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ABSTRACT

The initial stage of a model that simulates net prices facing degree students in New York State postsecondary institutions is described. The Student Support Sources model uses readily available data sources to simulate the processes by which family and student resources and financial aid are allocated to different types of students enrolled at different types of New York State institutions. This analog model attempts to replicate the aid allocation process on a student-by-student basis. The model is written in BASIC for a Radio Shack Model III microcomputer system. It simulates resource allocation to categorical types of postsecondary students from the major support sources in New York State and calculates alternatively defined values for net prices facing these student types. To calculate the dollar amount available to each type of student from each of seven sources of support, the model locates user defined price and resource allocation constraints and then adjusts the located dollar values to form a package of aid. Information is provided on the four main functions of the program, data requirements of the model, and limitations of the model. Illustrative data are provided, based on a comparison of dependent undergraduates who are campus-based aid recipients in the State University of New York and independent sectors. (SW)

A MODEL FOR ESTIMATING NET PRICES FACING POSTSECONDARY STUDENTS IN NEW YORK STATE

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Introduction

This paper describes the first stage in the development of a model that simulates net prices facing students in New York State enrolled in degree-granting postsecondary institutions. From the public policy and institutional presepective, net prices are important among the factors which determine aggregate enrollment demand and enrollment shares among types of institutions (Tierney, 1982, 1980; McPherson, 1978; Jackson and Weathersby, 1975). Net price differences between the public and independent sectors are a continuing policy concern. From the student persepective, net prices are among the factors which determine access and choice.

In the perfect world of theory, net price is defined as the marginal price paid by a resource unit, whether a student or a family, after subsidies have been deducted from the stated price of postsecondary education. Subsidies include non-returnable grant aid but not the "self-help" portion of work and loan aid. In the practical world of model building from exising data sources, the resource unit is commonly defined as the family and net price as the student expense budget minus grant aid from all sources.

Net prices are determined for individual students as student aid from federal, state, institutional and other private sources are deducted from stated prices. Among regulated student aid programs, such as Pell Grants, recipient characteristics and award size are defined by law. Among discretionary student aid programs that are administered at the campus level, student characteristics which are associated with the receipt of aid are less

well known (Porter and McColloch, 1982; Barnes and Neufeld, 1980; Huff, 1975). For any given student, deductions to price based on assessed need, merit or other criteria are contained in a "student aid package."

The result of student aid practices is a highly differentiated pricing structure in which the impact of alternative tuition pricing and student aid policy choices is difficult to estimate (Carnegie Council, 1979). Methods for estimating the net price of attendance facing different types of students at different types of institutions have involved the collection of survey data from students and from financial aid records (Olinsky, 1983; Stampen, 1983; Hodgkinson and Thrift, 1982; Hills and VanDusen, 1982; Maryland State Board for Higher Education, 1982; Indiana Commission for Higher Education, 1979). Survey methods have several disadvantages, however. First, they require large outlays of resources. Second, delays between problem specification, data collection, data analysis and report production can be large. Lastly, and most importantly, unless survey data are used to develop generalizable models of the relationships that exist within the pricing system, they do not permit planners to examine the consequences of alternative conditions and policies, the proverbial "what if" questions.

The Student Support Sources model uses readily available data sources to simulate the processes by which family and student resources and financial aid are allocated to different types of students enrolled at different types of institutions in New York State in order to meet student expense budgets. It is not a mathematical model. Rather, it is an analog model which attempts to replicate the aid allocation process on a student by student basis. By nature, a simulation is a simplification of the actual process and may produce results that are insufficiently related to reality for the purposes of decision making. Validation studies in which model results can be compared to actual data must occur before the model can be used to inform policy.

discussion. Despite these caveats, the relatively low cost of using a simulation model and a model's potential for exploring "what if" questions have provided sufficient incentive for the initial effort described here.

The Model

Student Support Sources is written in BASIC for a Radio Shack Model III microcomputer system with a NEWDOS/80 Version 2.0 disk operating system. The program is menu-driven and designed to be used by non-technical staff. It simulates resource allocation to categorical types of postsecondary students from the major support sources in New York State and calculates alternatively defined values for net prices facing these student types. The model consists of three major functional parts:

(1) The Student/Institution Type Selector;

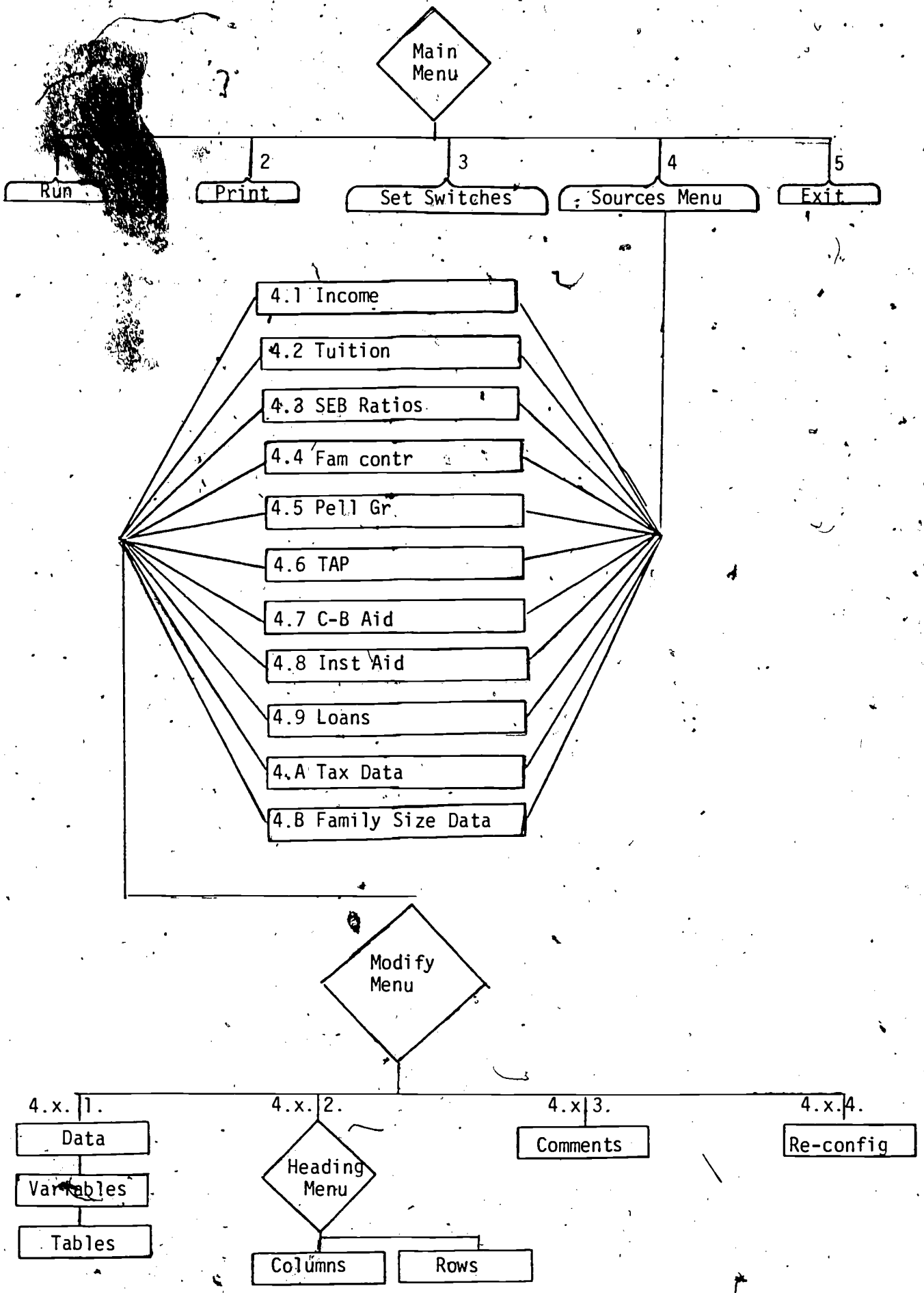
(2) Price and Resource Constraint Data Files; and

(3) The Packaging Calculator.

To calculate the dollar amount available to each type of student from each of seven sources of support, the model locates user defined price and resource allocation constraints and then adjusts the located dollar values to form a "package" of aid.

A diagram of the structure of the program is shown in Figure 1. The Main Menu branches to the four main functions of the program. Option 1 on the Main Menu begins a run of the simulation. During the run, histograms representing each simulated package of aid are displayed on the screen. The packaging algorithm is based on several simplifying assumptions: (1) All institutions add types of aid to a package in the same sequence until the student expense budget is met or until aid sources are depleted. (2) The sequence of aid packaging shifts the costs of attendance as much as possible to publicly

Figure 1. Program Structure



To proceed down the hierarchy, you select options on menus. To move up the hierarchy, you press @.

funded student aid programs and to students and their families. (3) Distinctions among types of aid (grants, loans or employment) are inconsequential for institutions who do the packaging. These assumptions can be accepted only after an adequate validation of the output which results from them.

Option 2 on the Main Menu leads to a printing routine. Hard copy output consists of a table in which information on seven support sources is presented for every student type included in the run. For each source of support, output is shown as a dollar amount and as a percent of student expense budget. Sources of support include Expected Family Contributions, Pell Grants, TAP (Tuition Assistance Program) Awards which are state entitlements, Federal Campus-based Aid, Federally subsized Loans, Institutional Aid, and Others. Finally, two versions of net price are printed for each student type. Net Price 1 refers only to the Expected Family Contribution. Net Price 2 refers to Net Price 1 plus the value of loan indebtedness for the academic year. These two definitions of net price, chosen for their simplicity, refer respectively to short-term and long-term prices, with short-term defined as the year of enrollment. For the 1980-81 data, the net price calculation excludes earnings and loans from the Federal Campus-based programs and from institutional programs. Each of the two net price estimates is printed as a dollar value, as a percent of student expense budget and as a percent of income.

Option 3 on the Main Menu permits the user to set switches that select up to ninety-six student types for each run. These student types represent the four-dimensional matrix formed by four sectors (SUNY, CUNY, Independent and Proprietary), four income points (quartiles), two dwelling groups (resident and commuter) and three emancipation categories (dependent, independent without dependents and independent with dependents).

Option 4 on the Main Menu allows the user to inspect, enter, change or reconfigure the data files which contain cost and resource constraints that apply to each student's package. Most files represent tables in which price or aid constraint data is stored along two student dimensions. By selecting one of these files from the menu, the user can easily inspect and modify the contents of the file, modify the headings associated with the file, or reconfigure the entire file. Changes to the cost and resource constraint files are easy to make so that the user can readily simulate actual or proposed policy programs.

Data Requirements of the Model

The data requirements of Student Support Sources are relatively modest. A brief description of the major cost and resource constraint files is presented below, with data sources that were used for the 1980-81 academic year simulation run. For 1980-81, sector cost constraints were the mean values of tuition and six student expense budgets for all institutions in each sector. However, values for price constraints can be calculated at any level of aggregation within sectors, including individual institutions, so that sector breakdowns of policy interest can be obtained.

For each run of the model, four income points are stored for dependent students and four are stored for independent students. For 1980-81, income points representing midpoints of income quartiles were obtained from the College Scholarship Service, Institutional Summary Data: New York State Report. The major drawbacks of this data source are that it represents aid applicants rather than enrolled students and that it excludes CUNY's aid applicants, because CUNY conducts its own need analysis. No existing data source is ideal, however, and multiple runs of the model for any given year

permit the use of an unlimited number of income points.

Tuition values are stored in a one-by-four array, with one tuition value per sector. The Higher Education Data System (HEDS) at the New York State Education Department collects tuition data annually.

Student expense budget data form a six-by-four array in which six student types per sector are represented. The student types include both resident and commuter students for each of the three emancipation categories. Student expense budget data were obtained from the records of the Bureau of Higher Education Opportunity Programs of the New York State Education Department. This data source represents a sizable sample of all CUNY, SUNY and Independent institutions and contains reliable data on budgets for all six types of students. For the proprietary sector student expense budget data, the College Scholarship Service College Cost Book was used. This data source was less detailed.

Expected Family Contribution data taken from the College Scholarship Service's New York State Report are contained in a table of twenty-six income categories by two emancipation categories. These data represent aid applicants rather than enrolled students and excludes CUNY students.

Pell Grant maxima, minima and flat reductions are stored as single variables. Student income is converted into a Student Eligibility Index (SEI) through a table that replicates the percentage frequency table published by the Department of Education in Pell Grants: End-of-Year Report. By using the summary table, the likely outcome of the Federal need analysis is estimated for each student type and the model does not have to replicate the entire need analysis process.

TAP Award maxima are stored as single variables. Reductions to the annual award ceiling are stored in a table that replicates the "TAP Award Reduction Schedules" published annually by the New York State Higher Education Services

Corporation (NYSHESC). In order to use the TAP Reduction Schedule, however, student income (Federal adjusted gross income) is converted into New York State taxable balance by a formula that includes terms for tax deductions and family size.

The average campus-based award for all three Federal campus-based programs (SEOG, CWS and NDSL) is stored for two emancipation categories per sector. The average is calculated from the annual FISAP Reports available on HEDS. Analysis of data on income and award size from the 1980-81 FISAP Reports for New York State campus-based aid recipients revealed that income had an insignificant effect on award size among campus-based aid recipients when the three programs were considered together. Therefore, the model does not use student income as a determinant of award size. However, since only a small percentage of student receive any form of campus-based aid, separate runs must be conducted for recipients and non-recipients.

Values for loan maxima are stored as single variables. These maxima are published annually by NYSHESC.

Rates at which to allocate institutional aid to student types are stored for each sector. These rates, which are calculated from summary tables of financial aid expenditures published annually by the NYSED Office of Research and Information Systems, are the weakest point in the model. Data on the characteristics of recipients of institutional aid are unavailable on a regular basis.

Limitations of the Model

All model development efforts involve tradeoffs between accuracy, efficiency, feasibility and interpretability. Limitations are unavoidable and must be made explicit to users. There are several obvious limitations to the current version of Student Support Sources. First, the model permits student

types to be defined only in categories which pertain to regulated need-based programs. In practice, a variety of student characteristics, such as measured ability, racial/ethnic background, major field of study, and Veteran's status, may also be determinants of the levels of support received from Federal, state and institutional sources. Second, some forms of support, such as Regents' Scholarships, Higher Education Opportuntiy Program awards, Veteran's Benefits, and Social Security benefits are excluded entirely from the model, except to the extent that they are incorporated into the need analysis for Expected Family Contribution. Third, the resource allocation algorithm for Expected Family Contribution, Pell Grants, Campus-based Aid and Institutional Aid uses aggregate data to allocate dollars to individual student types in a deterministic rather than probabilistic fashion. Fourth, the simplifying assumptions upon which the packaging algorithm is based may violate common practice. A survey study of packaging practices in New York State revealed no clear patterns of practice that could guide the development of alternative packaging routines, however (Singh and Winter, 1981). Fifth, the model uses definitions of net price which are simplistic. Students may make enrollment decisions based on more subtle calculations. For example, the subsidy portion of student loans and the default option may be considered reductions to net price. Lastly, no comparison between the model's estimates of typical student packages and actual packages has been made. The existence of a reliable data source based on student questionnaires and financial aid records for the 1981-82 academic year makes a validation study feasible (Olinsky, 1983). Expert review of the model is also a possible source of validation.

Illustrative Results

Table 1 illustrates one kind of information the Student Support Sources model can generate for one academic year. It compares dependent

undergraduates who are campus-based aid recipients in the SUNY and Independent sectors. Net price 1 is the same for students at each income point because Net Price 1 is the assessed Family Contribution that results from a standardized need analysis. In contrast, Net Price 2, which includes loans, differs markedly for the two sectors. In the SUNY sector, neither loans nor other forms of support are needed beyond the Expected Family Contribution. According to this table, in the Independent sector, even for the lowest income point, the student expense budget is not met by the combination of expected Expected Family Contribution plus public need-based and institutional aid. Borrowing is necessary for all students in the Independent sector. The low income student in the Independent sector would need to borrow an amount equal to almost half his or her family's annual adjusted gross income. In practice, institutional aid may function differently that it does in the model. From other data sources, we know that low income students do not commonly borrow maximum Guaranteed Student Loans. Nonetheless, it is clear from the table that regulated need-based programs do not shift resources to extremely needy students sufficient amounts to make the Independent sector competitive with comparable public sector institutions.

The Student Support Sources model can also provide trend data. So long as the methodology remains constant over several years, changes in net prices estimated by the model will reveal the impact of changes in price and resource constraints. Finally, information on "what if" questions can be generated easily by entering a variety of changes to price and resource constraint files for any academic year.

(Insert Table 1 about here.)

Table 1. Net Price Estimates
for Full-Time Dependent Undergraduate
Campus-based Aid Recipients
in the SUNY and Independent Sectors
in New York State, 1980-81.

NP1 = Total Expected Family Contribution
NP2 = NP1 + Guaranteed Student Loans
SEB = Total Student Expense Budget

Income (Quartile (Midpoint)	SUNY Sector (SEB = $4064) NP1	%Income	NP2	%Income	Independent Sector (SEB = $7364) NP1	%Income	NP2	%Income
$ 6000	702	12	702	12	702	12	2726	45
$16500	1333	8	1333	8	1333	8	3833	23
$25500	2346	9	2347	9	2347	9	4847	19
$37500	4064	10	4064	10	4354	12	6026	1[illegible]

Conclusion

The Student Support Sources model represents a first step in the development of a simulation method for providing policy makers with information about net prices facing postsecondary students in New York State. Limitations to the existing model are numerous and validation has not yet occurred. Further work is required before the model can be used to inform policy decisions at any level. Howeyer, the present stage of model development looks promising. An efficient tool for estimating the effects of alternative policy proposals for the various decision points in the student financial aid system is the desired outcome.

Note:
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