimated elasticity, assuming that the tax is somewhat regressive (which would be more realistic) and places a higher burden on poor towns does not substantially affect the calculations that follow.
23. In practice, no town is predicted to spend below foundation grant under Act 60, and only two are predicted to spend below foundation grant under Act 68.

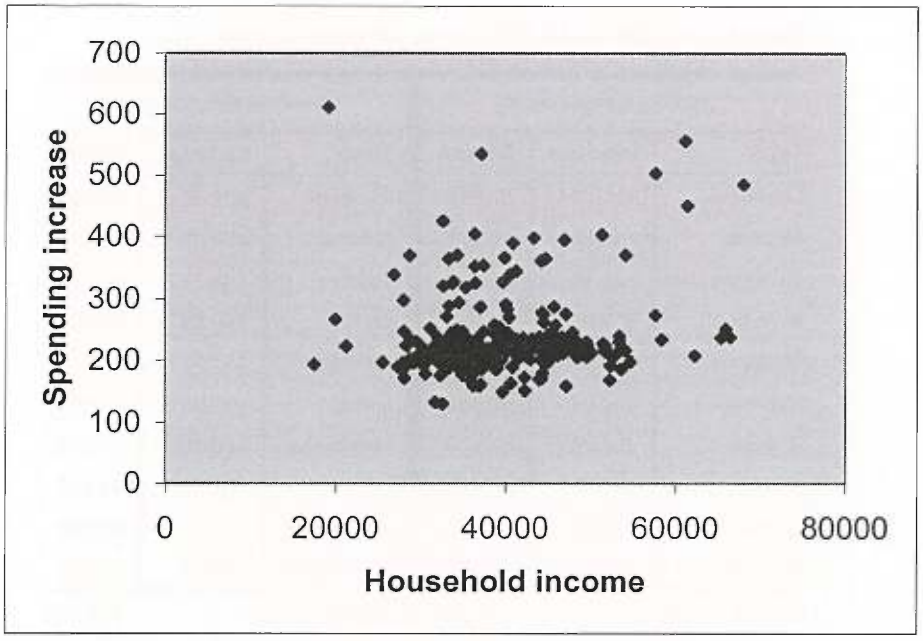

Figure 6. Changes in Spending vs. Income

We predict spending to rise in all towns in the state. The increases range from a maximum of $610 to a minimum of $148, or, in percentage terms, a maximum of 9.8 percent to a minimum of 1.8 percent. The average increase is $237, which is 3.04 percent of spending. The total increase, statewide, in education spending is $24.4 million. In two towns, the increase occurs because of the increase in foundation grant aid; towns that were predicted to spend between $5,800 and $6,800 per student increase spending to $6,800 as a consequence of the rise in the foundation aid. In all other towns the rise is due to the marginal incentive of lower tax prices. The average tax price has fallen from 65 cents to 42 cents; this produces a change of 0.031 in log spending or $256 in spending. The income effect of the sales tax increase is comparatively small. Log income falls by only 0.0079 (the $100 million increase in sales tax is 0.79 percent of state income), and log spending falls by 0.00186 as a result; spending declines by $15. The effect on spending from the lower tax prices greatly exceeds the effect of the higher taxes, leading to an increase in every town; the higher the fall in tax price, the greater the increase in local spending.

The consequences of this could be to decrease spending inequality if tax prices fell more in the towns with lower incomes. Unfortunately, that is not the case; tax prices fell more, on average, in towns with higher incomes. Figure 6 shows a scatter plot of changes in spending against per capita income. The correlation is not extremely strong, but it is positive: Act 68 leads to larger

Table 2. Towns with Largest and Smallest Changes in Spending

10 largest increases ($)			10 smallest increases ($)		
Town	**Increase**	**Income**	**Town**	**Increase**	**Income**
Maidstone	610.45	19,167	Tinmouth	129.87	32,604
Westford	556.37	61,205	Guildhall	132.36	31,750
St. Albans City	534.22	37,221	Stratton	148.37	39,688
Richmond	502.85	57,750	Grafton	150.69	42,313
Shelburne	484.71	68,091	Stannard	157.91	36,250
Williston	450.37	61,467	Ludlow	157.91	36,969
Granville	424.60	32,679	Manchester	158.15	47,196
Pawlet	403.66	36,429	Danby	160.77	37,137
Colchester	402.60	51,429	West Fairlee	162.61	40,667
Plymouth	397.70	43,438	Isle LaMotte	163.75	36,125
Average income		$46,888	Average income		$38,070

increases in school spending in high-income towns than it does in low-income ones. Table 2 shows the ten districts with the largest predicted increases in spending, and the ten districts with the smallest predicted increase, and their incomes. The average income in the towns with the largest increases is $8,818, or 23 percent, higher than average income in the towns with the smallest increases. Four of the ten towns with the largest increase are also among the ten towns with the highest incomes in the state.

Predicted changes in spending are similarly correlated with wealth. Figure 7 shows the correlation of spending with per capita resident property wealth. Again, the correlation, though not very strong, is positive: Wealthy towns increase spending more than poor ones do. The average increase in spending in Vermont's twenty-five poorest towns (that is, the bottom decile of the wealth distribution) is $217, or about 2.72 percent of spending in those towns. The average increase in state's twenty-five wealthiest towns is $281, or about 3.53 percent of spending in those towns.

Fortunately, because of the small elasticities of spending with respect to tax prices and income (−0.072 and 0.238, respectively), the changes in inequality of education by income and wealth caused by the change to Act 68 are not terribly large. The correlation between income and education spending rises under Act 68, but not greatly. An extra dollar of town income increases education spending by 4.82 cents under Act 60, and by 4.92 cents under Act 68—an increase in the effects of income, but not a large one. This occurs because the increases in inequality caused by Act 68, though significant, are relatively small compared to the inequalities that already exist.

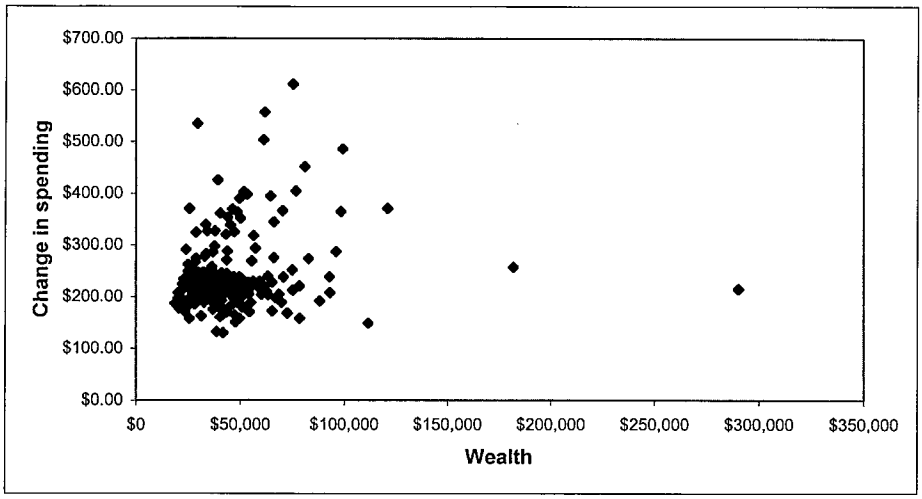

Figure 7. Changes in Spending vs. per Capita Resident Property Wealth

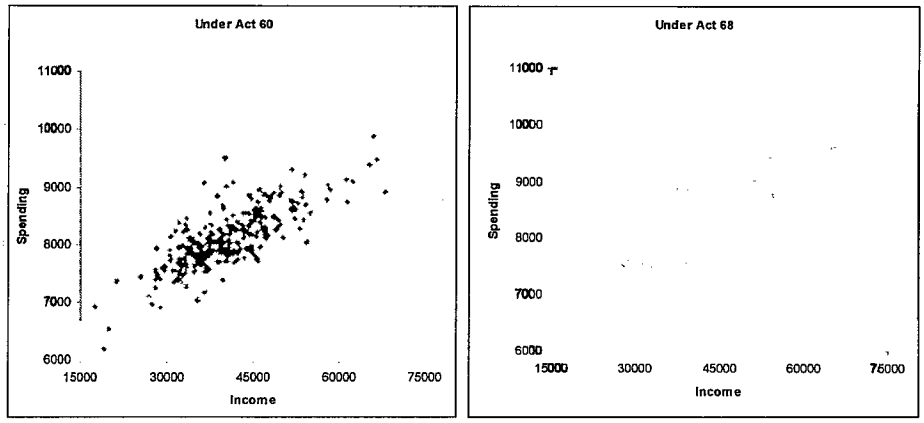

Figure 8. Spending as a Function of Income

Figure 8 demonstrates this graphically. In all towns, the effect of Act 68 is to increase spending, changing the town from a diamond plot on the left graph to a square one on the right graph. Because high-income towns (located on the right-hand part of each graph) increase spending by somewhat more than low-income towns (on the left-hand part of each graph), the line becomes steeper; a $1 increase in income causes a greater increase in spending than previously. However, since the highest-income towns already spend almost $2,000 per student more than the lowest-income towns, the effects of Act 68, which are on the order of $50 to $100, do not increase the slope of the relationship by much, and the relationship between property wealth and education spending is strengthened only very slightly by those effects.

6. CONCLUSIONS

In 2004, Vermont passed Act 68, changing its education finance system so that aid to poor towns was generated by state funding instead of by local property taxes in wealthy towns. In doing so, Vermont substantially increased the incentives of both poor and wealthy towns to spend money on local education and greatly reduced the extent to which the system provided equality by leveling-down spending in wealthy towns. This was desirable, as shown by the number of wealthy towns that had virtually eliminated local education spending in response to the strong incentives to reduce spending created by Act 60. However, the removal of incentives to reduce education spending in wealthy towns had the undesirable side effect of increasing spending disproportionately in wealthy towns. With the subsidization of poor towns coming from state money rather than property taxes from high-spending towns, the incentive for wealthy towns to reduce spending was weakened. This countered the intent of the original reform, which was to reduce inequality in spending caused by differences in wealth.

We find that Act 68 lowered both tax prices of education spending for both local governments and voters in all towns in Vermont. This helped make Act 68 politically feasible; the tax price of education fell for all towns in Vermont, although it fell more for rich towns than it did for poor ones. Thus, the towns that had received subsidies from the sharing pool under Act 60, which might otherwise have been expected to oppose the elimination of the sharing pool, also saw an increase in education spending. Since the increased spending was paid for with sales tax revenues, of which wealthy towns pay more than poor towns, the revision reduced the visibility of education subsidies to poor towns without eliminating them.

In response to lower tax prices for education, towns increased local spending on education; education spending statewide increased by $24.4 million as a consequence of Act 68. The decrease in tax prices was larger in wealthier towns than it was in poor towns. This made it substantially easier for wealthy towns to afford increases in education spending after the passage of Act 68. The effect was to substantially narrow the range of tax prices for education spending across Vermont towns, thus hampering the ability of the finance system to reduce inequality across towns.

We find that Act 68 did indeed result in increased inequality of education spending in Vermont. However, because state spending is quite inelastic with respect to tax prices, and even more so with respect to income, the increase in inequality that occurs is quite small relative to existing inequality. Spending increases in the wealthiest towns are only about $65 more than those in the poorest towns. This happens partly because the increase in the sales tax is borne more heavily by wealthier towns, but mostly because the changes in spending

Downes, Thomas. 1992. Evaluating the impact of school finance reform on the provision of education: The California case. *National Tax Journal* 45:405–19.

Evans, William N., Sheila E. Murray, and Robert M. Schwab. 1997. State education finance policy after court-mandated reform: The legacy of *Serrano*. Proceedings of the Eighty-Ninth Annual Conference on Taxation, Washington, DC, pp. 366–71.

Evans, William N., Sheila E. Murray, and Robert M. Schwab. 1996. School houses, court houses, and state houses after *Serrano*. *Journal of Policy Analysis and Management* 16:10–31.

Fischel, William A. 1989. Did *Serrano* cause Proposition 13? *National Tax Journal* 42:465–73.

Figlio, David N., Thomas A. Husted, and Lawrence W. Kenny. 2004. Political economy of the inequality in school spending. *Journal of Urban Economics* 55:338–49.

Heise, Michael. 1995. State constitutional litigation, educational finance, and legal impact: An empirical analysis. *University of Cincinnati Law Review* 63:1735–65.

Hoxby, Caroline M. 2001. All school finance equalizations are not created equal. *Quarterly Journal of Economics* 116:1189–1231.

Manwaring, Robert L., and Steven Sheffrin. 1997. Litigation, school finance reform, and aggregate educational spending. *International Tax and Public Finance* 4:107–27.

McCarty, Therese A., and Harvey Brazer. 1990. On equalizing school expenditures. *Economics of Education Review* 9 (3): 251–64.

Murray, Sheila E., William N. Evans, and Robert M. Schwab. 1998. Education finance reform and the distribution of education resources. *American Economic Review* 88:789–812.

O'Sullivan, Arthur, Terri A. Sexton, and Steven M. Sheffrin. 1995. *Property taxes and tax revolts: The legacy of Proposition 13*. Cambridge, UK: Cambridge University Press.

Silva, Fabio, and Jon Sonstelie. 1995. Did Serrano cause a decline in school spending? *National Tax Journal* 48: 199–215.

Zicconi, John. 2004. Two Vermont towns sue for more school aid. *Barre-Montpelier Times Argus*, 14 July, p. A1.

induced by Act 68 are small relative to the already-existing inequalities in education spending in Vermont. Act 68 makes the problem of inequality worse than before, but not much worse. As a result, Vermont has been able to reduce the political opposition to its reform at a relatively small cost in spending inequality.

We conclude that states reforming their education finance system should be aware of the changes reform makes, not only in the total burden borne by local governments but also in the marginal burden borne by local governments when they increase or decrease education spending, and of the likely responses of school districts to changes in those burdens. Reforms that, like Vermont's, give a stronger spending incentive to wealthy communities than to poor ones can affect spending in a way contrary to what was intended. This can easily happen if a reform that shifts the burden of education spending from school districts to state governments also shifts the burden on the margin from districts to states. If, as is the case with Act 68, the shift is greater in wealthy towns, the ability of the reform to equalize spending can be undercut. Designing reforms that set marginal incentives for spending well can, in contrast, help reduce inequality even if they do not result in large changes in the burden of inframarginal funding from local governments to the state.

We also conclude that the visibility of subsidies, as well as their level, is an important factor in their political viability. Act 68 managed to achieve nearly the same equality of spending as Act 60 but at a much lower political cost. States facing constitutional mandates to equalize spending may do better to use indirect methods of subsidy, like those of Act 68, rather than highly visible forms of subsidy like the sharing pool; Vermont made only a small sacrifice in equality by switching to subsidizing education from statewide sales tax revenues.

Part of the work in this article was done while Schmidt was a visiting scholar at Rensselaer Polytechnic Institute. Part of the work was supported by a grant from the Union College Scholar's Research Fund. Their support is gratefully acknowledged. The authors also thank Therese McCarty for her assistance, Bill Talbot and Jonathan Cogan for help with Vermont school finance law and data, two referees for their very helpful comments, and seminar participants at the 2005 American Education Finance Association meetings and at Rensselaer Polytechnic Institute for their comments on earlier drafts.

REFERENCES

Curtis, Brent. 2004. Killington takes secession proposal to New Hampshire next week. *Barre-Montpelier Times Argus,* 10 July, p. A1.

Downes, Thomas. 2002. School finance reform and school quality: Lessons from Vermont. In *Helping children left behind,* edited by John Yinger, pp. 283–316. Cambridge, MA: MIT Press.