Policy Analysis
No. 618 July 1, 2008

The Fiscal Impact of a Large-Scale Education Tax Credit Program

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With a Technical Appendix by Anca M. Cotet

Executive Summary

In this paper we estimate the budgetary impact of the Cato Institute's Public Education Tax Credit model legislation on five states and presents a generalized spreadsheet tool ("the Fiscal Impact Calculator") that can estimate the program's effect on any other state for which the necessary input data are supplied. It is estimated that, in its first 10 years of operation, savings from the PETC program would range from $1.1 billion for South Carolina to $15.9 billion for Texas. Illinois, Wisconsin, and New York are estimated to enjoy 10-year savings within that range.

Public Education Tax Credits reduce the state and local taxes owed by anyone who pays for the private schooling of an eligible child. Parents can claim credits for their own children's educational costs, and other taxpayers (including businesses) can claim credits when they pay for the education of someone else's child, either directly or by donating to a nonprofit scholarship-granting organization.

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If a four-to-eight-year phase-in period is included, all five states show substantial expected savings in every year of the program.

Savings from Public Education Tax Credits

Using data input by the user, the Fiscal Impact Calculator predicts the annual savings (or loss) for each of the first five years of the PETC program,[1] as well as computing total savings (or loss) over 10 years. This tool is based on formulas developed by economist Anca M. Cotet of Ball State University,[2] and its theoretical underpinnings are explained in the Appendix authored by Anca Cotet.

Extending Cotet's calculations, the tool can also assess the impact of the PETC program when tax credits for children already enrolled in private schools are phased in over several years (by age or grade). The purpose of such a phase-in is to spread out the impact of credit claims by families whose children are already enrolled in private schools (which reduce state and local revenues). A four-to-eight year phase-in period allows the revenue losses from tax credits for these students to be offset by the savings from students who are migrating from public to private schools, making it possible for the PETC program to generate savings from its first year of operation (see Tables 1 through 5, below).

Because the calculator uses the *marginal* cost[3] of serving a child in a public school when computing the district-level impact, and because that cost is below the *average* per pupil cost, district funding per pupil will rise as students migrate from public to private schools (see Tables 1 through 5). The PETC program is thus not only predicted to save money overall, it is expected to increase the funding available per pupil in public schools at the same time.

In states where the marginal cost is substantially below the average per pupil cost, the rise in per pupil funding will be dramatic. In New York state, per pupil funding is expected to exceed $22,000 by year five unless it is checked by the legislature, rising above $32,000 by year twelve. In such cases, legislators may find it both practically and politically desirable to cap the growth rate of per pupil spending in public schools to something close to historical levels for their state, freeing up additional resources for other uses. Such a cap could be integrated into the PETC enabling legislation.

The following tables describe the fiscal impact of the PETC program on Illinois, New York, South Carolina, Texas, and Wisconsin. Positive impact numbers represent savings.

The sections that follow provide a quick overview of the calculator's methodology, some general guidance on the Excel spreadsheet, and a step-by-step explanation of every formula used in that spreadsheet.

How the Fiscal Impact Calculator Works

The calculator begins by determining how many children are likely to eventually migrate from public to private schools because of the lower perceived cost of private schooling that

Table 1
PETC Impact on Illinois (8-Year Phase-in)

Year	Net State and District Impact	Public School Funding per Pupil
1	$308,162,689	$14,826
2	$307,840,096	$14,989
3	$346,670,126	$15,206
4	$426,710,292	$15,488
5	$545,581,697	$15,847
10yr Total	$5,147,906,259	

Table 2
PETC Impact on New York (7-Year Phase-in)

Year	Net State and District Impact	Public School Funding per Pupil
1	$814,118,911	$20,891
2	$880,555,032	$21,168
3	$1,041,886,255	$21,544
4	$1,303,099,421	$22,052
5	$1,658,428,744	$22,728
10yr Total	$15,140,364,437	

Table 3
PETC Impact on South Carolina (8-Year Phase-in)

Year	Net State and District Impact	Public School Funding per Pupil
1	$67,587,305	$12,992
2	$66,550,428	$13,152
3	$74,223,260	$13,366
4	$91,063,504	$13,651
5	$116,541,962	$14,024
10yr Total	$1,080,516,318	

Table 4
PETC Impact on Texas (4-Year Phase-in)

Year	Net State and District Impact	Public School Funding per Pupil
1	$508,432,914	$12,124
2	$417,477,038	$12,214
3	$402,594,949	$12,334
4	$337,749,934	$12,490
5	$868,492,139	$12,688
10yr Total	$15,913,536,653	

Table 5
PETC Impact on Wisconsin (4-Year Phase-in)

Year	Net State and District Impact	Public School Funding per Pupil
1	$298,216,180	$15,235
2	$239,333,208	$15,429
3	$225,772,879	$15,697
4	$180,881,366	$16,061
5	$497,082,795	$16,554
10yr Total	$9,310,293,631	

Public school district funding per pupil will rise as students migrate from public to private schools.

results from the PETC program. This is done using a conventional economic formula explained in the appendix and in the "Step-by-Step" section below. The calculator also assumes that a tax credit will be claimed for every child already enrolled in private school. It either assumes that all of these claims will occur right from the first year (if the user enters "1" for the phase-in period) or gradually over several years (if the user enters a number greater than one for the phase-in period).

Next, the state-level budget impact is calculated by taking the state-level savings arising from migration from public to private schools, and subtracting the state-level tax revenues lost from credits for migrating students and for students already in private schools. This state impact figure is calculated separately for each of the first 25 years of the program, because the migration is assumed to take place gradually over time.

Next, the district-level budget impact is computed by taking the district's savings due to migration and subtracting the lost per pupil state revenues and the lost local tax revenues resulting from credits claimed against local taxes. Again, this figure is separately computed for each of the first 25 years, accounting both for the gradual migration from the public to the private sector, and for any phase-in of eligibility for students already enrolled in private schools (if specified by the user).

Finally, the net impact for each of the first 25 years is calculated by summing the state and district figures over that period.

There are two noteworthy differences between the calculator and the analysis presented in the appendix when it comes to the rate at which migration from public to private schools is assumed to occur. The appendix assumes that all of the predicted migration would occur over a period of five years. This seems too short a time period, and so, to produce a more realistic estimate of the year-by-year savings, the calculator assumes that it will take until year 12 for 80 percent of the predicted migration to occur, and that it will take until year 20 for 99 percent of the predicted migration to occur.

The second difference is that while the appendix assumes that the rate of migration will be constant (i.e., linear), the calculator adopts an s-shaped model consistent with the research literature on the diffusion of new services, products, and technologies.[4] The diffusion of new options in the marketplace has been found, in general, to begin somewhat slowly, then to accelerate as information about the new options becomes widely available, and finally to slow as most of the consumers interested in the new options have already adopted them.

General Notes on the Spreadsheet

The PETC calculator spreadsheet uses a basic feature of Excel known as cell names. A cell name is a user-defined term that refers to a particular cell in the spreadsheet. Names are used in Excel formulas in place of normal cell references (such as "B2"), so that the purpose of the formulas can more easily be understood.

You can see whether or not a given cell has a name by selecting that cell and then looking at the "name box" just to the left of the Excel formula bar. This is where the cell's name will appear, if it has one. If it is not named, a normal cell reference will be displayed.

To make matters easier, the PETC calculator spreadsheet lists the cell name for each entry field in parentheses and italic font. For example, the very first entry field in the spreadsheet, cell E14, is named *Total_Expenditures*.

For further guidance on how to easily trace what is going on in Excel formulas, please search Excel's built-in help facility for the terms "trade dependents," "trade precedents," and "evaluate formula."

Fiscal Impact Calculations, Step-by-Step

Table 6 begins with the intermediate calculations, continues on to the state and district fiscal impact calculations, and ends with the net impact calculations.

Table 6
Fiscal Impact Calculations, Step-by-Step

Cell	Name	Explanation
Intermediate Calculations		
E90	Average_Support	Divides total public school expenditures by initial public school enrollment to obtain total per pupil funding before the PETC program is introduced.
E92	State_Local_Average_Support	Divides total state and local public school expenditures by initial public school enrollment to obtain total state and local per pupil funding before the PETC program is introduced.
E97 to I97	Students_ETC_Eligible1 to Students_ETC_Eligible5	Multiplies initial public school enrollment by the share of households in each of five income ranges (input in cells E32 through I32) to predict the number of public school students eligible for tax credits in each of those categories.
E102 to I102	Net_Private_Tuition1 to Net_Private_Tuition5	Subtracts the total tax credit value for which each income group is eligible from the average private school tuition to compute the net tuition that families at each income group would have to pay after the PETC program. The tax credit values for each income group are stipulated in the PETC legislation as a given share of total state and local funding for public schools.
E107 to I107	Migration1 to Migration5	Computes the number of public school students at each income level who are expected to migrate to the private sector due to the lower net cost of private schooling under the PETC program. As explained in the appendix, the amount of migration is calculated separately for each of the five income brackets, since the change in the perceived price of private schooling is different for each of those brackets due to the design of the PETC program. Within each income bracket, the formula for determining migration is a scaling value (alpha) multiplied by the difference between net private tuition to the power of Elasticity and initial private tuition to the power of Elasticity. Alpha can be obtained algebraically by solving the migration equation, $$\Delta q = \alpha P_1^{\varepsilon} - \alpha P_0^{\varepsilon} ,$$ for alpha, where delta q is the change in quantity demanded (i.e., the change in private school enrollment), and then plugging in prior data for private school tuition and enrollment. Hence, $$\alpha = \Delta q / (P_1^{\varepsilon} - P_0^{\varepsilon}) ,$$

Continued

Table 6 (*Continued*)

Cell	Name	Explanation
		and, assuming that enrollment went from zero at some initial time to its present value, we can say that initial price was infinity (i.e., that there was no price high enough at that time to allow consumption of private schooling). Since infinity to a negative power (the value of Elasticity is negative) is zero, the P_0 term drops out of the equation and we are left with α = current enrollment / (current price)$^{\varepsilon}$ Current enrollment for each income bracket is then calculated as total private school enrollment times the share of families in the given income bracket. Note that if the effective price of tuition in a given income bracket is reduced to zero, it is assumed that all public school students in that bracket will shift to the private sector. Also note that if the delta q calculation shown above generates a number larger than current public school enrollment in the given bracket, all public students in that bracket are expected to migrate to the private sector.
E110	Total_Migration	The sum of the migration figures computed in cells Migration1 through Migration5.
E112	Students_Remaining	The total number of students expected to remain in public schools after all predicted migration has taken place. This is simply initial public school enrollment minus Total_Migration.
E114	Credits_Migration	The total value of the tax credits claimable by students migrating from the public to the private sector.
E116	Credits_Private	The total value of the tax credits claimable by students already enrolled in private schools.
E119 to AH119	Phase_In1 to Phase_In5	Calculates the fraction of students already enrolled in private schools who will be eligible for credits in each year of the program, based on a user-selected phase-in period. If the phase-in period is set to 1, all these cells take on the value of 1. For phase-in periods of 2 to 10 years, these cells take on the value of the appropriate fractions of 13, since there are 13 grades from kindergarten through 12, inclusive. For instance, a three-year phase-in assumes that the first four grades are eligible in year 1 (4/13 = .31), the first eight grades in year 2 (8/13 = .62), and all grades in year 3 and after.
Savings and Loss Calculations		
G51	State_Migration_Savings	Funding that the state no longer needs to send to school districts due to the reduced enrollment from migration to the private sector. This is equal to the

Cell	Name	Explanation
		total number of migrating students times the state's share of average total state and local public school funding. Note that these state migration savings are based on average not marginal per pupil spending, because state spending is based on a per pupil formula. If a student leaves the public system, the entire state allocation for that student is no longer sent to the district.
G53	State_Migration_Rev_Reduction	Reduction in state revenues due to tax credits claimed against state taxes.
G55	State_Migration_Impact	Savings from migration minus revenue reductions due to migration
G57	State_Private_School_Rev_ Reduction	Reduction in state revenues due to tax credits claimed for students already enrolled in private schools.
G71 to AE71		Sigmoid (i.e., s-shaped) function of time (in years). Gives the share of total expected migration that is assumed to have taken place by the given year. This function was chosen to reflect the commonly observed s-shaped diffusion pattern of new services, products and technologies.
G72 to AE72		These cells compute the net impact of the PETC program on the state budget, from the first year of its operation (cell G50) to the fifth year (cell G58). Expected migration of students from public to private schools is assumed to take place at a constant rate over these five years, until it is completed in year five. So, in each of these five years, net impact is computed as the impact on the state budget of migration that has thus far taken place minus the revenue reduction due to credits claimed for students already in private schools (State_ Private_School_Rev_Reduction). In the first year, 20 percent of the migration impact is felt, in the second year, 40 percent, and so on.
G61	District_Migration_Savings	This is the amount that school district spending will be reduced due to declining enrollment from migration. It is calculated as the marginal cost of educating a student in the public schools times the number of public school students who migrate to the private sector. Note that this calculation uses marginal per pupil cost instead of average per pupil cost, because the district is not assumed to save 100 percent of its per pupil allowance every time a student leaves, since some costs are fixed. Also note that this calculation will yield a conservative (low) estimate of savings because many so-

Continued

Table 6 (*Continued*)

Cell	Name	Explanation
		called "fixed" costs, such as upkeep for school buildings, *will likely become variable costs over time*. As many students migrate, fewer buildings will be required, and buildings could be closed and sold. The cost of maintaining these buildings would go away, and their sale would generate revenue. None of this is included in the net fiscal impact numbers reported by this model. Under the model used in this calculator, even if every student left the public schools there would still be considerable state and local spending on those schools—an implausible scenario to say the least.
G63	Reduction_in_State_Rev	Reduction in revenues from the state as a result of student migration out of the public schools. This is Total_Migration times the state's share of all state and local public school spending.
G65	Local_Rev_Reduction_Migration	Reduction in local tax revenue due to migration. This is estimated as the local share of all tax revenue time the total value of credits for migrating students.
G67	District_Private_School_Rev_ Reduction	Reduction in local tax revenue due to credits claimed for students already enrolled in private schools. This is estimated as the local share of all tax revenue times the total value of credits for private school students.
Net Impact Calculations		
G73 to AE73		Net impact of the PETC program on school districts in each of the first five years of its operation. Expected migration of students from public to private schools is assumed to take place at a constant rate over these five years. Therefore, in each year, the net district impact equals the savings due to migration (to date), minus the reduction in revenues from the state due to migration (to date), minus the reduction in local tax revenues from migration (to date), minus reduction in local revenues due to credits for students already in private schools. In the first year, 20 percent of the migration impact is felt, in the second year, 40 percent, and so on. Note that all students in private schools are assumed to have credits claimed for them as soon as they are eligible, as determined by the user-selected phase-in period (see cells E119-AH119).
E43 to E47		The net, overall fiscal impact of the PETC program in years one through five. This is simply the sum of the state and district level impacts.
F43 to F47		The level of total public school spending that will exist in the given year in public schools for all those

Cell	Name	Explanation
		students remaining in the public sector. Because the model assumes that districts only save the marginal cost of educating a student when one student migrates to the private sector, and because the marginal cost is usually less than the average cost, districts end up with higher and higher average pupil spending as more and more students migrate. In practice, local and state officials and voters may decide that the rate of growth in per pupil spending should be capped, in which case they will enjoy larger savings than the model currently predicts.
E48		This represents the total predicted savings (loss) over the first 10 years of the program. It is calculated as the sum of the savings of the first five years, plus 5 times the savings in the 5th year (at which point the migration is expected to be complete).

Conclusion

Based on the findings of this study, and given the parameters it assumes, all five states examined would begin saving money under the Public Education Tax Credit act from its first year of operation, and these savings would run into the billions after just a handful of years. Any state contemplating the introduction of a school choice program or facing budgetary difficulties would thus do well to consider the PETC program.

Appendix: The Economics of the Fiscal Impact Calculator

By Anca M. Cotet

Introduction

This report accompanies the Cato Institute Public Education Tax Credit Calculator, a Microsoft Excel tool that estimates the fiscal impact of Cato's Public Education Tax Credit act. The purpose of the PETC is to allow all parents to choose the school that best fits the needs of their children. Under the Public Education Tax Credit act, all taxpayers, individual and corporate, would be allowed to claim credits for direct payment of educational expenses and for contributions to organizations that provide scholarships to lower-income families. Taxpayers could claim these credits against state income, sales, and local property taxes, and state and local business taxes, where applicable.

Any specific estimates obtained with the methodology presented in this report should be viewed as extensions of previous studies because all data and estimated parameters have been drawn from the existing literature, with extrapolations of identified trends into the school year 2008–2009, which is assumed to be the first year of implementation of the act. In addition, since the calculations use state level aggregate data, any numbers obtained by using this tool should be seen as approximations. However, this tool should be useful even to the person interested in precise estimates because it provides a way to assess the value of spending money on a more comprehensive study.

Given its billions in savings, any state contemplating the introduction of a school choice program or facing budgetary difficulties would do well to consider the PETC program.

The Model

The fiscal impact on state and local treasuries depends on how public school spending is affected by migration from public schools to independent schools. This study starts with the premise that state governments will continue their existing trends in per pupil spending, while local governments will reduce the amount they contribute to public schools by the amount of the tax credits claimed against local taxes. Thus, it is assumed that public school students will continue to obtain support from state, local, and federal governments, while the independent school sector will grow as more parents claim credits for their children's educational expenses and more individual and corporate taxpayers donate to scholarship granting organizations for lower-income families.

The expected student migration from public to private schools will affect school districts as well as state and local treasuries. It is important to note the difference between school districts and local governments. They are distinct entities, with the local government providing revenues to the school district, and the district spending those resources to provide educational services.

This study treats local and state treasuries separately. For every student that migrates from a public to an independent school, state governments need no longer spend the funds they would have normally contributed to that student's education. As a result, state treasuries may experience savings fully proportional to migration rates. On the other hand, local authorities tend to spend as much per pupil as they can. It is not expected that local support will be reduced on a per-capita basis as is expected for the state support. As a result, this study does not talk about savings for the local treasuries because, in this framework, any such savings will be automatically passed to the school districts. There are, however, some caveats about this methodology that need to be noted. First, local taxpayers are not infinitely generous, so local authorities can be expected to eventually lower tax rates, and thus their spending, in response to a noticeable drop in enrollment. Most likely this decrease in funding will not be fully proportional to declining enrollment and will vary across jurisdictions. As information becomes available, the interested party can easily adjust the computed fiscal impact at the school district level by replacing the value of the cells indicating the reduction in revenues from local sources with the actual change in local support. In its current form, those cells reflect the expected reduction in revenues at the local treasury due to the claimed education credits.

This brings to light a second consideration: we do not know what portion of all tax credits will be claimed against state taxes versus local taxes, since the credits will be applicable to taxes at both levels of government. As a working assumption, the calculator assumes that the proportion of all credits that would be claimed against state (as opposed to local) taxes would equal the ratio of revenues generated by the state-level taxes to which PETCs can be applied to the total revenue generated by all taxes to which PETCs can be applied . This approximation works very well if there is no difference in the cost of claiming a credit at the state versus the local level. In other words, it works well if it is just as easy to claim a credit against state taxes as it is to claim a credit against local taxes. The validity of that assumption depends on the institutional particularities of each state and also on how each state chooses to implement the legislation.

For each student who migrates to an independent school, state treasuries can retain the funds they would have normally contributed to that student's education. Hence, the total potential state savings from migration can be easily calculated by multiplying the average support per pupil from state sources by the number of students who migrate. On the other hand, the flow of tax revenues is reduced by the amount of tax credits offered to students migrating to independent schools or already in independent schools. The amount of foregone tax revenue can thus be calculated by summing up the state-tax credits offered to

students already in private schools and to students choosing to leave the public school system for an independent school.

Local treasuries, on the other hand, tend to spend as much as they collect in tax revenues. As a result, there cannot be a discussion about savings or costs at the local budget level. But it should be emphasized that in the longer term there will probably be savings for the taxpayers if there are tax adjustments. Such tax adjustments will reduce the revenues available to the school districts and, as such, adjustments should be made to the calculations, as mentioned above.

Just looking at the state and local budgets would fail to consider the full impact of education tax credits. Specifically, it would ignore the effect on the school districts. When calculating the total fiscal impact of education tax credits, the relevant comparison is with the situation that would exist if the credits were not introduced. In other words, we should compare the spending and revenue figures we estimate if the PETC is enacted with the figures that we would normally expect if the tax credit program were not enacted. To do that, the impact on school districts must be considered.

At the school district level, the impact is defined by the change in revenues and the change in expenditures. For reasons that will become obvious in the following pages, these calculations imply increasing levels of spending per pupil. This report does not suggest that spending per pupil should follow the same trend, and indeed it is to be expected that it will not. Rather it chooses a neutral position, simply estimating the outcome under PETCs as compared with the expected outcome if PETCs are not introduced. We recognize that voters and their elected representatives should be the ones choosing how eventual savings should be used or losses covered.

When computing savings or losses for school districts it is important to break out the funding from different levels of government because school districts will experience a reduction in the funding from the state and local levels but not from the federal level. According to the Secondary Education Act, federal funding is based on school-age population and poverty ratios and not on enrollment. Thus, first, the revenues of the school districts will be reduced by the amount the state governments would have contributed for the students migrating to independent schools. This reduction in school district revenues is exactly equal to the savings for the state treasury due to migration. What the state sees as savings, the school districts see as revenue reduction. Second, school districts will obtain less money from the local treasuries. In this setting revenues from local sources are reduced by the amount of education credits claimed against locally collected taxes. At the same time, school districts will experience savings in costs due to the reduction in the number of children to be educated (savings that would primarily be manifested as lower administrative and teacher payroll costs, but eventually as lower capital costs as well). These savings are calculated by multiplying the marginal cost of education in public schools by the number of students choosing to migrate toward independent schools.

Two questions need to be asked. First, what is the marginal cost of education in public schools, and second, how is the migration to independent schools calculated?

Marginal cost represents the cost associated with educating one additional student, or the savings that result from reducing enrollment by one student. Economists often estimate cost functions for various types of output, and as long as we recognize that educating a child is the unit of output for a school, the marginal cost of educating a student is readily estimable from available data.

Full and detailed explanations regarding the method of estimating the marginal cost of education in public schools are already available,[5] but to reassure the reader, a note should be made here too. Given that marginal cost calculations were made on historical data when no large changes in enrollment took place, there is no reason to assume that the costs of providing education are in largely fixed and thus there will be no savings. Most importantly, estimates of marginal cost suggest that public school administrators were able to efficient-

ly manage resources such that even small decreases in enrollment generated savings. As a result, we can be confident that they will be able to do the same with larger shifts in enrollment. For instance, using panel data for three years (2002 through 2004) Grecu and Lindsay find that variable costs make up about 80 percent of South Carolina public school costs.[6] These findings contradict the belief, posited by some,[7] that education costs are largely fixed and hence not conducive to savings from falling enrollment.

It is also worth noting that the fiscal impact calculator assumes that marginal cost will remain constant as public school enrollment falls. That is a strong assumption, but since it is very unlikely that the entire migration will take place in one year we can safely assume that for a longer period some of the fixed costs will become variable and thus the savings per migrating student could remain relatively constant even for a large migration. Migration is unlikely to take place entirely in one year. There are many real world frictions that would prevent such a scenario: low-income parents need time to find organizations that would provide scholarships, existing private schools would need time to accommodate increases in enrollment, and the creation of new schools in response to rising demand would not be an instantaneous process. If migration takes place over multiple years, there is enough time for costs that we call now "fixed" to become variable costs, making it easier to realize savings. The amount of these savings depends on whether the administrators will be able to respond quickly to changes in enrollment. That depends on the responsiveness of the bureaucratic process. But on the other hand it is also an endogenous process. If keeping empty buildings generates significant losses, administrators will have greater incentives to sell them as quickly as possible, perhaps to growing private schools.

The rate of migration is determined by the increased attractiveness of enrolling in a private school associated with the reduced effective tuition due to education tax credits. The lower the net tuition, the higher the expected migration will be. According to the Public Education Tax Credit act, the extent to which tuition is reduced by the education tax credits depends on family income. Evaluating the consumers' response to the reduced tuition is equivalent to measuring consumers' response to a change in the price of any other good or service and is generally measured by the price elasticity of demand, which tells us the extent to which demand is likely to rise as price falls, or how much it will drop as price rises. The elasticity of demand for private education was estimated to be -0.48 by Chiswick and Koutroumanes in 1996.[8] Moreover, a newer 2005 study by Grecu and Lindsay[9] using South Carolina data reinforces their result. An elasticity of demand for private education of -0.48 indicates that for a one percent decrease in the net tuition in private schools, there is a 0.48 percent increase in enrollment in private schools. Migration is thus predicted on the basis of this relationship between tuition and migration given the legislation's provisions regarding the availability of education tax credits and their impact on net tuition. Other sources[10] suggest that demand for private education is actually more elastic. If that is in fact true, the Education Tax Credit Calculator understates expected migration. However, the reality of a world with frictions makes it preferable to err on the side of understatement rather than overstatement of migration.

One caveat is that this paper assumes that migration toward private schools will take place in 5 years and that the demand for private education does not change during this period. This is a strong assumption given expected adjustments in the public school system triggered by migration. If the perceptions of private versus public schools change, the demand for private schools may change.

One simplification used in the calculator tool is that it uses the same elasticity value to predict migration for all categories of students while in fact the elasticity likely varies with income. But the way this simplification affects the validity of the results depends on how the elasticity varies with income. In general, people have more elastic demands for goods that take

a larger share of their income. As a result, we expect low-income people to have a more elastic demand for private education. Moreover, low income people are most likely to live in areas with lower-performing public schools. It is reasonably likely that those schools will end up closing and all their students will migrate to independent schools. But the timing of this migration is likely to be determined by the existence of viable alternatives within a reasonable distance. Since most independent schools are currently attended by students from medium- to high-income families, it is not obvious that, at the inception of the PETC (i.e., before there has been time for supply to catch up with growing demand), low-income students will always have private schools nearby. As a result, if we consider traveling costs, low income students will face a higher price of private education in the first few years of the program, such that even if the elasticity used underestimates the true elasticity, the predicted migration is likely to be reasonably correct. In the longer term, as supply responds to increased demand from low-income families (as can be seen in the proliferation of new private schools that opened to serve low-income families under Milwaukee's voucher program), this temporarily higher cost will likely go away.

An estimation problem may exist in the case of higher-income individuals, who probably live in neighborhoods with good public schools. If they are satisfied with their school why should they send their children to a private school? This issue is already embodied in the estimation of the elasticity of demand for private education. This estimate is calculated at a time when public education is free, so that people who choose private schools are more likely to come from the medium- to high-income brackets. There is no reason to believe this estimate is an overstatement for the elasticity of demand for private education of the high-income individuals.

Calculating migration on the basis of the estimated elasticity of demand assumes the demand function has the same elasticity at every price (Chiswick and Koutroumanes use this assumption to estimate the elasticity of demand[11]). Quantity demanded, q, is expressed as a function of price, P (tuition in this case):

$q=\alpha P^{\varepsilon}$, where ε is the estimated elasticity of demand, ε = -0.48, and α is a scaling variable that depends on demographic characteristics. If the tuition changes from P_0 to P_1, the resulting change in quantity demanded Δq may be expressed as

$$\Delta q = \alpha P_1^{\varepsilon} - \alpha P_0^{\varepsilon}$$

where P_0 is the existing tuition in private schools and P_1 is the net-of-tax-credit tuition. The scaling variable α will be calculated for each income category of students, but the elasticity ε is assumed to be the same for everybody. To predict the total rate of migration, a forecast of the impact of the education tax credits on net tuition is made for each income class.

Admittedly, the changes in public school enrollment associated with any voluntary school choice plan are likely to be small in the early years for several reasons. Parents need to acquire information about the available school options, lower-income parents need time to find organizations that would provide scholarships, existing private schools need time to accommodate increases in enrollment, and new private schools need time to form. How does this expected delay affect the estimated fiscal impact of the PETC?

First, if students from various income categories migrate out at the same rate, the only impact on the calculated effect of migration is that the effect should be divided by the number of years over which migration will take place. The only concern here is whether students will migrate at the same rate regardless of income. Since low-income students are allowed to claim more in tax credits, if they migrate first, it is more likely there will not be savings in the first years. Americans with low socioeconomic status are more likely to live in an area with low-performance public schools and show the highest levels of support for private school choice programs[12] so they do have incentives to migrate first. However, the reality is that school choice depends not only on price but also on transportation costs. If there are no private schools in the reasonable vicini-

ty, migration will be delayed. Taking these competing factors into account, it seems likely that migration will take place at approximately the same rate from all income groups.

However, even if delayed migration is not likely to bias the estimated effect of migrating students on budgets, delayed migration is likely to bias the total result due to expenditures on students already in private schools. As seen below, in early years it is more likely for the program to generate losses than it is at higher levels of migration. Students already in private schools do not bring any savings to the budget but are allowed to claim tax credits. However, the estimated amount of tax credits to be claimed by students already in private schools obtained using the attached tool probably overstates the actual amount. The reason is that the Excel calculations assume that students in private schools have the same income distribution as the entire population, while in reality they are more likely to come from medium or high-income families and thus will claim less in tax credits. Once again, however, it is wise to use the more conservative assumption so as to avoid the possibility of overstating program savings. But even then, the above discussion highlights the desirability of providing incentives and information to speed up migration, such as easily available information about the PETC program and organizations offering scholarships.

The spreadsheet calculates the expected impact on the budget under the assumption the migration will take five years. The numbers should be interpreted as comparing the budget if the PETCs were adopted in 2008 with the budget were PETCs not adopted. This strategy is particularly useful because it allows assessing the impact on the budget if in fact due to changes in environment the actual migration is lower than the predicted one. For instance, the characteristics of private schools may change and affect the demand for private education. Public schools may react to migration by increasing the quality of education and thus diminishing incentives toward migration.

Table A1
The Impact of PETCs on Illinois

Year	State Budget Impact ($)	School District Impact ($)	Net Impact ($)	Spending Per Pupil ($)
1	-805,191,286	-422,451,516	-1,227,642,801	15,066
2	-573,240,683	123,644,287	-449,596,395	15,955
3	-341,290,079	669,740,090	328,450,010	17,153
4	-109,339,476	1,215,835,892	1,106,496,416	18,859
5	122,611,127	1,761,931,695	1,884,542,822	21,477

Table A2
The Impact of PETCs on New York

Year	State Budget Impact ($)	School District Impact ($)	Net Impact ($)	Spending Per Pupil ($)
1	214,547,951	-2,316,179,779	-2,101,631,827	21,299
2	2,233,394,671	-2,449,257,733	-215,863,062	22,964
3	4,252,241,391	-2,582,335,687	1,669,905,704	25,653
4	6,271,088,110	-2,715,413,641	3,555,674,469	30,729
5	8,289,934,830	-2,848,491,595	5,441,443,235	43,906

Table A3
The Impact of PETCs on South Carolina

Year	State Budget Impact ($)	School District Impact ($)	Net Impact ($)	Spending Per Pupil ($)
1	-87,519,054	-198,123,055	-285,642,110	13,273
2	112,214,010	-224,775,586	-112,561,575	14,255
3	311,947,076	-251,428,117	60,518,959	15,713
4	511,680,141	-278,080,648	233,599,494	18,102
5	711,413,206	-304,733,178	406,680,029	22,732

Table A4
The Impact of PETCs on Texas

Year	State Budget Impact ($)	School District Impact ($)	Net Impact ($)	Spending Per Pupil ($)
1	86,111,529	-264,810,731	-178,699,202	12,273
2	884,070,765	448,978,960	1,333,049,725	12,784
3	1,682,030,001	1,162,768,651	2,844,798,652	13,471
4	2,479,989,238	1,876,558,342	4,356,547,579	14,445
5	3,277,948,474	2,590,348,033	5,868,296,507	15,933

Table A5
The Impact of PETCs on Wisconsin

Year	State Budget Impact ($)	School District Impact ($)	Net Impact ($)	Spending Per Pupil ($)
1	-133,106,521	6,301,870	-126,804,651	15,554
2	353,346,890	420,506,381	773,853,271	16,814
3	839,800,300	834,710,893	1,260,306,682	18,986
4	1,326,253,711	1,248,915,404	2,575,169,115	23,617
5	1,812,707,121	1,663,119,916	3,475,827,037	40,340

Findings and Discussion

The methodology described in the preceding pages was applied to the following states: Illinois, New York, South Carolina, Texas, and Wisconsin. The tables above report numbers calculated under the assumption that the migration will take five years (positive numbers indicate savings). These numbers speak for themselves, and the conclusion is that tuition tax credits as described by the Public Education Tax Credit act are able to pay for themselves in these states.

For a reasonable way of interpreting these numbers, the savings obtained at the district level can be added to the state budget savings to calculate one number that measures the full impact of PETCs, as shown in the "Net Impact" column. In Illinois, for example, net losses are expected in the first year since the savings at the school district level are not enough to cover the budget losses. However, by the third year there are net savings that become even more significant by the time the

entire predicted migration takes place. By the fifth year, there are savings at both the state budget level and the school district level. This study makes no recommendation as to what should happen with this money—that is up to the people and their elected representatives—but options include cutting taxes, increasing public school spending per pupil over its historical growth rate, or some combination of the two. Note however, that the savings or losses reported are obtained under the assumption that spending per pupil is allowed to increase without bound, that is, if school districts spend all the money they receive from federal, state, and local sources. That level of spending should not be necessary to ensure the same level of quality if in the longer term some fixed costs like buildings are eliminated.

According to this study PETC adoption will lead to mass migration. However, this is only true in a static environment. If the demand for education becomes less elastic, if due to institutional factors credits are hard to obtain, if for various reasons there is no fast entry in the private schools system, migration will be lower than predicted. Moreover, if under the pressure of competition public schools improve, the actual migration will be lower than that predicted under the assumptions used in this report. Would it still be worth implementing the PETC? This tool calculates the impact of a migration that takes place over a period of five years at a constant rate. It is very easy to see what the impact will be if the migration is for instance just half of that predicted—that is, if all the migration actually takes place in the first two and a half years and that there is then an equalization of quality, reducing the incentive to switch schools. So the total savings would be smaller, but as long as quality has value, the reduction in potential savings should be seen as equivalent in value to society of the increase in quality among public schools.

It should be noted that, although the most recent available data and parameters were used throughout this project, a few of those numbers are now somewhat dated, which may lower the precision of some of the estimates.[13] However, the precision of these estimates can be improved by any interested party simply by collecting current data and plugging them into the calculator.

Although this report does not claim to offer exact numbers, as no prediction can be 100 percent accurate, it will be useful even to the person interested in a precise number because it provides a way to assess the value of spending money on a more comprehensive study.

The fiscal impact numbers reported here indicate that all the states studied would enjoy large net savings if they adopted the Public Education Tax Credit. That is particularly significant given that the states in question vary widely in the income structure of their populations, their current levels of private and public school enrollment, their estimated private school tuitions, and the estimated marginal cost of education in their public schools. That all of these very different states are expected to experience savings from the program suggests that other states considering parental choice policies may want to investigate the Public Education Tax Credit.

Notes

1. Adam B. Schaeffer, "The Public Education Tax Credit," Cato Institute Policy Analysis no. 605, December 5, 2007.

2. See the "Cotet Formulas" spreadsheet tab of the *Cato_PETC_Calculator.xls* Excel file, http://www.cato.org/research/education/impact_calculator.xls.

3. See appendix for a discussion of marginal cost.

4. See, for instance: Vijay Mahajan, Etan Muller, and Frank M. Bass, "Diffusion of New Products: Empirical Generalizations and Managerial Uses," *Marketing Science*, vol. 14 (1995), no. 3, part 2 of 2.

5. Alex Grecu and Cotton M. Lindsay, "Cost Savings from Pupil Migration to Private Schools," Clemson University (2006), http://ssrn.com/abstract=1027763; and Cotton M. Lindsay, "The Marginal Cost of a Student: A Further Analysis," working paper, Clemson University, 2005, "http://www.scpolicycouncil.com/publications/61.pdf."

6. Grecu and Lindsay, "Cost Savings."

7. For instance, Harry Miley, "Marginal Cost and the Fiscal Impact of a Proposed Tuition Tax Credit in South Carolina," working paper prepared for The South Carolina School Boards Association and The South Carolina Association of School Administrators, Miley & Associates, 2005, http://www.scsba.org/acrobat/050207_mileystudy/050207_mileystudy_complete.pdf

8. Barry Chiswick and Stella Koutroumanes, "An Econometric Analysis of the Demand for Private Schooling," *Research in Labor Economics* 15 (1996): 209–37.

9. Alex Grecu and Cotton M. Lindsay, "Current Demand for Private Education in South Carolina," working paper, Clemson University, 2005.

10. An elasticity of 1.1 is reported in James D. Gwartney and Richard L. Stroup, *Microeconomics: Private and Public Choice*, 4th ed. (New York: Harcourt Brace Jovanovich, 1983), p. 114.

11. Chiswick and Koutroumanes.

12. Jonathan Sandy, "Evaluating the Public Support for Educational Vouchers: A Case Study," *Economics of Education Review* 11, no. 3 (September 1992): 249–256.

13. The most notable issue regards the marginal cost estimates. These estimates were calculated from cost functions estimated in papers using data as old as 1991 and/or as new as 2002 and were extrapolated to 2008 based on the historical rate of growth of spending per pupil.

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