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ABSTRACT

The model described in this report is a computer program capable of projecting population, enrollment, teacher supply (within six age classifications); and expenditures and revenues for 10 years for each intermediate unit, the State, and four residence classifications: metropolitan-center city, metropolitan-other, suburban or small community, and rural. The model can be used to pretest the financial impact of various assumptions about future trends, such as the impact of nonpublic school closings and the resultant influx of students into the public schools. All output is in terms of intermediate unit, type of residence, and State total. Almost any kind of proposed change can be simulated provided the proposal is clearly stated and quantifiable. The model pretests the financial outcome of proposed changes on the assumption that the interaction of variables within the educational finance system will be unchanged 10 years hence. (Author/EA)

An Educational Finance Planning Model for Pennsylvania

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SUMMARY

The model is a computer program capable of projecting population, enrollment, teacher supply within six age classifications, expenditures and revenues for 10 years for each intermediate unit, the state and four residence classifications: (1) metropolitan--center city, (2) metropolitan--other, (3) suburban or small community and (4) rural.

The model has been developed around assumptions about future trends in population growth, enrollment characteristics, etc., and the interaction of the different variables within the educational finance system.

The model can be used to pretest the financial impact of various assumptions about future trends. For example, it can pretest the impact of nonpublic school closings and the resultant influx of students into the public schools. Or it can test the impact of increasing pupil-teacher ratios. All output is in terms of intermediate unit, type of residence and state total. Almost any kind of proposed change can be simulated providing the proposal is clearly stated and able to be quantified, i.e., a proposed 20 per cent increase in pupil-teacher ratios. These changes can be made with varying degrees of ease, some being rather easily accommodated and others requiring substantial effort.

The model pretests the financial outcome of proposed changes assuming that the interaction of variables within the educational finance system will be essentially the same in 10 years as it is now.

CHAPTER I

PURPOSE, OBJECTIVES AND USE

A. Purposes

The President's Commission on School Finance submitted a proposal to the Pennsylvania Department of Education to undertake the development of an educational finance planning model. The primary purpose of this project was to develop a prototype model of the educational finance system in Pennsylvania and to test the feasibility of using a financial model framework developed on a national level at the state level.

The educational finance system is complex and few facts about the interaction of different variables within the system are available. Therefore, many of the interactions within the model are the result of subjective decisions and assumptions rather than hard empirical data. These decisions and assumptions, whenever possible, were tied to hard data, known economic relationships, research literature and the advice of experts. The model represents a description of the system of educational finance in Pennsylvania and from that viewpoint can be evaluated. At this point in time, there seem to be few, if any, such descriptions and from that stance alone the model represents an achievement of some worth.

The presentation of the model which follows will discuss data processing and collection, a narrative description of the interactions within the model, a discussion of output and a set of appendices to include a detailed users guide.

B. Objectives and Uses

Because of the overall complexity of attempting to create a model that could encompass all aspects of the educational finance system in Pennsylvania, a framework which would at a minimum be able to simulate using a wide range of assumptions about educational finance was developed. The model had to be able to accept data in the level of detail that could be developed within the time constraints of the agreement between the Commonwealth of Pennsylvania and the President's Commission on School Finance. The task was approached with the concept in mind that the model created would be a prototype and would lead the way to continuing comprehensive model building efforts and planning efforts. The model development was also undertaken to be as flexible as possible in the following areas of projection:

1. Projections of enrollments, using alternative assumptions related to population forecasting and enrollment trends.

2. Projections of teacher supply as a function of enrollments, hiring and rehiring assumptions.

3. Projections in expenditure levels required for various types of educational programs affecting certain target groups and dependent upon desired levels of program implementation.

4. Projections of revenue supply based upon alternative methods of financing education as related to population characteristics, economic forecasts, changes in taxation patterns and changes in distribution patterns.

5. Projection of differences between revenue supplied and expenditures anticipated for various kinds of school districts.

In addition, the model is designed to evaluate nonpublic enrollment and financial needs, the impact of different levels of federal funding, and the testing of various methods of achieving economies in education.

B. Long-Term Objectives and Uses

1. The model can serve as a guide to developing models that handle data on a more discrete level than the intermediate unit.

2. The model can provide a method for pretesting the financial implications of educational decisions prior to legislative processes or policy making.

3. The model can be used by planning agencies to pretest the financial implications of several alternatives prior to deciding which alternative will be developed.

4. The model can be updated, refined and used on a continual basis.

5. The model can be revised to forecast for longer periods of time, provided the trend data is available.

C. Summary

This project has resulted in the development of a model which can project educational finances under alternative assumptions. The model is a prototype and was developed under limited time constraints. As such, the concepts used for the prototype should serve as the guide for future models. In its present stage the model is useful, provided the user is aware of the limitations surrounding the equations and the data. (See Chapter II, Section II for these limitations.)

CHAPTER II

DATA COLLECTION AND PROCESSING

The educational finance planning model is structured in such a manner than the basic unit is the intermediate unit as defined by law.* In addition, within each intermediate unit individual school administrative units have been grouped into one of four residence classifications: (1) metropolitan--center city, (2) metropolitan--other, (3) suburban or small community and (4) rural.**

This scheme allows data to be taken into the model in any of four ways:

1. By Intermediate Unit
   Data can be developed for the intermediate unit and applied to each type of residence within the unit (29 possible entries).

2. By Type of Residence
   Data can be developed by type of residence on a state basis and applied to all intermediate units throughout the state (four possible entries).

3. By Type of Residence Within Intermediate Unit
   Data at this level is the most preferable in that it recognizes all regional and residential differences (73 possible entries).

4. By State Level
   One factor, if available only on a state basis, can be assumed to be the same throughout the state. This is the least adequate kind of data used.

Virtually no one classifies data in terms of intermediate unit and type of residence. Therefore, one of the major tasks of the project was to take existing data that came in by county, school administrative unit, state or samples of counties and municipalities and try to convert it to either intermediate unit level, type of residence level, or type of residence within intermediate unit level.

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*See Appendix B for a list of intermediate units.
**See Appendix A for definitions of type of residence and individual school administrative unit classifications.

A. Data Collection and Processing

Data collection and processing activities were undertaken on three levels: (1) the collection of basic source data, (2) processing of source data for conformity to the model structure and (3) editing data bases for use as input into the model. This section will discuss briefly the format of the data used for model input. Detailed information on the collection and processing to include systems books and file layouts is contained in Data Preparation for the Pennsylvania Educational Finance Planning Model, an in-house information publication.

1. Population

   a. The basic input for the population sector of the model was the 1970 1st Count Census. This data exists in five-year age groups and is available by county and municipality.

      (1) This data was prorated into population for individual years of age for county and major city using percentages obtained from 1960 census data. The assumption was made that there was the same percentage of each specific age in a five-year age group in 1970 as in 1960.

      (2) The next step required prorating the population for age groups within counties into age groups within type of residence within county. The percentages for prorating to type of residence within county were developed by using school district population data and residence classification. The percentages of all the school district population of a specific type of residence within a county was used as a standard percentage for prorating census data.

      (3) The county--type residence population percentages were applied to the census data, providing a 1970 census figure for county and type of residence within county.

      (4) The final step was summing the appropriate residence classifications for counties comprising the intermediate units to create population by type of residence within intermediate unit.

   b. Survival Rates

      (1) Survival rates for ages 0-19 for 1960 to 1969 were over 99 per cent for Pennsylvania. It was assumed that this rate would be the same for 1970 to 1980 and a factor of .9999 was entered as the survival rate for each type of residence and applied to all ages in all intermediate units.

c. Fertility Rates

(1) 1970 fertility rates were calculated by first prorating the live births by county for 1970 on the basis of the percentage of population by type of residence within each county. These numbers were summed into a total number of live births for type of residence within the state. This sum was then divided by the number of women age 15-44 in that type of residence within the state. These figures were applied to each type of residence within each intermediate unit.

EXAMPLE: $\text{Fertility Rate} = \frac{\text{Total live births by type of residence}}{\text{Total women, 15-44, by type of residence}}$

(2) 1980 fertility rates were arrived at by assuming that fertility rates would decline over 10 years. The rate of decline was calculated from projections of the fertility rate in Pennsylvania.

d. Increase in the Number of Mothers from Year to Year

(1) This figure was obtained from population projections developed by the Bureau of Educational Research, Department of Education.

e. Migration Rates

(1) Migration rates were developed for each county by comparing 1960 and 1970 population and creating a 10-year net migration rate.

(2) It was assumed that the net migration for 1970 to 1980 would be the same as that for 1960 to 1970.

(3) The county migration rates were prorated into residence classifications and summed into intermediate unit totals to provide a net migration rate for type of residence within intermediate unit.

2. Enrollment

a. Public Enrollment

(1) A matrix was developed, using 1960 census data, to show both the percentage of students of a specific age in school and the percentage of each age group in a particular grade.

(2) The basic assumption was that these percentages would remain the same over 10 years, with the additional assumption that by 1980 five per cent of the 3-year-olds and 15 per cent of the 4-year-olds would be in school.

b. Nonpublic Enrollment

(1) The percentage of nonpublic enrollment to total enrollment in 1970-71 was calculated for each type of residence within intermediate unit using existing state data.

(2) Ratios were developed from existing 1970-71 data to show the distribution of nonpublic enrollment over five grade levels on a statewdie basis: (1) preschool, (2) kindergarten, (3) grades 1-6, (4) 7-8 and (5) 9-12.

(3) For the basic model it was assumed that nonpublic enrollment would decrease as predicted by a report to the President's Commission on School Finance by the University of Notre Dame.

c. Special Education Enrollment

(1) A matrix was developed, from existing 1969-70 state data, to show the percentage of students with specific disabilities enrolled at different grade levels.

(2) It was assumed that these rates would remain the same between 1970 and 1980.

3. Teacher Supply and Demand

a. Pupil-Teacher Ratio

(1) Pupil-teacher ratios were calculated from existing state data. Pupil-teacher ratios for each school district were classified into type of residence within intermediate unit. These ratios were summed and averaged to provide an overall pupil-teacher ratio for type of residence within intermediate unit for 1970.

(2) It was assumed that the pupil-teacher ratio would decrease 10 per cent by 1980.

b. Number of Teachers and Salaries

(1) Teachers were grouped into six age classifications:

Less than 25
25-29
30-39
40-49
50-59
greater than 59

The actual number of teachers in each age classification and their mean salary for type of residence within intermediate unit was obtained from existing state records for 1970-71.

(2) Gross salaries for substitute teachers were calculated from existing 1970-71 data for each intermediate unit.

(3) Mean teacher salaries for each intermediate unit were calculated from existing data.

c. Hiring Ratios

(1) The number of teachers hired within an age group as related to the total number of teachers hired was obtained from existing 1970-71 state data.

(2) These ratios were created for each type of residence on a statewide basis.

d. Withdrawal Ratios

(1) The number of teachers in a specific age group who leave teaching as compared with the total number of teachers in that age group was obtained from existing 1970-71 state data.

(2) These ratios were created for each type of residence on a statewide basis.

4. Expenditures

a. Expenditure data was obtained from existing 1969-70 files. The following expenditure ratios were calculated for type of residence within intermediate unit:

(1) administrative salaries for education to total instructional salaries

(2) other administrative salaries to total administrative salaries

(3) other administrative costs to total administrative salaries

(4) federal program administration to total federal revenue

(5) supervisors' salaries to teachers' salaries

(6) other instructional salaries to total salaries

(7) secretarial, etc., salaries to teachers salaries

(8) instructional expenses to teachers salaries

(9) total pupil personnel expenditures to total instructional expense

(10) total operation and maintenance of plant to total instructional expense

(11) total fixed charges to total instructional expense

(12) total food services to total instructional expense

(13) total student activities to total instructional expense

(14) total community services to total instructional expense

(15) total other health services to total instructional expense

(16) the ratio of capital outlay to current expenditures

(17) the ratio of debt service to current expenditures

5. Revenue

a. Per pupil revenue for density and sparsity and per pupil revenue for other purposes was calculated from existing 1969-70 state data by type of residence within intermediate unit.

b. The per cent of federal revenue to total revenue was calculated from existing 1969-70 state data for each type of residence within intermediate unit.

c. The ratio of other local taxes to total taxes for 1969-70 was calculated for each type of residence within intermediate unit to determine that portion of local revenue obtained from property tax.

d. The millage on market value was calculated from existing 1969-70 data for each type of residence within intermediate unit.

e. Total market value and total taxes were calculated for each type of residence within intermediate unit.

f. Elasticity factors which show a percentage change in market value as personal income changes were developed for each intermediate unit.

g. Personal income by intermediate unit and type of residence was calculated from existing data obtained from the State Planning Board.

h. The following ratios were created by type of residence within intermediate unit from existing 1969-70 state data:

(1) total federal revenue to total revenue

(2) total state revenue to total revenue

(3) total local revenue to total revenue

i. Projected receipts from the state income tax were provided by the Department of Revenue, Commonwealth of Pennsylvania.

6. Transportation

a. A summary file of school transportation in Pennsylvania was created from existing 1969-70 state data which contains the following information by type of residence within intermediate unit:

(1) ratio of pupils transported to total pupils

(2) cost of transportation per pupil

(3) ratio of state reimbursement to total cost

(4) ratio of federal reimbursement to total cost

7. School Buildings

a. A file was created from existing 1960-70 state data by type of residence within intermediate unit that contains the number of school buildings in eight age classifications for both elementary and secondary schools.

b. Existing state data on school building costs for 1969-70 was collected for type of residence as follows:

(1) pupil capacity

(2) total project cost

(3) original site cost

(4) architect's fee

(5) elementary, secondary or special

8. Change in Millage Rate

a. The per cent change in millage rate was developed by type of residence and applied to all intermediate units in the state.

The per cent difference between 1968-69 millage and 1969-70 millage was calculated from existing state data.

9. Inflation Factor

   a. It was assumed that inflation would continue at a rate of two per cent a year.

10. Real Increase in Teachers' Salaries

   a. It was assumed that teachers' salaries would increase at a rate of .5 per cent a year.

11. Special Education Costs

   a. Special Education costs were obtained at the state level by several specific categories.

B. Limitations on Input Data

1. Rate of Inflation

   a. This variable was assumed to be two per cent. It is questionable whether or not the rate used is accurate or whether it will hold for 10 years. However, it was necessary to account for this factor in the model and an inflation rate of two per cent annually appears to be rather conservative.

2. Rate of Real Increase in Teachers' Salaries

   a. It was assumed that the real increase in teachers' salaries would be .5 per cent annually. It should be noted that this figure is used in reference to the average salary of large groups of teachers and not to individual salaries. There is no empirical evidence to support using .5 per cent in this instance; however, it appears reasonable to assume that teachers' salaries will continue upward and that the inflation factor of two per cent and the real increase factor of .5 per cent represent modest increases in teachers' salaries.

3. Cost Per Pupil of Various Special Education Programs

   a. This data represents statewide cost for specific categories of special education. Although the assumption can be made that these costs apply to all intermediate units and all types of residence, it appears obvious that there are differences between areas. This data should be collected for type of residence within intermediate unit in order to account for the necessary differentials.

4. Distribution of Nonpublic Enrollment Over Grade Levels

   a. This data was developed on a statewide basis and applied to all types of residence and intermediate units. It should be collected by type of residence within intermediate unit.

5. Ratio of Special Education Pupils by Program and Type of Residence to Public Enrollment

   a. This data was developed by type of residence using sample county level data and applied to all intermediate units. Greater accuracy could be obtained by collecting special education ratios specific to type of residence within intermediate unit.

6. Migration Rates for Age Groupings for Type of Residence Within Intermediate Unit

   a. This data does not reflect rates developed from actual data. Rather it represents combining and adjusting county rates to reflect approximations of rates for type of residence within intermediate unit. These rates would provide greater accuracy within the model if developed from the data for the specific type of residence within intermediate unit.

7. School Age Participation Rates for 1970-1980

   a. This data represents the percentage of a specific age group in school and was developed from 1960 data. In addition, it was created on a statewide basis which creates further inaccuracies. This data should be developed at the minimum by type of residence and preferably by type of residence within intermediate unit using 1970 census data.

8. The Percentage of a Specific Age Group in a Specific Grade

   a. This data was developed from 1960 data and on the state level. Additional accuracy could be gained by creating the rates either by type of residence or by intermediate unit using 1970 data.

9. The Ratio of 1980 Nonpublic Enrollment to 1970 by Type of Residence

   a. This data was extracted from research done for the President's Commission on School Finance and is on a state level. There is question as to whether these figures are accurate for each intermediate unit. However, it does not seem practical to try to develop these ratios on any other basis since the current situation is fluid and the accuracy of any such projected ratios would be equally questionable.

10. The Ratio of Teachers Hired Within a Particular Age Group to Total Hirings by Type of Residence

    a. These ratios were developed on a state level by type of residence. It might be worth the effort to create these ratios by type of residence within intermediate unit to both provide greater accuracy and examine differentials.

11. The Proportion of a Teachers Withdrawing from an Age Category

    (See comment for 10 above)

12. The Rate of Change in Market Value as Personal Income Changes

    a. This data was developed on an intermediate level. The question here is can personal income be related to market value. It is possible that econometric variables can be found that would be highly related to market value and for which projections exist, however, in this model the data from personal income was available and was used. The question of relationship still exists.

13. Change in Millage Rate by Type of Residence (1968-69 to 1969-70)

    a. This data should be developed on type of residence within intermediate unit for several years in order to increase the accuracy of the projections.

C. Summary

This chapter has provided a brief description of the data collection activities needed to develop the model and also a narrative description of the data itself. Sample data is provided in Appendix C. The section on data limitations is particularly important in that it allows the reader to assess the weakness in the output. Refinement of the model should include eliminating as many of the limitations as possible.

CHAPTER III

DESCRIPTION OF THE PENNSYLVANIA EDUCATIONAL FINANCE PLANNING MODEL

The simulation model (Appendix E) has extensive documentation included with the coding. By using the following description, in addition to the model coding, it should be fairly easy to understand the methodology and equations used. Reference numbers have also been included to facilitate cross checks against the program.*

For some variables, values for two points in time are given; the initial year and the final year. A statement function (REF. 1) is then used to linearly interpolate between these two points to give the variable a value at a set time. This interpolation is performed on the following data:

Distribution of nonpublic enrollment over grade (REF. 2)
Fertility rates (REF. 3)
Age/school participation rates (REF. 4)
Migration rates (REF. 5)
Proportion of enrollment which is nonpublic (REF. 6)
Pupil-teacher ratios (REF. 7)
Personal income by residence (REF. 8)

It is not necessary to increment within this model at yearly intervals. In fact, a more suitable model results when incrementation is taken at quarterly or half intervals. This means that those rates which are read in as annual rates must be adjusted for the incrementing period. The following are adjusted:

Statewide increase in women 15/44 (REF. 9)
Inflation rates (REF. 10)
Real increases in teachers' salaries (REF. 11)
Survival rates (REF. 12)

The effects of inflation are included in this model. The following costs have been adjusted for inflation:

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*Example: REF. 9 in Chapter III can be used to located the program statements (Appendix E) associated with the calculations. REF. 9 in the program in on page 83.

Special education costs (REF. 13)
Teachers' salaries (also adjusted for real increases) (REF. 14)
Density-sparsity payments (REF. 15)
Other state payments (REF. 16)
Per pupil cost of construction of school buildings (REF. 17)
Per pupil cost of transportation (REF. 18)

There are three major loops in the model. There is the time loop (REF. 19) which pushes the time frame ahead by one period each time all the operations have been completed within the other two loops. The other two loops allow the model to consider each intermediate unit (REF. 20) and all four types of residence (REF. 21) within an intermediate unit. A conditional statement moves the model to the next residence category or intermediate unit (REF. 22) should a type of residence not exist within the specific intermediate unit.

For each basic unit the following operations are performed within each time period:

1. Population Sector

REF. 23

(Supply of women 15/44 for new time period) = (Rate of increase in number of women statewide) x (Supply of women for previous time period)

x (1 + net migration rate for women)

REF. 24

Births = (Fertility rates) x (Number of women 15/44)

Then for each age group between 0 and 19, the following equations are used:

REF. 25

(Number in age group before aging) = (Total number in age group previous time period) x (1 + net migration rate)

x (Survival rate)

The effect of aging into the next age group is calculated assuming homogeneous distribution of births over the year.

REF. 26

(Number who age into next group) = (New number in age group) x (1/incrementation period)

REF. 27

Total population in age group = (Number entering age group* from lower age group) - (Number leaving age group for next age group) + (Number in age group before aging)

Thus, from the population sector, the model has generated for each time period population by single years of age. This allows one to proceed directly into calculating enrollments.

2. Enrollment Sector

REF. 28

(Total enrollment for specific grades by years of age) = (Population for age group) x (Proportion of age group participating in school) x (Proportion of age group participating in school in specific grade)

These enrollments by single years of age and grade are combined to give enrollments by the following grade groupings:

Prekindergarten (REF. 29)
Kindergarten (REF. 29)
Grades one through six (REF. 29)
Grades seven through eight (REF. 29)
Grades nine through 12 (REF. 29)
Total enrollment (REF. 30)

REF. 31

(Total nonpublic enrollment) = (Total enrollment) x (Ratio of nonpublic to total enrollment)

REF. 32

(Nonpublic enrollment by grade grouping) = (Proportion of nonpublic enrollment in grade group) x (Total nonpublic enrollment)

*For the first age group this is equal to the number of births.

REF. 33

(Total public enrollment) = (Total enrollment) - (Total nonpublic enrollment)

REF. 34

(Public enrollment by grade group) = (Total enrollment by grade group) - (Nonpublic enrollment by grade group)

For each special education program:

REF. 35

(Enrollment in special education programs by grade group) = (Ratio of special education public enrollment by grade group) x (Public enrollment by grade group)

REF. 36

(Enrollment in special education programs) = Sum of all (Enrollment in special education programs by grade group)

REF. 37

(Total special education enrollments by grade group) = Sum of all (Enrollments in all special education programs for a grade group)

REF. 38

(Enrollment weighted by state weighting) = Sum over all grade groups [(Enrollment for each age group) x (State weighting factors)]

REF. 39

Enrollment in regular programs (Weighted for attendance) = The sum of all grade groups

[(Public enrollment per grade group - All special education except itinerants)]

x (Weighting** factor for each grade group)

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*Weighting to establish WADM

**Utilization of resources to avoid double counting of prekindergarten and and kindergarten; .5 for PreK and K and 1 for all other.

3. Teachers

Once one has the enrollment in regular programs, it is fairly easy to calculate demand for teachers.

REF. 40

Demand for teachers = (Enrollment in regular programs) / Pupil-teacher ratios

The next task is to obtain the number of teachers presently teaching in the system. Reasons for teachers withdrawing from the system are broken into two categories--withdrawals that occur at any time during the year (death, pregnancy, etc.) and withdrawals which occur at end of school year (transfer, retirement).

REF. 41

(Withdrawal rate for each age group) = (Withdrawal rate continuous for each age group) x (1/incrementing period)

+ T2* x (Year end withdrawal rate for each age group)

REF. 42 (For each age group)

(Number of teachers after withdrawals) = (Withdrawal rate) x (Number of teachers in previous time period)

REF. 43 (For each age group)

(Number of teachers aging into next group) = (Number of teachers after withdrawals) x (1/incrementing period)

x (Annual proportion which leave age group)

*T2 = 0 when time period is fractional year
T2 = 1 at year end

REF. 44 (For each age group)

(Number of teachers) = (Number of teachers after withdrawals) + (Number entering* from lower age group)

- (Number** aging to next age group)

REF. 45

(Total number of teachers in system before hirings) = The sum for all age groups (Number of teachers in age group)

REF. 46

Total new hirings*** = (Demand for teachers) - (Total number of teachers in system)

REF. 47

(Hirings by age group) = (Total hirings) x (Ratio of hirings per age group to total hirings)

REF. 48

(Number of teachers in each age group) = (Total teachers in system before hiring in each age group) + (Hirings for each age group)

REF. 49

(Total salary for regular teachers) = Sum over each age group [(Number of teachers in each age group) x (Average salary for each age group)]

REF. 50

(Total salary for both regular and special education teachers) = (Total salary for regular teachers) + (Cost of special education)

x (Ratio of special education costs attributed to teachers)

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*This number is zero for the first age group.
**This number is also zero for the last age group. Hiring will cover all new entries into group as withdrawals will cover all retirements from the final age group.
***Total new hirings is not allowed to be negative.

REF. 51

(All teachers' salaries including fringe benefits) = (Total salary for both regular and special education teachers) x (1 + fringe factor)

4. Building Sector

A flow similar to that used in the population and teacher supply sector of this model is used in the building sector.

REF. 52

(Per pupil capacity of buildings after replacement needs) = (Per pupil capacity from previous period) x (1-proportion of buildings of that age to be replaced)

REF. 53

$$\text{(Per pupil building capacity aging into next category)} = 1/10 \times \frac{1}{\text{incrementing period}} \times \text{(Per pupil capacity of buildings after replacement needs)}$$

REF. 54

(Per cent building capacity within category) = (Building capacity of previous period within category) + (Building capacity aging into this category)

Building capacity for elementary and secondary students is calculated (REF. 55) as well as enrollments in elementary and secondary schools (REF. 56). Thus, demand for new buildings is calculated as the difference between capacity and number of students (REF. 57).

REF. 58 (The following is calculated for both elementary and secondary schools.)

Capacity of buildings in category 1 = (New buildings* to meet demand) + (Capacity of buildings for category 1 in previous period)

REF. 59

$$\text{(Cost of new buildings)} = \text{Sum for elementary and secondary} \left[\text{(New building capacity)} \times \text{(Per pupil cost of construction)} \right]$$

5. Revenue Sector

REF. 60

(Effective millage rate) = (Previous millage rate) x (1 + change in millage rate)

REF. 61

Present market value = (Base market value) + (Per cent change in personal income)

x (Base market value) x (Elasticity factor)

REF. 62

Total local taxes = (Market value) x (Effective millage rates)

REF. 63

(Local taxes from other source) = (Total local taxes) x (Ratio of other sources to total local revenue)

REF. 64

Property tax = (Total local tax) - (Local taxes from other sources)

REF. 65

(Density-sparsity payments) = WADM x (State density-sparsity payments per WADM)

REF. 66

(Total state aid) = (Density-sparsity payments) + [(Other state payments per WADM) x WADM]

REF. 67

(Total state and local revenue) = (State funds) + (Local taxes)

*This variable is restricted from being zero

REF. 68

(Federal revenues) = (Ratios of federal funds to total state and local) x (Total state and local revenues)

REF. 69

(Total revenue) = (Federal revenue) + (Total state and local revenue)

6. Expenditure Sector

REF. 70

(Federal program administration costs) = (Federal revenue) x (Ratio of federal program administration costs to federal funds)

REF. 71

(Supervisors' salaries) = (Total teachers' salaries) x (Ratio of supervisors to teachers)

REF. 72

(Cost for other instructional salaries) = (Ratio of other instructional salaries to teachers' salaries)

x (Teachers' salaries)

REF. 73

Secretarial salaries = (Ratio of secretarial salaries to teachers' salaries) x Teachers' salaries

REF. 74

(Other instructional costs) = (Ratio of other instructional costs to teachers' salaries)

x (Teachers' salaries)

REF. 75

(Total instructional salaries) = (Teachers' salaries) + (Secretarial salaries)

+ (Other instructional salaries) + (Supervisors' salaries)

REF. 76

(Administrative salaries, education) = (Ratio of administrative salaries, education to total instructional salaries)

x (Total instructional salaries)

REF. 77

(Other administrative salaries) = (Ratio of other administrative salaries to administrative salaries, education)

x (Salaries for administration-education)

REF. 78

(Other administration costs) = (Ratio of other adminstrative costs to administrative salaries)

x (Total administrative salaries)

REF. 79

(Total administration costs) = (Administrative salaries, education + (Administration salaries, other + (Other administrative costs)

REF. 80

(Total instructional costs) = (Instructional salaries) + (Other instructional costs)

REF. 81

(Total pupil personnel costs) = (Ratio of pupil personnel costs to instructional costs) x (Instructional costs)

REF. 82

(Costs of operations and maintenance) = (Ratio of operations and maintenance costs to instructional costs)

x (Instructional costs)

REF. 83

(Total fixed costs) = (Ratio of fixed costs to instructional costs) x (Instructional costs)

REF. 84

(Food services costs) = (Ratio of food services costs to instructional costs) x (Instructional costs)

REF. 85

(Student activities costs) = (Ratio of students activity to instructional costs) x (Instructional costs)

REF. 86

(Cost for community services) = (Ratio of community services costs to instructional costs) x (Instructional costs)

REF. 87

(Cost for health services) = (Ratio of health services to instructional costs) x (Instructional costs)

REF. 88

(Transportation costs) = (Cost per pupil transported)

x (Total enrollment)

x (Proportion of enrollment transported)

REF. 89

(Current expenditures) = (Administration costs) + (Instructional costs)

+ (Pupil personnel costs) + (Operations and maintenance costs)

+ (Fixed costs) + (Food services)

+ (Student activities) + (Community service)

+ (Health services) + (Transportation costs)

REF. 90

Debt service = (Ratio of debt service to current expenditures) x (Current expenditures)

REF. 91

(Capital expenditures) = (Ratio of capital expenditures to current expenditures) x (Current expenditures)

REF. 92

(Total expenditures) = (Current expenditures) + (Debt service) + (Capital expenditures)

The above equations cover all operations performed on each basic unit. The next two sections of the model aggregate the data from the basic unit into three levels: intermediate unit, statewide by type of residence, and total state (REF. 93).

The final section then converts this aggregated data into interger format suitable for writing out (REF. 94).

The equations illustrate the rationale used in calculating different outputs and provide a base for relating to the flow of the model. This description, used in conjunction with Appendix E, should allow the reader to fully comprehend the entire model.

CHAPTER IV

OUTPUT

A. General Description

This section contains selected projections to illustrate the results of the model. The original model output has been called the Basic Model and is based on the following assumptions:

1. Population

   a. Fertility rates will decrease between 1970 and 1980.

   b. Survival rates will remain constant between 1970 and 1980.

   c. Migration rates for basic units will be the same for the period 1970-1980 as they were in 1960-1969.

2. Enrollment

   a. The percentage of students of a specific age in school will be the same for the period 1970-1980 as it was in 1960 except for preschool ages which will increase.

   b. The percentage of a particular age in a specific grade will be the same for the period 1970-1980 as it was in 1960.

   c. Nonpublic enrollment will decrease as predicted by a report prepared for the President's Commission on School Finance by the University of Notre Dame.

   d. Special education incidence rates will be the same for the period 1970-1980 as they were in 1969.

3. Teacher Supply/Demand for Salary

   a. There is an infinite pool of possible teachers.

   b. Teacher will withdraw from the system and be hired into the system at the same rates during the period 1971 to 1980 as they were in 1970.

   c. Teachers' salaries will increase annually by a factor of two per cent for inflation and a factor of .5 per cent for real increases.

d. The pupil-teacher ratio will decrease by 10 per cent from 1971 to 1980.

4. Expenditures

a. Expenditures, other than transportation, are derived from total teachers' salaries and the relationships are assumed constant between 1970 and 1980.*

b. Transportation costs are derived by taking the cost per pupil (adjusted for inflation) multiplied by the number of pupils.

5. Revenue

a. Effective millage rates would increase at the same annual rate as they did between 1968-1969.

b. Personal income for intermediate unit and type of residence would be as predicted by the State Planning Board.

c. Market value increase or decreases are related to personal income increases or decreases.

d. Local tax revenues are computed from millage on market value.

e. Property tax revenue and other tax revenue will reflect the same percentages of total local taxes in 1980 as they did in 1969.

f. State revenue is calculated by assuming increases for inflation of the present base year data until 1980.

g. Density/sparsity payments are assumed to increase because of inflation until 1980.

h. Federal revenue is assumed to reflect the same percentage of total state and local revenue in 1980 as it did in 1969.

One projection was made using the basic model. Then three additional projections were made using the basic model with a change in one assumption. These simulations were:

Basic model except pupil-teacher ratios were increased to the 1960 level by 1980 instead of decreased by 10 per cent.

Basic model without decreasing nonpublic enrollment by 1980.

Basic model except nonpublic enrollment is decreased to 0 by 1980.

*These relationships are defined in Chapter III

These three simulations illustrate the possible use of the model. Any of the basic assumptions can be changed to reflect different "feelings" about future trends.

Tables 1, 2, 3 and 4 represent comparisons of projections made by the model using the basic run and the three simulations. The areas compared are current expenditures, total expenditures, instructional costs and teachers' salaries (Appendix D provides an example of the format of the print-out sheet and illustrates the kind of output provided for 29 intermediate units, four types of residence and state total).

B. Comparisons

Tables 1, 2, 3 and 4 represent the differences in cost between the basic model projections and simulations under different conditions. For example, Table 2 illustrates that if the pupil-teacher ratio is increased to its 1960 level by 1980, instead of being decreased by 10 per cent, the difference in total expenditures would be a decrease of 18 per cent for the state by 1980. The simulated data is compared against projections from the basic run assuming the basic run reflects the "most likely" circumstances in 1980.

Some basic findings can be stated if the assumptions made in the basic model are accepted as the "most likely" set of conditions in 1980:

1. Increasing the pupil-teacher ratio appears to be one way of significantly decreasing school costs.

2. If the nonpublic student population stays at the same proportion of public in 1980 as in 1970 the increase in expenditures would be less severe because of decreasing enrollments.

3. If nonpublic enrollment decreases to 0 by 1980, the effect on state expenditures will be only slightly higher than it would have been with less of a decrease in nonpublic enrollment. However, this condition would increase some individual intermediate unit costs by greater than 10 per cent and it appears as though all center cities would show high cost increases.

C. Summary

The output from these simulations must be interpreted in terms of the assumptions made in building the basic model. These projections were made using the best data available within the time constraints and the inter-relationships stated in Chapter III. Only on these terms is the output usable.

TABLE 1

*CURRENT EXPENDITURES**
(Selected Output Data)

Simulations

1 = Pupil-teacher ratio increased to 1960 level by 1980
2 = Nonpublic enrollment same in 1980 as 1970
3 = Nonpublic enrollment decreases to 0 by 1980

Type of** Residence	1972 Basic Model	1972 Simulations $ 1	1972 % diff	1972 $ 2	1972 % diff	1972 $ 3	1972 % diff	1976 Basic Model	1976 Simulations $ 1	1976 % diff	1976 $ 2	1976 % diff	1976 $ 3	1976 % diff	1980 Basic Model	1980 Simulations $ 1	1980 % diff	1980 $ 2	1980 % diff	1980 $ 3	1980 % diff
1	464657	441309	-5	441569	-5	478186	3	585775	501015	-15	503613	-15	635302	8	815048	633918	-23	644600	-21	919503	11
2	196019	187173	-5	188231	-4	199425	2	231807	303457	-13	207596	-11	243297	4	295615	244194	-18	252267	-15	316548	7
3	804619	776882	-3	790390	-2	810516	1	922788	814561	-12	876758	- 5	944091	2	1149933	959476	-17	1067673	- 8	1189297	3
4	242395	237479	-2	240871	-1	242506	0	272769	243643	-11	266779	- 3	274821	0	335676	283763	-16	325130	- 4	339720	1
State Total	1707683	1642837	-4	1661053	-3	1730627	1	2013123	1762670	-13	1854739	- 8	2097504	4	2596270	2121347	-19	2289267	-12	2765064	6
Selected Intermediate Units																					
2	65104	61427	-6	61235	-6	67321	3	81605	69170	-16	66120	-19	90368	10	118990	91481	-24	86328	-28	138443	16
3	163634	158900	-3	159516	-3	165544	1	183623	161608	-12	170757	- 8	189710	3	225536	187541	-17	203105	-10	236303	4
10	30255	29575	-3	30040	-1	30240	-1	35056	31213	-11	34375	- 2	35246	0	44388	37504	-16	43166	- 3	44820	0
17	36564	35861	-2	36387	-1	36516	-1	41080	36555	-12	40529	- 2	41204	0	49974	42211	-16	49062	- 2	50263	0
19	38631	37022	-5	37695	-3	39099	1	46090	40564	-12	43113	- 7	47686	3	58827	48409	-16	53045	-10	62003	5
20	39003	38817	-1	38895	-1	39002	0	44654	39088	-13	42183	- 6	45952	2	58408	47394	-19	53481	- 9	61120	4
26	247802	235280	-6	233226	-6	256911	3	317117	271518	-15	266811	- 6	348487	9	440553	342569	-23	336673	-24	505321	14
27	32218	31271	-3	31833	-2	32356	0	35693	31585	-12	34598	- 4	36181	1	43532	36694	-16	41650	- 5	44408	2

*Thousands of dollars
**1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 2

Simulations

1 = Pupil-teacher ratio increased to 1960 level by 1980
2 = Nonpublic enrollment same in 1980 as 1970
3 = Nonpublic enrollment decreases to 0 by 1980

TOTAL EXPENDITURES*
(Selected Output Data)

Type of** Residence	1972 Basic Model	1972 Simulations $ 1	% diff	$ 2	% diff	$ 3	% diff	1976 Basic Model	1976 Simulations $ 1	% diff	$ 2	% diff	$ 3	% diff	1980 Basic Model	1980 Simulations $ 1	% diff	$ 2	% diff	$ 3	% diff
1	512627	486950	-6	487225	-5	527515	2	646163	552652	-15	555630	-14	700737	8	899035	699209	-22	711212	-21	1014138	13
2	225566	215411	-5	216607	-4	229487	1	266754	234144	-12	238868	-10	279994	5	340260	281066	-18	290324	-15	364381	7
3	940927	908527	-4	924272	-2	947863	1	1079139	952513	-12	1025195	- 5	1104164	2	1344935	1121971	-17	1247995	- 7	1391144	3
4	281226	275510	-3	279450	-1	281363	0	316483	282675	-11	309941	- 2	318887	1	389482	329208	-15	377168	- 3	394213	1
State Total	1960340	1886392	-4	1907547	-3	1986222	1	2308535	2021978	-12	2129178	- 8	2403778	4	2973708	2431449	-18	2626695	-12	3163872	6
Selected Intermediate Units																					
2	71764	67711	-6	67499	-6	74208	3	89953	76247	-15	72884	-19	99612	11	131163	100840	-22	95159	-27	152595	16
3	188331	182934	-3	183607	-3	190529	1	211268	185947	-12	196487	- 7	218266	3	259472	215772	-17	233700	-10	271849	5
10	34504	33731	-2	34259	-1	34478	0	39976	35594	-11	39200	- 2	40193	1	50617	42767	-16	49224	- 3	51108	1
17	43010	42187	-2	42804	-1	42955	0	48329	43000	-11	47674	- 1	48466	0	58780	49651	-16	57710	- 2	59114	0
19	42289	40533	-4	41270	-2	42796	1	50424	44394	-12	47191	- 6	52153	3	64298	52950	-18	58026	-10	67732	5
20	46462	46242	-1	46335	0	46462	0	53187	46567	-12	50242	- 6	54737	3	69581	56451	-19	63704	- 8	72819	5
26	272756	258793	-7	256712	-6	282782	4	349051	298860	-14	293679	-16	383580	10	484917	377065	-22	370576	-24	556207	15
27	37014	35936	-3	36577	-1	37169	0	40987	36272	-12	39745	- 3	41539	1	49971	42125	-16	47837	- 4	50963	2

*Thousands of dollars
**1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 3

Simulations

1 = Pupil-teacher ratio increased to 1960 level by 1980
2 = Nonpublic enrollment same in 1980 as 1970
3 = Nonpublic enrollment decreases to 0 by 1980

INSTRUCTIONAL COSTS*
(Selected Output Data)

Type of** Residence	1972 Basic Model	1972 Simulations $ 1	1972 Simulations % diff	1972 Simulations $ 2	1972 Simulations % diff	1972 Simulations $ 3	1972 Simulations % diff	1976 Basic Model	1976 Simulations $ 1	1976 Simulations % diff	1976 Simulations $ 2	1976 Simulations % diff	1976 Simulations $ 3	1976 Simulations % diff	1980 Basic Model	1980 Simulations $ 1	1980 Simulations % diff	1980 Simulations $ 2	1980 Simulations % diff	1980 Simulations $ 3	1980 Simulations % diff
1	348352	331218	-5	331389	-5	359507	3	441754	377582	-15	379556	-14	480556	9	617571	479601	-22	487755	-21	698529	13
2	143600	137152	-4	137978	-4	146413	2	170993	149794	-12	153021	-11	179994	5	219476	180838	-18	187094	-15	235589	7
3	593522	572720	-4	583263	-2	598816	1	687247	603922	-12	652471	- 5	704548	3	864901	717721	-17	801868	- 7	896251	4
4	175620	172071	-2	174743	-1	176027	0	200366	177786	-11	195991	- 2	202325	1	250308	209829	-16	242369	- 3	253861	1
State Total	1261088	1213155	-4	1227367	-3	1280757	2	1500354	1309078	-13	1381024	- 8	1567367	4	1952251	1587982	-19	1719079	-12	2084224	7
Selected Intermediate Units																					
2	46712	44412	-5	44270	-5	48761	4	59979	50220	-16	47969	-20	65861	10	86567	66699	-23	62896	-27	101343	17
3	119517	116049	-3	116505	-3	121091	1	135204	118593	-13	125567	- 7	139994	4	167403	138659	-17	150523	-10	175794	5
10	21940	21437	-3	21835	-1	21992	0	25733	22802	-11	25275	- 2	25955	1	33010	27712	-16	32140	- 3	33432	1
17	26549	26072	-2	26481	-0	26582	0	30168	26711	-11	29815	- 2	30339	1	37199	31221	-16	36571	- 2	37504	1
19	27806	26606	-4	27121	-2	28183	1	33566	29387	-12	31339	- 7	34800	3	43319	35420	-18	38968	-10	45752	5
20	28485	28391	0	28435	0	28536	0	34654	28675	-17	31055	-10	33937	2	43453	35077	-19	39754	- 9	45591	5
26	190273	180490	-5	178885	-6	197390	4	244677	209052	-15	205374	-16	269186	10	341289	264736	-23	260130	-24	391891	15
27	23327	22636	-3	23063	-1	23458	1	26079	22982	-12	25279	- 3	26475	2	32111	26939	-16	30716	- 4	32801	2

*Thousands of dollars
**1 = Metropolitan--Center City, 2 = ,etropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 4

Simulations

1 = Pupil-teacher ratio increased to 1960 level by 1980
2 = Nonpublic enrollment same in 1980 as 1970
3 = Nonpublic enrollment decreases to 0 by 1980

TEACHERS SALARIES*
(Selected Output Data)

Type of** Residence	1972 Basic Model	1972 Simulations $ 1	1972 % diff	1972 $ 2	1972 % diff	1972 $ 3	1972 % diff	1976 Basic Model	1976 Simulations $ 1	1976 % diff	1976 $ 2	1976 % diff	1976 $ 3	1976 % diff	1980 Basic Model	1980 Simulations $ 1	1980 % diff	1980 $ 2	1980 % diff	1980 $ 3	1980 % diff
1	267218	254090	-5	254300	-5	275693	3	338761	289571	-15	291464	-14	368267	9	473282	367604	-22	374588	-21	534829	13
2	114709	109563	-4	110240	-4	116945	2	136551	119627	-12	122251	-10	143670	5	175246	144088	-18	149491	-15	188062	7
3	478612	461856	-3	470402	-2	482851	1	554074	486931	-12	526226	- 5	567931	3	697211	578655	-17	646743	- 7	722311	4
4	142554	139693	-2	141844	-1	142883	0	162632	144316	-11	159083	- 2	164222	1	203189	170343	-16	196747	- 3	206071	1
State Total	1003088	965196	-4	976779	-3	1018365	2	1192013	1040439	-13	1099017	-8	1244084	4	1548921	1261005	-19	1367562	-12	1651267	6
Selected Intermediate Units																					
2	33637	31980	-5	31878	-5	35112	4	42470	36163	-15	34542	-19	47425	12	62335	48029	-23	45291	-27	72967	17
3	95565	92791	-3	93156	-3	96824	1	108109	94827	-12	100404	- 7	111940	4	133856	110872	-18	120358	-10	140566	5
10	17990	17608	-2	17905	-1	18033	0	21100	18697	-11	20724	- 2	21282	1	27066	22723	-16	26353	- 3	27412	1
17	21508	21126	-2	21435	-1	21533	0	24432	21635	-11	24145	- 1	24571	1	30126	25285	-16	29615	- 2	30373	1
19	22168	21213	-4	21626	-2	22467	1	26749	23419	-12	24987	- 7	27726	4	34511	28219	-18	31065	-10	36438	6
20	22887	22814	0	22863	0	22982	0	26414	23037	-13	24945	- 6	27257	3	34895	28180	-19	31929	- 9	36607	3
26	144481	137052	-5	135833	-6	149885	4	185792	158740	-15	155947	-16	204402	10	259152	201023	-26	197525	-24	297576	15
27	19053	18489	-3	18837	-1	19160	1	21302	18772	-12	20648	- 3	21626	2	26230	22005	-16	25089	- 4	26794	2

*Thousands of dollars

**1 = Metropolitan--Center City, 2 = Metropolitan, 3 = Suburban or small community, 4 = Rural

APPENDIX A

TYPE OF RESIDENCE CLASSIFICATIONS

DEFINITIONS OF TYPE OF RESIDENCE

Each school administrative unit in the state was assigned one of the following residence classifications. The numbers were assigned by considering population, proximity to center city and a general knowledge of the state in terms of demographic characteristics:

1 = Metropolitan, Center City--School districts within the thickly settled urban core of a larger standard metropolitan area.

2 = Metropolitan, Other--School districts bordering the central city that are the densely populated fringe of the urban core.

3 = Nonmetropolitan, Suburban or Small Community--(a) School districts near urban areas that are not a part of the urban fringe and (b) school districts in small communities detached from urban areas and serving as a center for surrounding rural areas.

4 = Nonmetropolitan, Rural--(a) Rural school districts where the population is composed largely of farm population or from small communities and (b) large countywide or combined districts in rural counties.

TYPE OF RESIDENCE CLASSIFICATION

Adams	
Upper Adams	4
Bermudian Springs	4
Littlestown Area	4
Fairfield Area	4
Gettysburg Area	3
Conewago Twp.	4
New Oxford Area	4
Allegheny	
North Allegheny	3
Quaker Valley	3
Avalon Boro.	2
North Hills	3
Bellevue Boro.	2
Babcock	3
Hampton Twp.	3
Fox Chapel	3
Braddock Boro.	2
Allegheny Valley	3
Highland Area	3
Deer Lakes	3
Plum Boro.	3
Gateway Area	3
Churchill Area	3
Wilkinsburg	2
East Allegheny	2
Elizabeth-Forward	3
East Pittsburgh	2
Clairton City	2
Edgewood Boro.	2
West Jefferson Hills	3
Baldwin-Whitehall	3
Mt. Lebanon	3
Etna Boro.	3
Upper St. Clair	3
Bethel Park	3
Chartiers Valley	3
Keystone Oaks	3
Montour	3
Carlynton	2
Sto-Rox	2
West Allegheny	3
Pittsburgh	1

Allegheny (contd.)

Avonworth	2
Homestead Boro.	2
Duquesne City	2
Brentwood	2
South Park	3
South Fayette	3
Millvale	3
Moon Union	3
Munhall Boro.	3
Neville	2
North Braddock	2
Oakmont	3
Penn Hills	3
Rankin Boro.	2
Reserve	3
Shaler	3
Swissvale	2
Turtle Creek	2
Verona	3
West Homestead	2
Coraopolis	3
McKeesport Area	2
West Mifflin	3
South Allegheny	3

Armstrong

Armstrong	3
Apollo Ridge	3
Freeport Area	3
Leechburg Area	3

Beaver

Ambridge Area	2
Black Hawk	3
Big Beaver Falls	3
Monaca	3
Baden-Economy	2
Beaver Area	3
Western Beaver	4
Midland Boro.	2
Hopewell Area	3
Aliquippa Boro.	2
Center Twp.	3
Freedom Area	3
Rochester Area	3
New Brighton	3
Northeastern Beaver	3

Beaver (contd.)

South Side Area	3
Harmony Twp.	4
Potter Twp.	4

Bedford

Bedford Area	3
Chestnut Ridge	4
Everett Area	4
Northern Bedford Co.	4
Tussey Mountain	4

Berks

Boyertown	3
Brandywine	4
Conrad Weiser	3
Daniel Boone	3
Exeter	2
Fleetwood	4
Governor Mifflin	3
Hamburg	3
Kutztown	3
Antietam	2
Muhlenberg	2
Oley Valley	3
Reading	1
Schuylkill Valley	4
Tulpenhocken	4
Twin Valley	3
Wyomissing	2
Wilson	3

Blair

Tyrone	3
Bellwood-Antis	4
Altoona	1
Williamsburg	4
Hollidaysburg	3
Claysburg-Kimmel	4
Spring Cove	3

Bradford

Towanda	4
North East Bradford	4
Wyalusing	4
Canton	4
Troy	4
Athens	3
Sayre	4

Bucks

Palisades	4
Quakertown	4
Pennridge	4
Central Bucks	3
Council Rock	3
Centennial	3
Neshaminy	3
Pennsbury	3
Morrisville	3
Bristol Twp.	3
Bristol Boro.	3
Bensalem	3
New Hope-Solebury	4

Butler

Slippery Rock	3
Moniteau	4
Butler Area	2
Southwest Butler	3
Mars	4
South Butler	3
Karns	4

Cambria

Northern Cambria	4
Cambria Heights	3
Penn-Cambria	3
Portage Area	3
Forest Hills	3
Blacklick	4
Conemaugh Valley	3
Richland	3
Ferndale	3
Westmont Hilltop	3
Central Cambria	3
Greater Johnstown	1

Cameron

Cameron County	4

Carbon

Palmerton	4
Lehighton	3

Carbon (contd.)

Jim Thorpe	4
Panther Valley	4
Weatherly	4

Centre

Bald Eagle	3
Bellefonte	3
State College	3
Penns Valley	4

Chester

Owen J. Roberts	3
Oxford	3
Phoenixville	3
Downingtown	3
Coatesville	3
Octorara	3
Tredyffrin-Easttown	3
West Chester	3
Unionville-Chadds	3
Kennett	3
Avon-Grove	3
Great Valley	3

Clarion

Allegheny-Clarion	4
Clarion	4
Clarion-Limestone	4
Keystone	4
North Clarion	4
Redbank Valley	4
Union	4

Clearfield

West Branch	4
Moshannon	4
Harmony	4
DuBois	3
Curwensville	4
Clearfield	3
Philipsburg-Osceola	3
Glendale	4

Clinton

Keystone	4

Columbia

Benton Area	4
Berwick	3
Bloomsburg	3
Central Columbia	4
Millville	4
Southern Columbia	4

Crawford

Cambridge	4
Cochranton	4
Conneaut Lake	4
Conneaut Valley	4
Linesville-Conneaut	4
Meadville	3
Randolph-East Mead	4
Saegertown Jt.	4
Sparta Merged	4
Townville	4

Cumberland

Big Spring	3
Camp Hill	3
Carlisle Area	3
Cumberland Valley	3
East Pennsboro	3
Mechanicsburg	3
Shippensburg Area	3
South Middleton	3
West Shore	3

Dauphin

Upper Dauphin	3
Millersburg Area	3
Middletown Area	3
Central Dauphin	3
Lower Dauphin	3
Steelton-Highspire	3
Halifax-Area	3
Susquehanna Twp.	3
Derry Twp.	3
Harrisburg	1

Delaware

Radnor Twp.	2
Haverford	2
Ridley	2
Springfield	2
Marple Newtown	2
Rose Tree Media	2
Chester City	1
Chichester	2
Chester Twp.	2
Garnet Valley	2
Clifton Heights Boro.	2
Collingdale Boro.	2
Darby Colwyn	2
Darby Twp.	2
Folcroft Boro.	2
Interboro	2
Lansdowne Aldan	2
Nether Providence Twp.	2
Penn Delco Union	2
Sharon Hill Boro.	2
Swarthmore-Rutledge Union	2
Upland Boro.	2
Upper Darby Twp.	2
Yeadon Boro.	2

Elk

Johnsonburg Area	4
Ridgway Area	4
St. Mary's Area	4

Erie

Erie City	1
Millcreek Twp.	2
Fairview	3
Northwestern	4
General McLane	3
Fort LeBoeuf	3
Union City Area	3
Corry Area	3
Wattsburg Area	4
North East	4
Harbor Creek	3
Iroquois	2
Girard	3

Fayette

Albert Gallatin	3

Fayette (contd.)

Frazier	4
Brownsville Area	3
Connellsville Area	3
Laurel Highlands	3
Uniontown Area	3

Forest

Forest Area	4

Franklin

Chambersburg Area	3
Waynesboro Area	3
Tuscarora	4
Greencastle-Antrim	4
Fannett Metal	4

Fulton

Southern Fulton	4
Central Fulton	4
Forbes Road	4

Greene

West Greene	4
Central Greene	3
Jefferson-Morgan	4
Carmichaels Area	4
Southeastern Greene	4

Huntingdon

Juniata Valley	4
Huntingdon Area	3
Mount Union Area	4
Southern Huntingdon County	4

Indiana

United	4
Blairsville-Saltsburg	3
Homer Center	4
Penns Manor Area	4
Indiana Area	3
Purchase Line	4
Marion Center	4

Jefferson	
Brockway Area	4
Brookville Area	3
Punxsutawney Area	3
Juniata	
Juniata County	4
Lackawanna	
Scranton City	1
Valley View	3
Abington Heights	3
Carbondale Area	3
Dunmore Boro.	3
Mid Valley	3
Riverside	4
Lakeland	4
North Pocono	3
Old Forge	
Lancaster	
Cocalico Union	3
Columbia Boro.	3
Conestoga Valley	3
Donegal	3
Eastern Lancaster	3
Elizabethtown	4
Ephrata Area	3
Hempfield	3
Lampeter-Strasburg	1
Lancaster	4
Manheim Central	3
Manheim Twp.	3
Penn Manor Area	4
Pequea Valley	4
Solanco	3
Warwick	
Lawrence	
Ellwood City Area	3
Laurel	4
Mohawk Area	3
Neshannock Twp.	4
New Castle Area	2

Lawrence (contd.)

Shenango Area	4
Union Area	4
Wilmington Area	3

Lebanon

Palmyra Area	3
Annville-Cleona	3
Cornwall-Lebanon	3
Eastern Lebanon	3
Northern Lebanon	3
Lebanon	3

Lehigh

Allentown City	1
Catasauqua Area	3
East Penn	2
Northern Lehigh	3
Northwestern Lehigh	4
Parkland	3
Salisbury Twp.	3
Southern Lehigh	3
Whitehall-Coplay	3

Luzerne

Northwest Area	4
Ashley-Sugar Notch Jt.	4
Lake-Lehman	4
Bear Creek	4
Dallas	4
Wyoming Area	3
Pittston Area	3
Wyoming Valley West	3
Crestwood	3
Greater Nanticoke	3
Hazleton	1
Hanover Twp.	2
Plains Twp.	3
Wilkes-Barre City	1
Wilkes-Barre Twp.	2

Lycoming

East Lycoming	4
Muncy	4
Montgomery Area	4

Lycoming (contd.)

Montoursville Area	3
South Williamsport	3
Williamsport Area	2
Jersey Shore	3
Loyalsock	3

McKean

Bradford Area	3
Otto-Eldred	4
Port Allegheny	4
Smethport Area	4
Kane Area	4

Mercer

Jamestown Area	4
Commodore Perry	4
Mercer Area	3
Greenville Area	3
West Middlesex	4
Grove City Area	3
Lakeview	4
Sharon City	3
Hickory Twp.	3
Reynolds	4
Sharpsville Area	4
Farrell Area	3

Mifflin

Mifflin County	4

Monroe

Pleasant Valley	4
Pocono Mountain	3
East Stroudsburg	3
Stroudsburg Area	3

Montgomery

Upper Moreland	3
Lower Moreland	2
Abington	2
Jenkintown	3
Cheltenham	3
Springfield	2
Lower Merion	2

Montgomery (contd.)

Colonial	3
Wissahickon	3
Upper Dublin	3
Hatboro-Horsham	3
North Penn	3
Methacton	3
Norristown Area	3
Upper Merion	3
Spring-Ford	3
Souderton Area	3
Upper Perkiomen	3
Pottstown	2
Pottsgrove	3
Perkiomen	3

Montour

Danville Area	4

Northampton

Bangor Area	3
Pen Argyl Area	3
Nazareth Area	3
Northampton Area	3
Easton Area	1
Wilson Area	3
Saucon Valley	2
Bethlehem	1

Northumberland

Warrior Run	4
Milton Area	3
Shikellamy	3
Line Mountain	4
Shamokin Area	3
Mount Carmel	3

Perry

West Perry	4
Susquenita	4
Newport	4
Greenwood	4

Philadelphia

Philadelphia	1

Pike	
Delaware	4
Potter	
Oswayo Valley	4
Northern Potter	4
Coudersport Area	4
Galeton Area	4
Austin Area	4
Schuylkill	
Pine Grove	4
Williams Valley	4
Tri-Valley	4
Blue Mountain	4
Schuylkill Haven	4
Minersville Area	3
Pottsville Area	3
Saint Clair Area	4
North Schuylkill	3
Shenandoah	3
Mahanoy Area	3
Tamaqua	3
Snyder	
Midd-West	4
Selinsgrove	4
Somerset	
Berlin	4
Conemaugh	3
North Star	4
Meyersdale	4
Rockwood	4
Salisbury-Elk Lick	4
Shade-Central City	4
Shanksville	4
Somerset Area	3
Turkeyfoot Valley	4
Windber Area	3
Sullivan	
Sullivan County	4

Susquehanna	
Blue Ridge	4
Elk Lake	4
Forest City	4
Montrose Area	4
Mountain View	4
Susquehanna Community	4
Tioga	
Northern Tioga	4
Southern Tioga	4
Wellsboro Area	4
Union	
Lewisburg Area	3
Mifflinburg Area	3
Venango	
Oil City	3
Franklin Area	3
Cranberry	4
Valley Grove	4
Titusville Area	3
Warren	
Warren County	4
Washington	
Fort Cherry	4
Burgettstown	3
Avella Area	4
McGuffey	4
Canon-McMillan	3
Chartiers-Houston	3
Peters Twp.	3
Trinity Area	4
Washington	3
Ringgold	3
Charleroi Area	3
Bethlehem-Center	3
California Area	3
Bentworth	4

Wayne

Wayne Highlands	4
Wallenpaupack	4
Western Wayne	4

Westmoreland

Burrell	3
Kiski Area	3
Franklin Regional	3
Derry Area	3
Greater Latrobe	3
Mount Pleasant	3
Ligonier Valley	3
Hempfield	3
Greensburg	3
Yough	3
Monessen City	3
Belle Vernon	3
Jeannette	3
Norwin	3
Penn-Trafford	3
Southmoreland	3
New Kensington-Arnold	3

Wyoming

Tunkhannock	4
Lackawanna	4

York

Central York	3
Dallastown Area	3
Dover Area	3
Eastern York	3
Northeastern York	3
Northern York County	4
Red Lion Area	3
South Eastern	4
Southern York	4
South Western	4
Spring Grove	4
West York	4
York City	1
York Suburban	2
Hanover Boro.	3

APPENDIX B

INTERMEDIATE UNITS

INTERMEDIATE UNIT NAMES AND NUMBERS

Name	Number
Intermediate Unit 1*	01
Pittsburgh-Mount Oliver	02
Allegheny	03
Midwestern	04
Northwest Tri-County	05
Intermediate Unit 6**	06
Westmoreland	07
Intermediate Unit 8***	08
Seneca Highlands	09
Central	10
Tuscarora	11
Lincoln	12
Lancaster-Lebanon	13
Berks County	14
Capital Area	15
Central Susquehanna	16
Blast	17
Luzerne	18
Northeastern Educational	19
Colonial Northampton	20
Carbon Lehigh	21
Bucks County	22
Montgomery County	23
Chester County	24
Delaware County	25
Philadelphia	26
Beaver Valley	27
Arin	28
Schuylkill	29

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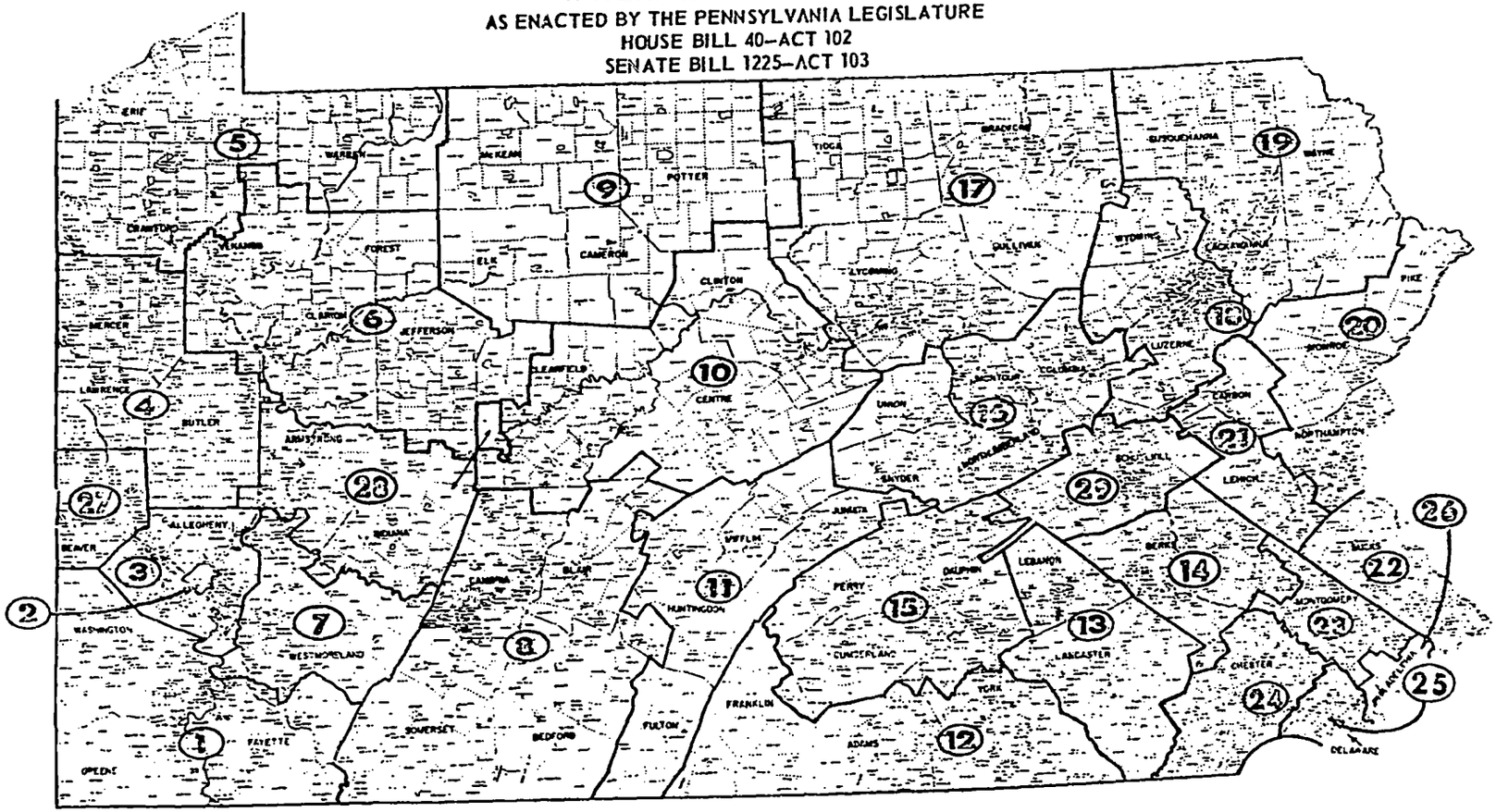
*Southwestern
**Clarion Manor
***Appalachia

INTERMEDIATE UNITS

AS ENACTED BY THE PENNSYLVANIA LEGISLATURE
HOUSE BILL 40–ACT 102
SENATE BILL 1225–ACT 103



APPENDIX C

INPUT DATA

TABLE 5

POPULATION BY INTERMEDIATE UNIT AND TYPE OF RESIDENCE FOR PENNSYLVANIA 1970

VARIABLE NAME: PEPOP
(Sample Data)

AGE

Inter. Unit	Type of Residence	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Femal 15-44
[illegible]	2	3684	4250	4701	5012	5453	5143	5124	5336	5616	5617	6101	6175	6224	6052	6115	6170	6102	6081	5534	4793	5859
1	4	1158	1336	1478	1575	1713	1637	1636	1705	1795	1795	1961	1985	2001	1945	2016	1999	1953	2005	1923	1671	1930
2	1	5537	6388	7066	7534	8195	7819	7820	8013	8437	8437	8994	9102	9174	8922	9099	9201	9121	9053	10705	10761	10620
3	2	3206	3699	4090	4362	4744	4644	4807	4951	5213	5213	5617	5685	5730	5572	5516	5491	5447	5327	4244	3483	5394
3	3	9813	11321	12519	13350	14521	14214	14715	15155	15955	15956	17192	17400	17541	17055	16885	16806	16673	16306	12990	10661	16512
4	2	1230	1419	1569	1673	1820	1718	1751	1798	1894	1893	2020	2044	2060	2004	1966	1972	1982	1932	1999	1826	1961
4	3	2199	2536	2805	2990	3253	3087	3131	3213	3383	3382	3667	3711	3740	3637	3702	3641	3714	3559	3660	3333	3532
4	4	1182	1364	1508	1608	1749	1659	1680	1730	1821	1821	1980	2004	2020	1964	1996	1975	2013	1930	1970	1790	1910
5	1	1795	2071	2291	2443	2657	2467	2530	2475	2606	2606	2685	2717	2740	2664	2687	2665	2549	2502	2762	2405	2617
5	2	631	728	805	859	934	867	889	870	916	916	944	955	963	936	944	936	896	879	971	845	920
5	3	1389	1603	1773	1891	2056	1901	1937	1897	1997	1997	2062	2087	2104	2045	2015	2031	1997	1946	2101	1893	2018
5	4	1644	1897	2098	2237	2433	2282	2266	2268	2387	2387	2481	2510	2531	2461	2345	2437	2466	2356	2199	2042	2421

TABLE 6

SURVIVAL RATES BY
TYPE OF RESIDENCE, AGES 0-19

VARIABLE: SURV

METROPOLITAN, CENTER CITY	METROPOLITAN, OTHER	SUBURBAN OR SMALL COMMUNITY	RURAL
.9999	.9999	.9999	.9999

TABLE 7

CHANGE IN MILLAGE RATE BY
TYPE OF RESIDENCE (1968-69 to 1969-70)

VARIABLE: DELM

METROPOLITAN, CENTER CITY	METROPOLITAN, OTHER	SUBURBAN OR SMALL COMMUNITY	RURAL
11.08%	15.11%	9.77%	2.55%

TABLE 8

DISTRIBUTION OF NONPUBLIC
ENROLLMENT OVER FIVE GRADE LEVELS

VARIABLE: WRPN

	PRESCHOOL	KINDERGARTEN	1-6	7-8	9-12
1970	.00%	1.9%	56.6%	17.3%	24.2%
1980	.00%	2.1%	52.8%	16.4%	28.7%

TABLE 9

FERTILITY RATES BY TYPE
OF RESIDENCE*

VARIABLE: FERT

	METROPOLITAN, CENTER CITY	METROPOLITAN, OTHER	SUBURBAN OR SMALL COMMUNITY	RURAL
1970	8.22	7.84	7.97	8.72
1980	7.76	7.77	7.73	7.97

*Number of births per 100 women aged 15-44

TABLE 10

MIGRATION RATES BY TYPE OF RESIDENCE
AND INTERMEDIATE UNIT FOR
TEN YEARS, 1960-1970*
VARIABLE: PEMIG

Intermediate Unit Number	Type of Residence	Age			
		0 - 9	10-14	15-19	Female 15-44
01	03	-.017	-.035	-.086	-.099
01	04	-.000	-.005	-.011	-.002
02	01	-.052	-.214	-.077	-.109
03	02	-.019	-.024	-.030	-.020
03	03	-.033	-.045	-.055	-.037
04	02	.006	-.008	-.025	-.011
04	03	.003	-.018	-.029	-.023
04	04	.002	-.013	-.023	-.018
05	01	-.005	-.013	-.005	-.001
05	02	-.002	-.005	-.002	-.003
05	03	-.003	-.007	-.003	-.005
05	04	.010	.007	-.006	-.015
06	03	-.012	-.037	-.070	-.069
06	04	-.006	-.031	-.061	-.022
07	03	.067	.040	-.070	-.037
08	01	-.010	-.016	-.019	-.025
08	03	-.015	-.021	-.038	-.050
08	04	-.009	-.010	-.036	-.035
09	03	-.013	-.026	-.070	-.046
09	04	-.016	-.046	-.116	-.078
10	03	-.016	-.048	.305	.052
10	04	-.015	-.031	.034	.024
11	03	-.001	-.005	.000	-.017
11	04	-.011	-.026	-.088	-.072
12	01	.005	.006	-.001	.002
12	02	.003	.003	-.001	.001
12	03	.020	.035	.016	.006
12	04	.011	.009	.000	.007
13	01	.007	.008	.010	.005
13	03	.033	.031	.036	.014
13	04	.007	.007	.010	.005
14	01	.012	.017	.013	.006
14	02	.007	.010	.008	.003
14	03	.019	1027	.021	.010
14	04	.005	.007	.005	.002
15	01	-.012	-.009	-.015	-.005
15	03	.058	.071	.126	.053
15	04	.001	.004	.000	-.004
16	03	-.010	-.016	-.062	-.041
16	04	.002	.012	.047	.014
17	02	.012	.006	.000	.006
17	03	.011	.006	.005	.005
17	04	.007	.014	.045	.022

TABLE 10
(continued)

Intermediate Unit Number	Type of Residence	Age			
		0 - 9	10-14	15-19	Female 15-44
18	01	.002	.008	-.001	-.019
18	02	.000	.001	.000	-.003
18	03	.002	.010	-.002	-.024
18	04	.011	.009	.001	-.008
19	01	.003	.001	.002	-.016
19	03	.005	.002	.002	.022
19	04	.005	.005	-.022	-.017
20	01	.029	.018	.042	-.011
20	02	.002	.002	.004	-.001
20	04	.011	.015	.008	.007
21	01	.019	.023	.011	.015
21	02	.006	.007	.003	.004
21	03	.019	.020	.003	-.017
21	04	.003	-.001	-.013	.007
22	03	.173	.135	.003	.117
22	04	.031	.024	.000	.021
23	02	.099	.134	.058	.510
23	03	.038	.052	.022	.199
24	03	.117	.266	.251	.172
25	01	-.001	-.001	-.003	-.001
25	02	-.011	-.005	.027	-.012
26	01	-.141	-.113	.063	-.030
27	02	-.001	-.003	-.006	-.005
27	03	-.010	-.046	-.082	-.075
27	04	.001	.003	.005	.004
28	03	.014	-.040	.021	-.054
28	04	-.001	-.005	.080	.010
29	03	-.010	-.017	-.067	-.065
29	04	-.008	-.014	-.053	-.051

*Assumed the same for 1970-1980.

TABLE 11

ENROLLMENT RATES BY AGE AND GRADE

VARIABLE NAME: PEROL

Age	Participation Rate for Age*		Enrollment Rates by Age and Grade**												
	1970	1980	Preschool	K	1	2	3	4	5	6	7	8	9	10	11	12
03	000	05.0	99.9													
04	000	15.0	72.5	27.5												
05	71.2	71.2		84.6	15.0	00.4										
06	94.9	94.9		06.7	82.3	10.6	00.4									
07	97.3	97.3			16.0	74.3	09.2	00.4								
08	97.8	97.8			01.4	18.7	72.4	07.2	00.3							
09	97.9	97.9			00.2	01.7	19.5	71.9	06.5	00.2						
10	98.0	98.0				00.3	02.2	19.7	71.4	06.6	00.3					
11	97.7	97.7					00.4	02.7	19.8	70.0	06.8	00.4				
12	97.3	97.3						00.6	02.9	19.9	69.0	07.1	00.6			
13	97.0	97.0							00.8	03.5	21.6	67.1	06.5	00.5		
14	95.3	95.3								00.9	03.9	20.9	66.1	07.7	00.4	
15	94.0	94.0									01.4	04.9	23.5	62.9	07.0	00.4
16	88.7	88.7										01.9	05.8	21.1	64.3	06.8
17	75.7	75.7											01.9	05.6	24.2	66.2
18	25.8	25.8												04.5	16.7	78.8
19	05.4	05.4													16.3	83.8

*Per cent of age group in school
**Per cent of age group in school in a specific grade

TABLE 12

SPECIAL EDUCATION RATIOS*

VARIABLE: SER

Type of Residence**	Educable			Trainable			Physically Handicapped			Socially and Emotionally Disturbed			Gifted			Itinerant		
	1-6	7-8	9-12	1-6	7-8	9-12	1-6	7-8	9-12	1-6	7-8	9-12	1-6	7-8	9-12	1-6	7-8	9-12
1	.0100	.0140	.0140	.0020	.0010	.0010	.0030	.0020	.0020	.0020	.0010	.0010	.0010	.0140	.0140	.0250	.0020	.0020
2	.0040	.0050	.0050	.0020	.0010	.0010	.0010	.0010	.0010	.0020	.0010	.0010	.0020	.0030	.0030	.0290	.0020	.0020
3	.0080	.0100	.0100	.0020	.0010	.0010	.0020	.0000	.0000	.0020	.0010	.0010	.0020	.0010	.0010	.0550	.0030	.0030
4	.0150	.0120	.0120	.0050	.0010	.0010	.0010	.0000	.0000	.0010	.0000	.0000	.0000	.0000	.0000	.0370	.0040	.0040

*Per cent of those enrolled in special education classification
**1 = Metropolitan--Center City, 2 = Metropolitan---Other, 3 = Suburban or small community, 4 = Rural

TABLE 13

PER CENT OF TOTAL ENROLLMENT IN NONPUBLIC SCHOOLS BY TYPE OF RESIDENCE WITHIN INTERMEDIATE UNIT

VARIABLE: RNP

Type of Residence*	Intermediate Unit	Per cent of Total Enrollment in Nonpublic	Type of Residence	Intermediate Unit	Per cent of Total Enrollment in Nonpublic	Type of Residence	Intermediate Unit	Per cent of Total Enrollment in Nonpublic
3	01	7.9	1	12	13.0	3	19	25.5
4	01	2.9	2	12	13.7	4	19	4.3
1	02	39.1	3	12	6.3	1	20	17.7
2	03	21.0	4	12	11.9	2	20	13.3
3	03	19.0	1	13	17.4	3	20	14.3
2	04	11.2	3	13	10.2	4	20	1.6
3	04	7.4	4	13	13.5	1	21	18.0
4	04	3.9	1	14	20.6	2	21	8.3
1	05	35.4	2	14	11.8	3	21	11.4
2	05	20.5	3	14	5.9	4	21	19.0
3	05	5.2	4	14	2.9	3	22	25.6
4	05	2.6	1	15	15.2	4	22	9.6
3	06	9.4	3	15	7.3	2	23	29.5
4	06	7.0	4	15	.6	3	23	22.2
3	07	12.8	3	16	11.9	3	24	13.1
1	08	22.0	4	16	4.9	1	25	23.0
3	08	13.3	2	17	6.1	2	25	38.1
4	08	4.3	3	17	5.9	1	26	35.3
3	09	8.3	4	17	1.7	2	27	16.2
4	09	15.4	1	18	22.5	3	27	6.6
3	10	6.5	2	18	21.4	4	27	7.6
4	10	4.0	3	18	21.6	3	28	5.2
3	11	.0	4	18	10.9	4	28	2.1
4	11	4.1	1	19	23.2	3	29	27.4
						4	29	10.7

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 14

RATIO OF 1980 NONPUBLIC
ENROLLMENT TO 1970 NONPUBLIC ENROLLMENT
BY TYPE OF RESIDENCE*

VARIABLE: TPEN

Metropolitan--Center City:	1980 nonpublic enrollment will be .384 of what it was in 1970.
Metropolitan--Other:	1980 nonpublic enrollment will be .332 of what it was in 1970.
Suburban or small community:	1980 nonpublic enrollment will be .332 of what it was in 1970.
Rural:	1980 nonpublic enrollment will be .309 of what it was in 1970.

*As developed by the University of Notre Dame for the President's Commission on School Finance.

TABLE 15

NUMBER OF TEACHERS AND MEAN SALARY
BY SIX AGE CLASSIFICATIONS FOR
TYPE OF RESIDENCE WITHIN INTERMEDIATE UNIT
(Sample Data)

VARIABLES: FETS SAL

Type of Residence*	Inter. Unit	Less than 25		25-29		30-39		40-49		50-59		Greater than 59		Total Teachers
		No.	Sal.	No.	Sal.	No.	Sal.	No.	Sal.	No.	Sal.	No.	Sal.	
3	01	00394	$06615	00630	$07327	00491	$08704	00404	$09476	00460	$09921	00397	$09888	02776
4	01	00119	06649	00224	07599	00171	08876	00162	09661	00182	09859	00182	09763	01040
1	02	00422	07402	00957	08495	00596	10335	00529	11222	00383	11658	00331	11949	03218
2	03	00273	07123	00619	07919	00368	09446	00327	10251	00340	10739	00341	10643	02268
3	03	01077	07157	02563	08210	01531	09902	01051	10745	00940	11205	00517	11151	07679
2	04	00109	07052	00241	07895	00166	09353	00139	10232	00129	10586	00080	10518	00864
3	04	00194	06857	00355	07756	00360	09377	00316	09875	00305	10313	00207	10188	01737
4	04	00122	06818	00239	07695	00223	09050	00160	09714	00176	10035	00111	09962	01031
1	05	00035	07529	00172	08490	00148	09825	00169	10610	00157	10531	00121	10329	00802
2	05	00064	07003	00125	07727	00100	09060	00067	10186	00067	10756	00027	10794	00450
3	05	00115	06722	00220	07400	00197	08528	00188	09467	00151	10117	00112	09910	00983
4	05	00162	06549	00295	07357	00271	08673	00180	09380	00170	09592	00191	09791	01269

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 16

PUPIL-TEACHER RATIOS

VARIABLE: PUTCH

Intermediate Unit	Type of Residence*	1970	1980**
1	3	22.7	20.4
1	4	23.4	21.0
2	1	21.1	18.9
3	2	20.7	18.6
3	3	22.7	20.4
4	2	23.5	21.1
4	3	22.9	20.6
4	4	22.9	20.6
5	1	24.1	21.6
5	2	24.5	22.0
5	3	23.4	21.0
5	4	23.4	21.0
6	3	23.3	20.9
6	4	22.5	20.2
7	3	23.9	21.5
8	1	22.6	20.3
8	3	24.0	21.5
8	4	22.9	20.6
9	3	19.5	17.5
9	4	23.5	21.1
10	3	23.6	21.2
10	4	23.3	20.9
11	3	21.5	19.3
11	4	23.6	21.2
12	1	18.9	17.0
12	2	19.6	17.6
12	3	22.8	20.5
12	4	23.4	21.0
13	1	18.1	16.2
13	3	22.3	20.0
13	4	21.3	19.1
14	1	21.4	19.2
14	2	19.4	17.4
14	3	22.7	20.4
14	4	24.0	21.5
15	1	19.7	17.7
15	3	21.5	19.3
15	4	21.6	19.4
16	3	24.1	21.6
16	4	23.7	21.3
17	2	24.4	21.9
17	3	23.3	20.9
17	4	22.6	20.3

TABLE 16
(Continued)

Intermediate Unit	Type of Residence*	1970	1980**
18	1	22.0	19.7
18	2	25.2	22.6
18	3	23.4	21.0
18	4	23.4	21.0
19	1	21.7	19.5
19	3	23.0	20.6
19	4	22.8	20.5
20	1	23.0	20.6
20	2	23.5	21.1
20	3	22.8	20.5
20	4	21.3	19.1
21	1	23.1	20.7
21	2	23.1	20.7
21	3	23.3	20.9
21	4	22.4	20.1
22	3	21.5	19.3
22	4	22.2	19.9
23	2	21.3	19.1
23	3	20.5	18.4
24	3	20.0	17.9
25	1	21.2	19.0
25	2	21.7	19.5
26	1	21.5	19.3
27	2	21.7	19.5
27	3	24.4	21.9
27	4	24.3	21.8
28	3	22.1	19.8
28	4	23.4	21.0
29	3	23.3	20.9
29	4	23.2	20.8

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 17

WITHDRAWALS FROM TEACHING*

VARIABLE NAME: WDRAWS

Type of** Residence	Withdrawal*** Code	Age Classification: Less than 25	25-29	30-39	40-49	50-59	Greater than 59
1	1	.3518	.0875	.0420	.0116	.0064	.2513
1	2	.1119	.0359	.0131	.0043	.0071	.0069
2	1	.2700	.1291	.0563	.0151	.0066	.2626
2	2	.1202	.1004	.0293	.0090	.0084	.0027
3	1	.2058	.1030	.0508	.0106	.0056	.2562
3	2	.1065	.0915	.0310	.0074	.0052	.0028
4	1	.2228	.1198	.0445	.0199	.0071	.2592
4	2	.1032	.0730	.0163	.0078	.0047	.0029

*Ratio of number age group withdrawing to total number in age group.

**1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

***2 = Left teaching permanently because of:

- Not suited for teaching
- Unsatisfactory teaching conditions
- Death
- Illness
- Maternity
- Moving due to husband's transfer

1 = All other reasons for withdrawal

TABLE 18

HIRING RATES*

VARIABLE NAME: HR

Type of Residence	Age Classification					
	Less than 25	25-29	30-39	40-49	50-59	Greater than 59
Metropolitan Center City	.3332	.2342	.1229	.1129	.0828	.1136
Metropolitan Other	.4894	.3279	.1076	.0583	.0125	.0040
Suburban or Small Community	.5487	.2627	.1145	.0570	.0138	.0029
Rural	.5716	.2313	.1236	.0520	.0173	.0040

*Ratio of teachers hired into a specific age classification to all teachers hired.

TABLE 19

EXPENDITURE RATIOS
(Selected Data)

Type of Residence	Intermediate Unit	Adm. Salaries for Ed./ Total Inst. Expense	Adm. Salaries, Other/ Total Salaries, Other	Other Adm. Exp./ Tot. Adm. Sal.	Fed. Prog. Adm./ Tot. Fed. Revenue	Supervisors Sal./ Teachers Sal.	Other Inst. Sal./ Teachers Sal.
3	01	.0284	.0189	.4725	.0408	.0686	.0315
4	01	.0267	.0207	.4308	.0589	.0548	.0320
1	02	.0307	.0239	.2960	.0647	.1217	.0652
3	03	.0303	.0217	.7074	.0466	.0827	.0299

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 20

TRANSPORTATION DATA
(Selected Data)

Type of Residence*	Intermediate Unit	Ratio of Number Transported to Total Students	Cost Per Pupil
3	01	0.741	$048.00
4	01	0.894	061.97
1	02	0.186	064.92
2	03	0.302	058.01
3	03	0.660	042.59
2	04	0.529	064.27
3	04	0.667	056.72
4	04	0.859	051.38
1	05	0.104	099.18
2	05	0.561	035.04

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 21

SCHOOL BUILDING COSTS
(Selected Data)

Type of Residence*	Intermediate Unit	Rated Pupil Capacity	Type of School**	Total Project Cost	Original Site Cost	Architects Fee
4	17	2682	2	$15,663,000	$223,767	$795,781
3	08	1352	2	6,575,000	222,643	285,533
4	03	455	1	970,849	38,371	47,807

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural
**1 = Elementary, 2 = Secondary

TABLE 22

SPECIAL EDUCATION COSTS*

VARIABLE: SCOST

1969-70

CATEGORY	PER PUPIL COST
Educable--Mentally Retarded	$ 850
Trainable--Mentally Retarded	1,461
Physically Handicapped	2,300
Socially and Emotionally Disturbed	2,188
Gifted	875
Itinerant	130 (Weighted mean)

*Special Education Programs for Exceptional Children 1968-69. (Bureau of Special Education, Pennsylvania Department of Education, 1970), p. 9.

TABLE 23

DENSITY/SPARSITY AND TOTAL PAYMENTS
MINUS DENSITY/SPARSITY PER WADM
BY INTERMEDIATE UNIT AND TYPE OF RESIDENCE
(Sample Data)

VARIABLE: PERSP

Intermediate Unit	Type of Residence*	Density/ Sparsity Per WADM	Total Payment Minus Density/ Sparsity Per WADM
01	3	$ 000.00	$ 369.23
01	4	012.97	336.99
02	1	104.24	152.45
03	2	109.86	130.33
03	3	003.14	239.20
04	2	000.00	318.28
04	3	087.55	228.82
04	4	187.39	177.54
05	1	000.00	264.16
05	2	000.00	220.98
05	3	000.00	331.88
05	4	267.51	118.37

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 24

PER CENT OF FEDERAL REVENUE TO TOTAL REVENUE
BY TYPE OF RESIDENCE AND INTERMEDIATE UNIT
(Selected Data)

Type of Residence*	Intermediate Unit	Per Cent of Federal Revenue
3	1	4.07%
4	1	3.63%
1	2	12.29%
2	3	3.83%
3	3	1.34%
2	4	3.18%
3	4	2.20%
4	4	1.57%
1	5	5.86%
2	5	3.45%

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 25

PER CENT OF TOTAL TAXES ACCOUNTED FOR
BY TAXES OTHER THAN THE PROPERTY TAX
BY TYPE OF RESIDENCE WITHIN INTERMEDIATE UNIT
(Selected Data)

Type of Residence*	Intermediate Unit	Per Cent, Other Taxes
3	1	33.42%
4	1	27.48%
1	2	42.32%
2	3	16.89%
3	3	18.03%
2	4	30.54%
3	4	31.27%
4	4	38.04%
1	5	23.71%
2	5	31.63%

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 26

MARKET VALUE, TOTAL TAXES AND
MILLS ON MARKET VALUE FOR
TYPE OF RESIDENCE WITHIN INTERMEDIATE UNIT
(sample data)

VARIABLE: PERMC

TYPE OF RESI-DENCE*	INTER. UNIT	MARKET VALUE	TOTAL TAXES	MILLS ON MARKET VALUE
3	01	$ 00,831,539,100	$ 0,018,545,444	22.3
4	01	$ 00,337,084,900	$ 0,007,264,740	21.6
1	02	$ 02,222,121,700	$ 0,046,536,520	20.9
2	03	$ 01,266,616,600	$ 0,027,101,449	21.4
3	03	$ 03,717,503,000	$ 0,094,719,751	25.5
2	04	$ 00,344,610,500	$ 0,007,615,772	22.1
3	04	$ 00,664,842,800	$ 0,015,287,606	23.0
4	04	$ 00,307,839,800	$ 0,007,218,336	23.4
1	05	$ 00,449,141,300	$ 0,009,359,188	20.8
2	05	$ 00,240,730,600	$ 0,005,522,316	22.9
3	05	$ 00,210,011,700	$ 0,007,343,785	35.0
4	05	$ 00,247,512,600	$ 0,008,366,655	33.8

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 27

PROJECTED RECEIPTS FROM INCOME TAX*
FOR PENNSYLVANIA

1971-72	$ 770,000,000
1972-73	930,000,000
1973-74	1,040,000,000
1974-75	1,100,000,000
1975-76	1,170,000,000
1976-77	1,240,000,000
1977-78	1,320,000,000

*Supplied by the Department of Revenue, Commonwealth of Pennsylvania

TABLE 28

PERSONAL INCOME BY RESIDENCE
(Selected Data)

Intermediate Unit	Type of Residence*	1970 Personal Income by Residence
1	3	$112,989,000
1	4	38,245,000
2	1	243,896,000
3	2	138,515,000
3	3	432,859,000
4	2	39,868,000
4	3	78,586,000
4	4	42,038,000
5	1	60,347,000

*1 = Metropolitan--Center City, 2 = Metropolitan--Other, 3 = Suburban or small community, 4 = Rural

TABLE 29

ELASTICITY FACTORS FOR PERSONAL INCOME BY
RESIDENCE AND MARKET VALUE*

VARIABLE: PEREF

Intermediate Unit	Elasticity Factor
1	.369
2	-.106
3	2.398
4	.581
5	.383
6	.400
7	.233
8	.244
9	.296
10	1.141
11	1.140
12	1.098
13	1.056
14	.365
15	.333
16	-.129
17	.682
18	1.121
19	.567
20	.769
21	.418
22	.794
23	-.374
24	1.161
25	.283
26	.239
27	.157
28	.393
29	.396

*For every increase in personal income by residence there is a .369 increase in market value in Intermediate Unit 1.

TABLE 30

MISCELLANEOUS VARIABLES

Inflation Factor:	.020
Real Increase in Teachers' Salaries:	.05
Increase in Mothers by Year:	10133

APPENDIX D

SAMPLE OF OUTPUT FORMAT

SAMPLE PAGE OF PRINT-OUT

IU: #34

POPULATION: 0-4: 0000000 5-9: 000000 10-14: 000000 15-19: 0000000 TOTAL: 0000000

ENROLLMENT DATA	PRE-K	KIND	1-6	7-8	9-12	TOTAL
PUBLIC ENROLLMENT	00000	000000	000000	000000	000000	0000000
NONPUBLIC ENROLLMENT	0	0000	000000	00000	000000	000000
EDUCABLE-MENTALLY RETARDED	0	0	0000	0000	0000	0000
TRAINABLE-MENTALLY RETARDED	0	0	0000	000	000	0000
PHYSICALLY HANDICAPPED	0	0	0000	000	000	0000
SOCIALLY/EMOTIONAL DISTURBED	0	0	0000	000	000	0000
GIFTED	0	0	0000	0000	0000	0000
ITINERANT	0	0	00000	000	0000	00000
TOTAL SPECIAL ED	0	0	00000	0000	00000	00000
TOTAL ENROLLMENT	00000	000000	0000000	000000	000000	0000000

PUPIL-TEACHER RATIO:....00.0
TEACHERS EMPLOYED: AGE GROUP 1: 0000 AGE GROUP 2: 00000 AGE GROUP 3: 00000 AGE GROUP 4: 00000 AGE GROUP 5: 00000 AGE GROUP 6: 00000
TOTAL TEACHERS' SALARY ($'000): 0000000

EXPENDITURE SUMMARY

	($'000)	($-PER-PUPIL)	(PCT)
ADMINISTRATION :	00000	00.00	0.0
INSTRUCTION :	0000000	000.00	00.0
PERSONNEL SERVICES :	00000	00.00	0.0
HEALTH SERVICES :	0000	0.00	0.0
TRANSPORTATION :	00000	00.00	0.0
OPERATION/MAINTENANCE OF PLANT :	000000	000.00	00.0
FIXED CHARGES :	00000	00.00	0.0
FOOD SERVICES :	0000	0.00	0.0
STUDENT BODY ACTIVITIES :	00000	00.00	0.0
COMMUNITY SERVICES :	00000	0.00	0.0
CURRENT EXPENDITURE :	0000000	0000.00	00.0
CAPITAL OUTLAY :	00000	00.00	0.0
DEBT SERVICE :	000000	000.00	00.0
TOTAL EXPENDITURE :	0000000	0000.00	000.0

REVENUE SUMMARY :	($'000)	($-PER-PUPIL)	(PCT)
LOCAL PROPERTY TAX :	-00000000	-0000.00	00.0
OTHER LOCAL REVENUE :	-0000000	-0000.00	00.0
STATE FUNDS :	000000	000.00	-0.0
FEDERAL FUNDS :	000000	00.00	-0.0
TOTAL REVENUE :	-00000000	-0000.00	000.0

SURPLUS/DEFICIT : -00000000

APPENDIX E

PROGRAM

```
//SBSPEMOD JOB (VEN1,243,B,6,10,,,,R),LAWRENCE
//SBSSTEP  EXEC FORCMPG,REGION=150K
//COMP.SYSIN DD *
C****PENNSYLVANIA EDUCATION PLANNING MODEL
C         SPECIFICATION SECTOR
       DIMENSION POP(21,4,29),ENRAT(20,14),RESMIG(4,4,29,2),IPOP(5),
      XERMTS(6),RNP(4,29,2),CM(5),SURV(4),FT(4),IG(21),
      XPART(20,2),PTR(20),CHR(5),WRNP(5,2),PNROL(6),NG(10),IGR(15),
      XSER(5,6,4),SENUM(7,6),TPEN(4),IPNRL(6),NX2(20),
      XPUTR(2),PUTCH(4,29,2),ISPD(7,6),IRMTS(6),DELM(4),
      XWDRAWS(6,2,4),FETS(6,4,29),PROMO(7),HR(6,4),SCOST(6),
      XBAB(21),SAL(6,4,29),PR(6),IA(4,29),FERT(4,2),PCFED(4,29),
      XR(23,4,29),ALPHA(6,34),ASN(7,7),IFETS(6),SPPAY(4,29),OSPAY(4,29),
      XTRMT(6,6),PPNRL(6,6),PSNUM(6,7,6),PFETS(6,6),APOP(6,5),
      XTCOST(6,20),COSTS(20),ACOST(8,20),ALPH1(3),TRAT(4,29),TRCT(4,29),
      XICOST(20),DATE(3),IDATE(3),TROLT(6),TTETS(6),TSALF(6),
      XICL(3),TMIL(4,29),PI(4,29,2),BMV(4,29),EF(29),OLRAT(4,29),
      XAXE1(5),AXE2(5),PERMT(6),PPRMT(6,6),IPRMT(6),PCOST(19),PCTC(19),
      XBLD(2,8,4,29),ADIST(8),AGBLD(9),TBLD(2),XNWBLD(2),COPB(2,4),
      XBLDT(6,8),IBLD(8),SROL(2),XBCOST(2,4,29),TOBDC(6)
       EQUIVALENCE (TADMX,COSTS(1)),(TIX,COSTS(2)),(PPX,COSTS(3)),
      2(SICK,COSTS(4)),(TCTS,COSTS(5)),(OMX,COSTS(6)),(FCX,COSTS(7)),
      3(FOODX,COSTS(8)),(SACTX,COSTS(9)),(CONMX,COSTS(10)),
      4(CUEXP,COSTS(11)),(CAPEX,COSTS(12)),(DEBTS,COSTS(13)),
      5(TOTEX,COSTS(14)),(PRTAX,COSTS(15)),(CLREV,COSTS(16)),
      6(STFDS,COSTS(17)),(FEDFDS,COSTS(18)),(TOTREV,COSTS(19))
C
C****STATEMENT FUNCTION TO LINEARLY INTERPOLATE RATES
C****REF 1
       FUNC(X1,X2,TT,TL,DT)=(X1+TL*(X2-X1)/TT)*DT
C
C****INPUT SECTOR
C
       DATA ANT,PROMO(1),SER,AGBLD(1),BLDT/1.,0.,169*0./
       DATA IA,IG/116*0,9*1,6*2,5*3,4/
       DATA NG/1,5,6,10,11,15,16,20,1,20/
       DATA IGR,IST/0,1,2,6*3,2*4,4*5,1/
       DATA APOP/30*0./
       DATA SER,PR/120*0.,.3,.2,.1,.1,.1,0./
       DATA TRMT,PPNRL,PSNUM,PFETS,TCOST,TSALF,PPRMT/522*0./
       DATA ALPH1/'AGE',' GR','OUP'/
       DATA CAPEX,DEBTS,TOTEX,TROLT,TTETS/15*0./
       DATA DATE,IDATE/'JUN','E  ',',  ',1972,1976,1980/
       DATA ICL(1),ICL(2),TOBDC,XBCOST/6,5,238*0./
C     AXE1=WEIGHTING FACTOR FOR CALCULATING PUPIL UTILIZATION OF RESOURCES
C     AXE2=STATE STATUTORY WEIGHTING FACTORS
       DATA AXE1,AXE2/.5,.5,1.,1.,1.,0.,.5,1.,1.,1.36/
C     N=NUMBER OF TIMES PER YEAR INCREMENTING OCCURS
C     IYEARS=TOTAL NUMBER OF YEARS MODEL PREDICTS
C     NSE=NUMBER OF SPECIAL EDUCATION OUTPUTS
       READ(1,5)N,IYEARS,NSE
C     NX1=NUMBER OF TIMES OUTPUT IS PRINTED
C     NX2=INCREMENTING PERIOD IN WHICH OUTPUT IS PRINTED
       READ(1,195)NX1,(NX2(I),I=1,NX1)
C     XINF=RATE OF INFLATION
C     XNSAL=REAL INCREASE IN TEACHER'S SALARY
       READ(1,225)XINF,XNSAL
C     SCOST=COST PER PUPIL OF VARIOUS SPECIAL ED PROGRAMS
       READ(1,255)(SCOST(I),I=1,6)
C     DELM=ANNUAL RATE OF CHANGE OF MILLAGE BY TYPE OF RESIDENCE
```

```
      READ(1,15) (DELM(I),I=1,4)
C     FERT=FERTILITY RATES BY TYPE OF RESIDENCE FOR 1970/1980
      READ(1,15) FERT
C     SURV=SURVIVAL RATES BY TYPE OF RESIDENCE
      READ(1,15) SURV
C     GM=ANNUAL RATE OF CHANGE OF NUMBER OF WOMEN 15/44
      READ(1,15) GM
C     TPEN=RATIO OF 1980 NON-PUBLIC ENROLLMENT TO 1970'S
      READ(1,155) TPEN
C     WRNP=DISTRIBUTION OF NON-PUBLIC ENROLLMENT OVER GRADE LEVELS
      READ(1,155) WRNP
C     ALPHA=NAMES OF RESIDENCE CATEGORIES,INTERMEDIATE UNITS AND STATE
      READ(1,65) ((ALPHA(I,J),I=1,6),J=1,34)
C     SER=RATIO OF SPECIAL ED PUPILS BY PROGRAM AND TYPE RESIDENCE TO
C         PUBLIC ENROLLMENT
      READ(1,75) (((SER(I,J,M),I=3,5),J=1,6),M=1,4)
C     ASN=NAMES OF SPECIAL ED PROGRAMS
      READ(1,85) ((ASN(I,J),I=1,7),J=1,7)
C     ACOST=NAMES OF VARIOUS EXPENDITURE/REVENUE CATEGORIES
      READ(1,145) ((ACOST(I,J),I=1,8),J=1,19)
C     ADIST=RATIO OF BUILDINGS TO BE REPLACED IN EACH AGE GROUP
      READ(1,265) ADIST
C     BUILDING COSTS PER PUPIL BY TYPE OF RESIDENCE
      READ(1,275) COPB
C     POP=INITIAL POPULATION BY BASIC UNIT FOR SINGLE YEARS OF AGE 0-19
C         AND FOR WOMEN 15/44
      READ(2,25) (I,J,(POP(IAGE,J,I),IAGE=1,21),NN=1,73)
C     RESMIG=MIGRATION RATES FOR AGE GROUPINGS FOR EACH BASIC UNIT 1970/1980
      READ(2,35) (I,J,((RESMIG(KP,J,I,M),KP=1,4),M=1,2),NN=1,73)
C     PART=SCHOOL-AGE PARTICIPATION RATES FOR 1970/1980
C     ENRAT=ENROLLMENT RATES BY AGE AND GRADE
      READ(2,45) ((PART(I,M),M=1,2),(ENRAT(I,J),J=1,14),I=4,20)
      DO 10 NN=1,73
C     FOR EACH BASIC UNIT:
C     TRAT=RATIO OF PUPILS TRANSPORTED TO TOTAL ENROLLMENT
C     TRCT=TRANSPORTATION COST PER PUPIL
C     RNP=RATIO OF NON-PUBLIC ENROLLMENT TO TOTAL ENROLLMET
      READ(2,55) I,J,TRAT(I,J),TRCT(I,J),RNP(I,J,1)
      RNP(I,J,2)=RNP(I,J,1)*TPEN(I)
   10 IA(I,J)=1
C     HR=RATI OF AN TEACHER'S AGE GROUP HIRINGS TO TOTAL HIRINGS
      READ(2,95) HR
C     WDRAWS=PROPORTION OF TEACHERS WITHDRAWING FROM AN AGE-CATEGORY
      READ(2,105) WDRAWS
C     PUTCH=PUPIL TEACHER RATIO FOR EACH BASIC UNIT 1970/1980
      READ(2,115) (I,J,(PUTCH(J,I,IM),IM=1,2),NN=1,73)
C     FOR EACH BASIC UNIT:
C     FETS=INITIAL NUMBER OF TEACHER'S FOR EACH AGE-CATEGORY
C     SAL=AVERAGE SALARY FOR TEACHERS BY EACH AGE-CATEGORY
      READ(2,125) (I,J,(FETS(IM,I,J),SAL(IM,I,J),IM=1,6),NN=1,73)
C     R(4,....=RATIO OF FEDERAL PROGRAM ADMIN COSTS TO TOTAL FEDERAL FUNDS
C     R(5,....=RATIO OF SUPERVISORS' SALARIES TO TEACHERS' SALARIES
C     R(6,....=RATIO OF OTHER INSTRUCTIONAL COSTS TO TEACHERS' SALARIES
C     R(7,....=RATIO OF SECRETARIAL SALARIES TO TEACHERS' SALARIES
C     R(8,....=RATIO OF OTHER INSTRUCTION COSTS TO TEACHERS' SALARIES
C     R(1,....=RATIO OF ADMIN SALARIES TO TOTAL INSRUCTIONAL COSTS
C     R(3,....=RATIO OF OTHER ADMIN COSTS TO TOTAL ADMIN SALARIES
C     R(9,....=RATIO OF PUPIL PERSONNEL COSTS TO TOTAL INSTRUCTIONAL COSTS
C     R(10,....=RATIO OF OPERATIONS AND MAITENANCE COSTS TO
C               TOTAL INSRUCTIONAL COSTS
C     R(12,....=RATIO OF FIXED COSTS TO TOTAL INSTRUCTIONAL COSTS
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C     R(13,....=RATIO OF FOOD SERVICES COSTS TO TOTAL INSTRUCTIONAL COST
C     R(14,....=RATIO OF STUDENT ACTIVITY COSTS TO TOTAL INSTUCTIONAL COST
C     R(15,....=RATIO OF COMMUNITY SERVICES COSTS TO TOTAL INSTRUCTIONAL COSTS
C     R(17,....=RATIO OF HEALTH SERVICES COSTS TO TOTAL INSTRUCTIONAL COSTS
      READ(2,135)(I,J,(R(IM,I,J),IM=1,21),NN=1,73)
C     R(22,....=RATIO OF CAPITAL EXPENDITURE TO CURRENT EXPENDITURE
C     R(23,....=RATIO OF DEBT SERVICE TO CURRENT EXPENDITURE
      READ(2,165)(I,J,R(22,J,I),R(23,J,I),NN=1,73)
C     PCFED=RATIO OF FEDERAL FUNDS TO STATE AND LOCAL FUNDS
C     OLRAT=RATIO OF OTHER LOCAL REVENUE TO TOTAL LOCAL REVENUE
      READ(2,175)(I,J,PCFED(I,J),OLRAT(I,J),NN=1,73)
C     SPPAY=DENSITY/SPARCITY PAYMENTS PER WADM
C     OSPAY=TOTAL OTHER STATE PAYMENTS PER WADM
      READ(2,185)(J,I,SPPAY(I,J),OSPAY(I,J),NN=1,73)
C     BMV=BASE MARKET VALUE
C     TMIL=MILLS ON MARKET VALUE(1970)
      READ(2,215)(I,J,BMV(I,J),TMIL(I,J),NN=1,73)
C     EF=ELASTICITY FACTOR
      READ(2,235)(EF(I),I=1,29)
C     PI=PERSONAL INCOME BY RESIDENCE(1970/1980)
      READ(2,245)(I,J,(PI(J,I,K),K=1,2),NN=1,73)
C     BLD=PUPIL CAPACITY OF BUILDINGS BY EACH AGE GROUP FOR EACH BASIC UNIT
      READ(2,285)(IR,IU,((BLD(I,J,IR,IU),I=1,2),J=1,8),NN=1,73)
    5 FORMAT(3I2)
   15 FORMAT(2X,4F5.4)
   25 FORMAT(I2,I1,20F6.0,F7.0)
   35 FORMAT(I2,I1,2X,4F6.4/5X,4F6.4)
   45 FORMAT(4X,16F3.3)
   55 FORMAT(I1,I2,F4.3,F5.2,8X,F4.3)
   65 FORMAT(6A4)
   75 FORMAT(1X,18F4.4)
   85 FORMAT(7A4)
   95 FORMAT(6(1X,F4.4))
  105 FORMAT(2X,6F4.4)
  115 FORMAT(2I2,2F5.1)
  125 FORMAT(I1,I2,12F5.0)
  135 FORMAT(I1,I2,21F6.4)
  145 FORMAT(8A4)
  155 FORMAT(5F4.3)
  165 FORMAT(I2,I1,2F5.4)
  175 FORMAT(I1,I2,F4.4,F5.4)
  185 FORMAT(I2,I1,1X,2F5.2)
  195 FORMAT(20I2)
  205 FORMAT(2F4.3)
  215 FORMAT(I1,I2,0P1F11.0,10X,1P1F3.3)
  225 FORMAT(2F5.3)
  235 FORMAT(2X,F8.3)
  245 FORMAT(I2,I1,2F9.0)
  255 FORMAT(6F4.0)
  265 FORMAT(8F4.3)
  275 FORMAT(8F4.0)
  285 FORMAT(I1,I2,16F6.0)
  505 FORMAT(/' POPULATION:',T25,'0-4:',I8,2X,'5-9:',I8,2X,'10-14:',
     2I8,2X,'15-19:',I8,2X,'TOTAL:',I8/)
  515 FORMAT(' TOTAL ENROLLMENT:',T25,6I12)
  525 FORMAT(' NON-PUBLIC ENROLLMENT:',T25,6I12)
  535 FORMAT('1','IU: #',I2,T40,6A4,3X,3A3,I5/)
  545 FORMAT(' ',7A4,I7,5I12)
  555 FORMAT(/' PUPIL-TEACHER RATIO:....',F4.1)
  565 FORMAT(' TEACHERS EMPLOYED:',T22,6(3A3,I2,':',I5,1X))
  575 FORMAT(' TOTAL TEACHERS'' SALARY($''000):',3X,I9//)
```

```
  585 FORMAT(' EXPENDITURE SUMMARY')
  595 FORMAT(' ',8A4,':',4X,I9,11X,F10.2,11X,F5.1)
  605 FORMAT(' ENRCLLMENT DATA',T32,'PRE-K',T44,'KIND',
     2T57,'1-6',T69,'7-8',T81,'9-12',T92,'TOTAL')
  615 FORMAT(//' REVENUE SUMMARY')
  625 FORMAT(' ',T41,'($''000)',T59,' ($-PER-PUPIL)',T80,'(PCT)')
  635 FORMAT(//' SURPLUS/DEFICIT',T34,':',4X,I9)
  645 FORMAT(' PUBLIC ENROLLMENT:',T25,6I12)
  655 FORMAT(//' SCHOOL BUILDING CAPACITY:',2X,8(3A3,I2,2X))
  665 FORMAT(' PUPIL STATIONS:',12X,8(I8,5X))
  675 FORMAT(/' TOTAL BUILDING COST($''000):',I8)
C
C****ADJUSTMENT OF ANNUAL RATES FOR INCREMENTATION PERIOD
C
      ES=1.00/N
C****REF 9
      GM=GM**ES
C****REF 10
      XINF=XINF*ES
C****REF 11
      XNSAL=XNSAL*ES
      DO 50 I=1,4
C****REF 12
   50 SURV(I)=SURV(I)**ES
C****TIME PERIOD MOVES AHEAD BY 1/N YEARS
C          N=NUMBER OF TIMES PER YEAR INCREMENTATION OCCURS
      NUMINC=IYEARS*N
      TINC=NUMINC
C****REF 19
      DO 1000 IT=1,NUMINC
      TI=IT
C
C****CALCULATION OF DISTRIBUTION OF NON-PUBLIC ENROLLMENTS OVER GRADES
C****REF 2
      DO 60 I=1,5
   60 CHR(I)=FUNC(WRNP(I,1),WRNP(I,2),TINC,TI,ANT)
      TE=TI*ES-IT/N
      IF(TE.EQ.0)TZ=1
      IF(TE.NE.0)TZ=0
      ITZ=TZ+1
C
C****CALCULATION BY INTERPOLATION OF FERTILITY RATES
C****REF 3
      DO 100 IRES=1,4
  100 FT(IRES)=FUNC(FERT(IRES,1),FERT(IRES,2),TINC,TI,ES)
C
C****CALCULATION BY INTERPOLATION OF AGE/SCHOOL PARTICIPATION RATES
C****REF 4
      DO 130 IAGE=4,20
  130 PTR(IAGE)=FUNC(PART(IAGE,1),PART(IAGE,2),TINC,TI,ANT)
C
C****ADJUSTMENTS FOR INFLATION
C
C    SPECIAL EDUCATION COSTS
      DO 70 I=1,6
C****REF 13
   70 SCOST(I)=SCOST(I)*(1+XINF)
C*REF 17* PER-PUPIL COSTS OF CONSTRUCTION
      DO 80 I=1,2
      DO 80 J=1,4
   80 COPB(I,J)=COPB(I,J)*(1+XINF)
```

```
C****REF 20
      DO 900 IU=1,29
C****REF 21
      DO 800 IRES=1,4
C****REF 22
      IF(IA(IRES,IU).EQ.0)GO TO 800
C          POPULATION SECTOR
C
C****CALCULATION BY INTERPOLATION OF MIGRATION RATES
C****REF 5
      DO 110 I=1,4
  110 CM(I)=FUNC(RESMIG(I,IRES,IU,1),RESMIG(I,IRES,IU,2),
     2TINC,TI,ES)
C****REF 23
      POP(21,IRES,IU)=GM*POP(21,IRES,IU)*(1+CM(4))
C****REF 24
      BAB(1)=FT(IRES)*POP(21,IRES,IU)
      DO 120 IAGE=1,20
      IGM=IG(IAGE)
C****REF 25
      POP1=POP(IAGE, RES,IU)*SURV(IRES)*(1+CM(IGM))
C****REF 26
      BAB(IAGE+1)=ES*POP1
C****REF 27
  120 POP(IAGE,IRES,IU)=BAB(IAGE)-BAB(IAGE+1)+POP1
      IF(IT.EQ.1)GO TO 800
C
C****ENROLLMENT SECTOR
C
      DO 150 IGRDE=2,15
      LEVEL=IGR(IGRDE)
      IF(LEVEL.NE.IGR(IGRDE-1))AROL=0
      DO 140 IAGE=4,20
C****REF 28
  140 AROL=PTR(IAGE)*ENRAT(IAGE,IGRDE-1)*POP(IAGE,IRES,IU)+AROL
C****REF 29
  150 ERMTS(LEVEL)=AROL
C
C****CALCULATION OF NON-PUBLIC ENROLLMENT
C
      COSTSE=0
      ERMTS(6)=0
      DO 170 I=1,7
  170 SENUM(I,6)=0
      WROL=0
      TROL=0
C****REF 6
      RNP1=FUNC(RNP(IRES,IU,1),RNP(IRES,IU,2),TINC,TI,ANT)
      DO 160 LEVEL=1,5
C****REF 30
  160 ERMTS(6)=ERMTS(6)+ERMTS(LEVEL)
C****REF 31
      PNROL(6)=RNP1*ERMTS(6)
C****REF 33
      PERMT(6)=ERMTS(6)-PNROL(6)
      DO 190 LEVEL=1,5
      SENUM(7,LEVEL)=0.
C****REF 32
      PNROL(LEVEL)=CHR(LEVEL)*PNROL(6)
C****REF 34
      PERMT(LEVEL)=ERMTS(LEVEL)-PNROL(LEVEL)
```

```
C
C****CALCULATION OF SPECIAL EDUCATION ENROLLMENTS
C
      DO 180 I=1,6
C****REF 35
      SENUM(I,LEVEL)=SER(LEVEL,I,IRES)*PERMT(LEVEL)
      COSTSE=COSTSE+SENUM(I,LEVEL)*SCOST(I)
C****REF 36
      SENUM(I,6)=SENUM(I,6)+SENUM(I,LEVEL)
C****REF 37
  180 SENUM(7,LEVEL)=SENUM(I,LEVEL)+SENUM(7,LEVEL)
      SENUM(7,6)=SENUM(7,LEVEL)+SENUM(7,6)
C****REF 38
      WROL=WROL+AXE2(LEVEL)*(PERMT(LEVEL))
C****REF 39
  190 TROL=TROL+(PERMT(LEVEL)-SENUM(7,LEVEL)+SENUM(6,LEVEL))*AXE1(LEVEL)
C
C****SECTOR TO CALCULATE DEMAND FOR TEACHERS
C
C****REF 7
      PT=FUNC(PUTCH(IRES,IU,1),PUTCH(IRES,IU,2),TINC,TI,ANT)
C****REF 40
      TCDM=TROL/PT
C
C****SECTOR TO CALCULATE SUPPLY OF TEACHERS
C
      TSAL=0
      TFETS=0
      DO 200 ICLASS=1,6
C****REF 14
      SAL(I,IRES,IU)=(1+XNSAL+XINF)*SAL(I,IRES,IU)
C****REF 41
      WD=WDRAWS(ICLASS,1,IRES)*ES+TZ*WDRAWS(ICLASS,2,IRES)
C****REF 42
      TFFTS=(1-WD*ES)*FETS(ICLASS,IRES,IU)
C****REF 43
      PROMO(ICLASS+1)=PR(ICLASS)*ES*TFFTS
C****REF 44
      FETS(ICLASS,IRES,IU)=TFFTS+PROMO(ICLASS)-PROMO(ICLASS+1)
C****REF 45
  200 TFETS=FETS(ICLASS,IRES,IU)+TFETS
C****REF 46
      HIRED=TCDM-TFETS
      IF(HIRED.GT.0)GO TO 210
      HIRED=0
  210 DO 220 ICLASS=1,6
C****REF 47,REF 48
      FETS(ICLASS,IRES,IU)=FETS(ICLASS,IRES,IU)+HR(ICLASS,IRES)*
     2HIRED
C****REF 49
      TSAL=FETS(ICLASS,IRES,IU)*SAL(ICLASS,IRES,IU)+TSAL
  220 CONTINUE
C****REF 50
      TSAL=TSAL+.72*COSTSE
C****CALCULATION OF TEACHER FRINGE BENEFITS
C****REF 51
      TSAL=1.078*TSAL
C
C****BUILDING SECTOR
C
      XBCOST(ITZ,IRES,IU)=0
```

```
      DO 250 J=1,2
  250 TBLD(J)=0
      DO 230 I=1,8
      DO 230 J=1,2
C****REF 52
      BDGR=BLD(J,I,IRES,IU)*(1-ADIST(I)*ES)
C****REF 53
      AGBLD(I+1)=.1*ES*BDGR
      AGBLD(9)=0
C****REF 54
      BLD(J,I,IRES,IU)=BDGR+AGBLD(I)-AGBLD(I+1)
C****REF 55
  230 TBLD(J)=TBLD(J)+BLD(J,I,IRES,IU)
C****REF 56
      SROL(1)=PERMT(1)+PERMT(2)+PERMT(3)
      SROL(2)=PERMT(4)+PERMT(5)
      DO 240 J=1,2
C****REF 57
      XNWBLD(J)=SROL(J)-TBLD(J)
      IF(XNWBLD(J).LT.0) XNWBLD(J)=0
C****REF 58
      BLD(J,1,IRES,IU)=XNWBLD(J)+BLD(J,1,IRES,IU)
C****REF 59
  240 XBCOST(ITZ,IRES,IU)=XBCOST(ITZ,IRES,IU)+XNWBLD(J)*COPB(J,IRES)
      IF(IT.NE.NX2(IST)) GO TO 800
C
C****REVENUE SECTOR
C
C****INFLATION INCREASES
C****REF 15
      SPPAY(IRES,IU)=SPPAY(IRES,IU)*(1+XINF)
C****REF 16
      OSPAY(IRES,IU)=OSPAY(IRES,IU)*(1+XINF)
C****COMPUTE EFFECTIVE TOTAL MILLAGE
C****REF 60
      TMIL(IRES,IU)=TMIL(IRES,IU)*(1+DELM(IRES))
C****COMPUTE TOTAL PERSONAL INCOME
C****REF 8
      PEINC=FUNC(PI(IRES,IU,1),PI(IRES,IU,2),TINC,TI,ANT)
C****COMPUTE PRESENT MARKET VALUE
C****REF 61
      XMV=BMV(IRES,IU)+((PEINC-PI(IRES,IU,1))/PI(IRES,IU,1))
     2*BMV(IRES,IU)*EF(IU)
C****COMPUTE LOCAL TAXES
C****REF 62
      LOCTAX=XMV*TMIL(IRES,IU)
C****COMPUTE DIVISION OF LOCAL TAXES BETWEEN PROPERTY AND OTHER
C****REF 63
      OLREV=OLRAT(IRES,IU)*LOCTAX
C****REF 64
      PRTAX=LOCTAX-OLREV
C****CALCULATION OF DENSITY SPARCITY PAYMENTS
C****REF 65
      DENPAY=SPPAY(IRES,IU)*WROL
C****CALCULATION OF TOTAL STATE AID
C****REF 66
      STFDS=DENPAY+OSPAY(IRES,IU)*WROL
C****FEDERAL FUNDS
C****REF 67
      TOTSL=STFDS+LOCTAX
C****REF 68
```

```
      FEDFDS=PCFED(IRES,IU)*TOTSL
C****REF 69
      TOTREV=FEDFDS+TOTSL
C
C****EXPENDITURE SECTOR
C
C  FEDERAL PROGRAM ADMINISTRATION  COSTS
C****REF 70
      FPA=R(4,IRES,IU)*FEDFDS
C  COSTS FOR SUPERVISORS' SALARIES
C****REF 71
      SSAL=R(5,IRES,IU)*TSAL
C  COSTS FOR OTHER INSTRUCTIONAL SALARIES
C****REF 72
      OISAL=R(6,IRES,IU)*TSAL
C  COSTS FOR SECRETARIAL SALARIES
C****REF 73
      SECSAL=R(7,IRES,IU)*TSAL
C  OTHER INSTRUCTIONAL COSTS
C****REF 74
      OIX=R(8,IRES,IU)*TSAL
C  COSTS FOR TOTAL INSTRUCTIONAL SALARIES
C****REF 75
      TISAL=TSAL+SSAL+OISAL
     X+SECSAL
C  COSTS FOR ADMINISTRATIVE SALARIES-EDUCATION
C****REF 76
      ASALE=R(1,IRES,IU)*TISAL
C  COSTS FOR ADMINISTRATIVE SALARIES-OTHER
C****REF 77
      ASALO=ASALE*(0.875)
C  OTHER ADMINISTRATIVE COSTS
C****REF 78
      OADMX=R(3,IRES,IU)*(ASALE+ASALO)
C  TOTAL ADMINISTRATIVE COSTS
C****REF 79
      TADMX=OADMX+ASALO+ASALE+FPA
C   TOTAL INSTRUCTIONAL COSTS
C****REF 80
      TIX=TISAL+OIX
C   TOTAL PUPIL PERSONNEL COSTS
C****REF 81
      PPX=R(9,IRES,IU)*TIX
C  TOTAL COSTS FOR OPERATIONS AND MAINTENANCE
C****REF 82
      OMX=R(10,IRES,IU)*TIX
C   TOTAL FIXED COSTS
C****REF 83
      FCX=R(12,IRES,IU)*TIX
C  TOTAL COSTS FOR  FOOD SERVICES
C****REF 84
      FOODX=R(13,IRES,IU)*TIX
C  TOTAL COSTS FOR  STUDENT ACTIVITIES
C****REF 85
      SACTX=R(14,IRES,IU)*TIX
C  TOTAL COSTS FOR  COMMUNITY SERVICES
C****REF 86
      CONMX=R(15,IRES,IU)*TIX
C  TOTAL COSTS FOR HEALTH SERVICES
C****REF 87
      SICK=R(17,IRES,IU)*TIX*10
```

```
C   TOTAL COST FOR TRANSPORTATION
      TRANS=0
C****ADJUSTMENT OF TRANSPORTATION COSTS FOR INFLATION
C****REF 18
      TRCT(IRES,IU)=TRCT(IRES,IU)*(1+XINF)
C****REF 88
      TCTS=ERMTS(6)*TRAT(IRES,IU)*TRCT(IRES,IU)
C CURRENT EXPENDITURE
C****REF 89
      CUEXP=0
      DO 460 I=1,10
  460 CUEXP=CUEXP+COSTS(I)
C****REF 91
      CAPEX=R(22,IRES,IU)*CUEXP
C****REF 90
      DEBTS=R(23,IRES,IU)*CUEXP
      TOTEX=0
      DO 470 I=11,13
C****REF 92
  470 TOTEX=TOTEX+COSTS(I)
      ICL(3)=IRES
C****REF 93
      DO 550 KX=1,3
      ICX=ICL(KX)
      I2=0
      DO 510 I=1,10,2
      I2=I2+1
      NG1=NG(I)
      NG2=NG(I+1)
      DO 510 J=NG1,NG2
  510 APOP(ICX,I2)=APOP(ICX,I2)+POP(J,IRES,IU)
      DO 520 I=1,6
      TRMT(ICX,I)=TRMT(ICX,I)+ERMTS(I)
      PPNRL(ICX,I)=PPNRL(ICX,I)+PNROL(I)
      PFETS(ICX,I)=PFETS(ICX,I)+FETS(I,IRES,IU)
      PPRMT(ICX,I)=PPRMT(ICX,I)+PERMT(I)
      DO 520 J=NSE,7
  520 PSNUM(ICX,J,I)=SENUM(J,I)+PSNUM(ICX,J,I)
      TROLT(ICX)=TROL+TROLT(ICX)
      TTETS(ICX)=TFETS+TTETS(ICX)
      TOBDC(ICX)=XBCOST(1,IRES,IU)+XBCOST(2,IRES,IU)+TOBDC(ICX)
      DO 540 I=1,19
  540 TCOST(ICX,I)=COSTS(I)+TCOST(ICX,I)
      TSALF(ICX)=TSALF(ICX)+TSAL
      DO 550 I=1,8
  550 BLDT(ICX,I)=BLD(1,I,IRES,IU)+BLD(2,I,IRES,IU)+BLDT(ICX,I)
  800 CONTINUE
      IF(IT.NE.NX2(IST))GO TO 900
      IUX=IU
      ICX=6
C****REF 94
  850 DO 820 I=1,5
      IPOP(I)=APOP(ICX,I)+.5
  820 CONTINUE
      DO 830 I=1,6
      IRMTS(I)=TRMT(ICX,I)+.5
      IPNRL(I)=PPNRL(ICX,I)+.5
      IPRMT(I)=PPRMT(ICX,I)+.5
      DO 810 J=NSE,7
  810 ISPD(J,I)=PSNUM(ICX,J,I)+.5
  830 IFETS(I)=PFETS(ICX,I)+.5
```

```
      ISAL=TSALF(ICX)/1000+.5
      PT=TROLT(ICX)/TTETS(ICX)
      ICBLD=TOBDC(ICX)/1000+.5
      TOTAL=TCOST(ICX,14)
      DO 840 I=1,19
      PCOST(I)=TCOST(ICX,I)/PPRMT(ICX,6)
      IF(I.GT. 14)TOTAL=TCOST(ICX,19)
      PCTC(I)=(TCOST(ICX,I)/TOTAL)*100
  840 ICOST(I)=TCOST(ICX,I)/1000+.5
      ICOST(20)=ICOST(19)-ICOST(14)
      DO 890 I=1,8
  890 IBLD(I)=BLDT(ICX,I)+.5
      WRITE(6,535)IUX,(ALPHA(I,IUX),I=1,6),(DATE(I),I=1,3),IDATE(IST)
      WRITE(6,505)(IPOP(I),I=1,5)
      WRITE(6,605)
      WRITE(6,645)(IPRMT(I),I=1,6)
      WRITE(6,525)(IPNRL(I),I=1,6)
      WRITE(6,545)((ASN(MI,J),MI=1,7),(ISPD(J,M),M=1,6),J=1,7)
      WRITE(6,515)(IRMTS(I),I=1,6)
      WRITE(6,555)PT
      WRITE(6,565)((ALPH1(J),J=1,3),I,IFETS(I),I=1,6)
      WRITE(6,575)ISAL
      WRITE(6,585)
      WRITE(6,625)
      WRITE(6,595)((ACOST(I,J),I=1,8),ICOST(J),PCOST(J),PCTC(J),J=1,14)
      WRITE(6,615)
      WRITE(6,625)
      WRITE(6,595)((ACOST(I,J),I=1,8),ICOST(J),PCOST(J),PCTC(J),J=15,19)
      WRITE(6,635)ICOST(20)
      WRITE(6,655)((ALPH1(J),J=1,3),NN,NN=1,8)
      WRITE(6,665)(IBLD(I),I=1,8)
      WRITE(6,675)ICBLD
      TSALF(ICX)=0
      TTETS(ICX)=0
      TROLT(ICX)=0
      TOBDC(ICX)=0
      DO 860 I=1,5
      APOP(ICX,I)=0
  860 CONTINUE
      DO 870 I=1,6
      PFETS(ICX,I)=0
      TRMT(ICX,I)=0
      PPNRL(ICX,I)=0
      PPRMT(ICX,I)=0
      DO 770 J=NSE,7
  770 PSNUM(ICX,J,I)=0
  870 CONTINUE
      DO 880 I=1,19
  880 TCOST(ICX,I)=0
      DO 780 I=1,8
  780 BLDT(ICX,I)=0
      IF(ICX.LT.6)GO TO 920
  900 CONTINUE
      IF(IT.NE.NX2(IST))GO TO 1000
      DO 920 ICX=1,5
      IUX=IUX+1
      GO TO 850
  920 CONTINUE
      IST=IST+1
 1000 CONTINUE
      STOP 888
```

```
      END
/*
//  EXEC EDSIN,NAME='VEN1SBS.PEDAT',DISK=FILE27
//  EXEC EDSIN,NAME='VEN1SBS.PETOT',DISK=FILE32,
//   INPUT='&TEMP1',LRECL=130,BLKSIZE=3510
//SBSSTEP2  EXEC  FORRUN,CORE=150K
//GO.SYSIN DD  DSN=&INPUT,DISP=(OLD,DELETE)
//GO.FT02F001  DD DSN=&TEMP1,DISP=(OLD,DELETE)
/*
```

APPENDIX F

VARIABLE NAMES AND DEFINITIONS

VARIABLE NAMES AND DEFINITIONS USED IN
THE EDUCATIONAL FINANCE PLANNING MODEL

ACOST	=	Names of various expenditure/revenue categories
ALPHA	=	Names of residence categories, intermediate units and state
ANT	=	Annual time
APOP	=	Population by five-year age cohorts between ages 0 to 19
AROL	=	Enrollment by grade groupings; prekindergarten, kindergarten, 1-6, 7-8, 9-12
ASALE	=	Administrative salaries for education
ASALO	=	Administrative salaries, other than education
ASN	=	Names of special education programs
AXE1	=	Weighting matrix to provide ADA figures for public enrollment
AXE2	=	Weighting factors to provide WADM from enrollment
BAB	=	Number of a specific age group aging into the next age group
BMV	=	Base market value
CAPEX	=	Capital expenditures
CHR	=	Ratio of grade level nonpublic enrollment to total nonpublic enrollment
CM	=	Migration rate for each age group
CONMX	=	Costs for community services
COSTS	=	Expenditures and revenues for major accounting functions
COSTSE	=	Per pupil costs for special education
CUEXP	=	Current expenditures
DEBTS	=	Debt Service
DELM	=	Annual rate of change of millage by type of residence
EF	=	Elasticity factor
ENRAT	=	Enrollment rates by age and grade
ERMTS	=	Total enrollment by grade classifications
ES	=	Factor to account for number of increments per year
FCX	=	Total fixed costs
FEDFDS	=	Federal funds
FERT	=	Fertility rates by type of residence for 1970/1980
FETS	=	Initial number of teachers in each age category by basic unit
FOODX	=	Costs for food services
FPA	=	Federal program administration costs
GM	=	Annual rate of change in the number of women
HIR	=	Ratio of teachers' age group hirings to total hirings
HIRED	=	Total number of teachers hired

IA = Variable for testing if specific basic unit exists
ICL = Variable for controlling output
ICLASS = Variable to number teacher classifications
ICX = Dummy variable equal to TCL
IFETS = Interger format for PFETS
IG = Matrix to control population output printing
IGM = Dummy variable equal to IG
IGR = Variable to control aggregating of enrollments to grade level
IGRDE = Counter to aggregate enrollment
IPNRL = Interger form of PPNRL
IPOP = Interger form of APOP
IPRMT = Interger form of PPRMT
IRES = Type of residence
IRMTS = Interger form of EMERTS
ISAL = Interger form of TSAL
IU = Intermediate unit
IUX = Counter to control leaders
IYEARS = Total number of years model predicts
I2 = Counter

J = Counter

KX = Counter

LEVEL = Counter for grade groupings
LOCTAX = Local taxes

N = Number of times per year incrementation occurs
NG = Variable to control aggregating of population
NG1 = Dummy variable equal to NG
NG2 = Dummy variable equal to NG
NPR = Printing instruction for a specific time
NSE = Number of special education outputs
NUMINC = Total number of increments
NX1 = Number of times output is printed
NX2 = Incrementing period in which output is printed

OADMX = Other administrative costs
OCCX = Occupancy and equipment utilization cost
OISAL = Other instructional salaries
OIX = Other instructional costs
OLRAT = Ratio of other local revenue to total local revenue
OLREV = Tax revenue other than property
OMX = Operation and maintenance costs
OSPAY = Total other state payments per WADM

PART = School age participation rates for 1970/1980
PCFED = Ratio of federal funds to state and local funds
PCOST = Per pupil expenditures and revenues by major accounting category
PCTC = Per cent of expenditures/revenues to total expenditures/revenues
PEINC = Total personal income
PENPAY = Density payments
PERMT = Public enrollment
PFETS = Supply of teachers by age category for each intermediate unit
PI = Personal income by residence for each basic unit 1970/1980
PNROL = Nonpublic enrollment by grade category for each basic unit
POP = Initial population by basic unit for single years of age 0-19
POPI = Population of basic unit after migration but before aging
PPNRL = Nonpublic enrollment by intermediate unit
PPX = Pupil personnel costs
PROMO = Number of teachers aging into unit age category
PRTAX = Tax revenue from property tax
PSNUN = Number of special education students by program by intermediate unit
PT = Ratio of population 0-19 participating in school
PTR = Pupil-teacher ratio for specific basic unit
PUTCH = Pupil-teacher ratios for each basic unit 1970/1980

RC1.... = Ratio of administrative salaries to total instructional costs
RC3.... = Ratio of other administrative costs to total administration salaries
RC4.... = Ratio of federal program administrative costs to total federal funds
RC5.... = Ratio of supervisors' salaries to teachers' salaries
RC6.... = Ratio of other instructional costs to teachers' salaries
RC7.... = Ratio of secretarial salaries to teachers' salaries
RC8.... = Ratio of other instructional costs to teachers' salaries
RC9.... = Ratio of pupil personnel costs to total instructional costs
RC10....= Total of operation and maintenance costs to total instructional costs
RC12....= Ratio of fixed costs to total instructional costs
RC13....= Ratio of food service costs to total instructional cost
RC14....= Ratio of student activity costs to total instructional costs
RC15....= Ratio of community services costs to total instructional costs
RC17....= Ratio of health services costs to total instructional costs
RC22....= Ratio of capital expenditure to current expenditure
RC23....= Ratio of debt service to current expenditure
RESMIG = Migration rates for age grouping for each basic unit 1970/1980
RNP = Ratio of nonpublic enrollment to total enrollment for each basic unit

SACTX = Costs for student activities
SAL = Average salary for teachers by age category for basic unit
SCOST = Cost per pupil for special education programs
SECSAL = Secretarial salaries
SENUM = Number of special education students by program

SER	=	Ratio of special education pupils by program and type of residence to total enrollment
SICK	=	Costs for health services
SPPAY	=	Density/sparsity payments per WADM
SSAL	=	Supervisors salaries
STFDS	=	Total state payments
SURV	=	Survival rates by type of residence
TADMC	=	Total administrative costs
TCDM	=	Total teacher demand
TCOST	=	Expenditure and revenue for each intermediate unit by accounting category
TE	=	Dummy variable to test whether time period is end of school year
TFETS	=	Number of teachers by age category for each basic unit
TFFTS	=	Dummy variable used in calculating TFETS
TI	=	Decimal format for IT
TINC	=	Decimal format of NUMINC
TISAL	=	Total instructional salaries
TIX	=	Total instructional costs
TMIL	=	Total mills on market value
TMLX	=	Effective total millage
TPEN	=	Ratio of 1980 nonpublic enrollment to 1970 by type of residence
TOTAL	=	Dummy variable to change base for calculating per cent of specific expenditure/revenue
TOTREV	=	Total revenue
TOTSL	=	Total state payments plus local taxes
TRANS	=	Costs for transportation
TRAT	=	Ratio of pupils transported to total enrollment for each basic unit
TRCT	=	Transportation cost per pupil for each basic unit
TROL	=	Total public enrollment per basic unit
TROLT	=	Total public enrollment per intermediate unit
TSAL	=	Teachers salaries per basic unit
TSALF	=	Teachers salaries per intermediate unit
TTETS	=	Number of teachers per intermediate unit
TZ	=	Variable to determine which teacher withdrawal rate to use
TOTEX	=	Total expenditures
WD	=	Number
WDRAWS	=	Proportion of teachers withdrawing from an age category
WRNP	=	Distribution of nonpublic enrollment over grade levels
WROL	=	WADM
XINF	=	Rate of inflation
XMV	=	Present market value
XNSAL	=	Real increase in teachers' salaries

APPENDIX G

USER'S MANUAL AND GUIDE

EDUCATIONAL FINANCE PLANNING MODEL

User Manual for RCA Spectra 70

1. General

This short manual when used in conjunction with the model description (Chapter III) and the data descriptions (Chapter II and Appendix C) should allow one to perform simulations on the Pennsylvania Educational Finance Planning Model. It's to be noted that the planning model is still in a prototype state and improvements have to be made both with the basic program and also with the data handling capabilities. At present, no data update capability is available and the user must resort to the tedious job of manually revising the data decks. An update capability should be available in the near future.

The model and data are on the following media:

a. a Fortran program (card deck)
b. control data (card deck)
c. basic data (tape, record length-130)

Control data is comprised of data which is more likely to be changed in simulation runs than the basic data. It has been placed on cards to simplify revision.

2. Job Control Language

In order to compile the Fortran program it is necessary to use the 131 K compiler. The Job Control Language (JCL) for this step is:

```
                                  1 1 1 1 1 1 1 1 1 1 2
Col. 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

 / /   S T A R T M
 / /   J O B
 / /   P A R A M         D E B U G = N O
 / /   P A R A M         L I S T = N O
 / /   E X E C           F O R 1 3 i
```

Program

```
 / /   L N K E D T
 / /   E X E C
```

Data

```
 / /   E N D
```

Once a "basic run" has been achieved, the user may wish to make further runs with parameter changes. A description of the layout of the control data follows.

3. Control Data*

Card 1

Positions 1,2--number of times per year incrementing occurs

Positions 3,4--total number of years model is to run

Positions 5,6--control of special education outputs

1 = output by special education program and total
2 = output of total special education only

Card 2

Positions 1,2--number of times output is printed

Positions 3,4--number of time periods before output is first printed

Positions 5,6--number of periods output printing occurs

Positions 2n+1,2(n+1)--number of periods output printed for the nth time

Card 3

Positions 1-5 (3 decimal places)--rate of inflation (annual)

Positions 6-10 (3 decimal places)--real increase in teachers' salaries)

Card 4

Positions 1-4--Per pupil cost for educable mentally retarded

Positions 5-8--Per pupil cost for trainable mentally retarded

Positions 9-12--Per pupil cost for physically handicapped

Positions 13-16--Per pupil cost for socially and emotionally disturbed

Positions 17-20--Per pupil cost for gifted

Positions 21-24--Per pupil cost for itinerant

*All data is right justified. Comments concerning decimal places indicate the format of the variable.

Card 5

Positions 3-7--annual change in effective millage rate--residence 1

Positions 8-12--annual change in effective millage rate--residence 2

Positions 13-17--annual change in effective millage rate--residence 3

Positions 18-22--annual change in effective millage rate--residence 4

Card 6

Positions 3-7 (4 decimal places) fertility rate--residence 1 (1970)

Positions 8-12 (4 decimal places) fertility rate--residence 2 (1970)

Positions 13-17 (4 decimal places) fertility rate--residence 3 (1970)

Positions 18-22 (4 decimal places) fertility rate--residence 4 (1970)

Card 7

Same as Card 6 except fertility rates are for 1980.

Card 8

Positions 3-7 (4 decimal places) survival rate--residence 1

Positions 8-12 (4 decimal places) survival rate--residence 2

Positions 13-17 (4 decimal places) survival rate--residence 3

Positions 18-22 (4 decimal places) survival rate--residence 4

Card 9

Positions 3-7 (4 decimal places) ratio of number of women in 1980 over women in 1970

Card 10

Positions 1-4 (3 decimal places) ratio of 1980 nonpublic enrollment to 1970's for residence 1

Positions 5-8 (3 decimal places) ratio of 1980 nonpublic enrollment to 1970's for residence 2

Positions 9-12 (3 decimal places) ratio of 1980 nonpublic enrollment to 1970's for residence 3

Positions 13-16 (3 decimal places) ratio of 1980 nonpublic enrollment to 1970's for residence 4

Card 11

Positions 1-4--ratio of nonpublic prekindergarten enrollment to total nonpublic (1970)

Positions 5-8--ratio of nonpublic kindergarten enrollment to total nonpublic (1970)

Positions 9-12--ratio of nonpublic grades 1-6 enrollment to total nonpublic (1970)

Positions 13-16--ratio of nonpublic grades 7-8 enrollment to total nonpublic (1970)

Positions 17-20--ratio of nonpublic grades 9-12 enrollment to total nonpublic (1970)

Card 12

Same as Card 11 except for 1980

Card 13-46

First 20 positions or card detail names of intermediate units, type of residence categories and total state.

Card 47

Position 1--residence 1 classification

Positions 2-5--ratio for educable mentally retarded grades 1-6

Positions 6-9--ratio for educable mentally retarded grades 7-8

Positions 10-13--ratio for educable mentally retarded grades 9-12

Positions 14-17--ratio for trainable mentally retarded grades 1-6

Positions 18-21--ratio for trainable mentally retarded grades 7-8

Positions 22-25--ratio for trainable mentally retarded grades 9-12

Positions 26-29--ratio for physically handicapped grades 1-6

Positions 30-33--ratio for physically handicapped grades 7-8

Positions 34-37--ratio for physically handicapped grades 9-12

Positions 38-41--ratio for socially and emotionally disturbed grades 1-6

Positions 42-45--ratio for socially and emotionally disturbed grades 7-8

Positions 46-49--ratio for socially and emotionally disturbed grades 9-12

Positions 50-53--ratio for gifted grades 1-6

Positions 54-57--ratio for gifted grades 7-8

Positions 58-61--ratio for gifted grades 9-12

Positions 62-65--ratio for itinerant grades 1-6

Positions 66-69--ratio for itinerant grades 7-8

Positions 70-73--ratio for itinerant grades 9-13

Card 48

Same as Card 47 except for residence 2

Card 49

Same as Card 47 except for residence 3

Card 50

Same as Card 47 except for residence 4

Card 51-57

First 24 positions on cards detail names of special education program types

Card 58-76

First 32 positions on cards detail expenditure or revenue names

Card 76

Positions 1-3 (3 decimal places) proportion of buildings in age group 1 to be replaced annually

Positions 5-8 (3 decimal places) proportion of buildings in age group 2 to be replaced annually

Positions 9-12 (3 decimal places) proportion of buildings in age group 3 to be replaced annually

Positions 13-16 (3 decimal places) proportion of buildings in age group 4 to be replaced annually

Positions 17-20 (3 decimal places) proportion of buildings in age group 5 to be replaced annually

Positions 21-24 (3 decimal places) proportion of buildings in age group 6 to be replaced annually

Positions 25-28 (3 decimal places) proportion of buildings in age group 7 to be replaced annually

Positions 29-32 (3 decimal places) proportion of buildings in age group 8 to be replaced annually

Card 77

Positions 1-4--Per pupil cost of buildings in residence 1-Elementary
Positions 5-8--Per pupil cost of buildings in residence 1-Secondary
Positions 9-12-Per pupil cost of buildings in residence 2-Elementary
Positions 13-16-Per pupil cost of buildings in residence 2-Secondary
Positions 17-20-Per pupil cost of buildings in residence 3-Elementary
Positions 21-24-Per pupil costoof buildings in residence 3-Secondary
Positions 25-28-Per pupil cost of buildings in residence 4-Elementary
Positions 29-32-Per pupil cost of buildings in residence 4-Secondary

This covers all cards in the control card deck. The user can change a parameter in the model by merely changing the data on the cards.

Example: If the planner wishes to assumer higher inflation rates than those assumed in the basic model and/or higher real increases for teachers' salaries, he must change the data on Card 3 to reflect his assumption.

The basic data contained on tape is described on the attached file layout. In the present stage of model development there is no easy way to change this data. It would require a programmer to create a new tape to incorporate a desired parameter change. A routine to update this file in a much less tedious manner is planned for the near future.

FILE LAYOUT OF DATA ON TAPE

This file is held on tape. Record length is 130 bytes. Blocksize is 3510. Subsets of records have different layouts. These are described below.

Subset 1 (First 73 records)

Population--each record is for basic unit:

Bytes 1-3--code for basic unit
20--6 byte fields for age groups 0-19
1--7 byte field for women 15-44

Subset 2 (Records 74-219)

Migration rates--(odd numbered records 1970, even numbered 1980):

Bytes 1-3--code for basic unit
Bytes 4-5--year
Bytes 6-11--migration rate for age group 0-6 (4 decimal places, .0000)
Bytes 12-17--migration rate for age group 7-15 (4 decimal places, .0000)
Bytes 18-23--migration rate for age group 16-19 (4 decimal places, .0000)
Bytes 24-29--migration rate for women 15-44 (4 decimal places, .0000)

Subset 3 (Records 220-236)

Participation rates and enrollment rates:
Bytes 1-2--Blank
Bytes 2-4--age (ages 3-19)
1--3 byte field for age-school participation (1970) (3 decimal places, .000)
1--3 byte field for age-school participation (1980) (3 decimal places, .000)
14--3 byte fields for age-enrollment rates (3 decimal places, .000)

Subset 4 (Records 237-309)

Transportation, nonpublic ratios:

Each record in this subset represents a basic unit.

Bytes 1-3--code for basic unit
Bytes 4-7--ratio of pupils transported to total enrollment (3 decimal places, .000)
Bytes 8-12-- per pupil cost of transportation (2 decimal places, .00)
Bytes 13-20--blank
Bytes 21-24--ratios of nonpublic enrollment to total enrollment (3 decimal places, .000)

Subset 5 (Records 310-313)

Ratio of hirings to number of teachers in an age group for the four residence classifications:

Byte 1--residence classification
6--4 byte fields for hiring rates (4 decimal places, .0000)

Subset 6 (Records 314-321)

Ratio of teachers withdrawing by age group to total withdrawals:

Byte 1--residence classification
Byte 2--blank
6--4 byte fields for withdrawal rates (4 decimal places, .0000)

Subset 7 (Records 322-394)

Pupil-teacher ratios for 1970/1980 for each basic unit:

Bytes 2-4--Intermediate Unit Number
Bytes 1-2--Type of Residence
Bytes 5-9--pupil-teacher ratios 1970 (1 decimal place, 00.0)
Bytes 10-14--pupil-teacher ratios 1980 (1 decimal place, 00.0)

Subset 8 (Records 395-467)

Supply and average salary of teachers by age group and basic unit:

Bytes 1-3--basic unit code
Bytes 4-8--number of teachers in age group 1
Bytes 9-13--average salary of age group 1
Bytes 14-18--number of teachers in age group 2
Bytes 19-23--average salary of age group 2
Bytes 24-28--number of teachers in age group 3
Bytes 29-33--average salary of age group 3
Bytes 34-38--number of teachers in age group 4
Bytes 39-43--average salary of age group 4
Bytes 44-48--number of teachers in age group 5
Bytes 49-53--average salary of age group 5
Bytes 54-58--number of teachers in age group 6
Bytes 59-63--average salary of age group 6

Subset 9 (Records 468-540)

Expenditure ratios by basic unit:

Bytes 1-3--basic unit code
All of the following have 4 decimal places. (.0000)
Bytes 4-9--administrative salaries/total instructional costs
Bytes 10-15--blank
Bytes 16-21--administrative costs/administrative salaries

Bytes 22-27--federal program administration costs/federal funds
Bytes 28-33--supervisors' salaries/teachers' salaries
Bytes 34-39--other instructional costs/teachers' salaries
Bytes 40-45--secretarial salaries/teachers' salaries
Bytes 46-51--instructional expense/teachers' salaries
Bytes 52-57--pupil-personnel/total instructional costs
Bytes 58-63--operations and maintenance costs/total instructional costs
Bytes 64-69--blank
Bytes 70-75--fixed costs/total instructional costs
Bytes 76-81--food services costs/total instructional costs
Bytes 82-87--student/activity costs/total instructional costs
Bytes 88-93--community service/total instructional costs
Bytes 94-99--blank
Bytes 100-105--health services/total instructional costs

Subset 10 (Records 541-613)

Additional expenditures ratios by basic unit:

Bytes 1-3--basic unit code
Bytes 4-8--capital expenditure/current expenditure (4 decimal places .0000)
Bytes 9-13--debt service/current expenditure (4 decimal places, .0000)

Subset 11 (Records 614-686)

Revenue distribution data for each basic unit:

Bytes 1-3--basic unit code
Bytes 4-7--federal funds/total state and local (4 decimal places, .0000)
Byte 8--blank
Bytes 9-12--other local revenue/total local revenue (4 decimal places, .0000)

Subset 12 (Records 687-759)

State payments for density/sparsity:

Bytes 1-3--basic unit code
Byte 4--blank
Bytes 5-9 --density/sparsity per WADM (2 decimal places, 000.00)
Bytes 10-14--other state payments per WADM (2 decimal places, 000.00)

Subset 13 (Records 760-832)

Data on property tax revenues by basic unit:

Bytes 1-3--basic unit code
Bytes 4-14--market value of taxable property
Bytes 15-24--blank
Bytes 25-27--effective millage rate (1 decimal place, 00.0)

Subset 14 (Records 833-861)

Elasticity factor relating growth in market value to personal income by basic unit:

Bytes 1-2--intermediate unit number
Bytes 3-10--elasticity factor (3 decimal places, 00000.000)

Subset 15 (Records 862-934)

Personal income 1970/1980 by basic unit:

Bytes 1-3--basic unit code
Bytes 4-12--personal income 1970
Bytes 13-21--personal income 1980

Subset 16 (Records 935-1007)

Building capacity (elementary and secondary) by age group for each basic unit:

Bytes 1-3--basic unit code
Bytes 4-9--capacity of elementary schools age group 1
Bytes 10-15--capacity of secondary schools age group 1
Bytes 16-21--capacity of elementary schools age group 2
Bytes 22-27--capacity of secondary schools age group 2
Bytes 28-33--capacity of elementary schools age group 3
Bytes 34-39--capacity of secondary schools age group 3
Bytes 40-45--capacity of elementary schools age group 4
Bytes 46-51--capacity of secondary schools age group 4
Bytes 52-57--capacity of elementary schools age group 5
Bytes 58-63--capacity of secondary schools age group 5
Bytes 64-69--capacity of elementary schools age group 6
Bytes 70-75--capacity of secondary schools age group 6
Bytes 76-81--capacity of elementary schools age group 7
Bytes 82-87--capacity of secondary schools age group 7
Bytes 88-93--capacity of elementary schools age group 8
Bytes 94-99--capacity of secondary schools age group 8

BIBLIOGRAPHY

REFERENCES

An Intermediate Unit for Pennsylvania. State Board of Education, 1967.

Annual Certification of the Pennsylvania State Tax Equalization Board. Commonwealth of Pennsylvania, 1965, 1966, 1967, 1968, 1969.

Armitage, Peter and Smith, Cyril. "The Development of Computable Model of the British Educational System and Their Possible Users," Mathematical Models in Educational Planning. Paris: Organization for Economic Cooperation and Development, 1967.

Calculator. Bureau of Educational Statistics, Pennsylvania Department of Education, Vol. XIII, No. 3, 1971.

Correa, Hector. Quantitative Methods of Educational Planning. Scranton, Pennsylvania: International Textbook Company, 1969.

Economic Problems of Nonpublic Schools. Office of Educational Research, University of Notre Dame, 1971.

Establishing the Intermediate Unit. Pennsylvania Department of Education, 1970.

Forrester, Jay. Industrial Dynamics. Cambridge, Massachusetts: Massachusetts Institute of Technology Press, 1961.

Kleindorfer, George B. and Roy, Latet, M.S. A Model for Educational Planning in East Pakistan. Islamabad, Pakistan: Ford Foundations, 1969.

Llewellyn, Robert W. FORDYN An Industrial Dynamics Simulator. North Carolina State University, 1965.

Mathematical Models in Educational Planning. Organization for Economics Cooperation and Development, Paris, 1967.

NEFP Decision Process. National Education Finance Project, 1971.

Our Schools Today, Public School Financial Statistics Report 1968-69. Bureau of Educational Statistics, Pennsylvania Department of Education, 1970.

Our Schools Today, Public School Financial Statistics Report 1969-70. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Our Schools Today, Nonpublic Secondary School Report 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Our Schools Today, Professional Personnel Report 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Our Schools Today, Public Elementary Report 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Our Schools Today, Public Secondary School Report 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Our Schools Today, Public School Building Report 1969-70. Bureau of Educational Statistics, Pennsylvania Department of Education, 1970.

Our Schools Today, Public School Building Report 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Pennsylvania Population Growth and Net Migration 1960-1970. Bureau of Educational Research, Pennsylvania Department of Education, 1971.

Preliminary Projections of Employment and Population. State Planning Board, Commonwealth of Pennsylvania, 1971.

Projections Selected Statistics for Pennsylvania to 1979-80. Bureau of Educational Statistics, Pennsylvania Department of Education, 1970.

Projections Selected Statistics for Pennsylvania to 1980-81. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Ratio '70: A Listing of Teacher-Pupil and Staff Per 1000 Pupils Ratios in Public Schools 1970-71. Bureau of Educational Statistics, Pennsylvania Department of Education, 1971.

Special Education Programs for Exceptional Children, 1968-69. Pennsylvania Department of Education, 1970.

Special Education Programs/Service 1970-71. Pennsylvania Department of Education, 1971.

Special Education Programs/Service 1969-70. Pennsylvania Department of Education, 1970.

Stallard, Troy Francis. A Computerized Model of a Public School System. Raleigh: Center for Occupational Education, North Carolina State University, 1970.

Thonstad, Tore. Education and Manpower: Theoretical Models and Empirical Application. Toronto: University of Toronto Press, 1968.