DOCUMENT RESUME

ED 410 647 EA 028 539

AUTHOR Greyser, Linda L.

TITLE An Examination of Change Resulting from a Public Policy Shift from "Falls the Shadow: Changes in Funding Massachusetts K12 Public Education in the First Decade of Proposition 2 1/2, 1982-91."

PUB DATE 1997-03-00

NOTE 26p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, March 24-28, 1997).

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS *Costs; Educational Equity (Finance); Elementary Secondary Education; *Fiscal Capacity; *Property Taxes; *Public Education; *Resource Allocation; School District Wealth; *State Aid; State Legislation

IDENTIFIERS Hierarchical Linear Modeling; *Massachusetts

ABSTRACT

In November 1980, Massachusetts citizens voted to limit the allowable increase in local property tax revenue by supporting a state-ballot referendum named Proposition 2 1/2. This paper presents findings of a study that examined changes in both the sources and extent of funding for public education in Massachusetts communities during the first decade of Proposition 2 1/2, fiscal years 1982-1991, and explored whether or not those changes were associated with a community's socioeconomic/demographic profile. The study used hierarchical linear modeling (HLM) to examine how and why funding changes occurred. Five outcomes were examined: integrated school costs; integrated per pupil costs; gross state aid allocation; the percentage of municipal spending that is integrated school costs; and the percentage of integrated school costs that is gross state aid. The data indicate that while communities might have sought fiscal equilibrium, their condition increasingly becomes one of fiscal disequilibrium. Some kinds of communities fared better than others. The flow of state aid was the first crucial determinant of a community's apparent financial well-being, followed by a community's growth profile. The tax cap was a destabilizing force that only temporarily reversed the course of property tax growth. Finally, economic models represent an ideal world; however, the real world of children, schools, and communities is much more complex. Seven exhibits are included. (LMI)

AERA SYMPOSIUM
Measuring Change Over Time Using Growth Modeling

Chicago, Illinois
March 27, 1997

An Examination of Change Resulting from a Public Policy Shift

Falls the Shadow: Changes in Funding Massachusetts K12 Public Education in the First Decade of Proposition 2 ½, 1982-1991

Linda L. Greyser, Ed.D.
Harvard University Graduate School of Education
339 Gutman Library
Cambridge, MA 02138
tel: 617/496-8227 fax: 617/496-8051 email: linda_greyser@harvard.edu

An Examination of Change Resulting from a Public Policy Shift from "Falls the Shadow: Changes in Funding Massachusetts K12 Public Education in the First Decade of Proposition 2 1/2, 1982-91"

Goals

This study examined changes in both the sources and extent of funding for public education in Massachusetts communities during the first decade of Proposition 2 1/2, FY1982-1991, and explored whether or not those changes were associated with a community's socioeconomic/demographic profile. Within the public policy arena related to funding public education in Massachusetts during this period, the study addressed the following broad research themes:

1. What changes occurred in educational funding in Massachusetts?
2. What shifts, if any, were there in the amount of state aid and in the balance between state aid and local funding?
3. Are differences in state and local funding linked to kind-of-community classifications?

Some background

Virtually since colonial times, with their town meeting form of government, Massachusetts communities have been able to provide local services in an environment of almost total fiscal self-determination. This tradition actually goes back to The Massachusetts Act of 1647 which, among other things, required towns to establish schools to educate their children and identified local tax levies as a source of funding for those schools.[1]

In November of 1980, Massachusetts citizens voted to limit the allowable increase in local property tax revenue by supporting (by a 59% to 41% margin) a state ballot referendum question named

Proposition 2 1/2. In its wake, there would be predictable effects on the financial resources communities could allocate to support their schools as well as other town services. Typically, educational spending comprises the largest portion of state and local expenditures. This study looked at the changes and shifts in the allocation of state and local funds to education during this period and examined the relationship of these changes to a communities kind-of-community classification.

EXHIBIT 1

KIND-OF-COMMUNITY CLASSIFICATIONS IN MASSACHUSETTS[2]

NAME	NUMBER	DESCRIPTION
Urbanized Center	45	Manufacturing and commercial center; densely populated; culturally diverse
Economically Developed Suburbs	59	Suburbs with high levels of economic activity, social complexity; and relatively high income levels
Growth Communities	46	Rapidly expanding communities in transition
Residential Suburbs	53	Affluent communities with low levels of economic activity
Rural Economic Centers	61	Historic manufacturing and commercial communities; moderate levels of economic activity
Small Rural Communities	46	Small towns; sparsely populated; economically underdeveloped
Resort/Retirement and Artistic Communities	41	Communities with high property values; relatively low income levels and enclaves of retirees, artists, vacationers and academicians

The Study

In using growth modeling to examine how funding changed, the focus in this study was on questions such as: How do integrated school costs change over time for each community? Did the allocation of state aid to a community stay the same, rise, or fall over time? Does the ratio of education to municipal spending in a community maintain a steady level or are there "peaks" and "valleys" between them? To examine why funding changed, growth modeling can help discover whether funding changes differed in a systematic way that is related to a specific background characteristic: affiliation with a kind-of-community type (KOC). Answers are sought to questions such as: Is affiliation in a particular KOC associated with integrated school costs? What variation can be discovered in the rate of change in educational spending for communities in large urban areas, as opposed to those in suburban areas, or in rural economic centers? If one knows a community's KOC type, can one estimate its rate of change in state aid allocation, or integrated school costs, or per pupil costs, etc?

Research Questions

Thus the five research questions articulated for this study explored two components of education funding changes: change within each community and change among kinds-of-communities (KOCs)--using the seven kinds-of-community classifications as the predictors. In all, five outcomes were examined:

EXHIBIT 2

OUTCOMES

1. integrated school costs
2. integrated per pupil costs
3. gross state aid allocation
4. the percentage that integrated school costs represents of municipal spending
5. the percentage that gross state aid represents of integrated school costs

The five Research Questions modeled Question One:

Question One

1.(a.) Within each community, how do integrated school costs change over time?

1.(b.) Among communities, are changes in integrated school costs related to kind-of-community classification?

The KOCs were the key predictors. The seven KOCs were operationalized as seven dummy variables that categorized each community into its kind-of-community type.

In each research question, part "a" asks "How does each community vary?" and leads to the fitting of a statistical model whose parameters summarize each community's educational funding changes. Part "b" asks "Why does it vary?" and leads to the fitting of a between-KOC or "Level-2" model in which the parameters from Level-1 become the outcome variables at Level-2. The Level-2 parameters are hypothesized to vary as a function of socioeconomic and demographic characteristics represented by the seven kind-of-community classifications.

The unit of analysis is the community -- in fact, the sample consists of all 351 Massachusetts cities and towns. The primary sources of data were the Massachusetts Department of Education's

End-of-the-Year Reports, which are reported by community rather than by school district. The department organizes data in this manner in order that each community's schools be positioned on a single community K12 basis. This systematic approach is employed even though in reality the community may enroll its children in schools either unique to that community, or in regional school districts serving children from several communities, in outside special education placements, in regional voc-tech schools, etc. Data from the Massachusetts Department of Revenue was obtained from the department's Municipal Data Bank, compiled annually from financial documents that each municipality files with the Department and with other state agencies.

Analytic Procedure

My analysis went through three stages:

1) a preliminary stage in which I explored the state for trends in funding changes and chose a statistical model to represent those trends within each community

2) a model specification stage in which I used HLM to fit specific Level-1 and Level-2 models, and

3) a hypothesis-testing stage in which I assessed the tenability of a variety of fitted models

The Level-1 Model

I formulated the following Level-1 quadratic model describing changes over time for each community during the decade under study:

EXHIBIT 3

LEVEL-1 MODEL

$$Y_{ij}=\pi_{0i}+\pi_{1i}YEAR_j+\pi_{2i}YEAR^{2j}+e_{ij}$$

In the model,

Y_{ij} = the observed integrated school cost for the ith community in the jth year of measurement

$YEAR_j$ = the time at which the jth measurement was observed (for FY1982, $YEAR_1=0$; in FY1983, $YEAR_2=1$;...in FY1991, $YEAR_{10}=9$)

π_{0i} = the intercept: the value of integrated school cost for the ith community in FY1982 (when $YEAR_1 = 0$)

π_{1i} = the slope: the yearly rate of change in integrated school cost for the ith community in FY1982 (when $YEAR_1 = 0$)

π_{2i} = the quadratic term: a parameter related to the acceleration or deceleration in integrated school cost for the ith community

e_{ij} = within-community random error for the ith prototypical community in the jth year

In summary, the Level-1 model characterizes each community's integrated school cost between FY1982-FY1991 as a quadratic change trajectory determined by three within-community change parameters: π_{0i}, π_{1i}, π_{2i}, each defined as previously mentioned.

The Level-2 Model

Once changes in integrated school costs were depicted within each community by the Level-1 model, a second model was specified, one that related (π_{0i}, π_{1i}, π_{2i}), the change parameters, systematically to selected background characteristics. In this analysis, the background characteristics of interest are the seven KOCs.

In the Level-2 model, essentially, the Level-1 intercept (π_{0i})

and the two slopes (π_{1i}, π_{2i}) become the outcomes at Level-2, where the background characteristics, i.e., the seven KOCs, were operationalized as dummy variables to detect differences in integrated school costs for each KOC.

The Unconditional Level-2 Model

I first fit an unconditional Level-2 model for π_{0i}, π_{1i}, and for π_{2i} respectively. Unconditional Level-2 models contain no predictors, and provide useful empirical evidence for determining a proper specification of the individual growth equation and baseline statistics for evaluating subsequent Level-2 models. This too was an exploratory activity, in a sense, because it enquired whether, in fact, there was any variation in π_{0i}, π_{1i}, and π_{2i} across community types. The three unconditional models and their interpretations were:

EXHIBIT 4
UNCONDITIONAL MODELS

1) $\pi_{0i} = \beta_{00} + r_{0i}$

A community's initial integrated school cost can be represented solely as a grand mean integrated school cost plus random error

2) $\pi_{1i} = \beta_{10} + r_{1i}$

A community's yearly rate of change in integrated school cost in 1982 can be represented solely as a grand mean yearly rate of change in integrated school cost in 1982 plus random error

3) $\pi_{2i} = \beta_{20} + r_{2i}$

A community's acceleration or deceleration of integrated school cost can be represented solely as a grand mean acceleration or deceleration plus random error

In the unconditional models no independent variables were designated as predictors. A closer inspection of the above models made it clear that inter-community differences in initial status (π_{0i}), rate of change (π_{1i}), and acceleration/deceleration (π_{2i}) are hypothesized to be attributable entirely to variation in the random error terms, since no other predictors are present and the value of the grand mean, β_{00}, is constant throughout. I tested the variance of each random error term to determine whether or not its value was different from zero for each parameter. By rejecting each null hypothesis, I confirmed that there was variation across KOCs in initial status (π_{0i}), in yearly rate of change (π_{1i}), and in yearly rate of acceleration/deceleration (π_{2i}), respectively.

The Conditional Level-2 Models

A conditional Level-2 model with three components was specified to represent inter-community variation in initial status (π_{0i}), in rate of change (π_{1i}), and in rate of acceleration/deceleration (π_{2i}):

EXHIBIT 5

CONDITIONAL LEVEL-2 MODELS

$$\pi_{0i}=\beta_{00}+\beta_{01}D_{1i}+\beta_{02}D_{2i}+\ldots+\beta_{06}D_{6i}+r_{0i}$$

$$\pi_{1i}=\beta_{10}+\beta_{11}D_{1i}+\beta_{12}D_{2i}+\ldots+\beta_{16}D_{6i}+r_{1i}$$

$$\pi_{2i}=\beta_{20}+\beta_{21}D_{1i}+\beta_{22}D_{2i}+\ldots+\beta_{26}D_{6i}+r_{2i}$$

Each of the three outcomes for the Level-2 model are expressed as functions of the following terms:

$D_{1i}\ldots D_{6i}$ represent dummy variables for the kind-of-community classifications. D_1 = 1 for "urbanized center," 0 = all other KOCs; D_2 = 1 for "economically developed suburbs," 0 = all other KOCs, etc.

β_{00} = the average value of integrated school cost in the initial year of measurement, FY1982, for the baseline kind of community, in this analysis KOC1 is the baseline KOC

$\beta_{01}...\beta_{06}$ = the mean difference in FY1982 integrated school cost between each community type and the "baseline" kind-of-community", i.e., the one whose "D" is omitted; here it is KOC1

β_{10} = the average yearly rate of change in integrated school cost in the first year of measurement, FY1982, in the baseline kind-of-community

$\beta_{11}...\beta_{16}$ = the mean difference between each kind-of-community and the baseline kind-of-community (KOC1) in yearly rate of change in integrated school cost in the first year of measurement, FY1982

β_{20} = the average acceleration or deceleration of integrated school cost in the baseline kind-of-community

$\beta_{21}...\beta_{26}$ = the mean differences between each kind-of-community and the baseline kind-of-community (KOC1) in average acceleration or deceleration of integrated school cost

r_{0i}, r_{1i}, r_{2i} = random errors for the ith kind-of-community

Once the models had been fitted to data, constructing prototypical fitted community growth trajectories allowed me to illustrate the shape of the changes in educational funding for the typical community in each KOC and helped in comparing and contrasting them with one another. Before the fitted trajectories were constructed, however, I "antilogged" the fitted datapoints by exponentiating their values in order to construct a fitted trajectory showing the funding changes expressed in inflation-corrected dollar values.

Hypothesis testing for the conditional models tested the homogeneity of the coefficients in the model. These parameters summarize the relationship between within-community change and the predictors of change, e.g., the seven KOCs. Beta coefficients can be interpreted like regression coefficients in normal regression

analysis and are tested in a similar manner.

I used a multiparameter hypothesis test to test a combined null hypothesis that all of the beta parameters associated with each of the Level-1 parameters were equal, and equal to zero. For each beta parameter that qualified as different in both respects, the corresponding KOC then differed from other types of community in growth in integrated school costs. For example, for KOC2, Economically Developed Suburbs, if β_{01} were different from zero and different from $\beta_{02}...\beta_{07}$, then I could reject the null hypothesis and conclude that a community's affiliation with the community type of KOC2 was associated with initial differences in integrated school cost (i.e., difference in initial status of integrated school costs, difference in yearly rate of change in integrated school costs, difference in acceleration/deceleration of same.)

Some Prototypical Growth Curves

EXHIBIT 6 (see appendix)

Fitted Plots for Urbanized Centers - KOC1

EXHIBIT 7 (see appendix)

Fitted Plots for All KOCs
Changes in Integrated School Costs

Importance of Growth Modeling

Growth modeling with HLM is an ideal analytical method for this research because the HLM software allowed a simultaneous and linked analysis on two levels enabling both the exploration of change over time and the detection of predictors of that change.

By using multiple measures or multiple waves of data, rather than two measures, and modeling change over those multiple intervals, I could gain a sense of the trajectory of the change being observed. What occurs during the process of change may well be as important and as interesting as the net change itself.

Measurement and design weaknesses can also be related to the conceptual flaws of two-wave measures in assessing change. When prior methodologists measured study subjects at two fixed points in time -- usually prior to and subsequent to a particular event -- it was difficult to consider change taking place "over time," i.e., in a continuum. The two measures merely offered a "snapshot" in time rather than providing clues about the complexity and potentially interesting "tone and tint" of the process of change. The study's multi-wave longitudinal strategy also fosters improved measurement precision. Better precision is produced since the more waves of data one adds to the design, the more the standard errors of the fitted growth-rates decrease.[3] Prior attempts to analyze change using ordinary least squares regression or ANOVA analyses often produced "biased standard error estimates, and, as a result, erroneous probability values in hypothesis testing."[4]

Findings

By examining funding trends in the seven community types, a decade of contrasts emerges from the shadow of Proposition 2 1/2. While communities might have sought fiscal equilibrium, their condition increasingly became one of fiscal disequilibrium. While the state attempted to equalize educational funding through a

"needs-based" local aid distribution, state aid became increasingly more inequitable. While both state and local governments hoped for an environment of fiscal stability to fund local services, their funding environment became more and more unstable.

Some kinds-of-communities fared much better than others in coping with the fiscal restraints. In fact, there were clear "winners" and "losers" when particular outcomes were examined -- on both the revenue side and on the spending side. Highlights of these findings are underscored as follows:

1. Among the seven KOCs, there is a variation in the yearly rates of change in educational funding over time that is linked to differences in KOC.

2. The relative positioning of each KOC's aggregate integrated school costs stayed intact across the decade. However, the gap widened between KOCs spending the most and KOCs spending the least during the period.

3. when educational funding is considered as integrated per pupil costs, there was change in the positioning of KOCs. Also, the gap widened between the KOCs spending the most per pupil and the least per pupil during the decade.

4. The rate of increase in integrated per pupil costs appears to be slowing for the typical community in all KOCs other than KOC7, Resort/Retirement/Artistic Communities.

5. four of the seven KOCs allocated a larger portion of their total municipal revenue to educational spending during the decade.

6. During the decade, the rhythm of gaining substantial state aid and then losing substantial state aid created an unstable fiscal environment for the typical community in all KOCs.

7. The positive flow of state aid was followed by two phenomena: a) some KOCs first experienced yearly decreases in the rate of increase of state aid; b) some KOCs experienced yearly net decreases in dollars of state aid. Eventually, all KOCs got to #2, some sooner rather than later.

8. The declared state-local partnership between the Commonwealth and local governments is more a partnership for some KOCs than for other KOCs.

9. Less wealthy communities are handicapped in supplementing local property tax revenue with revenue from successful override votes.

10. Increasing student enrollment and new demands on the use and condition of school physical plants will continue to put additional financial stress on Massachusetts schools as communities move to reopen previously closed school buildings, renovate currently operating school buildings, and/or build new schools. [This is where we re now!]

In retrospect, the flow of state aid was the first crucial determinant of a prototypical community's apparent financial well-being. There was a direct relationship by community type between the degree of state financial support and the degree to which the tax burden of Proposition 2 1/2 could be meaningfully lessened.

A community's growth profile was a second key determinant of its financial condition. The ebb and flow of the state's own economic well-being and its determination of its fiscal priorities were the final factors that affected the situation. The lessons learned from this study have much to do with the importance of the stability of revenue flow to local governments. As a public policy, the Massachusetts tax cap proved, on the whole, to be a destablizing force. On the positive side, it turned around the growing burden of property taxes by reversing the course of property tax growth -- but only temporarily. When increased levels of support from the state flattened and then declined, the tax burden began to increase once more. On the negative side, it placed an added burden on the state to shore up its financial support of cities and towns, a task it did only unevenly, ultimately leaving some types of communities in worse condition in terms of adequate financial support than they had been initially.

However, I think it's important to link the discussion of educational finance to the social objectives of a just society, as well as to its economic and political objectives. Educational funding must be as fair to students as it is to taxpayers and politicians. Approaching educational finance solely as a "tug" between economics and politics does not to education justice, nor does it resolve the problems faced in seeking o fund school adequately. Although the economic market may be a "perfect" market (at least according to economists), the economics of education are not. Although economic models may be representations of an ideal world, the real world of children, schools, and communities is much more complex. While politicians can caucus, make deals, compromise, and engage in power struggles, the struggle to educate the next generation is a power struggle where the only acceptable outcome is for all children to win, none to lose. when children lose, we have failed them. Ultimately, we fail our own futures, our ideals, and our way of life.

EXHIBIT 1

KIND-OF-COMMUNITY CLASSIFICATIONS IN MASSACHUSETTS[5]

NAME	NUMBER	DESCRIPTION
Urbanized Center	45	Manufacturing and commercial center; densely populated; culturally diverse
Economically Developed Suburbs	59	Suburbs with high levels of economic activity, social complexity; and relatively high income levels
Growth Communities	46	Rapidly expanding communities in transition
Residential Suburbs	53	Affluent communities with low levels of economic activity
Rural Economic Centers	61	Historic manufacturing and commercial communities; moderate levels of economic activity
Small Rural Communities	46	Small towns; sparsely populated; economically underdeveloped
Resort/Retirement and Artistic Communities	41	Communities with high property values; relatively low income levels and enclaves of retirees, artists, vacationers and academicians

EXHIBIT 2
OUTCOMES

1. integrated school costs
2. integrated per pupil costs
3. gross state aid allocation
4. the percentage that integrated school costs represents of municipal spending
5. the percentage that gross state aid represents of integrated school costs

EXHIBIT 3

LEVEL-1 MODEL

$$Y_{ij}=\pi_{0i}+\pi_{1i}YEAR_j+\pi_{2i}YEAR^{2j}+e_{ij}$$

Y_{ij} = the observed integrated school cost for the ith community in the jth year of measurement

$YEAR_j$ = the time at which the jth measurement was observed (for FY1982, $YEAR_1=0$; in FY1983, $YEAR_2=1$;...in FY1991, $YEAR_{10}=9$)

π_{0i} = the intercept: the value of integrated school cost for the ith community in FY1982 (when $YEAR_1 = 0$)

π_{1i} = the slope: the yearly rate of change in integrated school cost for the ith community in FY1982 (when $YEAR_1 = 0$)

π_{2i} = the quadratic term: a parameter related to the acceleration or deceleration in integrated school cost for the ith community

e_{ij} = within-community random error for the ith prototypical community in the jth year

EXHIBIT 4
UNCONDITIONAL MODELS

1) $\pi_{0i} = \beta_{00} + r_{0i}$

A community's initial integrated school cost can be represented solely as a grand mean integrated school cost plus random error

2) $\pi_{1i} = \beta_{10} + r_{1i}$

A community's yearly rate of change in integrated school cost in 1982 can be represented solely as a grand mean yearly rate of change in integrated school cost in 1982 plus random error

3) $\pi_{2i} = \beta_{20} + r_{2i}$

A community's acceleration or deceleration of integrated school cost can be represented solely as a grand mean acceleration or deceleration plus random error

EXHIBIT 5

CONDITIONAL LEVEL-2 MODELS

$$\pi_{0i}=\beta_{00}+\beta_{01}D_{1i}+\beta_{02}D_{2i}+\ldots+\beta_{06}D_{6i}+r_{0i}$$

$$\pi_{1i}=\beta_{10}+\beta_{11}D_{1i}+\beta_{12}D_{2i}+\ldots+\beta_{16}D_{6i}+r_{1i}$$

$$\pi_{2i}=\beta_{20}+\beta_{21}D_{1i}+\beta_{22}D_{2i}+\ldots+\beta_{26}D_{6i}+r_{2i}$$

$D_{1i}\ldots D_{6i}$ represent dummy variables for the kind-of-community classifications. D_1 = 1 for "urbanized center," 0 = all other KOCs; D_2 = 1 for "economically developed suburbs," 0 = all other KOCs, etc.

β_{00} = the average value of integrated school cost in the initial year of measurement, FY1982, for the baseline kind of community, in this analysis KOC1 is the baseline KOC

$\beta_{01}\ldots\beta_{06}$ = the mean difference in FY1982 integrated school cost between each community type and the "baseline" kind-of-community", i.e., the one whose "D" is omitted; here it is KOC1

β_{10} = the average yearly rate of change in integrated school cost in the first year of measurement, FY1982, in the baseline kind-of-community

$\beta_{11}\ldots\beta_{16}$ = the mean difference between each kind-of-community and the baseline kind-of-community (KOC1) in yearly rate of change in integrated school cost in the first year of measurement, FY1982

β_{20} = the average acceleration or deceleration of integrated school cost in the baseline kind-of-community

$\beta_{21}\ldots\beta_{26}$ = the mean differences between each kind-of-community and the baseline kind-of-community (KOC1) in average acceleration or deceleration of integrated school cost

r_{0i}, r_{1i}, r_{2i} = random errors for the ith kind-of-community

EXHIBIT 6

Urbanized Centers - KOC1

Fitted plots of changes in Integrated School Costs, Integrated Per Pupil Costs, Total Municipal Revenue, Gross State Aid Allocation, the percentage that Integrated School Costs represents of Total Municipal Revenue, and the percentage that Gross State Aid Allocation represents of Integrated School Costs, FY1982 - FY1991.

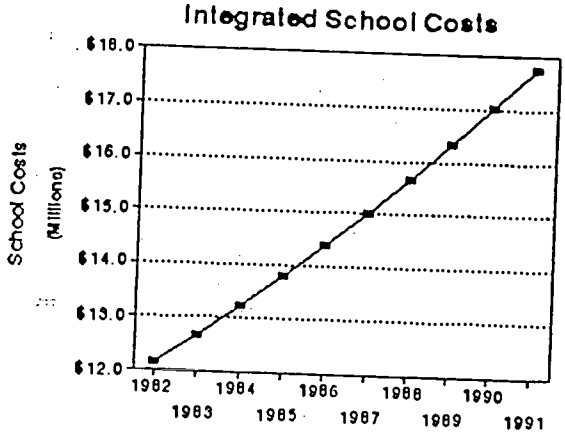


Figure A.1

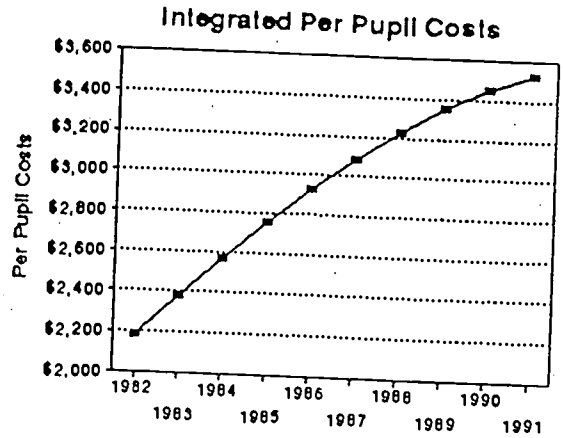


Figure A.2

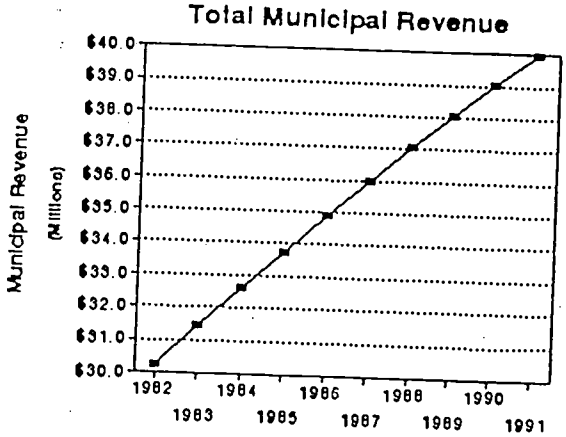


Figure A.3

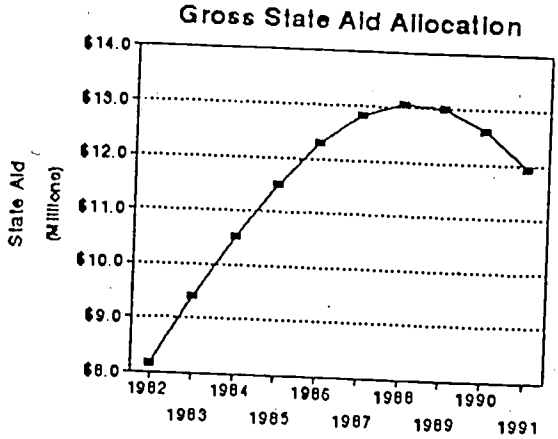


Figure A.4

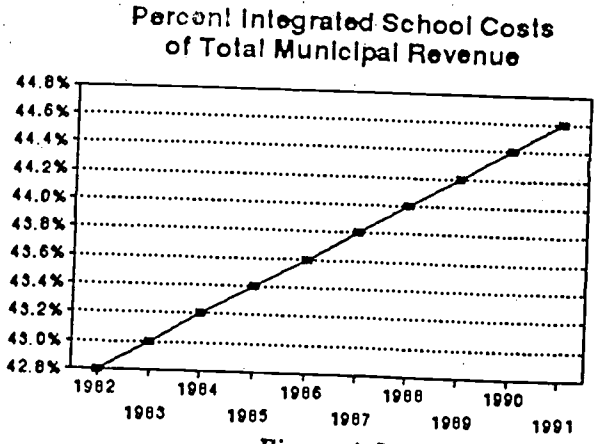


Figure A.5

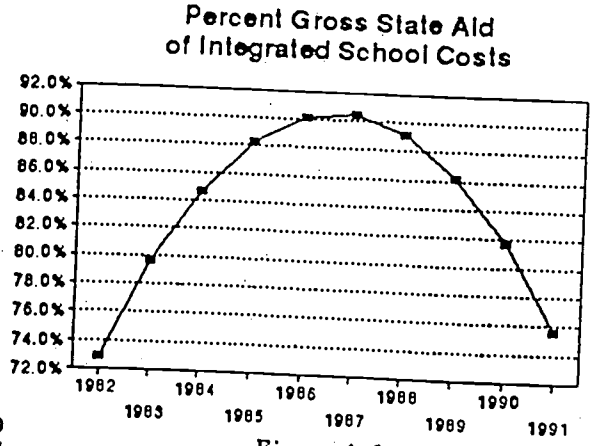


Figure A.6

Urbanized Centers - KOC1

Fitted plots of changes in Student Enrollment, Property Tax Levy, Total Municipal Revenue, and the percentage that the Property Tax Levy represents of Total Municipal Revenue, FY1982 - FY1991.

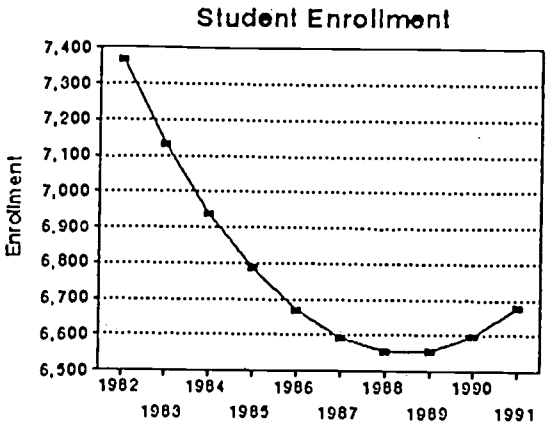


Figure A.7

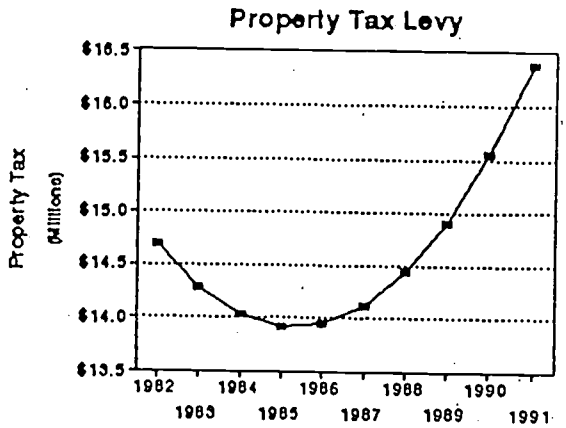


Figure A.8

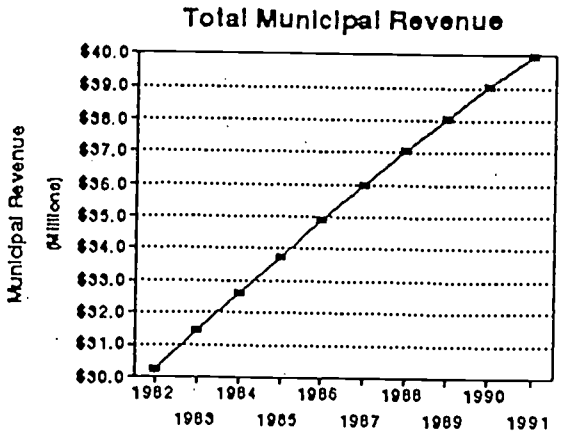


Figure A.9

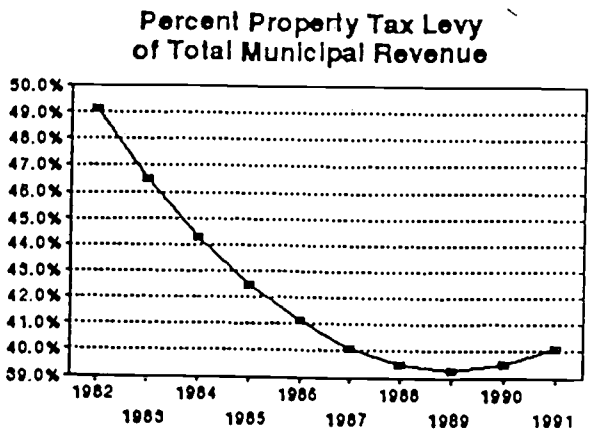
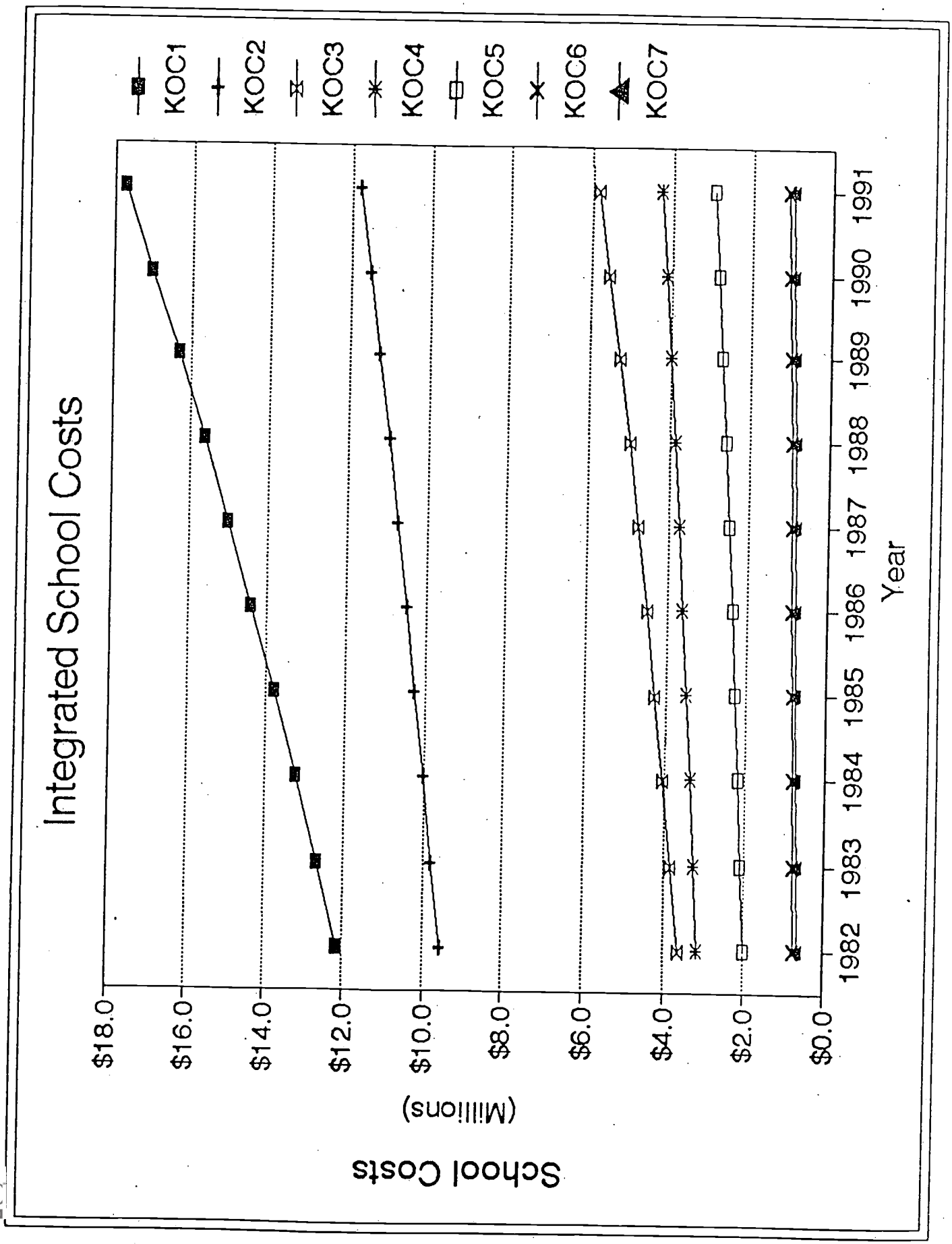


Figure A.10

EXHIBIT 7


Integrated School Costs
KOC1
KOC2
KOC3
KOC4
KOC5
KOC6
KOC7
$18.0
$16.0
$14.0
$12.0
$10.0
$8.0
$6.0
$4.0
$2.0
$0.0
School Costs
(Millions)
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991
Year

1.R. Freeman Butts and Lawrence A. Cremin, A History of Education in American Culture, (New York: Holt, 1953) 101.

2. Massachusetts Department of Education, "A New Classification Scheme for Massachusetts Communities," (Quincy: Massachusetts Department of education, 1985).

3. John B. Willett, "Measuring change more effectively by modeling individual growth over time," T. Husen & T.N. Postlethwaite (Eds.), The International Encyclopedia of Education. 2nd edition (Oxford, UK: Pergamon Press, 1994) 7. Reduced standard errors indicate better precision since reliability is, by nature, "a measure of interindividual differentiation" according to Rogosa, Brandt, and Zimowski, "A Growth Curve Approach to the Measurement of Change," Psychological Bulletin, 90, 1982; 729.

4. Anthony Bryk, Stephen W. Raudenbush, Michael Seltzer, and Richard R. Congdon, "An Introduction to HLM: Computer Program and Users' Guide," 1989,3.

5. Massachusetts Department of Education, "A New Classification Scheme for Massachusetts Communities," (Quincy: Massachusetts Department of education, 1985).

EA 026 021

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Measuring Change Over Time Using Growth Modeling

Author(s): Linda L. Greyser

Corporate Source: Harvard University

Publication Date: March 27, 1997

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.

☑

Check here
For Level 1 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) *and* paper copy.

The sample sticker shown below will be affixed to all **Level 1** documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all **Level 2** documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2

☐

Check here
For Level 2 Release:
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but *not* in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at **Level 1**.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here→ please

Signature: Linda L. Greyser

Printed Name/Position/Title: Linda L. GREYSER Associate Director Programs in Professional Education

Organization/Address: Programs in Professional Education
Gutman 339
Harvard Graduate School of Education
Cambridge, MA 02138

Telephone: 617-498-8227

FAX: 617 496-8051

E-Mail Address: Linda_Greyser@harvard.edu

Date: 5/30/97

CUA

THE CATHOLIC UNIVERSITY OF AMERICA
Department of Education, O'Boyle Hall
Washington, DC 20064

800 464-3742 (Go4-ERIC)

April 25, 1997

Dear AERA Presenter,

Hopefully, the convention was a productive and rewarding event. We feel you have a responsibility to make your paper readily available. If you haven't done so already, please submit copies of your papers for consideration for inclusion in the ERIC database. If you have submitted your paper, you can track its progress at http://ericae2.educ.cua.edu.

Abstracts of papers accepted by ERIC appear in *Resources in Education (RIE)* and are announced to over 5,000 organizations. The inclusion of your work makes it readily available to other researchers, provides a permanent archive, and enhances the quality of *RIE*. Abstracts of your contribution will be accessible through the printed and electronic versions of *RIE*. The paper will be available through the microfiche collections that are housed at libraries around the world and through the ERIC Document Reproduction Service.

We are soliciting all the AERA Conference papers and will route your paper to the appropriate clearinghouse. You will be notified if your paper meets ERIC's criteria for inclusion in *RIE*: contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality.

Please sign the Reproduction Release Form on the back of this letter and stet **two** copies of your paper. The Release Form gives ERIC permission to make and distribute copies of your paper. It does not preclude you from publishing your work. You can mail your paper to our attention at the address below. Please feel free to copy the form for future or additional submissions.

Mail to: AERA 1997/ERIC Acquisitions
The Catholic University of America
O'Boyle Hall, Room 210
Washington, DC 20064

Sincerely,

Lawrence M. Rudner, Ph.D.
Director, ERIC/E

ERIC® Clearinghouse on Assessment and Evaluation