A PRELIMINARY SYSTEM DYNAMICS MODEL OF THE ALLOCATION OF STATE AID TO EDUCATION

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ABSTRACT

A system dynamics simulation of state aid to education policies is presented. The model contains a state taxation sector, a state aid distribution sector, and a representation of the taxation and expenditure policies of four aggregate local districts. Preliminary results from system simulations suggest that policies directed at equalizing educational expenditures may be effective in the short run (1 to 2 years) but will have little, if any, impact in the long run (7 plus years). Furthermore, local expenditure patterns may be very sensitive to factors (such as changes in the state's non-educational expenditures) that have traditionally been excluded from formal analyses of state aid to education.

INTRODUCTION

The decade of the 1970's has witnessed the proliferation of numerous challenging issues in the field of public school finance. Widespread movements seeking to limit property taxes and to cap state and local expenditures have been successful in many states, the most famous example being California's Proposition 13, which was passed in June 1978.

In addition, various court cases have focused on new issues, broadening earlier interpretations of state laws across the nation. Under the equal protection clause, for instance, the provision of quality of education has been declared a fundamental right in many states.[1] Court rulings have also re-interpreted legal expenditures and debt limitations for some city school districts,[2] and have required tax base equalization within local taxing jurisdictions.[3] More recently, Nassau County Supreme Court ruled in *Levittown v. Nyquist* (now pending appeal) that New York State's current method of funding education is unconstitutional.[4]

The Levittown decision raises a series of related issues: the problem of equity in educational finance, i.e. whether pupils attending school throughout the state school system are given equal educational opportunities regardless of the wealth of the school district in which they reside; the problem of educational overburden, or how a state aid formula should take into account the high concentration of pupils with special and costly educational needs in central cities; and finally, the question of municipal overburden which, if complied with, would require the state aid formula to compensate central cities for their tax base already overloaded with non-education services not needed in other types of localities (such as subways and high social services payments).

In the midst of this redefinition of the field of local finance by the courts and legislatures, issues as to how schools are and should be financed, and who will bear the final costs of providing education in the state have become a major concern for legislators, local administrators, and taxpayers as well as educators.

Typically, school finance issues have been analyzed using highly disaggregated simulation models which project for one year in advance the impact of changes in the methods of funding education. These models, however, often fail to capture the multi-year dynamics of the system, and overlook the long-run consequences of proposed changes. As a result, projections from the models may differ considerably from the reality since the simulations do not take into account crucial dynamic interactions within the system under study.[5]

This paper will present a preliminary system dynamics model of the local school finance system within one state (New York State has been chosen for the convenience of data collection). The purpose of the study is to investigate the initial feasibility of using aggregate system dynamics simulations to supplement the highly disaggregated class of simulation models currently used to analyze school finance reforms.

The first version of the model, EDFIN1, was sponsored by an institutional grant to the State University of New York at Albany. The second version of the model, EDFIN2, which is in the process of final polishing, is sponsored by the Education Department of New York State. So far, the conclusions of the study have not had direct impact on the real policies. However, the sponsor of the second model edition has shown great interests in the model results.

MODEL STRUCTURE

The overall structure of the model is illustrated by the sectorial diagram shown in Figure 1. The major model components are four local taxation sectors, four education distribution sectors, and the state taxation sector. The four local sectors which represent different types of school districts[6]

are connected to each other through the state taxation sector and the education distribution sectors. These connections incorporate both how the state government senses and reacts to the local education expenditure needs, and how the state distributes available funds among the different local sectors.
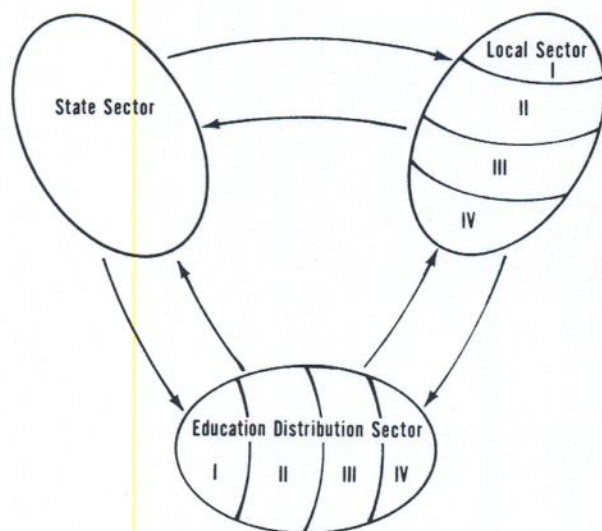

Figure 1. Sectorial Diagram

The basic structure of the four local sectors is identical although parametric values do differ to represent differing types of local school districts. In addition, much of the structure used to set the tax rate within the state sector is a replication of the local sectors. Several major pieces of the model structure are presented below. A complete flow chart diagram, equations for one local sector and for the state sector, together with a variable definition list are presented in the appendices. A more complete description of the model is given elsewhere.[7]

THE LOCAL TAXATION SECTOR. The locality raises revenues from a local property tax. The actual local property tax rate is the result of a dynamic adjustment between the local needed tax rate and the maximum at which the locality is willing to tax itself. The amount and speed of the adjustment reflect the readiness of the community to sustain further tax increases. The smaller the gap between the needed and the maximum tax rate, the more reluctant the local community will be to tax itself and the longer it will take to reach the target tax rate. Total local revenues is the simple product of the property tax base and the actual property tax rate.

A community will decide how to divide its locally raised revenues between educational and other services by using a fraction which reflects the localities' preferences for the two types of services. In general, the actual amount of money allocated for one type of services will depend on how much money is needed to provide these services, and how much is available in the local sector. "Need" is defined by historic expenditure patterns normalised to 1975 budget levels. There is a delay in the local expenditures distribution process, considering the fact that localities do not adjust expenditures instantaneously.[8]

THE STATE SECTOR. Similar structures operate at the state level including an income tax revenue sector and an expenditure distribution sector which divides state funds among educational and non-educational expenditures. Needed state education expenditures is the sum of the needed education expenditures from all the local sectors times a traditional fraction of state aid to localities. This fraction, also called historical state aid fraction, is a three-year delay of the actual state aid fraction, and reflects the delay in state response to local demands which may be caused either by legal or political process.

THE EDUCATION DISTRIBUTION SECTOR. Given the monies actually available to fund educational services, the state distributes aid to each locality according to a state aid formula. The distribution formula currently in use in the model is modelled after the current operating aid formula of the State of New York.

One of the main concerns in the study of this model is to analyze how various types of local school districts are affected by the changes proposed by the courts and the legislatures. Consequently, we have differentiated the following four major types of local school districts: 1) localities with high full property value per pupil, adequate local tax rate, minimum state aid, and very high educational expenditure per pupil[9]; 2) localities with medium to high full property value per pupil, sufficient local tax rate, minimum level of state aid, and high educational expenditure per pupil; 3) localities with medium to low full property value per pupil, inadequate local property tax rate, some state aid, and average educational expenditure per pupil; and 4) localities with low full property value per pupil, insufficient local tax rate, very high level of state aid, and low expenditure per pupil.[10]

MODEL BEHAVIOUR

The model is initialized in equilibrium. That is, no growth in pupils, in tax base, nor in expenditures per pupil is assumed initially. Model tests consist of experiments that disturb the model from equilibrium by an input of known character. The system then exhibits a "pure" response to the test input which is analyzed to understand better how the system behaves. It is possible to observe how the system responds to the policy change without confounding influences from growth or decline in pupils, tax base or expenditures. Of course, these equilibrium conditions could be relaxed in later simulations. They are, however, most useful for initial explorations of policy impacts.

To illustrate model behaviour, the equilibrium condition was disturbed by a 20% step increase in needed state expenditures for non-educational purposes (such as road construction, social services, etc.). This test was chosen for illustrative purposes because it will show the amount of coupling that exists between educational expenditures and non-educational expenditures at local and state levels. The model shows that local educational expenditures are amazingly sensitive to state expenditure patterns, especially in poorer sectors that rely heavily upon state aid. These surprisingly strong effects would not be found within a traditional simulation model with a more tightly drawn boundary of analysis.

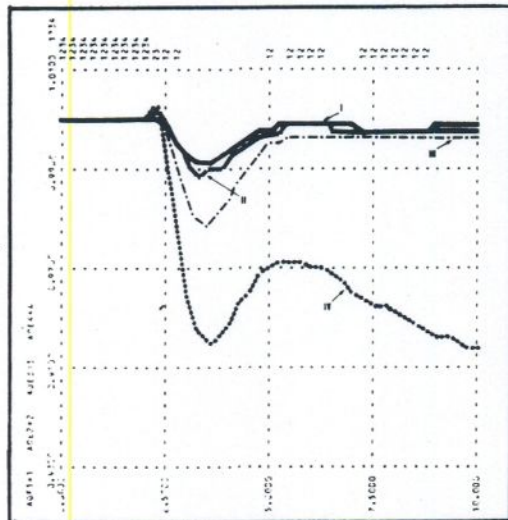Figure 2 shows the response of five key plots of system performance to the 20% step change in state non-educational
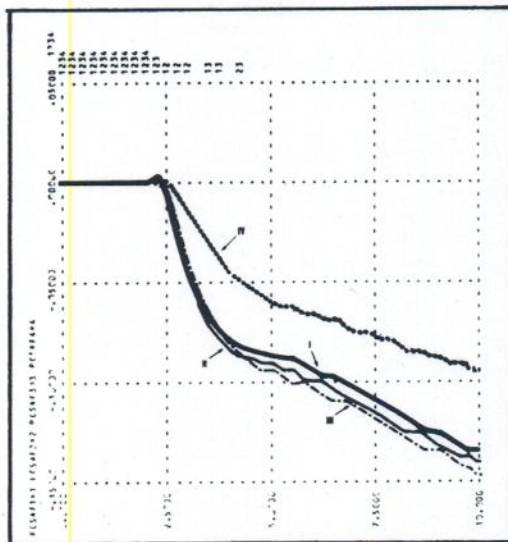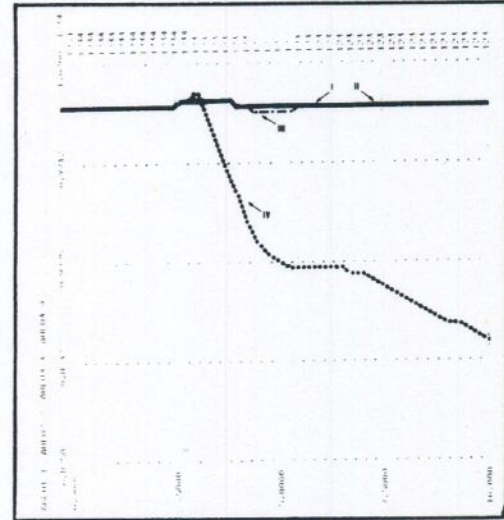
A. Percentage Change of State Aid Fraction
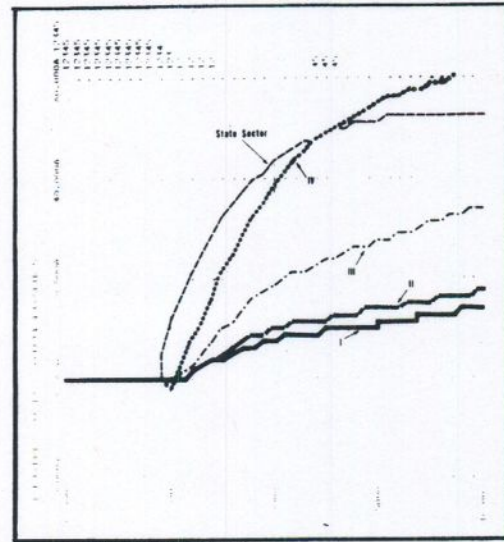
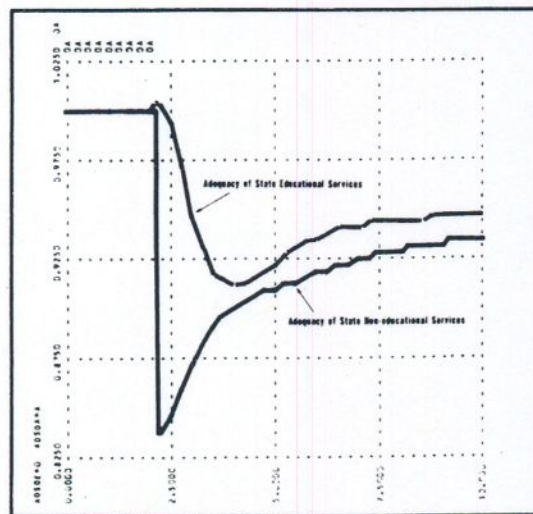**B. Percentage Change of Tax Rates**

C. Adequacy of Education

D. Adequacy of Local Other Services

E. Adequacy of State Services

Figure 2. Changes in Both State and Local Sectors Resulting from a 20% Step Increase in State Other Services

expenditures. Graph A of figure 2 shows that the state aid fraction for education decreases in all four local sectors, since the state does not have a tax base sufficient to readily absorb the 20% need increase. In order to see who bears the cost of the 20% growth in state other expenditures, Graph B illustrates the percentage change of tax rate in all four sectors. The state sector originally has the highest tax rate increase and local sector IV, representing low wealth localities, is the next highest one — then, sector III, II and I in that order. The interesting thing is that in the long run local sector IV has an increase of more than 6% which is even more than the 5.3% increase of the state sector and far ahead of the 1.4% to 3.3% increase in the other local sectors. Similarly, Graphs C and D show the adequacies of educational services and of other local services. We notice that local sector IV is the one which is the most influenced among all the local sectors. It registers a significant negative change in the adequacy of education and other expenditures. (For the purpose of this simulation, adequacy is defined as actual expenditures divided by needed expenditures, where needed expenditures are defined by historically observed patterns in the local districts).

The main reason for this behaviour is that, of the four types of sectors, sector IV depends the most on the state for aid to education (with an initial stated aid fraction of .76). It also has the lowest property value and does not have a tax base that is large enough to make up for a drop in state aid.

Graph E shows the adequacy of state services. We may notice that the increase in the state's need for non-educational services does not only have an impact on the adequacy of this type of services but also on the adequacy of operating aid. At the end of the tenth year, the levels of adequacy for both educational and non-educational services are lower than their initial values due to significant strains on the state tax base.

The behaviour presented in Figure 2 illustrates the potential complexities that must be taken into account when attempting to analyze school finance policies. Although the test increase in expenditures was within the state's operating budget, and had nothing to do with educational expenditures, repercussions on both the tax rate and the adequacy of educational expenditures were felt in all of the local sectors, with the most severe effects being felt in those poorer sectors that

relied heavily upon state aid to education. The existence of relatively tight intercouplings between the state's non-educational operating budget and local expenditures for schooling considerably complicates the task of analyzing local school finance reform policies because a host of factors, previously assumed to be held constant by traditional school finance simulations, may require much more analytic attention.
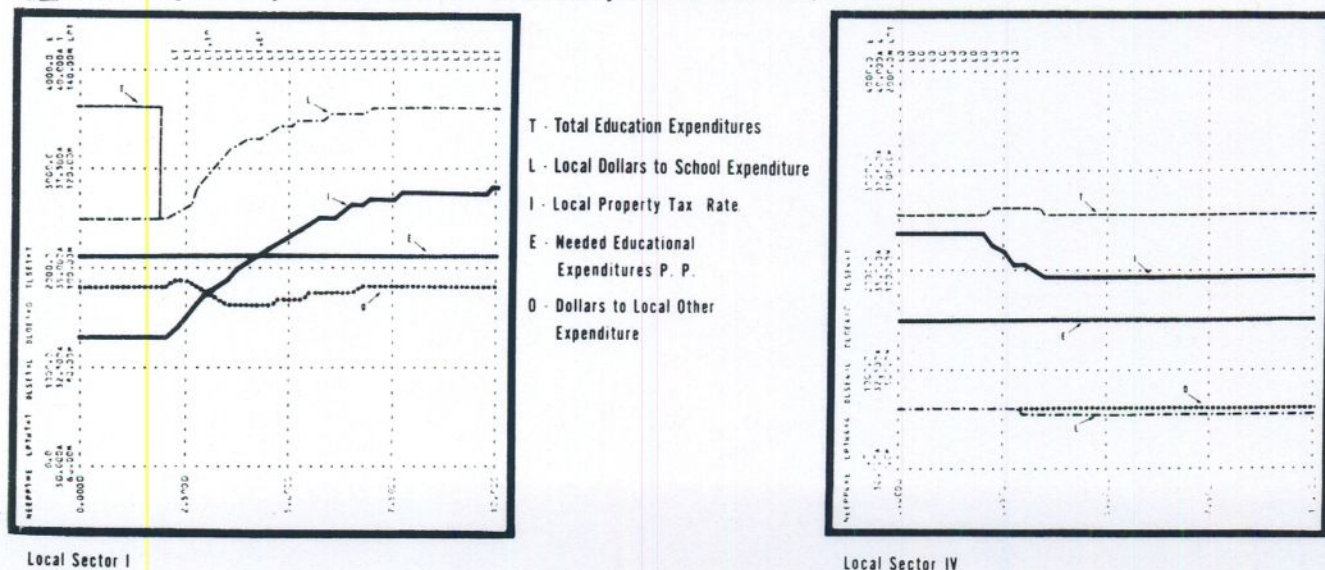
A POLICY TEST

Although still in a preliminary state of development, the dynamic model as currently configures can be used on a preliminary basis to test several policy options currently under consideration to achieve greater equity in the financing of local public schooling. The results of one such policy test — the elimination of "floor" aid — is presented below. By floor aid we mean that a minimum state aid level (set at 360 dollars in N.Y.S.) is granted to every pupil regardless of the wealth of a school district. That is, high wealth communities that might not be entitled to any state aid due to an equalizing formula will always receive at least this minimal amount of floor aid per pupil.

The policy tests show that in the short run the elimination of floor aid does have a sudden and dramatic impact on the educational expenditure patterns within and across sectors. Over the longer run, however, the system exhibits an amazing capability to correct itself. That is, the initially occurring perturbations in expenditure patterns are rapidly met by self-adjusting taxation policies on the part of localities so that by the end of year seven (or thereabouts) the expenditure patterns are about what they were at year 0. Although the much hoped for equalization does appear as a transient, self-adjusting forces within the system cause the system to revert to expenditure patterns quite similar to the pre-reform patterns. A more detailed discussion of the impact of this policy follows.

While eliminating floor aid, we will pay special attention to the different types of local sectors. Basically, the behaviours in sectors I and II (relatively rich sectors) are similar and the behaviours in sectors III and IV (relatively poor sectors) are similar. In order to better explain the sector-specific behaviour pattern, more detailed plots of sectors I and IV are shown in Figure 3.

Figure 3. Comparison of Two Local Sector Behaviours from Elimination of Floor Aid

T - Total Education Expenditures

L - Local Dollars to School Expenditure

I - Local Property Tax Rate

E - Needed Educational Expenditures P. P.

O - Dollars to Local Other Expenditure

Local Sector I

Local Sector IV

In sector I, total education expenditure spent by the sector (T) drops at year two (the year of policy testing) to equal the total amount of local dollars raised for schooling (L). From this result we infer that all local expenditures for education are coming from the local tax base and hence state aid for education has dropped to zero in sector I. The local property tax rate (I) in sector I increases from 3.3% to 3.7%. Total local school expenditure drops at year two and comes back to equilibrium again at year seven. Also, notice that there is some impact on the dollars to local other expenditures (0) reflecting an overall tight fiscal situation in local sector I.

In contrast, the property tax rate (I) of local sector IV decreases from 3.6% to 3.5%. The total local school expenditure (T) remains the same except for a slight move in year three. However, dollars to local school expenditure (L) sponsored by the local sector itself decreases, and the dollars to other local services (0) have not been influenced. Thus, generally speaking, we know that poorer localities would benefit from this policy while the wealthier districts would not.

In order to look more closely at the policy impacts, the following indicators of the system's behaviour are illustrated in Figure 4.

First, the plot in graph A shows that the state aid fraction decreases by 100% in sector I, and by 2% in sector II. It remains the same in sector III, and increases by 1.5% in sector IV. Secondly, we notice in graph B that the cost of this policy has been absorbed by local sector I, which registers a 10% tax rate increase, and by local sector II, which has a 1% tax rate increase. Meanwhile, both local sectors III and IV show tax decreases of 5% and 3.1%, respectively. Thirdly, graph C shows a slight increase in the adequacy of education during the first two years in local sectors III and IV, representing the poorer districts, but a greater decrease in sectors I and II, the wealthier districts. It takes sector I six years for its level of adequacy to come back to equilibrium, and two years for sector II. Fourthly, a similar situation happens in graph D which shows the adequacy of local other services. The adequacy of non-educational services drops by

A.
Left. Percentage Change in State Aid Fraction.

B.
Right. Percentage change in Local Property Tax Rate & State Equalization Tax Rate.

C.
Left. Adequacy of Education Expenditure.
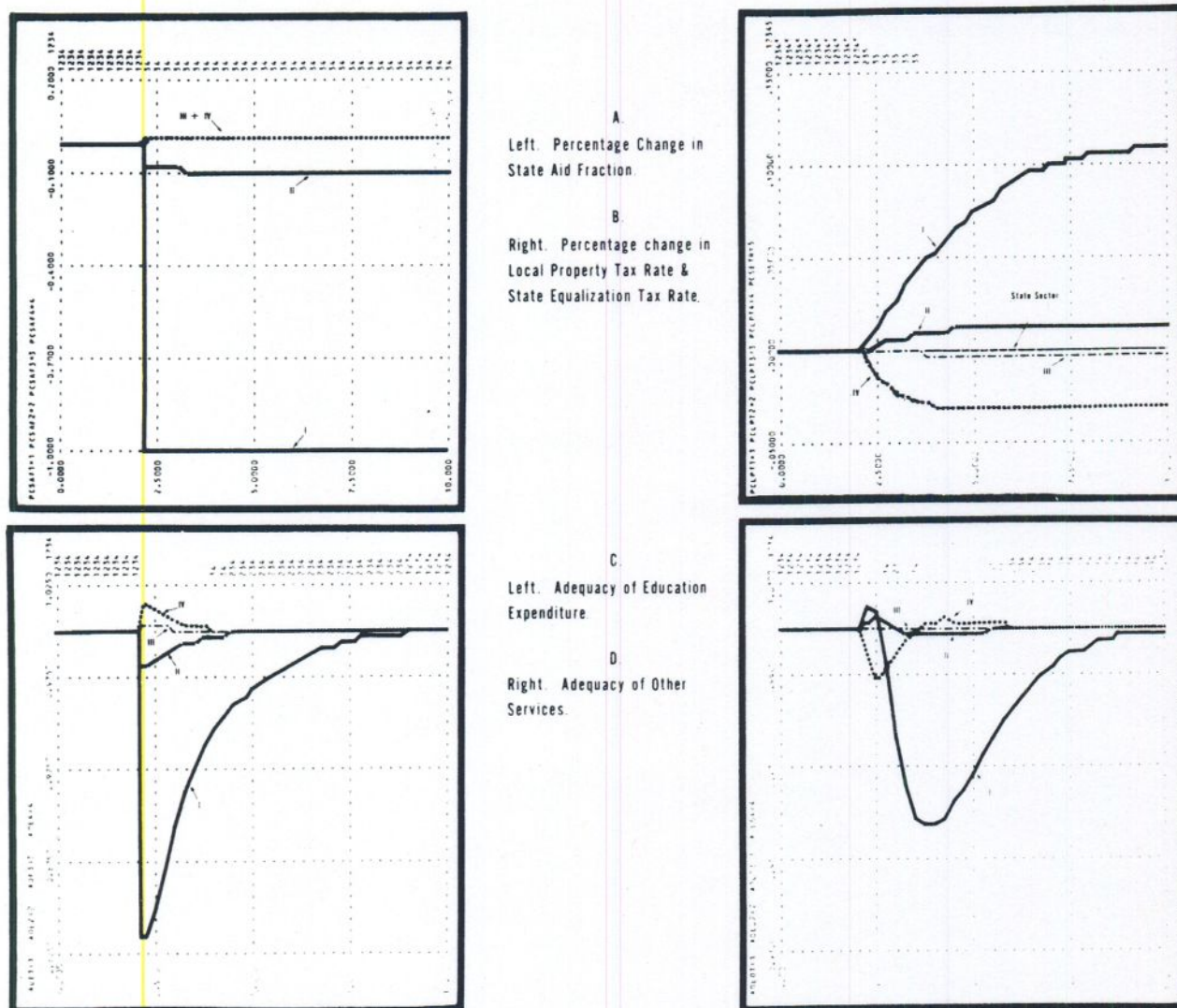
D.
Right. Adequacy of Other Services.

Figure 4. *Overview of Impacts of Eliminating Floor Aid.*

3.2% in local sector I and it takes seven years for the sector to reach stability at a lower level than the original equilibrium. In the first year after the policy implementation, the adequacy of local other services decreases a little in sector IV while increasing in sector I. This effect occurs because of the overall decrease (or increase) in local property tax rates in each individual sector.

Generally speaking, in the short run (one to two years) the policy of eliminating floor aid has significant negative impact on the wealthy localities, while the poorer districts benefit from the policy change. In the long run (seven years plus), however, the proposed policy has virtually no effect on the adequacy and equity of expenditures between sectors. Instead, the policy initially designed to equalize expenditures has resulted in relatively minor adjustments in local tax rates with little long run impact on the quality or equity of local education expenditures.

IMPLICATIONS

Although the work presented here is still in preliminary stages of development, some interesting implications have already begun to emerge. First, although attempts at school finance reform (such as the elimination of the floor aid) may work in the short run to reverse patterns of inequity in educational expenditures, in the longer run (seven years or so) these moves toward greater equity will in all likelihood reverse themselves as self-adjusting forces within the local taxation and finance system revert to the initial conditions of inequity. Traditional school finance models that predict increased equity from such reforms may be accurately predicting a short-run transient. The long-run implications of many policies, however, may not be similar to what is predicted by traditional simulation models that focus on detailed projections of next year's aid distribution pattern.

Second, non-educational fiscal matters (such as the level of the state's non-educational expenditures) may have as great an impact on the adequacy of educational expenditures (and the tax rate) within localities as do policies explicitly designed to have an impact on educational expenditures. That is, the equity and adequacy of local educational expenditures are to a large degree being influenced by factors totally outside the boundary of analysis of traditional school finance simulations.

Finally, the work presented here, although promising, is based upon a very preliminary model that needs extensive, empirical corroboration before it becomes an effective policy-setting instrument. Hence, the work points to the need for further research both into the dynamics of local school finance reform and into the applicability of various simulation technologies for studying those dynamics.

REFERENCES

1. *Horton v. Meskill*, 31 conn. sup. 377, 332 a.2d 813 (Hartford County Superior Court 1974) and *Serrano v. Priest* 5 Cal. 3d 584, 96 Cal. Rptr. 601, 487 P. 2d 1241 (1971), subsequent opinions, 45 U.S.L.W. 2340 (Dec. 30, 1976).

2. *Hurd v. Nyquist* (72 Misc 2d 213.)

3. Hellerstein v. Assessor of Town of Islip (37 NY 2d 1.)

4. *Board of Education, Levittown Union Free District v. Nyquist*, 94 Misc. 2d 466; 407 NYS 2d. 606. (Nassau County Supreme Court).

5. David F. Andersen, "Using Feedback Simulations to Test Educational Finance Policies," *Policy Sciences*, October, 1980.

6. For more details concerning model structure, see Fiona F. Chen, "A Broad Quantitative View of Public School Financing," Unpublished manuscript, Graduate School of Public Affairs, SUNY/Albany 12222.

7. Ibid.

8. The fractional formulation presented in the Appendix was formulated after a Cobb-Douglas production function representing overall community utility. Specifically,

$$U = S^{\alpha} N^{(1-\alpha)}$$

where U = a hypothetical measure of district utility
  S = dollars expended for schooling in a local community
  N = dollars for non-schooling expenditures in a locality.

Differentiating to set marginal utilities equal in an assumed equilibrium:

$$\frac{\partial U}{\partial S} = \frac{\partial U}{\partial N}$$

We can see that the equilibrium expenditure pattern will occur when the following simple algebraic condition is met:

$$\frac{\alpha}{(1-\alpha)} = \frac{S}{N}$$

Hence, future preferences may be approximated by aggregate data on present expenditure patterns. Of course, among other things, this assumes that in the aggregate, local communities are operating to maximize a mythical utility measure.
Although good for a "first cut", this rather simple formulation of community preferences, based upon standard micro-economic theory will need to be considerably elaborated and expanded upon in the final work. An accurate, empirically derived representation of community preferences and responses to state aid is an essential portion of the model's structure.

9. The adequacy and insufficiency of the tax rates in the model are defined by the sufficiency of the distance between the present tax rate and the maximum limitation on it. In the preliminary runs, in the situation of adequate tax rate, the tax limitation is double the present tax rate. In the situations of insufficient tax rate, the tax limitation is set as 10% more than the present tax rate.

10. This aggregation scheme is based upon a review by Mark Rose of present methods presently used in New York State to aggregate communities for purposes of analysis. See "Aggregation Schemes for Studying School Finance in New York State". Unpublished manuscript, Graduate School of Public Affairs, SUNY-Albany. A formal cluster analysis should be performed to determine whether a parsimonious number of aggregate districts do, in fact, exist and what the exact aggregation scheme should be.
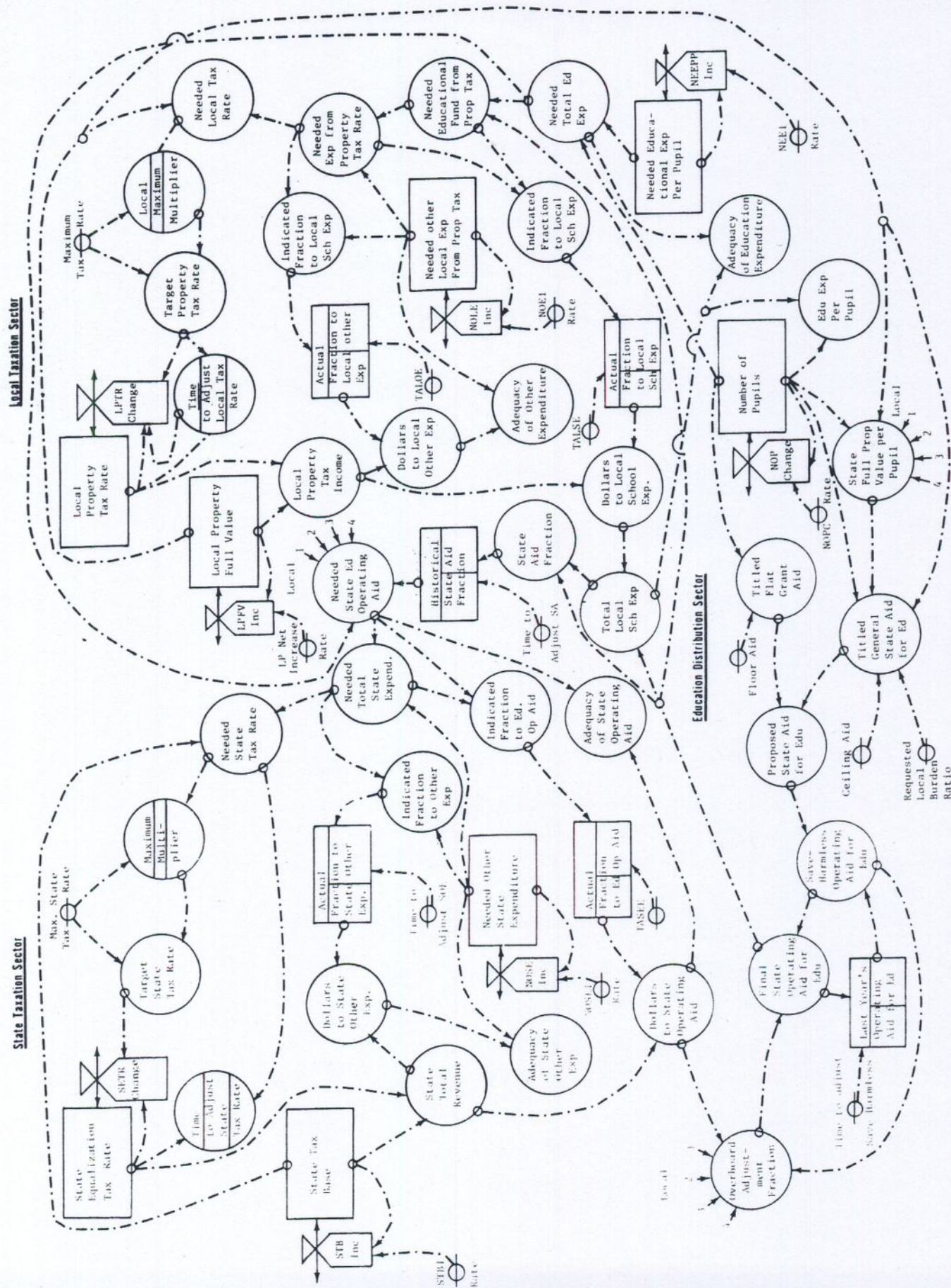
APPENDIX A. FLOW DIAGRAM FOR A PRELIMINARY SYSTEM DYNAMICS MODEL OF THE ALLOCATION OF STATE AID TO EDUCATION

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 1:NOTE
 2:NOTE
 3:NOTE  ------------------------------
 4:NOTE
 5:NOTE LOCAL TAX SECTOR 1
 6:NOTE  ------------------------------
 7:NOTE
 8:NOTE
 9:NOTE TAX RATE 1
10:NOTE
11:L LPTR1.K=LPTR1.J+(DT)(LPTRC1.JK)                     LOCAL PROPERTY TAX RATE
12:N LPTR1=LPTRN1
13:C LPTRN1=.073736
14:R LPTRC1.KL=(TARPT1.K-LPTR1.K)/TALTR1.K              LOCAL PRO TAX RATE CHANG
15:A TARPT1.K=MTR1*LMAXM1.K                        TARGET PROPERTY TAX RATE
16:A LMAXM1.K=TABHL(LMAXT1,NLTR1.K/MTR1,0,2.25,.25)       LOCAL MAX TAX MUL
17:T LMAXT1=0/.25/.5/.75/.9/.94/.95/.99/1/1
18:A TALTR1.K=TABHL(TALTT1,TARPT1.K/LPTR1.K,.9,1.1,.05)    TIME TO ADJ TR
19:T TALTT1=.5/.55/1/2.5/3
20:C MTR1=.06                                 MAX. TAX RATE
21:A NLTR1.K=NEFPT1.K/LPFV1.K                      NEEDED LOCAL TAX RATE
22:L LPFV1.K=LPFV1.J+(DT)(LPFVI1.JK)          LOCAL PROPERTY FULL VALUE
23:N LPFV1=LPFVN1
24:C LPFVN1=6214414300
25:R LPFVI1.KL=LPFV1.K*LPNIR1                 LOCAL PROPERTY FULL V INCREASE
26:C LPNIR1=0                           LOCAL PROPERTY NET INCREASE RATE
27:NOTE
28:NOTE NEEDED EXPENDITURE 1
29:NOTE
30:A NEFPT1.K=NOLEF1.K+MAX(NEFFP1.K,0)               NEEDED EXP. FROM PROP TAX
31:L NOLEF1.K=NOLEF1.J+(DT)(NOLEI1.JK)        NEEDED OTHER LOC EXP. FROM PROP
32:N NOLEF1=NOLEN1
33:C NOLEN1=96679120
34:R NOLEI1.KL=NOLEF1.K*NOEIR1+PULSE(OP1,T2,700)         NEEDED OTHER LOCAL EXP. INCREASE
35:C NOEIR1=0
36:A NEFFP1.K=NTEE1.K-FSAFE1.K                    NEEDED EDU FUND FROM PRO
37:A NTEE1.K=NEEPP1.K*NOP1.K           NEEDED TOTAL EDU EXP
38:L NEEPP1.K=NEEPP1.J+(DT)(NEEPI1.JK)             NEEDED EDU EXP PER PUPIL
39:N NEEPP1=NEEPN1
40:C NEEPN1=2120
41:R NEEPI1.KL=NEEPP1.K*NEEIR1+PULSE(EP1,T1,700)      NEEDED EDU EXP PER PUIPL INC
42:C NEEIR1=0                     NEEDED EDU EXP INC RATE
43:NOTE
44:NOTE LOCAL EXPENDITURE DISTRIBUTION 1
45:NOTE
46:A INFLO1.K=1-INFLS1.K                   INDICATED FRAC TO LOCAL OTH EXP
47:A INFLS1.K=NEFFP1.K/NEFPT1.K     INDICATED FRAC TO LOC SCH EP
48:A LPTI1.K=LPFV1.K*LPTR1.K              LOCAL PROPERTY TAX INCOME
49:A DLOE1.K=LPTI1.K*AFTLO1.K     DOLLARS TO LOCAL OTH EXP
50:A DLSE1.K=LPTI1.K*AFTLS1.K          DOLLARS TO LOCAL SCH EXP
51:A AFTLO1.K=DELAY3(INFLO1.K,TALOE1)     ACT FRAC TO LOCAL OTH EXP
52:C TALOE1=1                       TIME TO ADJ LOC OTH EXP DIST
53:A AFTLS1.K=DELAY3(INFLS1.K,TALSE1)     ACT FRAC TO LOCAL SCH EXP
54:C TALSE1=1                       TIME TO ADJ LOC SCH EXP DIS
55:A TLSE1.K=FSAFE1.K+DLSE1.K          TOTAL LOCAL SCH EXP
56:NOTE
57:NOTE EDUCATION FEEDBACK 1
58:NOTE
59:A SAF1.K=FSAFE1.K/TLSE1.K                     STATE AID FRACTION
60:A HSAF1.K=CLIP(H1,DELAY3(SAF1.K,TASA1),TIME,TS)        HISTORICAL STATE AID FRACTION
61:C TASA1=3                 TIME TO ADJUST FOR STATE AID
62:A AOE1.K=TLSE1.K/NTEE1.K             ADQUACY OF EDU EXP
63:A AOLO1.K=DLOE1.K/NOLEF1.K              ADQUACY OF LOCAL OTH EXP
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64:A EEPP1.K=TLSE1.K/NOP1.K              EDU EXP PER PUPIL
65:N HSAF1=HSAFI1
66:C HSAFI1=.16984
67:NOTE ------------------------------------
68:NOTE
69:NOTE LOCAL EDUCATION DISTRIBUTION SECTOR 1
70:NOTE
71:NOTE ------------------------------------
72:NOTE
73:NOTE OPERATING AID
74:NOTE
75:NOTE TIELED GENERAL STATE AID FOR EDUCATION 1
76:NOTE
77:A GSAFE1.K=CA.K*(1-(LPFV1.K/NOP1.K/SFPVP.K)*RLBR)*NOP1.K
78:NOTE TITLED GENERAL STATE AID FOR EDUCATION
79:L NOP1.K=NOP1.J+(DT)(NOPCH1.JK)          NUMBER OF PUPIL
80:N NOP1=NOPN1
81:C NOPN1=62778
82:R NOPCH1.KL=NOP1.K*PCHR1            NUMBER OF PUPIL CHANGE
83:C PCHR1=0
84:NOTE
85:NOTE TITLED FLAT GRANT AID
86:NOTE
87:A TFGA1.K=FA.K*NOP1.K                 TITLED FLAT GRANT AID
88:NOTE
89:NOTE FLOOR AID PROTECTION
90:NOTE
91:A PSAFE1.K=MAX(GSAFE1.K,TFGA1.K)      PROPOSED TITLED STATE AID FOR ED
92:NOTE
93:NOTE SAVE HARMLESS
94:NOTE
95:A SHSAF1.K=CLIP(NTEE1.K,MAX(FSAFE1.K,LYAFE1.K),TIME,T5)  SAVEHARMLESS STATE AID FOR ED
96:A LYAFE1.K=CLIP(LYA1,DELAY3(FSAFE1.K,TASH1),TIME,T4)    LAST YEAR'S AID FOR ED
97:C TASH1=1                          TIME TO ADJUST FOR SAVEHARMLESS
98:N LYAFE1=LYAFN1
99:C LYAFN1=22604000
100:A FSAFE1.K=SHSAF1.K*OPAF.K        FINAL TRUE STATE AID FOR ED
401:NOTE ------------------------
402:NOTE
403:NOTE STATE TAX SECTOR
404:NOTE
405:NOTE ----------------
406:NOTE
407:NOTE TAX RATE
408:NOTE
409:L SETR.K=SETR.J+(DT)(SETRC.JK)          STATE EQULIZATION TAX RATE
410:N SETR=SETRN
411:C SETRN=.079997
412:R SETRC.KL=(TARSTX.K-SETR.K)/TASTR.K      SE TAX RATE CHAN
413:A TARSTX.K=MSTR*MAXMUL.K               TARGET STATE TAX RATE
414:A MAXMUL.K=TABHL(MAXMLT,NSTR.K/MSTR,0,1.71,.19)   MAX TR MULTI
415:T MAXMLT=0/.19/.38/.57/.76/.95/.97/.98/1/1
416:A TASTR.K=TABHL(TASTRT,NSTR.K/SETR.K,.9,1.1,.05)   TIME TO ADJ STR
417:T TASTRT=.6/.9/1/1.5/2
418:C MSTR=.0579967                         MAX STATE TAX RATE
419:A NSTR.K=NSE.K/STB.K                 NEEDED STATE TAX RATE
420:L STB.K=STB.J+(DT)(STBI.JK)              STATE TAX BASE
421:N STB=STBN
422:C STBN=1115410000000
423:R STBI.KL=STB.K*STBIR               STATE TAX BASE INCREASE
424:C STBIR=0                         STATE TAX BASE INCREASE
425:NOTE
426:NOTE NEEDED EXPENDITURE
427:NOTE
428:A NSE.K=NOSE.K+NSEE.K               NEEDED STATE EXP
429:L NOSE.K=NOSE.J+(DT)(NOSEI.JK)           NEEDED OTHER STATE EXP
430:N NOSE=NOSEN
431:C NOSEN=6580799780
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432:R NOSEI.KL=NOSE.K*NOSEIR+PULSE(SOP,T3,700)              NEEDED OTHER STATE EXP INC
433:C NOSEIR=0                                   NOSE INC RATE
434:A NSEE.K=NTEE1.K*HSAF1.K+NTEE2.K*HSAF2.K+NTEE3.K*HSAF3.K+NTEE4.K*HSAF4.K   NEEDED STA EC
435:NOTE
436:NOTE $ TO STATE AID FOR EDUCATION ·
437:NOTE
438:A STR.K=STE.K*SETR.K                    STATE TOTAL REVENUE
439:A INFTO.K=NOSE.K/NSE.K                  INDICATED FRACTION TO OTHER EXP
440:A INFTS.K=NSEE.K/NSE.K                  INDICATED FRACTION TO SCH EXP
441:A DTSOA.K=STR.K*ACFRSE.K                DOLLARS TO STATE OPERATION AID
442:A ACFRSE.K=DELAY3(INFTS.K,TASEE)        ACTUAL FRAC TO STAT EDU EXP
443:C TASEE=1      TIME TO ADJUST STATE EDU EXP
444:A DTSOE.K=STR.K*ACFRSO.K           DOLLARS TO STAT OTH EXP
445:A ACFRSO.K=DELAY3(INFTO.K,TASOE)        ACTUAL FRAC TO STAT  OTH EXP
446:C TASOE=1                     TIME TO ADJUST STATE OTH EXP
447:A AOSOE.K=DTSOE.K/NOSE.K               ADQUACY OF STATE OTHER EXP
448:A AOSOA.K=DTSOA.K/NSEE.K               ADQUACY OF STATE OPERATING AID
449:A OBAF.K=DTSOA.K/(SHSAF1.K+SHSAF2.K+SHSAF3.K+SHSAF4.K)       OVER BROAD ADJ FRAC
450:A SFPVP.K=(LPFV1.K+LPFV2.K+LPFV3.K+LPFV4.K)/(NOP1.K+NOP2.K+NOP3.K+NOP4.K
451:X )                   STATE AVERAGE FULL PROPERTY VALUES
452:A CA.K=CLIP(CAA,1450,TIME,T6)
453:A FA.K=CLIP(FAA,360,TIME,T4)
454:C RLER=.51                       REQUEST LOCAL EFFORT
455:C EP1=0
456:C EP2=0
457:C EP3=0
458:C EP4=0
459:C OP1=0
460:C OP2=0
461:C OP3=0
462:C OP4=0
463:C SOP=0
464:C FAA=360
465:C LYA1=0
466:C LYA2=0
467:C LYA3=0
468:C LYA4=0
469:C H1=1
470:C H2=1
471:C H3=1
472:C H4=1
473:C T1=700
474:C T2=700
475:C T3=700
476:C T4=700
477:C T5=700
478:C T6=700
479:C CAA=1450
480:A PCLPT1.K=(LPTR1.K-LPTRN1)/LPTRN1
481:A PCLPT2.K=(LPTR2.K-LPTRN2)/LPTRN2
482:A PCLPT3.K=(LPTR3.K-LPTRN3)/LPTRN3
483:A PCLPT4.K=(LPTR4.K-LPTRN4)/LPTRN4
484:A PCSETR.K=(SETR.K-SETRN)/SETRN
485:A PCSAF1.K=(SAF1.K-HSAFI1)/HSAFI1
486:A PCSAF2.K=(SAF2.K-HSAFI2)/HSAFI2
487:A PCSAF3.K=(SAF3.K-HSAFI3)/HSAFI3
488:A PCSAF4.K=(SAF4.K-HSAFI4)/HSAFI4
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APPENDIX C

DEFINITIONS OF VARIABLES

ACFRSE	ACTUAL FRACTION TO STATE EDUCATION EXPENDITURE
ACFRSO	ACTUAL FRACTION TO STATE OTHER EXPENDITURE
AOE	ADEQUACY OF EDUCATION EXPENDIRURE
AOLO	ADEQUACY OF LOCAL OTHER EXPENDITURE
AOSOE	ADEQUACY OF STATE OTHER EXPENDITURE
CA	CEILING AID (PER PUPIL)
DLOE	DOLLARS TO LOCAL OTHER EXPENDITURE
DLSE	DOLLARS TO LOCAL SCHOOL EXPENDITURE
DTSOA	DOLLARS TO STATE OPERATING AID
EEPP	EDUCATION EXPENDITURE PER PUPIL
FA	FLOOR AID (PER PUPIL)
FSAFE	FINAL TRUE STATE AID FOR EDUCATION
GSAFE	(TITLEC) GENERAL STATE AID FOR EDUCATION
HSAF	HISTORICAL STATE AID FRACTION
HSAFE	HISTORICAL STATE AID FRACTION INITIAL
INFLO	INDICATED FRACTION TO LOCAL OTHER (EXPENDITURE)
INFLS	INDICATED FRACTION TO LOCAL SCHOOL (EXPENDITURE)
INFTO	INDICATED FRACTION TO (STATE) OTHER EXPENDITURE
INFTS	INDICATED FRACTION TO (STATE) SCHOOL EXPENDITURE
LMAXM	LOCAL MAXIMUM TAX MULTIPLIER
LMAXT	LOCAL MAXIMUM TAX MULTIPLIER TABLE
LPFV	LOCAL PROPERTY FULL VALUE
LPFVI	LOCAL PROPERTY FULL VALUE INCREASE
LPFVN	LOCAL PROPERTY FULL VALUE INITIAL
LPNIR	LOCAL PROPERTY NET INCREASE RATE
LPTI	LOCAL PROPERTY TAX INCOME
LPTR	LOCAL PROPERTY TAX RATE
LPTRC	LOCAL PROPERTY TAX RATE CHANGE
LPTRN	LOCAL PROPERTY TAX RATE
LYAFE	LAST YEAR'S AID FOR EDUCATION
LYAFN	LAST YEAR'S AID FOR EDUCATION INITIAL
MAXMLT	MAXIMUM (STATE) TAX RATE MULTIPLIER TABLE
MAXMUL	MAXIMUM (STATE) TAX RATE MULTIPLIER
MSTR	MAXIMUM STATE TAX RATE
MTR	MAXIMUM (LOCAL) TAX RATE
NEEIR	NEEDED EDUCATION EXPENDITURE INCREASE RATE
NEEPI	NEEDED EDUCATION EXPENDITURE PER PUPIL INCREASE
NEEPN	NEEDED EDUCATION EXPENDITURE PER PUPIL INITIAL
NEEPP	NEEDED EDUCATION EXPENDITURE PER PUPIL
NEFFP	NEEDED EDUCATION FUND FROM PROPERTY TAX
NEFPT	NEEDED EXPENDITURE FROM PROPERTY TAX
NLTR	NEEDED LOCAL TAX RATE
NOEIR	NEEDED OTHER (LOCAL) EXPENDITURE INCREASE RATE
NOLEF	NEEDED OTHER LOCAL EXPENDITURE FROM PROPERTY TAX
NOLEI	NEEDED OTHER LOCAL EXPENDITURE INCREASE
NOLEN	NEEDED OTHER LOCAL EXPENDITURE INITIAL
NOP	NUMBER OF PUPIL
NOPCH	NUMBER OF PUPIL CHANGE
NOPN	NUMBER OF PUPIL INITIAL
NOSE	NEEDED OTHER STATE EXPENDITURE
NOSEI	NEEDED OTHER STATE EXPENDITURE INCREASE
NOSEIR	NEEDED OTHER STATE EXPENDITURE INCREASE RATE
NOSEN	NEEDED OTHER STATE EXPENDITURE INITIAL
NSE	NEEDED (TOTAL) STATE EXPENDITURE

NSEE	NEEDED STATE EDUCATION EXPENDITURE
NSTR	NEEDED STATE TAX RATE
OBAF	OVERBOARD ADJUSTMENT FRACTION
PCHR	PUPIL CHANGE RATE
PSAFE	PROPOSED STATE AID FOR EDUCATION
RLBR	REQUEST LOCAL BURDEN RATIO
SAF	STATE AID FRACTION
SETR	STATE EQUALIZATION TAX RATE
SETRC	STATE EQUALIZATION TAX RATE CHANGE
SETRN	STATE EQUALIZATION TAX RATE INITIAL
SFPVP	STATE AVERAGE FULL PROPERTY VALUE PER PUPIL
STR	STATE TAX BASE
STRIR	STATE TAX BASE INCREASE
STRN	STATE TAX BASE INITIAL
STR	STATE TOTAL REVENUE
TALOE	TIME TO ADJUST LOCAL OTHER EXPENDITURE
TALSE	TIME TO ADJUST LOCAL SCHOOL EXPENDITURE
TALTR	TIME TO ADJUST LOCAL TAX RATE
TALTT	TIME TO ADJUST LOCAL TAX RATE TABLE
TARPT	TARGET PROPERTY TAX RATE
TARSTX	TARGET STATE TAX RATE
TASA	TIME TO ADJUST STATE AID
TASEE	TIME TO ADJUST EDUCATION EXPENDITURE
TASH	TIME TO ADJUST FOR SAVE-HARMLESS
TASOE	TIME TO ADJUST STATE OTHER EXPENDITURE
TASTR	TIME TO ADJUST STATE TAX RATE
TASTRT	TIME TO ADJUST STATE TAX RATE TABLE
TFGA	TITLED FLAT GRANT AID
TLSE	TOTAL LOCAL SCHOOL EXPENDITURE