



9-1-1994

The Fiscal Aftermath of Educational Reform

Faith E. Compton

Follow this and additional works at: <https://newprairiepress.org/edconsiderations>



Part of the [Higher Education Commons](#)



This work is licensed under a [Creative Commons Attribution-Noncommercial-Share Alike 4.0 License](#).

Recommended Citation

Compton, Faith E. (1994) "The Fiscal Aftermath of Educational Reform," *Educational Considerations*: Vol. 22: No. 1. <https://doi.org/10.4148/0146-9282.1451>

This Article is brought to you for free and open access by New Prairie Press. It has been accepted for inclusion in Educational Considerations by an authorized administrator of New Prairie Press. For more information, please contact cads@k-state.edu.

[E]ducation reform has had little real impact on local tax revenues and educational expenditures.

The Fiscal Aftermath of Educational Reform¹

by Faith E. Crampton

The end of the 1980s signaled the close to a decade of elementary and secondary school reform in the United States that reflected growing national concern regarding public education. In response to these expressions of concern, states drafted and implemented numerous education reform proposals.² Although many of the proposals did not directly address funding issues, each reform had fiscal implications, implications that have largely been ignored by policymakers.³ This research examined one aspect of the potential impact of state-level education reforms; that is, what was the fiscal impact of state-mandated educational reforms on the local tax revenues and expenditures for schools across the United States?⁴

Educational Reform in the 1980s

The report of the National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform*, issued in 1983, heralded the beginning of the reform era in U.S. education.⁵ While no formal federal legislation on education reform was enacted, this report had a profound effect on states. Although the reform efforts varied greatly across and within states, they can be divided into five broad categories: restructuring curriculum; the teaching profession; student outcomes; school management; and parental choice.

With regard to restructuring of curriculum, many states moved toward a return to a more traditional curriculum that emphasized core subjects, such as English, mathematics, and science while upgrading graduation requirements and lengthening the time students spent in school either through longer school days or a longer academic year or both.

Faith E. Crampton, National Conference of State Legislatures, specializes in education finance, and serves on the Board of Directors of the American Education Finance Association. Her recent publications include: "Entrepreneurship and Education: Origins, Applications, and Implications," *CEFPI Journal* (Council for Educational Facilities Planners International), in press, and "A Primer on State Aid to Local School Districts: Partnership or Property Tax Relief?" *Journal of School Business Management*, 5:2:22-35 (April 1993).

Reforms in the teaching profession centered on increasing compensation, either through across the board salary increases or through career ladders that provide teachers with upward mobility and higher salaries without moving into formal administrative positions. Of school management reforms, a move toward site-based management and budgeting was the most exciting. In this scenario, principals were given greater responsibility for planning, instruction, and budgeting, usually in collaboration with school councils composed of community members and educators.

For student outcomes, reforms centered on testing, from elementary levels through high school graduation. A number of states instituted tests for high school graduation as well as mandating competency-based testing at designated intervals beginning in elementary school. Choice reforms allowed parents greater opportunity to select their children's schools either within a given school district or across districts. Some choice reforms, such as Minnesota's, allowed high school students to attend higher education institutions and earn credits.

As this brief summary demonstrates, education reforms were numerous and varied. However, the five major categories described above did emerge, and these were utilized as independent variables in the statistical analysis to estimate the economic impact of reforms on local educational tax revenues and expenditures.

Theoretical Framework

One way to analyze the economic impact of education reforms is to examine its impact on local educational revenues and expenditures over time; that is, did the reforms result in increased tax effort and educational spending at the local level; no difference in local educational taxes and spending; or a reduction in local taxing and spending? While there may be nothing in the written legislation that these reforms should stimulate local tax effort and spending, certainly policymakers would hope that in response to education reform initiatives that school districts would not reduce tax effort and spending on educational programs. In other words, policymakers might hope for some return on investment of state dollars into education reform as a measure of the efficiency of the reform.⁶ At the very least, policymakers would hope for a neutral economic impact on revenues and expenditures. The assumptions underlying this type of analysis are based in the theory of consumer behavior in the field of microeconomics where the unit of government, here the school district, becomes the consumer.⁷

Methodology

This study utilized multiple regression analysis and canonical analysis in order to determine the impact of state level education reform on school districts' revenues and expenditures.

For the multiple regression analysis, the Ordinary Least Squares method of estimation was utilized, and four equations were formulated. The years 1984 and 1989 were selected so as to look at points of time in early and late reform. A secondary database was utilized. The information on type and number state-mandated education reforms in all fifty states was gathered by the National Governors' Association with the state as the unit of analysis.⁸

For 1984, the two equations were specified as follows:

$$Y_{1t} = c + a_1X_{1t} + a_2X_{2t} + a_3X_{3t} + a_4X_{4t} + a_5X_{5t} \quad (1)$$

$$Y_{2t} = c + a_1X_{1t} + a_2X_{2t} + a_3X_{3t} + a_4X_{4t} + a_5X_{5t} \quad (2)$$

where c is a constant, and a_1, a_2, \dots, a_5 are coefficients; and where

Y_{1t} = per pupil tax revenues for year t

Y_{2t} = per pupil educational expenditures for year t

X_{1t} = curriculum reform for year t

- X_{2t} = teacher reform for year t
- X_{3t} = student outcomes reform for year t
- X_{4t} = management reform for year t
- X_{5t} = per capita income for year t

For 1989, two multiple regression equations were specified as follows:

$$Y_{1t} = c + a_1X_{1t} + a_2X_{2t} + a_3X_{3t} + a_4X_{4t} + a_5X_{5t} + a_6X_{6t} \quad (3)$$

$$Y_{2t} = c + a_1X_{1t} + a_2X_{2t} + a_3X_{3t} + a_4X_{4t} + a_5X_{5t} + a_6X_{6t} \quad (4)$$

where c is a constant, and a_1, a_2, \dots, a_6 are coefficients; and where

- Y_{1t} = per pupil tax revenues for year t
- Y_{2t} = per pupil educational expenditures for year t
- X_{1t} = curriculum reform for year t
- X_{2t} = teacher reform for year t
- X_{3t} = student outcomes reform for year t
- X_{4t} = management reform for year t
- X_{5t} = choice reform for year t
- X_{6t} = per capita income for year t

For the year 1984 two equations were specified, one with per pupil tax revenues and one with per pupil expenditures as the dependent variables. Independent variables included reforms in the four areas of curriculum, teaching, student outcomes, and school management. In 1989, a fifth independent variable for reforms in the area of school choice reform was added to each equation; in 1984, there were no legislated choice programs in existence at the state level.⁹ Per capita income was added as an independent variable to each equation in order to control for the propensity of those at higher income levels to spend at higher levels on education.

While the variables for revenue, expenditure, and income were continuous, reform variables were categorical; that is, they were coded 0 and 1 for the absence or presence of a particular type of education reform. Given the small number of reforms in some categories, continuous variables would not have yielded sufficient variation for meaningful results in the regression analysis.¹⁰

Because canonical analysis is not familiar to some researchers, a brief explanation is offered here.¹¹ Simply stated, canonical analysis analyzes the relationship between two sets of variables. Its value in the context of this study rests with its ability to extend the multiple regression analysis in order to examine a model where more than one dependent variable is present. A simultaneous equation model was not chosen because of the lack of causality, theoretically speaking, between the dependent variables. The common link between revenues and expenditures is the education budget, and hence the causal arrow originates with the budget rather than revenues or expenditures.

An explanation regarding terminology is also offered. In the research literature, canonical analysis,¹² canonical correlation,¹³ and canonical regression¹⁴ frequently are used interchangeably to define the same methodology.¹⁵ This study employs the more general and, in my opinion, more accurate term, canonical analysis. Although canonical analysis like multiple regression is based upon correlation, utilizing the phrase canonical correlation to describe the methodology would be analogous to referring to multiple regression as correlation—it is misleading and limiting. Canonical analysis represents a much more powerful research tool than simple correlation, e.g., a Pearson product moment correlation coefficient. Canonical regression is also a misnomer in that it implies canonical analysis is a special case of regression whereas the opposite is true: multiple regression represents a special case of canonical analysis.

Results of the Analysis

Multiple Regression Analysis

In this section the results of the regression analysis are presented first from a cross-sectional perspective and then longitudinally. Before proceeding, it is important to note that the original analysis included a poverty factor as well as a wealth factor. The poverty factor was defined as the percentage of students receiving free or reduced price lunches. From an empirical viewpoint, the inclusion of a poverty factor appeared desirable, particularly with respect to urban school districts where

Table 1. Regression Estimates of the Impact of Education Reform on School Districts' Revenues and Expenditures

Independent Variables	Early Reform (1984)		Late Reform (1989)	
	Revenue	Expenditure	Revenue	Expenditure
Curriculum Reform	-49.61 (0.11)	582.56 (2.07)	-471.51 (1.10)	141.55 (0.54)
Teacher Reform	-67.89 (0.20)	-117.30 (0.58)	523.53 (0.90)	-79.65 (0.22)
Student Outcomes Reform	45.64 (0.14)	-103.38 (0.51)	547.56 (1.28)	399.68 (1.55)
Management Reform	-501.24 (1.63)	-1.85 (0.01)	-579.06 (1.57)	-264.04 (1.18)
Choice Reform	—	—	-202.17 (0.45)	17.96 (0.06)
Per Capita Income	0.29 (3.94)	0.36 (7.95)	0.38 (5.78)	0.38 (9.66)
Constant	-1279.91 (1.19)	-1723.44 (2.58)	-3205.32 (2.72)	-1598.10 (2.25)
R ²	.35	.59	.50	.73
F Ratio	4.92	13.03	7.36	20.11
N=50				

Note: Absolute T values in parentheses. $T \geq 2.01$ is significant at the .05 probability level.

All F ratios are significant at the .01 probability level.

per capita income may appear relatively high while the socioeconomic status of students is much lower. However in the course of the statistical analysis it became apparent that the inclusion of the poverty factor created a serious multicollinearity problem with per capita income while contributing little to the explanatory power of the model. (See correlation matrices, Appendix A.) Because students receiving reduced priced lunches as well as those receiving free lunches were included in the variable, it may be limited as an indicator of poverty.¹⁶ Given the issues of multicollinearity and limitations of the variable, the poverty factor was deleted from the model. The resulting equation yielded more stable and substantial results.

Overall the independent variables accounted for 35% of the variation in local tax revenues for education and 59% of the variation in local educational expenditures in 1984. In 1989, the independent variables accounted for 50% of the variation in local revenues and 73% of the variation in local expenditures. The F ratios were statistically significant at the .01 probability level for all four equations, indicating that the model specified was robust. As expected, coefficients for per capita income were statistically significant and positive, indicating the necessity of the addition of this variable to the model to control for the propensity of the more affluent to tax and spend at higher levels on education.

In early reform, of the four types of reform specified, i.e., curriculum, teacher, management and student outcomes, only curricular reform yielded a statistically significant regression coefficient of 582.56 on the expenditure side. This result indicated that school districts spent \$582.56 more per student as a result of state curriculum reform. The coefficient on the revenue side, while statistically insignificant, was negative, raising concerns that while schools were spending more as a result of curriculum reform, they may have utilized state dollars to reduce property tax effort.¹⁷ However, a positive, statistically significant regression coefficient for educational expenditure does not tell us whether the additional expenditure was on curriculum, nor does it tell us whether the additional expenditure came from state or local sources, but the coefficient on the revenue side can shed light here. A positive, significant coefficient would indicate that a greater property tax effort was being made at the same time additional funds were being spent; while a negative, significant coefficient would indicate property tax effort was being reduced while expenditures were rising.

With the exception of curriculum reform, the results for other types of reform were inconclusive for 1984. The coefficients for teacher and management reform, while statistically insignificant, indicated that these reform may have exerted a negative impact on both revenues and expenditures. The coefficients for student outcomes reforms indicated these may have had a dampening impact on expenditures but no impact on revenues.

In 1989, choice reform was added as an independent variable. By late reform, none of the five reform categories yielded a statistically significant regression coefficient. Again examination of the direction of signs of the coefficients is instructive. With regard to student outcomes, the coefficients were positive for revenues and expenditures indicating that such reforms may have been stimulative. On the expenditure side the coefficients for management and choice reforms were positive while on the revenue side they were negative; indicating that while these reforms may have resulted in increased expenditure, they may have led to potential tax substitution. Results for teacher reform indicated no impact the expenditure side but a potentially positive one on the revenue side.

Looking at the results over time gives a picture of change from early to late reform. Over time the model accounted for a greater percentage of the variation in educational revenues and expenditures: a 15% increase for the former and a 14% in-

crease for the latter. By 1989, the model accounted for half of the variation in local tax revenues and approximately two-thirds of the variation in local educational expenditures. However, most of the increase appeared to be attributable to per capita income as coefficients rose from .29 to .38 on the revenue sides and from .36 to .38 on the expenditure side.

Over time state level educational reforms had less impact on educational revenues and expenditures. It is important to keep in mind that even in early reform only curriculum reform had a statistically significant impact, and that was limited to expenditure side. In addition the negative coefficient on the revenue side pointed to potential tax substitution. By late reform none of the education reforms, even with the addition of choice reform, had a significant impact on revenues or expenditures.

For the majority of the reforms, coefficients were statistically insignificant so that only the signs may be examined for potential direction of impact. Coefficients for teacher reform were negative at both points in time on the expenditure side; while on the revenue side they moved from negative to positive. This combination would seem to indicate teacher reforms may have exerted a depressing impact on expenditures but had no discernible impact on property tax revenues. With regard to student outcomes reform, the coefficients on the expenditure side moved from negative to positive, indicating that these reforms may have moved from substitutive in early reform to stimulative in late reform. Finally the coefficients for choice reform were positive on the expenditure side but negative on the revenue side during late reform, indicating a potential for tax substitution.

Even having controlled statistically for the impact of personal income, one must conclude that state level education reform had little impact on educational revenues and expenditures. Only curriculum reform appeared to have some expenditure impact in the early reform era, but potentially at the expense of tax revenues.

Canonical Analysis

As mentioned previously, one way of conceptualizing canonical analysis is to view it as an extension of multiple regression.¹⁸ Because canonical analysis is not limited to continuous variables, its use in this study with categorical as well as continuous variables is appropriate. While conceptually the shift from multiple regression to canonical analysis is not large, the statistical one is substantial; the latter may account in part for the failure of researchers to utilize canonical analysis more frequently.¹⁹ For the purposes of this study, the major advantage offered by canonical analysis is its ability to deal with more than one dependent variable at a time. Its major disadvantage lies in the difficulty of interpretation of some of the statistical results generated.²⁰ The relative strengths and weaknesses of canonical analysis are discussed in greater detail below.

The foundation of canonical analysis is the formation of two linear combinations, one of X_p variables and one of Y_p variables, by differentially weighting them in order to obtain the maximum possible correlation. In this context X_p represents the set of independent variables where $X_p > 1$, and Y_p represents the set of dependent variables where $Y_p > 1$. The correlation between the two linear combinations is referred to as the canonical correlation (R_c)²¹ and the square of the canonical correlation (R_c^2) is an estimate of the variance shared by the two canonical variates. The overall test of significance for the model specified in this study was Wilks' Lambda.

Like multiple regression, canonical analysis yields a set of weights that will maximize a correlation coefficient, but unlike multiple regression in which only the independent variables can be weighted, in canonical analysis both the dependent and independent variables are differentially weighted. Therefore in

this study where one wants to examine both the revenue and expenditure side, canonical analysis provides an avenue to do so whereas multiple regression limits analysis to one dependent variable at a time.

After having obtained the maximum R_c in canonical analysis, additional R_c 's are calculated, up to the number of variables in the smaller set. Each succeeding pair of canonical variates cannot be correlated with all the pairs of canonical variates that precede it. The maximum number of R_c 's equals the number of variables in the smaller set. For this study where the dependent variables were limited to two ($X_c=2$), five independent variables were used in the equations for 1984 ($Y_p=5$) and six independent variables for 1989 ($Y_p=6$), the maximum number of canonical correlations extracted was two (R_{c1} , R_{c2}).

Canonical analysis also generates structure coefficients, sometimes referred to as loadings, which represent the correlation between the variables and their canonical variates. In general, only structure coefficients greater to or equal to .30 ($s>.30$) are considered meaningful for interpretation. If the canonical correlation is not statistically significant, structure coefficients are not generally computed. The square of a structure coefficient represents the proportion of variance of the variable with which it is associated that is accounted for by the function.

Table 2 presents the results of the canonical analysis for early and late reform. Overall the model specified was robust as indicated by the statistically significant F Ratios computed for Wilks' Lambda for 1984 and 1989. Two canonical correlations were extracted for each year; however in both cases only the first was statistically significant, .77 in 1984 and .85 in 1989. Of greater interest was the square of the canonical correlation (R_c^2) which may be interpreted in a manner similar to the R^2 in the regression analysis. For early reform the independent variables accounted for 60% of the variation in school districts' revenues and expenditures while in late reform, the percentage increased to 73%. In general these are consistent with, and even slightly larger than, the results of the regression analysis.

Table 2. Canonical Estimates of the Impact of Education Reform on School Districts' Revenues and Expenditure

	Structure Coefficients	
	Early Reform (1984)	Late Reform (1989)
Management Reform		
Curriculum Reform	.08	.15
Teacher Reform	-.01	.13
Student Outcomes Reform	-.03	-.17
Management Reform	.21	-.43
Choice Reform	—	.36
Per Capita Income	.97	.98
Wilks' Lambda	.34	.23
F Ratio	6.06	7.44
Rc1	.77	.85
Rc12	.60	.73
Chi Square (Probability)	48.03 (.0001)	64.46 (.0001)
Rc2	.35	.32
Rc22	.12	.10
Chi Square (Probability)	6.08 (.19)	4.97 (.41)
N=50		

Note: F ratios significant at the .01 probability level.

Structure coefficients were generated only for the first "root" or statistically significant canonical correlation. Given the rule of thumb that structure coefficients equal or exceed .30 for interpretation, only choice ($s=.36$) and management reform ($s=.43$) yielded meaningful structure coefficients in late reform. The square of a structure coefficient indicates the proportion of the variance of the dependent variables accounted for. Hence choice reform accounted for 18% and management reform for 12% of the variation in local tax revenues and educational expenditures in late reform. Choice reform exerted a small but positive impact on revenues and expenditures while management reform's impact was negative.

These findings differ from those of the multiple regression where only the regression coefficients for curriculum reform were statistically significant in early reform. How are we to reconcile the differences in results of the two methods of statistical analysis? Because canonical analysis allows the researcher to consider more than one dependent variable in relationship to a set of independent variables, it offers a more complex, holistic and hence superior analysis in this case. Overall the percentage of variance explained by the independent variables improved with canonical analysis, but choice and management reforms emerged as meaningful in late reform while curriculum reform in early reform was obscured.

While these results indicate the need for further research into the particular initiatives with regard to parental choice and management reform, some preliminary comments might be offered here. The majority of choice initiatives in the late 1980s centered around public school choice and results of the canonical analysis indicate they had a stimulative impact on revenues and expenditures. Part of their stimulative impact may lie with their targeted nature whereas other reform initiatives, e.g., curriculum and the teaching profession, have been broad-based and eclectic. Also choice reforms may be viewed more positively by the general public as they give the impression of making schools more "competitive," and hence local taxpayers may be more willing to pay higher taxes when choice reforms are present. On the other hand, management reforms have not been as targeted and may in fact be viewed less positively by the taxpaying public as ineffective efforts to reduce the costly bureaucracies of school districts.

This study represented a first cut at a complex research question regarding the fiscal impact of educational reform. In order to refine the findings, reform initiatives must be examined in greater detail in order to determine the presence or absence of funding, and if funded, the structure of funding. Such information will lend a much higher level of precision to the analysis and offer a finer-grained portrait of the fiscal aftermath of educational reform.

Conclusions and Policy Implications

The 1980s represented a decade full of reform rhetoric at the national level and legislated reform at the state level, with a substantial increase in the state dollars invested in elementary and secondary education in the name of those reforms. There are many questions that might be asked, and indeed need to be asked, about the impact of educational reform over this time period. This study addressed only one, regarding the fiscal impact of state-legislated educational reforms on local tax revenues and educational expenditures. State policymakers and taxpayers may legitimately ask, what happened to those dollars? Were they used as incentives whereby the local level school districts matched them with their own resources? Were they an add-on to current levels of expenditures? Or, were state dollars substituted for local expenditure resulting in tax substitution?

Earlier studies have classified reform efforts and the dollars attached to them, utilizing descriptive methods.²² While these studies serve as useful reference sources, they lack the insights

offered by inferential statistical analysis where the impact of different types of reforms may be considered simultaneously while controlling for the impact of more affluent communities to spend more on education. This type of rigorous analysis is necessary in a complex world of competing policy goals.

The results of this study indicate that education reform has had little real impact on local tax revenues and educational expenditures, whether examined in early reform or late reform; in addition, there was some indication that tax substitution may have taken place. When the multiple regression analysis was extended by utilizing canonical analysis, curriculum reform was no longer statistically significant. Instead parental choice and management reforms emerged in late reform as meaningful. While parental choice reforms appeared to have a positive, stimulative impact on revenues and expenditure, management reforms had a negative impact.

The implications for national and state policymakers are twofold as interest in effecting meaningful educational reform continues.²³ First is the critical need for further research on the fiscal impact of educational reform. This research needs to be extended and refined to examine state by state the crafting of reform initiative in terms of not only whether they are funded, but how they are funded. In structuring a reform initiative as a grant, policymakers can shape local fiscal response. The results of such a study provide the crucial database for policymakers to correct existing reform programs that are ineffectively structured and to insure that future initiatives are crafted to maximize the impact of state resources. Secondly closer examination of state-by-state fiscal response may lead to a re-examination of the federal role in funding educational reform initiatives to achieve greater equity and efficiency across states of varying wealth.

Endnotes

1. This article is based upon a paper given at the Annual Conference of the American Education Finance Association, Albuquerque, New Mexico, March 1993. The author wishes to thank the guest editor, Deborah A. Verstegen, for suggestions in the revision of this manuscript.
2. For summary and discussion of reform efforts, see S. B. Bacharach (ed.), *Education Reform: Making Sense of It All*. (Boston: Allyn and Bacon, 1990).
3. For an introduction to finance and education reform, see F. E. Crampton, "Fiscal Policy Issues and School Reform," *ERIC Digest Series*, Number EA 50 (June) 1990.
4. For the purposes of this study, only state-level education reforms that were written into law or administrative rules were considered.
5. The National Commission on Excellence in Education. *A Nation at Risk: The Imperative for Educational Reform*. (Washington, D.C.: U.S. Department of Education, 1983).
6. One must be careful to note here that all reforms are included for the purposes of analysis, regardless of whether they had separate funding attached to them or not.
7. See F. E. Crampton, *The Fiscal Impact of Educational Grants on Local Revenues and Expenditures: The Case of Ohio*. Student dissertation completed at The Ohio State University, 1987, for a fuller explanation of the theoretical base for this type of analysis.
8. *The Governors' 1991 Report on Education: Results in Education, 1987* (Washington, D.C.: The National Governors' Association, 1987); *The Governors' 1991 Report on Education: Results in Education, 1989* (Washington, D.C.: The National Governors' Association, 1989).

9. The categories of reform used in this study are somewhat different from those listed in *The Governors' 1991 Report on Education: Results in Education, 1984* and *The Governors' 1991 Report on Education: Results in Education, 1989*. In the 1987 edition, proposed and mandated reforms fell into seven categories: teaching; leadership and management; parent involvement and choice; readiness; technology; school facilities; and college quality (p. 43). The 1989 edition maintained similar categories with two exceptions: "leadership and management" became simply "school leadership"; and a new category, "school organization/accountability," was added (p. 55). "College quality" was not utilized as this study limited itself to reforms in elementary and secondary education. Examination of the definitions of the remaining categories led to a reassignment of the reforms listed there to the broader categories of teaching, curriculum, management, student, and choice reforms.
10. See E. J. Pedhazur, *Multiple Regression in Behavioral Research: Explanation and Prediction*, 2d ed. (New York: Holt, Rinehart, and Winston, 1982). In particular, Chapter 13, "Continuous and Categorical Independent Variables," pp. 436-492, gives a thorough treatment of the justification, mathematical proofs, and interpretation of multiple regression equations utilizing both continuous and categorical independent variables.
11. For the reader who desires to learn about canonical analysis in greater depth, see E. J. Pedhazur, *Multiple Regression in Behavior Research*, pp. 720-743.
12. See, for example, M. Perry and B. C. Hamm, "Canonical Analysis of Relations Between Socioeconomic Risk and Personal Influence in Purchase Decisions," *Journal of Marketing Research* 6 (August 1969): 351-354; E. J. Pedhazur, *Multiple Regression in Behavioral Research*, pp. 720-743; M. S. Levine, *Canonical Analysis and Factor Comparison* (Beverly Hills, CA: Sage Publications, Inc., 1977).
13. See, for example, J. F. Chizmar and T. A. Zak, "Canonical Estimation of Joint Educational Production Functions," *Economics of Education Review* 3, 1 (1984): 37-43.
14. See, for example, L. C. Adkins and R. C. Hill, "A Primer on the Use of Canonical Forms and Transformations in the Linear Regression Model," *American Economist* 35, 1 (Spring 1991): 40-51; and K. Gyimah-Brempong and A. O. Gyapong, "Characteristics of Education Production Functions: An Application of Canonical Regression Analysis," *Economics of Education Review* 10, 1 (1991): 7-17.
15. See, for example, B. Thompson, *Canonical Correlation Analysis: Uses and Interpretation* (Beverly Hills, CA: Sage Publications, 1984), which actually uses the terms canonical analysis, canonical correlation, and canonical correlation analysis interchangeably.
16. Previous research has indicated that the percentage of students whose families receive Aid to Dependent Children is an even better indicator of poverty than percentage of children receiving free lunch because some children's families may choose not to participate in the program. Also there does not appear to be an issue of multicollinearity. See, for example, F. E. Crampton, *The Fiscal Impact of Educational Grants on Local Revenues and Expenditures*.
17. Because the analysis is of a population, i.e., all fifty states, and F statistics for all equations were statistically significant, indicating the statistical model is robust, I have examined the signs of statistically insignificant coefficients for indications of directionality.

The key word is "indication" of directionality, denoting the caution with which the interpretations are made. Also I have qualified my interpretations with phrases such as, "may have had an impact."

18. Another, or alternative way, of viewing canonical analysis is to portray it as subsuming a number of multivariate techniques, such as multiple regression, discriminant analysis and MANOVA (Multiple Analysis of Variance).
19. Although canonical analysis originated more than fifty years ago in the work of Hottelling, it lay dormant in the social sciences because the level of statistical complexity necessitated mainframe computing capacity and sophisticated statistical software. Over the past ten years, more powerful microcomputers and microcomputer-based statistical software such as SYSTAT have opened the door to the usage of canonical analysis. SYSTAT for Windows, Version 5.01, was used in this study.
20. Part of the difficulty in interpreting some of the statistical results generated by canonical analysis are due to its lack of use by researchers. For example, multiple

regression has been much more frequently used by researchers over the past twenty years. Hence interpretation of results has evolved and matured, becoming more refined over time. Interpretation of the results of canonical analysis might be considered at the early stages.

21. One may also find the canonical correlation referred to as a canonical variate.
22. D. Inman, *The Fiscal Impact of Educational Reform* (New York: Center for Education Finance, New York University, 1987); D. Inman, *The Fiscal Impact of Educational Reform: Implications for Policy* (New York: Center for Education Finance, New York University, 1987); K. F. Jordan and M. P. McKeown, "State Fiscal Policy and Education Reform," in J. E. Murphy (ed.), *The Educational Reform Movement of the 1980s: Perspectives and Cases*, (Berkeley, CA: McCutchan Publishing Company, 1990).
23. See, for example, B. Clinton, "Priority for the States as Educational Reform Continues," *Stanford Law & Policy Review* 1 (Fall 1989): 5-16.

Appendix A: Correlation Matrices

CUR84	1.00					
TCH84	.17	1.00				
STU84	.41*	.16	1.00			
MGT84	.34**	.19	.38*	1.00		
PCINC84	-.28**	.05	-.05	-.20	1.00	
PLUN84	.27	.21	.29	.35	.48*	1.00
	CUR84	TCH84	STU84	MGT84	PCINC84	PLUN84
CUR84	1.00					
TCH89	.14	1.00				
STU89	.20	.04	1.00			
MGT89	.05	.05	.11	1.00		
CH89	-.06	.17	.01	-.15	1.00	
PCINC89	.07	.14	-.32**	-.08	-.33**	
PLUN89	-.12	.02	.09	.31**	-.21	
	CUR89	TCH89	STU89	MGT89	CH89	
PINC89	1.00					
PLUN89	-.51*	1.00				
	PINC89	PLUN89				

* Significant at the .01 probability level.

**Significant at the .05 probability level.