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ABSTRACT

Designed as a tool for colleges and the State Board for Community Colleges in Maryland to update economic impact data on a regular basis, this manual describes sources of impact information, and how the information can be used in economic equations. Part I of the manual describes how values for short-term economic impacts of community college expenditures can be calculated using data on expenditures of government appropriations and student fees and tuition for salaries, purchase of materials, and capital building improvement. The models, which use linear cash-flow equations, are designed to assess the impacts on the business and government sectors of the economy, and can be used for either a statewide or individual campus study. Part II presents the equations used to determine how much more money a college student will earn than a high school graduate; how much more money college students will earn because of the total investment of the state, local jurisdictions, and the students themselves; and the value of the additional tax revenues generated from the increased earnings. Part III describes the computer programs designed for the study. A bibliography, sample computer print-out, and sample surveys are included. (MB)

ECONOMIC IMPACT MANUAL

FOR

MARYLAND COMMUNITY COLLEGES

Dorothy S. Linthicum

Maryland State Board for Community Colleges
The Jeffrey Building • Annapolis, Maryland 21401

September 1978

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PREFACE

The study described in this manual represents the first comprehensive, Statewide analysis of the costs and benefits of Maryland community colleges. These impacts often have been alluded to, but until now the quantitative information has not been available.

This manual is to be used in conjunction with *The Economic Impacts of Maryland Community Colleges: A Closer Look*, a comprehensive document describing the theory and computations used in the study. A summary report, *The Economic Impacts of Maryland Community Colleges*, highlights the major points in the comprehensive report. The summary is available from the State Board for Community Colleges (SBCC), and the technical report can be obtained through the Educational Resources Information Center (ERIC).

This manual is designed as a tool for colleges and the State Board for Community Colleges to update economic impact data on a regular basis. The manual describes where information is available and how it can be used in the equations. Suggestions are also made about how to improve data collection by using survey information and by tapping the resources of local officials.

The State Board for Community Colleges was able to conduct the cost-benefit analysis through a grant from the Maryland State Department of Education, Division of Vocational-Technical Education.

Brent M. Johnson
Executive Director

INTRODUCTION

The economic impacts of Maryland community colleges were recently examined in a study published in September 1978 by the State Board for Community Colleges (SBCC). Estimates of the impacts were measured in two ways. In the short-term approach, the total expenditures of the colleges in FY 1977 were traced throughout the State. Along with the Statewide study, estimates also were made of the economic impacts each college had on its local jurisdiction in FY 1977. In the long-term approach, the effect of the investments made by Maryland community college students and society as a whole were considered.

This manual is designed to be used by the seventeen community colleges and the SBCC in conjunction with the technical report, *Economic Impacts of Maryland Community Colleges: A Closer Look*, which is available from the SBCC or through the Educational Resources Information Center (ERIC). The theory explained in the technical report is not repeated here. This document is a "how-to" manual for those who may wish to update data for future studies or to add survey data that was not available for the 1977 study. Suggestions also are included for refining data collection and use.

The manual is divided into three parts: Part I describes how the values for the short-term impacts were calculated, Part II identifies sources of data used in the long-term or human capital study, and Part III describes the computer programs designed for the study.

In the technical report, a series of questions are used to present the results. The same questions are used in this manual for ease of comparison. The first two parts of the manual include the basic equations and information about data sources, while Part III contains descriptions of the computer programs developed for the study. The manual explains how to add or delete information and how to run basic programs. The actual Fortran and Basic programming are not described, but a printout of program designs can be obtained from the computer.

A word of caution from the technical report is worth repeating here: There is no way to add all the benefits in a credit column and all the costs in a debit column to come out with one neat answer. First of all, some expenditures and costs would be listed more than once. Second, the impact analysis computes both stock and flow figures. These are economic terms which refer to spending on items which are quickly consumed (flow), and spending on items that have a longer life span (stock). Theoretically, these cannot be added to or subtracted from one another. A third related point deals with the use of long-term and short-term analysis in one study. Like the stock goods, human capital studies deal with long-term investments over a person's lifetime. The impact, or short-term, analysis is comparable to the flow goods because it is concerned only with training expenditures for one year.

PART I: ECONOMIC IMPACT OF EXPENDITURES

The seventeen Maryland community colleges circulate funds through the economy by expenditures for salaries, purchase of materials, and capital building improvements. The funds come from internal sources, including State and local appropriations and student fees and tuition; and from external sources, such as the federal government. It is through the circulation of these funds that the colleges generate their economic impact.

Linear cash-flow equations are used in this study and include only what can be readily counted. They attempt to identify who is spending, how much is spent, and where spending is being done. No single figure tells the story. The equations compute not only the benefits of spending by colleges and their staffs in the State, but also the costs of supporting them.

The models, or equations, used in this study are not appropriate for either planning or forecasting purposes. They do not include business cycle impacts on the State and local jurisdictions, nor do they take into consideration multi-region interdependence. This means they do not take into account the tempo of economic activity, the economic calendar, or economic stability. The models do describe, however, what is happening to the money the public invests in Maryland community colleges.

The models also are limited to estimating short-term economic impacts. They are not concerned with the ultimate economic impact of the colleges upon the State and local jurisdictions; and they do not consider what the economy might have been like without the colleges.

Perhaps most important, the models provide a built-in understatement. The actual economic impacts are probably greater than the figures suggest. The models also are flexible and comprehensive in the measurement of dollar outlay, and they indicate where and how the dollars invested in community colleges were spent.

The models, based on the Caffrey and Isaacs study [7], are designed to assess the impacts on two sectors of the economy, business, and government. Because attention is focused on the variety of impacts on each major sector rather than on a simple net positive or negative impact, there is no summary business or government model.

Most equations described below can be used for either a Statewide or individual college study. The word "local" in the variable descriptions applies to whatever jurisdiction is under consideration, whether it is the State, a county, city, or region. Any discrepancies in the equations that result because of differences in the jurisdictions are noted.

The manual ties in explanations of the variables with the appropriate computer printouts to allow easy comparison for those using the computer. The variables have also been standardized to match the actual printout. This does not mean that the computer program must be used; the equations can be calculated separately. However, use of the computer can lessen the chance of error and allow the researcher to change a data element easily. This is important for some uses of the equations that will be described later. (See Appendix A for a computer printout sample.)

Because one of the goals of the SBCC study was to calculate the economic impacts of community colleges by using existing data, estimates for some of the variables were based on Census reports and other State and federal documents. Often the assumption was made that characteristics of community college personnel were similar to those of the population in general. This assumption may or may not be valid, but concrete data to dispute it were usually unavailable. Some colleges may feel, for example, that their personnel spend a greater proportion of their incomes for rental housing than average, or that the average household size of college personnel is smaller than the 1970 Census indicates. The best way to find out if these variables have been misrepresented is by conducting a survey. Appendix B contains a sample survey of questions that relate to variables used in the equations.

BUSINESS SECTOR

What was the total impact of expenditures by the Maryland community colleges and their staffs?

The answer to this question is the one most extensively estimated by the equations, and it is probably of greatest importance in terms of dollar-measured activity. In the computer printout, the answer to this question is the amount for BVCR.

Model BVCR and its component submodels accumulate the direct purchases from local businesses made by the college faculty and staff, the purchases from local sources by local businesses in support of their college-related business volume, and the amount of local business volume stimulated by the expenditure of college-related income by local individuals other than faculty or staff.

BVCR

BVCR = M x ELCR

M = multiplier effect

ELCR = college-related local expenditures

The total impact of expenditures is calculated by applying the multiplier effect to the total college-related local expenditures. Economists use a "multiplier effect" to gauge the expansion of dollars as they are respent within an economy. Because a state has such a varied economic base, fewer dollars "leak" out to other regions. Therefore, Statewide multipliers are larger than

those used for smaller jurisdictions. Most economists would agree that the 2.0 multiplier used in this study is acceptable. There is some question about whether spending for community colleges is really an additional spending. It could be argued that the money would have been spent for other public or private alternatives if the colleges did not exist. In that case, the multiplier should be applied only to federal or other outside funds coming into the State. However, because the equations attempt to assess the total impact of dollars spent, the multiplier is applied to total expenditures.

Suggested multipliers for individual colleges are:

Community College	Impact Region	Projected Population January 1, 1977	m and j
Allegany	Allegany County	82,100	1.2
Anne Arundel . .	Anne Arundel County	355,300	1.3
Baltimore. . . .	Baltimore City	826,200	1.45
Catonsville, Dundalk, Essex. . . .	Baltimore County	643,800	1.4
Cecil.	Cecil County	56,700	1.2
Charles.	Charles County	63,800	1.2
Chesapeake . . .	Kent, Talbot, Queen Anne's, and Caroline Counties	85,900	1.2
Frederick. . . .	Frederick County	101,000	1.3
Garrett.	Garrett County	24,900	1.2
Hagerstown . . .	Washington County	110,000	1.3
Harford.	Harford County	141,200	1.3
Howard	Howard County	108,500	1.3
Montgomery . . .	Montgomery County	585,300	1.3
Prince George's.	Prince George's County	682,400	1.3
Wor-Wic Tech . .	Worcester and Wicomico Counties	88,400	1.3
Maryland Community Colleges . .	State of Maryland	4,170,600	2.0 (m) 1.5 (j)

The multipliers used here reflect conservative estimates. Recent studies indicate multipliers in the past may have overestimated the effects of respending and increased employment because of the leakage of dollars in the later rounds of spending. A more complete discussion of multipliers is in Appendix A of the technical report.

ELCR

Model ELCR is the dollar value of college-related local direct expenditures. These include expenditures by the college as an institution and expenditures by college employees and students.

ELCR = ELC + ELF + ELS

ELC = local expenditures by the college

ELF = local expenditures by faculty and staff

ELS = local expenditures by students

This formula serves a simple accumulating function rather than a specific estimating function.

LC

LC estimates the value of purchases of goods and services by the college from local businesses which are only a portion of total college expenditures.

LC = ELC x (EC - WF - RC)

ELC = proportion of total college expenditures that are local, excluding compensation, internal items, and taxes

EC = total college expenditures

WF = gross compensation to faculty, staff

RC = taxes and other payments to governments

Several methods can be used to estimate the first variable in the equation ELC. Because of the large number of expenditure transactions, the college may sample its disbursements and vendor records to estimate the proportion of total expenditures which are local. The business officer should be consulted about which time period is most representative for a sample of vendor records. (Some colleges may decide to look at an entire year as opposed to a sample time period.) After the time period has been determined, disbursement lists are coupled with vendor records, which indicate the addresses or locations of vendors to determine how much money was spent within and without the jurisdiction under study. Using zip code designations simplifies this process. The information can be collected manually by noting the amount spent by address or zip code. The proportion ELC is then calculated by dividing the total amount spent by the amount spent in the local jurisdiction. Colleges whose purchasing is computerized may be able to get the same information by using special programming.

In the equation LC, the proportion is multiplied by the total expenditures of the college, less wages and salaries and taxes. Amounts for total college

expenditures (EC) and gross compensation (WF) for a Statewide study can be found in annual audit reports filed by the colleges at the end of each fiscal year. Colleges may use these same reports or get the information directly from their business officers or budgets. The taxes and other payments to governments (RC) are usually indicated in the college budget or are available from the business office.

Wages and salaries are not included here but are considered seprately below. Taxes and other payments to all governments are excluded because, by definition, they are not in the business sector. It is suggested that the college exclude other expenditures which are obviously not spent on goods and services. These expenditures include student aid funds (which are not included in the SBCC study) and other funds earmarked for special purposes, such as debt retirement.

This model tends to understate the total impact of a college. By exempting wages, for example, deductions for pensions and insurance are excluded as well.

ELF

Model ELF estimates the dollar volume of local purchases of personal goods and services by college faculty and staff households. Understatement is evident in this model. Owner-occupied dwelling units are not considered. Real property value is considered elsewhere, but this model excludes such items as payments to real estate brokers, payment of interest charges on outstanding mortgages to local banks, and payment of insurance premiums on owner-occupied dwelling units. The inputed-rental on houses owned by faculty and staff is also avoided.

ELF = EHF + ENHF + ELNLF

EHF = expenditures by faculty and staff for local rental housing

ENHF = local nonhousing expenditures by local faculty and staff

ELNLF = local expenditures by nonlocal faculty and staff

This model measures expenditures for rental housing made by faculty and staff living in the jurisdiction under study.

EHF = FL x FH x DIF x EH

FL = proportion of faculty and staff residing locally

FH = proportion of local faculty and staff who rent housing

DIF = total disposable income of faculty and staff

EH = proportion of a tenant's total expenditures likely to be spent for rental housing

The proportion of faculty and staff residing locally can be estimated from personnel directories or by using a sort program on the college computer. Zip codes can be used for an initial count, although in some areas, such as Baltimore City, the actual addresses are needed for zip code areas that straddle boundary lines. The number of faculty and staff living in the local area is divided by the total number of faculty and staff to arrive at the proportion FL.

The proportion of faculty and staff who rent housing (FH) can be estimated from Census data or obtained from a faculty/staff survey. Use of Census data assumes college personnel are as likely to rent housing as the population in general. A problem with using the Census is the timeliness of the data, but local officials from planning or economic development offices may be able to update Census information. The percentage of owner and renter occupied housing by political subdivision and for the State is estimated in the *Census of Housing 1970, Detailed Housing Characteristics* Final Report HC(1)-B22 Maryland, published by the U. S. Bureau of Census. It is available at most libraries, including the library at the SBCC. If a survey is conducted, this information can be obtained directly. (Appendix B contains a sample survey that includes the relevant questions for these equations.)

The total disposable income of faculty and staff (DIF) can be estimated by examining the net payroll amount for several sample weeks. Colleges that pay support staff and professional staff on alternate weeks must get samples of both kinds of pay periods. The payroll or business office should be consulted about which pay periods are most representative for the year. The disposable income is estimated by multiplying the average net payroll by the number of pay periods in one year. Colleges with computerized payrolls may find it easier to simply compute the total net payments made in one year. Another alternative is to estimate the proportion of take-home pay to gross wages for the average employee (about 75 percent in most cases).

The proportion of a tenant's total expenditures likely to be spent for rent (EH) can be estimated from studies of consumer spending or from a survey. Figures used in the SBCC study came from the Bureau of Labor Statistics report *Three Standards of Living for an Urban Family of Four Persons* which is revised periodically. [48] The report lists three levels of annual costs per family in a number of metropolitan and nonmetropolitan areas in the United States. Using this report, a college can select the information from a location which is most relevant to its situation. In the past, the Bureau of Labor Statistics has conducted comprehensive surveys at intervals of only ten years or more. To provide more timeliness and greater flexibility for updating the Consumer Price Index (CPI), the Bureau is introducing an ongoing quarterly consumer expenditure survey. These figures should be available from the Bureau of Labor Statistics in Washington, D. C. or through a local office of economic development.

ENHF

ENHF estimates nonhousing expenditures made in the jurisdiction under study by faculty and staff living in that jurisdiction.

$ENHF = FL \times EL \times DIF \times NHF$

FL = proportion of faculty and staff residing locally

EL = proportion of total nonhousing expenditures that an individual is likely to make in his local environment

DIF = total disposable income of faculty and staff

NHF = proportion of a consumer's total expenditures spent on nonhousing items

The estimates for FL and DIF used above are repeated in this equation. The value for EL can be estimated from survey information or by using the gravity theory. The theory states that the amount of money spent for nonhousing expenditures is inversely proportional to the square of the distance to the point of purchase. The equation for this is shown as:

$$EL = \frac{\frac{RS_L}{D_L^2}}{\frac{RS_L}{D_L^2} + \frac{RS_{N^1}}{D_{N^1}^2} + \frac{RS_{N^2}}{D_{N^2}^2} + \frac{RS_{N^n}}{D_{N^n}^2}}$$

RS_L = total period retail sales in the local environment

D_L = average distance or travel time for a local individual to make a purchase within his local environment

RS_{N^n} = total period retail sales in the n^{th} competing neighboring community

D_{N^n} = average distance or travel time for the local individual to make a purchase in the n^{th} competing neighboring community

This assumed proportion is not necessarily universally true, and studies by area or State planning departments should be consulted when available. Geography also should be considered. For example, although Talbot County may be relatively close to the Annapolis area, the existence of a toll bridge probably limits the dollar flow from Talbot County to Annapolis.

The retail sales figures for RS_L and RS_{Nn} can be estimated from the *1972 Retail Trade Area Statistics and Selected Services*, Census of Business. [49] Figures by State and by county are available. The 1977 Retail Trade Census should be available by 1979 and more recent figures may be available from interim publications of the Census of Business. Libraries which are depositories of State and State-related federal documents, such as McKeldin Library at the University of Maryland College Park, should have not only the full Census reports, but also any interim reports. Any community considered to be in competition with the jurisdiction under study should be included in the equation.

The equation D_L can be estimated by taking one fourth of the longest distance in the jurisdiction, assuming it has a more or less circular area. The average distance for a local individual to make a purchase in the competing communities ($D_N n$) can be estimated from a map of the area. By using the zip code frequencies collected earlier for FL, it is possible to estimate average distances for $D_N n$.

The proportion of a consumer's expenditures spent on nonhousing items (NHF) can be estimated from the Bureau of Labor Statistics report cited above or from survey information. Comparisons with similar studies showed that values for NHF ranged from .63 to .672, while values for EH ranged from .276 to .32. A Bureau of Labor Statistics report indicates income spent for housing is on the increase. [11] The proportion for housing spent by urban wage earners and clerical workers increased from 35.5 percent in 1935 to 40.7 percent in 1973. If a survey instrument is not used, recent trends in reports by the Bureau of Labor Statistics should be considered.

Both EHF and NHF are subject to an inherent bias. Both multiply the take-home pay of faculty and staff by the proportion of faculty and staff residing in the community. The underlying assumption is that the income received by those who reside in the college community is representative of all faculty and staff. To reduce this error, both the income figure and the faculty and staff living in the local environment could be stratified by income class, type of employee, and other suitable categories that would take these effects into account.

Table 1 illustrates how employees could be stratified by type and income. The variables listed are those most likely to be affected by these two factors. For example, a college may find that its classified employees are more likely to rent housing and that they spend a greater proportion of their income on nonhousing items. A survey instrument would be necessary to get the specific information, with the possible exception of disposable income (DIF).

ELNLF

ELNLF = estimates local expendiutres made by nonlocal faculty and staff

ELNLF = (1 - FL) x F x EIF

FL = proportion of faculty and staff residing locally

F = total number of faculty and staff

EIF = estimated average local expenditures by each nonlocal faculty and staff person

Subtracting the proportion of faculty and staff residing locally (EL) from one results in the proportion of faculty and staff who do not reside in the

TABLE 1

VARIABLES BY TYPE OF EMPLOYEE

Employee Category	n	Proportion Living in Local Jurisdiction FL	Total Disposable Income DIF	Proportion Who Rent Housing FH	Proportion of Expenditures for Rent EH	Proportion of Expenditures for Nonhousing Items NHF	Average Demand Deposit DDF	Average Time Deposit TDF
College faculty								
College technical, supervisory, and other professional staff								
College secretarial and other support staff								
College custodial staff								

area. (FL is calculated in the equation for EHF above.) The total number of faculty and staff can be found in HEGIS data submitted by the colleges or from personnel offices. The researcher must decide whether or not to include any part-time employees. (A discussion of this issue is found in Part II, Chapter 2 of the technical report.) The estimated average local expenditures by each nonlocal faculty and staff person (EIF) can come from survey results or similar studies. The SBCC estimate of $300 was conservative compared to figures from similar studies which ranged from $500 to over $1,000.

ELS

The impact of student expenditures and costs was not included directly in the SBCC Statewide study. First of all, data about student expenditures from the colleges was not available, and the literature deals almost exclusively with the traditional four-year student. Without survey data, it would have been difficult to determine how many students would have lived in Maryland regardless of the community colleges. The second factor that influenced the decision not to include student expenditures was the increasing number of part-time students. Although they are college-related, college may not be their primary activity.

The same reasoning used in the State study was applied to the impact statements for the larger metropolitan community colleges. However, colleges in more rural parts of the State pointed out that the jurisdiction would very likely lose part of its population, especially younger people, if the college did not exist. To meet this need, a series of equations was added to measure student impacts. In calculating the economic impacts of individual colleges located in more rural areas, estimates of student housing and expenditure patterns were based on similar studies. If feasible, the variables should be based on survey information which would be more reflective of the locale and community students. (See Appendix B.)

The computer program is written to allow inclusion of student impacts by any college. Colleges receiving a significant amount of federal money for Basic Educational Opportunity Grants, for example, may wish to add on the effects of the student expenditures.

ELS = SF x (EMS + EHS + ENHS)

SF = proportion of students attending college full-time

EMS = local miscellaneous expenditures by students living with parents

EHS = expenditures by students for local rental housing

ENHS = local nonhousing expenditures by students who rent local housing

The total expenditures by students are multiplied by the proportion of students attending a college full-time (SF) in an attempt to count only that

spending which occurs because of the presence of the college. This eliminates expenditures of part-time students whose primary economic activity is not with the college. Full-time students, especially the younger, traditional students, are also the group more likely to leave an area to pursue a higher education if a community or local college is not available. It could be argued that all student expenditures should be included, but the assumption is made here that for the most part, money spent by part-time students would have been spent in the area even if the college did not exist. The number of full-time students is available from college admissions offices or the SBCC.

Two categories of full-time students are considered in the equation ELS. The first category includes students who live with their parents or legal guardians and therefore do not purchase housing services in the community. A considerable portion of their food expenditures is probably included in the household budget and therefore not included as college-related spending. A second category is composed of students who live in the community in private quarters, alone or with others. By using only full-time students whose median age is 20, it is assumed that most of these students probably rent housing as opposed to owning it.

EMS

This equation measures the miscellaneous expenditures by students living with parents or legal guardians.

EMS = SL x EMES x EL

SL = number of local students living with parents

EMES = average miscellaneous expenditures, exclusive of room and board per student of this type

EL = proportion of total expenditures, exclusive of room and board, a student is likely to make in the local environment

The number of local students living with parents or legal guardians (SL) can best be estimated from a student survey. Some colleges may be able to get this kind of information from a related survey, from admission forms, or from financial aid applications. Only those students living in the jurisdiction should be included unless there is evidence that nonlocal students living with their parents make most of their miscellaneous expenditures in the local area. The SBCC study made estimates based on similar studies [38] for the variable SL for the individual impact statements of nonmetropolitan colleges for which student expenditures were included. (No student expenditures were included in the Statewide estimates.)

Estimates of average miscellaneous expenditures, exclusive of room and board, (EMES) can be made from student surveys or from similar studies. Studies of student expenditures have been made in all parts of the country, and although they deal primarily with four-year students, the figures for

miscellaneous expenditures are probably similar to those for community college students. [12, 7] Recent studies in this region estimate miscellaneous expenditures to be about $500 for metropolitan areas. [22, 38] The SBCC used a conservative $450 estimate for the impact statements of nonmetropolitan colleges. If a survey is not feasible, student services personnel at the college may be able to provide a better estimate than is available in the literature that takes into account the economy of the region as well as the current prices.

The proportion of total expenditures a student is likely to make in the local environment (EL) is the same value used in the equation ENHF above.

EHS

EHS depicts expenditures by students for local rental housing.

EHS = SH x HS

SH = number of students renting local housing

HS = average rental housing expenditures per student

The number of students renting local housing (SH) can be estimated from survey, admissions data, or financial aid applications. The college student government association also may be able to provide this kind of information. The SBCC study of nonmetropolitan colleges used estimates based on similar studies. [38] It can be assumed that the average rental housing expenditures per student (HS) equals the average rent paid in that area. This may result in an overestimation since many students may share the rent with others. However, unless survey data are available, the average rent figure is probably the best estimate. The average monthly rent per dwelling for each subdivision in Maryland is available in the U. S. Census *Detailed Housing Characteristics for Maryland*. [42] This average should be multiplied by nine (9) to reflect the annual expenditures for rent made during the regular school year.

ENHS

Local nonhousing expenditures by students who rent local housing are estimated in ENHS.

ENHS = SH x NHS x EL

SH = number of students renting local housing

NHS = average nonhousing expenditures per student

EL = proportion of total nonhousing expenditures a student is likely to make in the local environment

The number of students renting local housing (SH) is the same variable used in EHS above. The average nonhousing expenditures per student (NHS) can be based on a survey or from the same studies used in estimating EMES in the equation for EMS above. Studies in this region estimated nonhousing expenditures ranging from $850 to over $1,400. [22, 38] The current prices, especially costs of food, and the economy of the area should be considered in making this estimate if survey data is not used. The proportion of total expenditures a student is likely to make in the local environment (EL) is the same value used in the equation ENHF above.

How much Maryland business property exists in support of the expenditures of Maryland community colleges and their employees?

PRBCR

Model PRBCR pictures the capital property related to the business activity generated by the presence of a college. It is an indication of how much capital and property are currently employed by business enterprises for each dollar of sales. This average figure is then apportioned to college-related sales. (If student expenditures are included, PRBCR will also estimate the property related to those expenditures.)

PRBCR = RPBCR + IBCR

RPBCR = value of local business real property committed to college-related business

IBCR = value of local business inventory committed to college-related business

RPBCR

The value of local business real property committed to college-related business is estimated in RPBCR.

RPBCR = (BVCR ÷ BVL) x (VB ÷ AMV)

BVCR = college-related local business volume

BVL = local business volume

VB = assessed valuation of local business real property

AMV = local ratio of assessed value to market value of taxable real property

The first part of the equation estimates the proportion of total business volume in the jurisdiction that is college-related. The value for BVCR is calculated in the first equation above. The total local business volume (BVL)

can be computed or may be available from local economic development or planning offices. Information about business volume is readily available but not always for the time period needed. The business volumes for Maryland and the local jurisdictions in the SBCC study were estimated by first obtaining the sum of the dollar volume of retail, selected services and wholesale sales, and value added by manufacturing. Because the most recent figures available for all of these values were for 1972, this sum was weighted by the ratio of 1976 sales tax receipts for the jurisdiction to the 1972 receipts to make the figure more representative of current conditions. The example below shows how Maryland business volume was computed.

1971-72 Maryland retail sales	$ 9,480,043,000
1971-72 Maryland selected services.	2,261,677,000
1971-72 Maryland wholesale sales.	10,212,246,000
1971-72 Value added by Maryland manufacturing .	4,697,400,000
Total Maryland business volume 1971-72. . . .	$26,651,366,000

1972 Sales tax receipts . . . $291,981,000
1976 Sales tax receipts . . . 419,412,000

$$BVL = \$26,651,366,000 \times \frac{\$419,412,000}{\$291,981,000}$$

$$BVL = \$26,651,366,000 \times 1.4364$$

$$BVL = \$38,282,022,100$$

The amount for retail sales and selected services is in the *Retail Trade Area Statistics and Selected Services* [49]; wholesale sales are in the *Wholesale Trade Area Statistics* [50]; and value added by manufacturing is in the *Census of Manufacturing* [43]. Sales tax receipts collected by jurisdiction are available in the annual *Report of the Comptroller* [10] or the annual reports of the sales tax division. All of these reports are available from comprehensive libraries, including McKeldin Library at the University of Maryland College Park. The 1977 Census reports of sales and value added should be available by 1979, and annual reports issued by State agencies are usually available six months after the close of the fiscal year.

The second part of the equation is an estimate of the value of all business real property. A direct statement of the dollar value of capital facilities in the business community is usually not available, making it necessary to use assessed valuation of business property. The frequency of reassessment will influence the estimates for this model, with rising prices old assessments understate current market values. The VB value is converted to market value by the locally used ratio of assessed value to market value of taxable real property. The assessed value of local business property by jurisdiction (VB)

is available in the annual report of the Department of Assessments and Taxation. [25] The report lists the number of properties, and the base of values by whether they are residential, agriculture, or commercial. In the same table the local ratio of assessed value to market value (AMV) is estimated as the weighted ratio of assessment to sales prices. This ratio by law is computed for each jurisdiction by type of property each year. This report is available from the Department of Assessments and Taxation in Baltimore or from a comprehensive library.

IBCR

To calculate IBCR, college-related business volume is multiplied by the locally used inventory-to-business-volume ratio.

IBCR = IBV x BVCR

IBV = inventory-to-business-volume ratio

BVCR = college-related local business volume

The inventory-to-business-volume ratio (IBV) differs from business to business and community to community. The local economic development office may be able to provide a reliable ratio. If not, a sample of local businesses can be made to determine how much inventory to total business volume is kept on hand. In the SBCC study, percentages were calculated from the Internal Revenue Service's *Statistics of Income: Business Income Tax Returns*. [51] (This book is also available at comprehensive libraries.) The value for college-related local business volume (BVCR) is calculated above.

Another secondary effect resulting from the economic activity of the college and of its personnel is the expansion of the credit base of local banks resulting from deposits by the college and its personnel and from the business activity they generate. Given the complexities of the banking business and the prevalence of branch banking, it is difficult to say how much the credit base of local banks is expanded by these deposits. It is possible, however, to obtain a minimum estimate by using model CB. It is assumed that the average level of deposits in the time and demand accounts of the college, faculty and staff, and business enterprises can be expanded by one minus the minimum reserve requirements. Whether the funds are loaned and to whom they are loaned are not of interest; the intent is to note the availability of more funds in the local money market.

CB = (1-T) x [TDC + (TDF x F)] + (1-D) x [DDC + (DDF x F) + (CBV x BVCR)]

T = local time deposit reserve requirement

TDC = average time deposit of the college in local banks

TDF = average time deposit of each faculty and staff person in local banks

F = total number of faculty and staff

D = local demand deposit reserve requirement

DDC = average demand deposit of the college in local banks

DDF = average demand deposit of each faculty and staff person in local banks

CBV = cash-to-business volume ratio

BVCR = college-related local business volume

The local time and demand deposit reserve requirements (T and D) can be easily obtained from local bank officials. The requirements fluctuate with the availability of money, so it is important to get the figures for the time period under study.

The average time and demand deposits of each faculty and staff member (TDF and DDF) can be estimated from survey data using stratified employee categories (see Table 1) or from studies of consumer spending and saving behavior. Studies have been made showing how much the average person is likely to save according to income and age. Other economic impact studies which use survey instruments to get faculty and student data found many respondents unwilling to give this kind of information. If the researcher knows the age and income of an employee, the use of consumer studies to estimate savings in banks might be as valid as actual survey information.

In the SBCC study, the average age of a college employee was estimated to be between 35 and 45, and average incomes for professional staff and for support staff were estimated from SBCC and State Board for Higher Education salary reports. The average time and demand deposits for both professional and support staffs came from a Federal Reserve study showing bank deposits by selected age and income categories. [35] The two numbers for time deposits and demand deposits were weighted according to the number of full-time support and professional staff employed by a college. The example below shows how the estimates are made.

	Average Income	Average Demand Deposit	Average Time Deposit	n
Support staff . . .	$ 8,930	$277	$1,057	150
Professional staff.	19,700	857	2,872	212

Total full-time staff: 362

$$DDF = \frac{(277)(150) + (857)(212)}{362}$$

$$= \$617$$

$$TDF = \frac{(1,057)(150) + (2,872)(212)}{362}$$

$$= \$2,120$$

Average time and demand deposits of the college in local banks (TDC and DDC) can be estimated by the college business officer. The deposits of colleges often fluctuate from day to day, even in time or savings accounts. However, by looking at total deposits over a period of time, average deposits in savings and checking accounts can be estimated.

The cash-to-business-volume ratio is calculated similarly to the ratio for inventory-to-business-volume. The most accurate way to estimate local tendencies for businesses to maintain cash to support business volume is to sample community businesses. If this is not feasible, a percentage can be calculated from the Internal Revenue Service's *Statistics of Income*. [51] The total number of faculty and staff (F) is the same figure used in the calculation of ELNLF, and college-related local business volume (BVCR) is calculated in the first equation.

How much Maryland business volume was unrealized in the business sector because of the Maryland community colleges?

BVUC

Colleges are in competition with all other economic enterprises for the dollars of their constituents. Within the vast and variegated college enterprise are business activities directly comparable to and competitive with businesses that might exist in the community. College cafeterias, for example, compete with local restaurants. The hypothetical questions, such as what business might not have been established in the community had it not been for the presence of the college, are not addressed.

BVUC = income received by the college from the operation of auxiliary business enterprise

The income received by the college from auxiliary enterprises should include gross revenues as opposed to net revenues because measuring the college-related business volume in BVCR, the gross impacts were estimated instead of net profits. This information is usually available in college budgets or from the business officers. Some college audit reports also have detailed auxiliary enterprise financial statements which can be used to estimate gross income.

BM

By using gross revenues in BVUC it is possible to make a more comprehensive estimate of the community college impact on local businesses. Equation BM considers the negative as well as the positive impacts of the college on the business sector.

BM = BVCR - BVUC

BVCR = college-related local business volume

BVUC = local business volume unrealized because of the existence of college enterprises

GOVERNMENT SECTOR

How much tax revenue and transfer payments did the State of Maryland receive because of the presence of the colleges?

Different equations are needed to answer this question from a Statewide perspective as opposed to a local perspective. Those equations which apply only to a Statewide situation or a local jurisdiction will be so indicated. While some of the variable labels overlap, the computer is programmed to differentiate between a local and a Statewide analysis.

RCR

RCR summarizes the annual tax receipts, State and federal aid, and other tax receipts derived from the college and from college-related persons and business activity. The submodels do not take into account the national diversity of taxation, fee structures, user charges, and other revenue techniques of local governments. Therefore, the models are in the most general terms, to be manipulated to allow for the different structures of Maryland government finance.

Statewide:

RCR = RRECR + RNRECR + RSTCR + RICR + RACH + RFCR + RFC

RRECR = college-related real estate taxes paid to the State

RNRECR = college-related property taxes, other than real estate paid to the State

RSTCR = sales tax revenue received by the State as a result of college-related purchases

RICR = income tax received by the State allocable to college-related influences

RACH = federal aid to public schools allocable to the presence of the colleges

RFCR = federal revenue sharing to the State allocable to the presence of the college

RFC = federal aid for community colleges, excluding aid to students

Local:

RCR = RRECR + RNRECR + RICR + RACH + RFCR + RFC + RST

RRECR = college-related real estate taxes paid to local governments

RNRECR = college-related property taxes, other than real estate, paid to local governments

RICR = income tax received by local governments from college-related sources

RACH = State aid to local governments allocable to the presence of the college

RFCR = federal revenue sharing to local governments allocable to the presence of the college

RFC = federal aid for community colleges, excluding aid to students

RST = State aid for community colleges, excluding aid to students

All the variables in RCR are calculated except for RFC and RST. The amount of federal aid for community colleges can be found in annual audit reports filed at the SBCC or from the college business offices. It is suggested that student aid not be included to avoid double counting. The amounts for student aid are also included in the audit reports or can be obtained from college financial aid offices. The amount of State aid for community colleges is available from college budgets, audit reports, business officers, or the SBCC. These variables are not included in the computer program in order to separate college-generated revenues from direct aid to the colleges. The inclusion of these amounts in the final impact statement, however, seems reasonable since the jurisdiction would not have received the funds if the college did not exist.

RRECR

This equation estimates the annual payment of real estate taxes to local governments by the college, by local faculty and staff, and by local businesses for real property allocable to college-related business.

Statewide and local:

RRECR = RREC + RREF + RREBCR

RREC = real estate taxes paid to local governments by the college

RREF = real estate taxes paid to local governments by local faculty and staff

RREBCR = real estate taxes paid to local governments by local businesses for real property allocable to college-related business

The amount of real estate taxes paid to governments by a college can be estimated from the budget or from the business officer. Most colleges do not directly pay any real estate taxes because of their tax exempt status. However, those colleges that rent any facilities, such as Wor-Wic Tech Community College, should estimate the proportion of rent that is used to pay real estate taxes.

RREF

Model RREF represents the real estate taxes paid to local governments by local faculty and staff. The equation assumes that faculty and staff personnel who own their own homes live in facilities of average value.

Statewide and local:

RREF = LF x (1 - FH) x [(PT) x (VPR ÷ NPR)]

LF = number of faculty and staff residing locally

FH = proportion of local faculty and staff who rent housing

PT = local property tax rate

VPR = total assessed valuation of all local private residences

NPR = total number of local private residences

The number of faculty and staff residing locally (LF) can be calculated by multiplying the proportion of local faculty and staff (FL) times the total number of faculty and staff (F). (See equation above for values of FL and F.) The proportion of local faculty and staff who rent housing (FH, used in equation EHF above) subtracted from one results in the proportion of employees who own housing.

The last part of the equation is an estimate of the average value of private dwelling units in the community. This estimate may be unnecessary if other figures of the value of owner-occupied dwelling units are available. The

U. S. Census of Housing does provide median values of private residences, but the information from the Census may be too outdated in light of the current housing market. A local economic development or planning office or even a large real estate firm may be able to provide a better estimate than the calculated average value. The local property tax rate (PT), the total assessed value of private residences (VPR), and the total number of private residences (NPR) are available from the Department of Assessments and Taxation annual report. [25]

RREBCR

This model estimates the value of real estate taxes paid to local governments by local businesses for real property allocable to college-related business.

Statewide and local:

RREBCR = PT x [(BVCR + BVL) x VB]

PT = local property tax rate

BVCR = college-related local business volume

BVL = local business volume

VB = assessed valuation of local business real property

The second part of the equation is an estimate of the assessed value of business property that is related to college expenditures. It is multiplied by the local property tax rate (PT) to find the value of real estate taxes paid by businesses for their college-related business. All the variables used to find RREBCR have been used in prior equations.

RNRECR

Equation RNRECR is concerned with the payment of property taxes, other than real estate, allocable to the college, such as inventory and personal property taxes.

Statewide and local:

RNRECR = RNREF + RNREBC

RNREF = nonreal property taxes paid to local governments by local faculty and staff

RNREBC = inventory and other nonreal property taxes paid to local governments by local businesses for assets allocable to college-related business

RNREF

RNREF expresses the value of nonreal property taxes paid to local governments by local faculty and staff. It assumes that faculty and staff households will pay the same proportions of such taxes as the other local citizens.

Statewide and local:

$$RNREF = LF \times (ROP \div TC)$$

LF = number of faculty and staff residing locally

ROP = total property taxes for other than real estate or inventories paid to local governments

TC = total number of local households

Nonreal property taxes paid by college personnel are estimated by multiplying the number of faculty and staff residing locally times the average nonreal property tax paid by each household in the jurisdiction. (LF is used in an equation above.) To estimate the average tax paid, the total property taxes for other than real estate or inventories (ROP) are needed as well as the total number of local households (TC).

Most property tax is related either to land or improvements to land, but a significant amount of tax dollars is also paid for nonland-related items, such as tangible personal property. The easiest way to get an estimate of the nonreal property taxes paid in a jurisdiction is to contact the local budget or tax office. In a Statewide study, that may not always be feasible, but an estimate can still be made by using the annual report of the Department of Assessments and Taxation. [25] The report breaks down the taxable basis for county (and Baltimore City) purposes by category, such as land, improvements to land, and tangible personal property. The taxable base can then be multiplied by the effective tax rate for an estimate of taxes paid by category. When using the Assessments and Taxation report, the researcher should be careful to select the tables which are applicable to the unit under study. For example, very similar tables are used to estimate the taxable basis by county, except one table is for county purposes while the other is for State purposes. In most cases the State table figures are higher because the State allows fewer exemptions than most counties. In a Statewide study, figures for State purposes should be used, while figures for county purposes should be used in individual college studies.

Local officials in planning or development offices may be the best sources for the variable TC. The Census also provides this information, but it may be out of date. Regional agencies may also be able to provide this kind of information. For example, in the Washington area, a regional publication called *Trends Alert* provides updated information about households in the metropolitan counties. The Census also publishes interim reports with data on households.

This information, however, is rarely available by county and usually is on a Statewide basis only. If figures are not available for certain areas, there is a way to update Census numbers by using population figures supplied by the Department of Health and Mental Hygiene. For example, from the U. S. *Census of the Population* for Maryland [44], the number of households for 1970 and the average household size can be taken. The increase (or decrease) in population can be found by subtracting the number of people living in a jurisdiction in 1970 from the number living there in the year for which the study is being conducted. This result is divided by the average household size for an estimate of the number of households that have been added (or subtracted) since 1970. This number is added (or subtracted) from the base Census figure for an estimate of the current number of total households.

RNREBC

This equation estimates the inventory taxes paid to local governments by local businesses for assets allocable to college-related business.

Statewide and local:

RNREBC = IT x IBCR

IT = local inventory tax rate

IBCR = value of local business inventory committed to college-related business

This equation will not be used by many of the colleges for individual studies because most counties do not have an inventory tax as an incentive to business. Maryland does have an inventory tax, and at the time of the SBCC study, Allegany, Baltimore, Garrett, Washington, Wicomico, and Worcester Counties and Baltimore City also had a tax on inventories. The inventory tax rate, which is usually a percentage of the property tax rate (except for the State) is available from the Maryland Department of Economic and Community Development *Industrial Facts* [26]. The value of local business inventory committed to college-related business (IBCR) is calculated above.

RSTCR

RSTCR estimates the sales tax received by Maryland as a result of college-related purchases.

Statewide:

RSTCR = ST x (BVCR ÷ BVL)

Variables:

ST = total sales tax collected in Maryland

BVCR = college-related business volume

BVL = Maryland business volume

Sales tax collected by the counties and Baltimore City goes directly to the State and, therefore, this equation is applicable only to a Statewide study. The portion of the total business volume in Maryland, found by dividing BVCR by VBL (see equations above for these values), is multiplied by the total sales tax receipts (ST) for an estimate of college-related sales tax. The sales tax receipts can be found in the annual report of the Comptroller of the Treasury. [10]

RICR

This represents the revenues received by governments from income taxes allocable to college-related influences.

Statewide and local:

RICR = FL x IL x WF

FL = proportion of faculty and staff residing locally

IL = proportion of income paid to local governments for local income tax

WF = gross compensation paid to faculty and staff

Income taxes are levied by both the State and local jurisdictions in Maryland. The values of the proportion of faculty and staff residing locally (FL) and gross compensation paid to faculty and staff (WF) are discussed in the equations above. The proportion of income paid to Maryland for income tax can be found by dividing the total gross personal income by the income tax receipts. These figures are available from the annual report of the Income Tax Division of the Comptroller of the Treasury. [9] The report is available at any comprehensive library or from the Income Tax Division, and it contains similar figures for gross incomes and tax receipts by county and Baltimore City.

This equation estimates the State or federal aid provided to local public schools that is allocable to children of college-related families.

Statewide:

RACH = APS x (CHPSF ÷ CHPS)

Variables:

APS = total federal aid to public schools

CHPSF = number of faculty and staff children attending public schools

CHPS = total number of children attending public schools

Local:

RACH = APS x (CHPSF ÷ CHPS)

APS = total State aid to local public schools

CHPSF = number of faculty and staff children attending local public schools

CHPS = total number of children attending local public schools

In the Statewide study, RACH computes the amount of federal aid for public schools (elementary and secondary) allocable to children of college-related families. RACH for local studies of individual colleges computes the amount of State aid for public schools that is a result of children of college-related families. Because State aid is based on the number of students in average daily attendance, the local school district receives funds for each child from faculty and staff families. Federal aid is not based entirely on a per capita basis, but it is assumed that public school operating costs are directly related to the number of students enrolled.

Figures for the total federal aid to public schools (APS - Statewide), the total State aid to local public schools (APS - Local), and the total number of children attending public schools (CHPS) are available from the Maryland State Department of Education *Facts About Maryland Public Education* published annually [32] or from local boards of education. The number of faculty and staff children attending public schools (CHPSF) can come from survey data or from estimates based on aggregate data. Census data provide information about ages which can be juxtaposed with household data for an estimate of the number of school-aged children in the average household. However, that does not take into account those children attending private or parochial schools. The SBCC study assumed that household characteristics of college personnel were similar to those of the general population, but a different technique was used to account for children of school age who do not attend public schools. The total public school enrollment for a jurisdiction, either the State or political subdivision, was divided by the number of households in that jurisdiction (TC) to estimate the average number of children attending public school per household. This average was then multiplied by the number of faculty and staff (F) for an estimate of CHPSF.

RFCR

This model reflects the amount of federal revenue sharing, which is allocated on a per capita basis, the local government receives as a result of the presence of faculty and staff and their families.

Statewide and local:

RFCR = FHL x (RF ÷ POPLR)

FHL = total number in faculty and staff households

RF = federal revenue sharing received by the local governments

POPLR = total local resident population

The only federal aid allocated on a per capita basis identified in this study is federal revenue sharing. Other tax transfers from the federal government can be included in this equation if the presence of additional population is directly reflected on aid payments. The amount of federal revenue sharing received by different levels of government (RF) is available from the U. S. Office of Revenue Sharing in Washington, D. C.; from *Local Government Finances in Maryland* [27], or from local budget officials. In Maryland each county, Baltimore City, and the State receive funds from this source. The SBCC Statewide study did not use a cumulative amount since the State had no control over local federal revenue sharing funds and instead included only that amount which went directly to the State.

To find the average amount per person received by a jurisdiction for revenue sharing, the total receipts are divided by the resident population (POPLR). Current population estimates are available from the Maryland Department of Health and Mental Hygiene in Baltimore [28] or from local planning offices. The computed average is then multiplied by the number of persons in faculty and staff households (FHL). FHL can be found by multiplying the number of faculty and staff (F) by the average household size for the jurisdiction under study. (See above for value of these variables.)

How much revenue did the local jurisdictions receive because of the presence of the seventeen community colleges?

In the Statewide study, an estimate of the revenue received by local jurisdictions can be made by adding the individual RCR variables calculated for each college. Caution should be used in comparing these figures with Statewide results to avoid double counting.

How much did it cost the State of Maryland to provide services for the colleges and their staffs?

OCMPSC

OCMPSC expresses the annual operating costs of government services that are provided to the college or to individuals related to the college.

Statewide and local:

OCMPSC = OCMCR + OCPSCR

OCMCR = operating cost of local government-provided municipal services allocable to college-related influences

OCPSCR = operating cost of local public schools allocable to college-related persons

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OCMCR

This model estimates the cost of government-provided municipal services allocable to college-related influences. If it were possible to separate these services definitively into those that are people-oriented versus those that are property-oriented, allocation would be made on a prorated basis with respect to population in the first case and with respect to either geographic area or value of property in the second. Such a distinction, however, is not easily made. Because a college is usually labor intensive, the share of government expenditures allocated to it under this technique will probably be higher than it would be for an industrial installation.

Statewide and local:

$$OCMCR = \frac{[(F \div POPLD) + (FHL \div POPLR)]}{2} \times BMS$$

F = total number of faculty and staff

POPLD = total local daytime population

FHL = total number of persons in local faculty and staff households

POPLR = total local resident population

BMS = local governments' operating budget except public schools

The first part of the equation OCMCR deals with the problem of assigning costs of government not only to those living in jurisdiction, but also to commuters. Baltimore City officials, for example, point out that the commuting population imposes real costs for street and road repair, water and sewer, and other related services. The daytime population (POPLD) of a jurisdiction can be estimated by local planning or traffic control officials. Estimates also can be based on studies of commuting patterns made by the Maryland State Department of Planning. Some areas, such as the Washington metropolitan region, may have fewer people in the daytime population, while others will have more. Values for the number of faculty and staff (F), the number of persons in faculty and staff households (FHL), and the resident population (POPLR) are found in equations above.

The amount of a government's operating budget, except public schools (BMS), is available from local or State budget officials. This amount should include only those expenditures made from revenues collected by the jurisdiction under study. For example, the total county budget usually includes all revenues,

including State and federal aid. The question the equation is attempting to answer for an individual study, however, is how much does the jurisdiction spend in support of college personnel and their families. Since the equations only require local expenditures to be broken down into two major categories, elimination of outside revenues is relatively simple.

This information is also available from State publications. The annual report of the Comptroller of the Treasury [10] contains detailed information for State expenditures, and *Local Government Finances in Maryland* published annually by the Department of Fiscal Services [27] has county and Baltimore City information. Both of these are usually kept on reserve at comprehensive libraries. If the data from Fiscal Services is used, comparisons must be made between expenditure and revenue tables to identify how much of the total budget comes from local monies. Because both of these publications are often not immediately available, a local official may be able to provide more timely information.

OCPSCR

OCPSCR, using similar logic to the previous model, estimates operating costs of local public schools allocable to college-related persons.

Statewide and local:

OCPSCR = CHPSF ÷ CHPS x BPS

CHPSF = number of faculty and staff children attending local public schools

CHPS = total number of children attending local public schools

BPS = local governments' operating budgets for public schools

The number of faculty and staff children attending local public schools (CHPSF) and the total number of children attending public schools (CHPS) are both used in calculating RACH above. The local operating budget for public schools (BPS) is available from the same sources used to find BMS above. The amount for BPS should only include funds from the jurisdiction under study; in a county study, only county revenue is included while State and federal aid is not. (This information is also available from the State Department of Education.)

What is the value of State property related to services provided for the colleges and their employees?

GPCR

GPCR indicates the dollar value of local government-owned capital facilities that exist in support of services provided to the college and to college-

related individuals. It provides an estimate of related capital facilities without attempting to state how much capital outlay will be needed specifically to provide such services. This would involve assumptions concerning the nature of capital investment, the scale of operations at the time the investment is made, and many other factors that are beyond the scope of this study.

Statewide and local:

GPCR = [(OCMCR ÷ BMS) x GPM] + [(OCPSCR ÷ BPS) x GPPS]

OCMCR = operating cost of government-provided municipal services allocable to college-related influences

BMS = local governments' operating budget except public schools

GPM = value of all local government property except public schools

OCPSCR = operating cost of local public schools allocable to college-related persons

BPS = local governments' operating budgets for public schools

GPPS = value of all local government property associated with public schools

Only two variables in this equation, GPM and GPPS, are not calculated or used in the equations above. Both are available from the annual report of the Department of Assessments and Taxation [25] or from local tax offices. The annual report provides a table that shows the value of government-owned tax-exempt property by where it is located. The table also indicates how the property is used, for schools or office buildings for example, so values for both GPM and GPPS can be determined.

How much real estate taxes are foregone by the State of Maryland because of the tax exempt status of the colleges?

RFREC

This equation estimates the value of property taxes that the college would pay if it were subject to such taxes on its currently exempt holdings. The key assumption behind this model is that the assessed value of the college's land would be similar to that of other land in the community.

Statewide and local:

RFREC = (RRE - RREC) x (GC ÷ CL) - RREC

RRE = total real estate taxes collected by local governments

RREC = real estate taxes paid to local governments by the college

GC = geographical area of the college

GL = geographical area of the local environment, exclusive of the college

The amount of real estate taxes paid by the college (RREC) is used in calculating RRECR above. Total real estate taxes collected by local government (RRE) is available from local budget or tax offices or from the annual report of the Department of Assessments and Taxation. [25] This figure should only include that portion of the property tax which comes from real estate.

The geographical area of the colleges (GC) is available from college facilities offices or from the Director of Facilities at the SBCC. The geographical area of the local jurisdictions can be found in the *Maryland Manual* [29], from local planning offices, or from the Department of Economic and Community Development *Brief Industrial Facts* [26]. GL is computed by subtracting GC from the total geographical area.

What is the value of municipal-type services a college provides itself?

OCMSC

This variable indicates the value of municipal-type services provided by the college instead of or in addition to those provided by local government. These include services such as police and security, health and sanitation, street lighting, street maintenance, and grounds maintenance.

Even assuming comparability in the quality of services, it is not certain that the expenditures by the college are equal to those that would be made by the local government.

Local:

OCMSC = value of municipal-type services self-provided by college

The value of services self-provided by the college (OCMSC) can be estimated from college budgets or by the business officer. Some information may also be available from the annual audit reports filed with the SBCC.

GENERAL EMPLOYMENT

How many full-time jobs are available in Maryland because of the operation of the seventeen community colleges?

JM

By using the employment multiplier effect J, the number of jobs in the

community attributable to the presence of the college can be determined.

JM = J x F

J = multiplier effect

F = total number of full-time faculty and staff

The employment multiplier (J) is based on the same theory that determines the expenditure multiplier (M). For individual college studies, J and M are identical. (See equation BVCR above for explanation of multiplier effects.) For the Statewide study, the SBCC study used 2.0 as the expenditure multiplier, and 1.5 as the employment multiplier (J). This was a reflection of current literature that suggests employment multipliers may have been overestimated in the past. The total number of full-time faculty and staff (F) is available from the equations above.

REGIONAL STUDIES

Both the equations and the computer programs can be adapted to measure the impact of a single college on a region (as opposed to a single jurisdiction) or a cluster of colleges on a single jurisdiction. An example of the first type of study is the impact of Chesapeake College on its four-county region, and an example of the second is the impact of the three Baltimore County community colleges on Baltimore County.

In the first type of study, which will be referred to as a regional study, all variables relating to the college or its faculty and staff are computed as described in the narrative above. Variables relating to the study area itself require special treatment by either aggregating raw data or by using weighted averages. The following variables would be affected:

M - multiplier effect
Enlarging the study area from a single jurisdiction to a region may result in a larger M. For example, Worcester County or Wicomico County by themselves justify only a 1.2 multiplier but together result in a 1.3 effect.

EL - proportion of nonhousing expenditures an individual is likely to make in his local environment
A larger region will affect the gravity theory by changing the status of competing communities resulting in an increased proportion.

BVL - local business volume
To compute a regional BVL, the business volume from all jurisdictions is simply added together.

VB - assessed valuation of local business real property
This variable also calls for adding together the assessed valuations from all jurisdictions.

AMV - local ratio of assessed value to market value of taxable real property

Usually these ratios are very similar, especially if there are economic ties among the jurisdictions within the region under study. A regional ratio can be computed by weighting the jurisdictional ratios by the assessed valuation of real property and calculating an average.

IBV - inventory-to-business-volume ratio

This ratio will vary little among jurisdictions within a region. If significant variance is found, a weighted average can be computed.

CBV - cash-to-business-volume ratio

(see IBV)

PT - local property tax rate

It is likely that the tax rate will vary from jurisdiction to jurisdiction. A weighted average can be calculated using the total assessed valuation of all local private residences. (see VPR)

VPR - total assessed valuation of all local private residences

A regional VPR can be computed by adding together the assessed valuations for each jurisdiction.

NPR - total number of local private residences

NPR can be computed by adding together the number of residences of each jurisdiction.

ROP - total property taxes for other than real estate or inventories paid to governments

ROP can be computed by adding together the total nonproperty taxes of each jurisdiction.

TC - total number of local households

Regional TC is the total number of households of all jurisdictions in the region.

IT - local inventory tax rate

If an inventory tax rate exists, it can be computed similarly to PT above.

IL - proportion of income paid to local governments for local income tax

The proportion IL is found by dividing the total gross personal income for the region by the total income tax redeipts.

RF - federal revenue sharing received by the local governments

RF is computed by adding together the total revenue sharing received by each jurisdiction.

POPLR - total local resident population
POPLR is computed by adding up the population of all jurisdictions included in the region.

POPLD - total local daytime population
POPLD is computed by adding the daytime population of all jurisdictions in the region.

BMS - local governments' operating budget except public schools
BMS is computed by adding together the operating budgets of each jurisdiction.

CHPS - total number of children attending local public schools
CHPS is the number of children attending public schools in all the jurisdictions in the region.

BPS - local governments' operating budgets for public schools
BPS is computed by adding together the school budgets of each jurisdiction.

GPM - value of all local government property except public schools
GPM is the value of local government property in all jurisdictions in the region.

GPPS - value of all local government property associated with public schools
GPPS is the value of all school property in the jurisdictions in the region.

RRE - total real estate taxes collected by local governments
RRE is computed by adding together the real estate taxes collected by all jurisdictions in the region.

GL - geographical area of the local environment, exclusive of the college
GL is computed by adding together the area of all jurisdictions in the region.

J - employment multiplier effect
(see M)

Regional studies may be useful for colleges that are not included formally in a community college region (as Chesapeake College and Wor-Wic Tech Community College) but have informal or economic ties to neighboring jurisdictions. For example, Allegany County has strong ties to parts of West Virginia and Pennsylvania. Not only does the college impact students from these out-of-state areas, but it also effects the economies of these areas. For this reason, Allegany Community College may decide to assess its impacts on the tri-state region as well as the local jurisdiction which supports it.

The equations can also be used for a second type of study, which will be called a "cluster study," to examine the effects of two or more colleges on a

single jurisdiction. All variables relating to the jurisdiction are computed in the normal way. Variables relating to the colleges and their personnel are usually aggregate numbers found by adding totals for each college. Variables which require simple addition are:

EC - total college expenditures

WF - gross compensation to faculty and staff

RC - taxes and other payments to governments

DIF - total disposable income of faculty and staff

f - total number of faculty and staff

TDC - average time deposit of the college in local banks

DDC - average demand deposit of the college in local banks

RREC - real estate taxes paid to local governments by the colleges

CHPSF - number of faculty and staff children attending local public schools

FHL - total number of persons in local faculty and staff households

GC - geographical area of the colleges

OCMSC - value of municipal-type services self-provided by the colleges

Other variables may require more than simple addition for their computation:

FL - proportion of faculty and staff residing locally
"Using the same method described in the narrative above, the number of personnel from all colleges living within the jurisdiction under study can be compared with the total number of personnel.

FH - proportion of local faculty and staff who rent housing
If county-wide Census estimates are used, FH will not have to be computed separately. However, if survey data is used, a weighted average based on the total number of faculty can be computed.

TDF - average time deposits of each faculty and staff person in local banks
If one college has higher salaries overall or is dominated by more professional staff as opposed to support staff, a separate TDF should be computed using the method described in the narrative above.

DDF - average demand deposit of each faculty and staff person in local banks
(see TDF)

LF - number of faculty and staff residing locally
LF is based on the FL computed above.

The cluster study is useful for a college that wants to compare its individual impacts on a jurisdiction with the joint impact. At present, cluster studies apply only to the Baltimore County community college system.

ADDITIONAL USES OF IMPACT ANALYSIS

The primary use of information from the impact analysis is to inform a community about the effects of a community college on the local economy. Often the economic relationships are not fully comprehended. The results of this study can clarify different aspects about these relationships and indicate how a college can strengthen these ties.

The study was designed to help college researchers update economic impact data easily. New information does not have to be generated, but data from a special survey might add new insight. Reports in newspapers and popular magazines that appear regularly can be used to update certain variables. News magazines, for example, often carry reports of consumer spending, the price index, and the tax structure. By being open to a variety of informtion sources, a college could schedule an annual update of the study with only minimal work. After the information is collected, the analysis can be quickly computed at the SBCC. (See Part III.) Comparisons between years can then be made.

The effect of different assumptions can also be compared. A college might want to establish a range of impacts between conservative and more liberal assumptions. For example, by adjusting the multiplier effect a college could show that college-related business volume ranged from one point to another. In this case, two computations would be made with different values assigned to M.

In addition, this information could be used during the budget planning process. The State, for example, could be shown the difference a $100 increase per full-time student would make in the economy. A college could also point out to its local subdivision the effects of a budget cut on the economy and the local tax receipts. In estimating the effects of a decrease or increase, three variables should be adjusted. The total college expenditures (EC) would be altered to reflect a percentage or actual dollar change. The gross compensation to faculty and staff (WF) also should be changed by an actual dollar figure from the budget or a percentage based on an overall cut or increase. The total disposable income of faculty and staff (DIF) is then equal to 75 percent of the new figure for WF. (This assumes about 25 percent of an individual's salary is withheld for taxes and insurance premiums.)

The addition of other equations or variables will not necessarily preclude the use of the study itself or the computer programming. The equations are basically linear operations, so the addition of a new element should not be difficult. Even if totals are changed, it may be useful to have the basic computations.

PART II: HUMAN CAPITAL INVESTMENT

Studies of human capital investments usually include a large sample, not only because data is not available for smaller groups; but also because the sheer size can eliminate discrepancies that tend to distort the final results. In the 1977 SBCC study, an assessment of human capital investments of community college students was made on a Statewide basis only. For this reason, there is less diversity in the data collection process and, therefore, less explanation in this portion of the manual.

This manual also does not repeat the theory used in setting up the equations to measure human capital investments. The equations used in the technical report are simply repeated here and the actual data sources described. The technical report includes explanations of the variables, how and why they were selected, and how the equations are used. Three different sets of equations are used to compute private investments, social investments, and tax returns.

How much more money in present dollars will a Maryland community college student earn during his or her life than a high school graduate?

Equations for Private Investment

Part-time students

$$\frac{-TF-BS-e(FG)}{(1+i)^1} + \frac{-TF-BS-e(FG)}{(1+i)^2} + \frac{(1-a)(e)(ED)}{(1+i)^3} + \ldots + \frac{(1-a)(e)(ED)}{(1+i)^n} = PV$$

Full-time students

$$\frac{-TF-BS-e(FG)+FA}{(1+i)^1} + \frac{(1-a)(e)(ED)}{(1+i)^2} + \ldots + \frac{(1-a)(e)(ED)}{(1+i)^n} = PV$$

TF - tuition and fees
BS - books and supplies
e - labor force participation rate (employment rate)
FG - foregone earnings
FA - financial aid
i - interest rate
a - ability adjustment factor
ED - earning differential between high school graduate and person with less than three years of college
PV - present value of community college investment

In establishing an amount for tuition and fees, the cost schedules for each of the community colleges must be considered. Tuition charges for full-time resident students range from $150 to $300 per term. The State Board for Higher Education annually estimates the average charge for tuition and fees at Maryland community colleges using weighting methods. In the SBCC study, the SBHE estimate of $430 for full-time resident students was used for the variable TF in the full-time student equations, while $215, or half that amount, was used for the variable TF in the part-time equations. This may have caused an understatement of tuition paid by students because it did not adjust for students paying out-of-jurisdiction or out-of-state fees. However, it is a good estimate of how much the average community college student in Maryland pays for tuition and fees for one year.

Another direct, out-of-pocket expense for the student is for books and supplies. While some curriculums may require minimal expenses for books and supplies, other programs, such as art, may require extensive investment. The SBCC study used a rough estimate of about $300 per year for full-time students and $150 a year for part-time students, which results in about $25 per course for books and supplies. This amount is reasonable for 1976-77, but it may need adjustment over time.

Several factors should be noted before further discussion of the actual variables in the equations. First of all, it is obvious from a quick examination of the equations that the cost stream for part-time students is two years, while the cost stream for full-time students is only one year. This seems to run counter to the idea that community colleges are "two-year colleges." However, according to data from the latest *Student Follow-Up Study: First-Time Students Fall 1972* [41], the average community college student in Maryland attends college 33.2 hours. This was the basis of terminating the cost stream for full-time students after one year and extending it for part-time students for two years. Several studies also indicate that returns past age 60 are usually insignificant. In the SBCC study, income stream was arbitrarily terminated at age 64.

Another factor is determining the point in an individual's life in which the investment stream should begin. Human capital studies in the past have dealt almost exclusively with the traditional 18- to 22-year-old, four-year college student. Community colleges, however, have increasingly attracted the older student which is reflected in a rising median age of community college students. To accurately portray present trends, the investment stream should not arbitrarily begin at age 18 but should reflect actual experiences of average students. In the SBCC study, HEGIS data was used which broke down student categories by age and sex. For full-time males, for example, the stream began at age 20, while the stream for part-time women began at age 28. The age factor is also important in determining other variables, such as employment rates which are discussed below.

The last major cost to [illegible] in the equations is foregone earnings (FG). As noted in the technical report, while this cost is often overlooked, it is the deciding factor for many students in determining the affordability of higher education. The values to use the foregone earnings depend on age and whether

the student is male or female. Human capital studies based on traditional students have estimated foregone earnings of 18- to 22-year-olds, making minor adjustments for summer employment and low-paying part-time work. The older community college student, however, who gives up a job at age 27 or 28 to return to college is obviously foregoing more income than the 18-year-old high school graduate. The old measurements also do not allow for the majority of community college students who work at regular full- or part-time jobs in the community while attending college at night.

The SBCC tapped the resources of the Follow-Up Study data bank to arrive at an estimate of the value of foregone earnings. Students who reported that they were employed full-time were shown to have zero costs in foregone earnings. From the Follow-Up data, it was possible to calculate the mean salary of students employed full- or part-time upon leaving college for those students who were employed while attending college. These figures may be slightly high, but they reflect the salary a student might have earned if he or she had remained in the labor market instead of attending school. (The program used to extract the Follow-Up data is described in the next section on computer usage.)

The raw figures for foregone earnings show how much a person could have earned if he worked but they do not reflect the fact that some people would not have worked even if the college did not exist. The SBCC study used rates of employment (C) to adjust foregone earnings for this factor. These figures by age and sex are available from *The Labor Force of Maryland* published by the Maryland State Department of Planning. [33] The document contains projections of socioeconomic characteristics of the Maryland work force through 1980. An update may be available which is more reflective of current trends toward increased participation of women in the labor force.

The final variable that occurs in the first year of the cost stream is financial aid payments (FA), which are a benefit to the student. Until recently, most aid payments, from both the State and federal governments, have gone to full-time students only. This practice is changing and if significant aid payments go to part-time students the FA variable should be added in the part-time student equations. However, at the time of the SBCC study in FY 1977, almost all of the financial aid was still going to full-time students. For this reason financial aid benefits were included only for full-time students.

The total amount of financial aid can be computed for each college from the annual *Desegregation Status Report for Public Postsecondary Education in Maryland*. [31] This report includes Federal Basic and Supplemental Educational Opportunity Grants as well as State scholarships and grants. In computing the total aid monies for community college students, amounts for State and federal loans were omitted. The average amount of financial aid per full-time student was estimated by dividing the total amount of straight aid by the number of full-time students enrolled in the Fall 1976 semester.

The interest rate (i) in determining the present value of a specific investment is selected according to prevailing market conditions. The standard rate for evaluating public investments is at least 5 percent but the current money market and continuing inflation indicate this may be too low. The SBCC

study used both a 5 and 10 percent value for "i" to give a range of results. In determining internal rates of return (see technical report), the equation is solved for "i" to determine the discount rate which makes the earning differentials equal to an estimate of the costs.

The earning differential between high school graduates and a person with less than three years of college (ED) is available from Census data. The main source for the SBCC data was the 1970 Census [45] which provides the most recent and comprehensive data base available for estimating educational rates of return. The 1970 data included more detailed breakdowns than any of the preceding censuses. Age by income distributions were available for high school and college graduates and also for individuals completing one and two years of college. By using the Consumer Price Index (CPI), it was possible to update the data to 1976. (See technical report for discussion of use of Census data.)

For each age group the amount of raw differentials was computed by subtracting the earnings of high school graduates from earnings of those completing less than three years of college. Returns were not adjusted for mortality because previous studies found that the mortality adjustment has no impact on the rates of return.

The figures computed by this method can be substituted for ED in the equations or they may be adjusted by applying a growth rate that captures anticipated inflation or productivity increases. The estimate of the growth of money incomes should be based on current conditions and historical evidence. The SBCC used an accepted annual growth rate of 3.5 percent. (See the Review of the Literature in the technical report.)

The ability adjustment factor (a) is used to acknowledge that variables, other than educational attainment, affect the differentials in average earnings. The ability factor accounts not only for those with higher intelligence levels who are likely to be more successful, but also for those with exceptional economic or "money-making" abilities. To account for ability differences in the SBCC study, the income differentials between all educational categories were reduced by both 15 and 25 percent.

The present value of community college investments (PV) is calculated when values for all variables are supplied. The results will span a wide range depending on which values are selected for the equations. For a conservative estimate, a 10 percent discount rate (i) can be selected, along with a 25 percent ability factor (a), and no growth rate adjustment between differentials. A liberal estimate can use a 5 percent discount rate, a 15 percent ability factor, and the 3.5 percent growth rate adjustment. If the equations are being used to compute internal rates of return, PV is assigned a value of zero, and the problem is solved for "i".

How much more money in present dollars will be earned by Maryland community college students attending college in the Fall 1976 semester because of the total investment by the State of Maryland, the local jurisdictions, and the students themselves?

Equations for Social Investments

Part-time students

$$\frac{-SC-BS-e(FG)}{(1+i)^1} + \frac{-SC-BS-e(FG)}{(1+i)^2} + \frac{(1-a)(e)(ED)}{(1+i)^3} + \ldots + \frac{(1-a)(e)(ED)}{(1+i)^n} = PV$$

Full-time students

$$\frac{-SC-BS-e(FG)+FA}{(1+i)^1} + \frac{(1-a)(e)(ED)}{(1+i)^2} + \ldots + \frac{(1-a)(e)(ED)}{(1+i)^n} = PV$$

SC - social cost, including State and local expenditures and student tuition and fees
BS - books and supplies
e - labor force participation rate (employment rate)
FG - foregone earnings
FA - financial aid
i - interest rate
a - ability adjustment factor
ED - earning differential between high school graduate and person with less than three years of college
PV - present value of community college investment

Equations for social investments are very similar to those used for measuring private investments. Social rates of return attempt to measure all costs of education to society as well as the benefits of increased productivity resulting from additional education. The costs include not only the amount the student spends for tuition, fees, books, supplies, and foregone earnings, but also the public payment of subsidies. The benefits of increased productivity are measured by increased earnings.

In the SBCC study the people of Maryland were designated as the "society" who make the investment and receive the benefits. The social cost per student (SC) included expenditures by the State, the local subdivisions, and students for tuition and fees. To get estimate of hourly costs, the total amount spent by the State, the jurisdictions, and the students is divided by the number of credit hours taken during the time under study. (Because estimates are also needed in the second year for part-time students, the procedure is repeated with cost data from the following year.) Using the information from the Follow-Up Study, the average credit hours taken by each student can be estimated. This estimate is then multiplied by the computed hourly costs to arrive at the average student cost (SC). In the SBCC study, full-time student costs were found by multiplying 33.2 times $55.50, the cost per credit hour, while part-time student cost was found by multiplying 16.6 times $55.50 for the first year of the cost

stream, and then multiplying 16.6 times $60.06 (the FY 1978 cost per credit hour) for the second year of the cost stream.

The amounts for books and supplies (BS), foregone earnings (FG), and the labor force participation rates (e) were the same figures used in estimating the private investment returns. The average financial aid payment per full-time student (FA) should be adjusted to include only federal student grants and scholarships. Maryland student aid is not included because it is a cost to society where it had been a benefit to the private individual. It is not included as a separate cost because usually it is used for tuition and fees which have already been accounted for in the equations in SC. FA in the social equations is computed the same way it was computed in the private equations, using the same source of information.

The primary benefit to society from its investment in higher education is the increased productivity resulting from the increased earnings. This is measured by differences in earnings of those with different educational backgrounds. The same factors which affected the earning differentials in the private calculations, such as growth adjustment, ability (a), and employment rates (e), also affect the social computations. The same rationale used in selecting the interest rate (i) earlier should be used for selecting an (i) for social equations.

What is the present value of the additional State and local tax revenues generated from the increased earnings?

Tax Equations

Part-time students

$$\frac{-(t)(e)(FG)}{(1+i)^1} + \frac{-(t)(e)(FG)}{(1+i)^2} + \frac{(t)(1-a)(e)(ED)}{(1+i)^3} + \ldots + \frac{(t)(1-a)(e)(ED)}{(1+i)^n} + PV$$

Full-time students

$$\frac{-(t)(e)(FG)}{(1+i)^1} + \frac{(t)(1-a)(e)(ED)}{(1+i)^2} + \ldots + \frac{(t)(1-a)(e)(ED)}{(1+i)^n} = PV$$

t - average percentage of personal income paid in State and local taxes, exclusive of the property tax
e - labor force participation rate (employment rate)
FG - foregone earnings
i - interest rate
a - ability adjustment factor
ED - earning differential between high school graduate and person with less than three years of college
PV - present value of community college investment

Another way of looking at social benefits is by estimating the benefits in the forum of future tax returns. Tax estimates come from estimates used in the private human capital equations by applying marginal tax rates to the income increments.

The average percentage of personal income paid in State and local taxes, exclusive of the property tax (t), can be found in tax reports or consumer surveys. Property taxes are excluded since it is questionable if increased taxes on capital investments are directly linked to educational differences. There is some evidence that those making more money, which are often those with more education, are likely to invest more heavily into capital goods. A study by the Federal Reserve Board [35] indicates the higher the annual income, the greater the propensity to own homes. The SBCC study estimated the percentage of income spent for State and local taxes to be 5.6 percent, exclusive of property tax. According to a recent report by the Conference Board [11], in 1977 that figure nationally may be closer to 6 percent, while inclusion of the property tax would raise it to almost 9 percent. The U. S. Department of Commerce [39] estimates the share of personal income that goes to state and local governments (inclusive of property tax) is 12.5 percent nationwide and 12.7 percent in Maryland. To update Maryland data, the office of the Comptroller of the Treasury or the Department of Economic and Community Development should be consulted.

All other values in the tax equations have been described in the narrative above.

PART III: COMPUTER PROGRAMMING

This section will briefly describe how to use the computer programs for the impact analysis and human capital studies. The instructions are primarily for those who will be running programs at the SBCC at the request of college researchers.

The use of a simple format in the submission of data by the colleges will be helpful to those operating the computer. The computer printout now provides the variable number, label, and value. (See Appendix A.) It also indicates whether or not the value is "input" or "calculated" and only those variables labeled "input" can be altered. The format used on the printout should be used when submitting new data. The new value for variables which are being changed should be listed if only a few values are affected. An example is given below.

No.	Description of Variable	Name	Value
	Analysis Request #1		
6	Total college expenditures	EC	$3,400,000
7	Gross compensation to faculty and staff	WF	2,628,000
13	Total disposable income of faculty and staff	DIF	1,971,000
	Analysis Request #2		
6	Total college expenditures	EC	$3,570,000
7	Gross compensation to faculty and staff	WF	2,759,400
13	Total disposable income of faculty and staff	DIF	2,069,550

If many changes are requested, values for all input variables should be listed. This will insure the computer file is compatible with the college data.

Data requests can be forwarded to the Director of Planning and Research at the SBCC offices in Annapolis. Results should be available within one to two weeks depending on the current demand for computer time. The data in the files are listed according to these run codes.

A permanent disc file must be created for data to give the run program something to read. The commands to create a separate data file are:

```
@CAT EI-DATA.
@ED EI-DATA.
                    (blank line)
ADD SP.EI-DATA
@
```

There are two ways new data can be entered. If only a few changes are to be made, the edit mechanism should be used. If substantial changes are requested, the college can be assigned a new run code, and values can be entered through an input program. To get into the editor after the disc file is created, the following command is given:

```
@ED EI-DATA.
```

The computer will indicate whether the program is ready for edit or input functions. If the word INPUT is printed, the operator should hit the return and wait for the computer to respond with the word EDIT. By using basic editing language, the values or year of entry can be altered.

Because all this work is done on a separate file, it will be lost when the file is removed. If new data is added or permanent changes made, the work should be copied onto the permanent tape for future use. The commands to copy data changes are as follows. Computer responses are marked with a dagger (†).

```
 @ED SP.EI-DATA
†ED 29B 07/31/78 16:03 EI-DATA(0):F      (Will vary according to date
†EDIT                                     and time of changes)
 D,*
†EOF AT LINE 0
 T
 ADD EI-DATA.
 NLA                          (To see if all records are copied, last line
   †1035:    707775 ELC       of file is requested; response will vary)
 T                            (Optional)
 F 707791 RC                  (Will vary according to which variables are
†707791 RC   999999            to be checked)
 @
```

Changes made on the temporary file will be on the program file after these commands are given. Before copying changes over, the operator should make sure that the new values are correct because the old values will be deleted completely.

Computer Commands

Programs for both the economic impact analysis and the human capital investment are stored on tape at the University of Maryland College Park data center. This tape, which includes additional SBCC materials, can be loaded onto the computer through a series of commands from the SBCC terminal. A temporary file is created when these commands are used which will stay on the computer for 20 days after the last time of use. The commands can be fed into the terminal after the normal sign-in process is completed. Computer responses are

marked with a dagger (†). To load programs:

```
 @CAT SP.
†READY
 @ASG,T TAPE.,8C9,P4369
†READY
 @COPIN,SRA TAPE.,SP.
†FURPUR R26V 05130-14111          (This may vary)
†24 SYM 3 REL 3 ABS               (This may vary)
 @FREE TAPE.
†READY
```

The program file will be ready for use after these commands are given.

ECONOMIC IMPACT ANALYSIS

A series of commands can be used to add or change data and tabulate the results for the economic impact programs. In the 1977 SBCC study each college was assigned a number to serve as the run code.

Allegany Community College	05
Anne Arundel Community College	10
Community College of Baltimore	15
Catonsville Community College	20
Cecil Community College	25
Charles County Community College	30
Chesapeake College	35
Dundalk Community College	40
Essex Community College	45
Frederick Community College	50
Garrett Community College	55
Hagerstown Junior College	60
Harford Community College	65
Howard Community College	70
Montgomery Community College	75
Prince George's Community College	80
Wor-Wic Tech Community College	85
Maryland Community Colleges	90
Baltimore County Community Colleges	95

In the input program the values are identified not only by run code, but also by year of entry, such as "77" for 1977. For later reference, the data used for a particular year can be easily identified. The command for the input program is:

```
@ADD SP.R-IN
```

Instructions for how to use the program are printed by the computer. They read:

YOU WILL BE ASKED TO ENTER RUN CODE (RC) AND VARIABLE VALUE (V). THE RUN CODE MAY BE THE SAME AS THE COLLEGE CODE. ENTER "99" FOR RUN CODE TO END ENTRY FOR THAT VARIABLE. DO NOT USE DECIMAL POINTS; WHEN ENTERING PROPORTIONS ALWAYS USE 4 POSITIONS, FOR EXAMPLE 8.13% OR .0813 WOULD BE ENTERED AS 0813. PLEASE ENTER YEAR. EG "78".

After the operator responds with the appropriate year, the computer will query:

WHAT VARIABLE ARE YOU ENTERING? NAME OR "END"

The operator responds with the variable to be entered, such as ED. The computer asks:

RC,V?

The operator then types in the run code and value, such as 03,3400000. The computer again will ask RC,V? If no more values are to be entered for that variable, the operator types 99, . When values for all the variables are entered, the operator will type END after the query from the computer:

WHAT VARIABLE ARE YOU ENTERING? NAME OR "END"

The program is terminated by a normal exit.

The input program has one idiosyncracy. Each time the program is entered, the BVL value for Maryland (90) reverts to an overflow or negative value. An error message indicates the record does not correspond to format specifications. The correct BVL value can be reinserted by using the editor. Before any Statewide run is attempted, the editor should be used to make sure the value is listed correctly. This problem will occur any time more than ten characters are recorded for one value through the input program.

When the values have been correctly entered through either the edit or input programs, the results are ready to be calculated. Through these commands, several copies of the same printout can be requested and will be available at the University of Maryland College Park computer center dispatch window. This eliminates tying up the SBCC terminal with routine printing. The commands to run the program are as follows. Computer responses are marked with a dagger (†).

```
 @SUSPEND
†SUSPENDED
 @ADD SP.R.-MOD
 20                                          (college run code)
 NO                                          (not a Statewide run)
 TITLE OF RUN                                (run label)
                                             (hit return)
 @RESUME
†EXAMINE, DROP, PRINT, HOLD?  (type) EXAMINE
†EDIT
 L SBCC
```

```
Response from computer    (This locates the first line of the program)
P,*                         (Before hitting return, position paper
  Program printout (3 pages)  with form feed, and space down three lines
EXIT                          by hitting "New Line" key three times)
†EXAMINE, DROP, PRINT, HOLD?
```

The operator will type the word DROP immediately after the question mark if no additional copies are desired. If several copies are to be printed at the University computer center, the operator types the word PRINT and then indicates the number of copies to be printed. For example:

```
†EXAMINE, DROP, PRINT, HOLD? PRINT 3
```

After the computer responds with WHERE, the operator should hit the return key. The computer then indicates the task is complete by showing the copies are sent. For example:

```
3 COPIES SENT
```

Another file can be edited to allow the operator to change the variable, name, description, and label as input or calculated. The designation of the variable as a dollar figure, proportion, or number also can be altered. The file lists the variable number and the order in which the data are printed in columns 1 to 3; columns 5 to 10 contain the variable name as used in the programs; column 12 indicates whether the variable is a dollar figure ($), a proportion (P), or a number (N); column 14 indicates whether the variable is input (I) or calculated (C); and columns 16 to 80 contain the variable description. The command to edit the variables is:

```
@ED SP.VAR
```

The computer can also list the actual program used to calculate the results in @ADD SP.R-MOD. A printout can show the order of the calculations and other aspects of the Fortran programming. The commands to list the program are:

```
@ED SP.MOD
P,*
AB
```

HUMAN CAPITAL INVESTMENT

Computer programs are used to compute foregone earnings from follow-up data, present values, and internal rates of return. To calculate foregone earnings, an SPSS breakdown program is used with three variables. The outcome shows the mean value of student salaries by full- or part-time employed by sex. The salary variable is the salary that students who were employed full- or part-time while they were in college were making upon leaving college. Another factor can be added to limit the population to students 16 to 24 years of age. This provides a better measure of foregone earnings of younger students. To run the program:

```
@CAT,P FP.
@ASG,T TAPE.,U9H,P4900
@COPIN TAPE.,FP.
@FREE TAPE.
@ASG,UP FLUPSAVE.,F///256
@FREE FLUPSAVE.
@ASG,A FLUPSAVE.
@ASG,T TAPE.,U9H,P4007
@COPY,G TAPE.,FLUPSAVE.
@FREE TAPE.
SELECT SUBFILES IN FP.72SAL
@ADD FP.R-72SAL
AT THE END OF THE RUNSTREAM, YOU WILL BE LOOKING AT
THE PRINTOUT IN TEMPORARY FILE PRT-72SAL.
```

(The SPSS program is shown below)

```
RUN NAME        FOLLOW-UP STUDY FIRST TIME STUDENTS FALL 1972 - MD COM COLS
GET FILE        FLUPFILE
RUN SUBFILES    (ALL,ANN)
TASK NAME       STUDY OF FORGONE INCOME WHILE ATTENDING COLLEGE
*SELECT IF      (SAMEJOB EQ 1)
BREAKDOWN       VARIABLES = INSAL(1000,50000) EMPPTFT(1,2) SEX(1,2) AGE(16,99)/
                TABLES = INSAL BY EMPPTFT BY SEX/
                AGE BY EMPPTFT BY SEX/
STATISTICS      1
FINISH
EOF AT LINE 32
*@
```

Two Basic programs are used to compute present values and internal rates of return. The programs are set up for a 45-year time-stream which includes both costs and benefits. The editor is used to add or change data and to adjust the discount rate.

Before using the editor to input data, the equations must be simplified to permit only one number in the numerator. (See equations in human capital section of this manual.) For example, the numerator for the third year in the equation for part-time students is (1-a)(e)(ED) which equals (1-.25)(.947)(1,200) or 852. The arithmetic must be completed for every year before entering data on the computer.

To compute present values, the editor is used to add data and adjust the discount rate. The command for the editor is:

```
@ED SP.TSERIES
```

The discount rate can be located beginning at line 13. To change the discount rate, a single command can be given to eliminate the need to change it each time it appears. For example:

```
VC,* /1.1/1.05/G
```

The data from the numerators begin at line 24 and continues through line 88. Five values can be added per line. Negative values are shown with a minus sign preceding the number. An example of how the data are entered is:

```
80 DATA -3704,-3704,852,852,852
```

Each time a new run is made new values must be inserted. To change the data, the command R- is used. For example:

```
R 80 DATA -480,621,621,621,621
```

After data has been entered for all 45 years and for the discount rate, the time series program is ready to run. Since the time streams for part-time students is only 37 or 38 years long, zeros should be entered in the last seven or eight categories. Line 32 will read:

```
88 DATA 0,0,0,0,0
```

To run the program:

```
@ADD SP.TSERIES
```

The results are labeled EARNING DIFFERENTIAL and are computed to the nearest 10^{th}.

The Basic program for computing internal rates of return is similar to the time series program, but does not require a value for the discount rate. In effect, the program finds the discount rate which results in a present value equal to zero. The data for each year is entered just as it was in the time series programs. To edit the internal rate of return program:

```
@ED SP.INT
```

To run the program:

```
@ADD SP.INT
```

In the equations, the demoninator is $(1 + i)^n$, or one plus the interest or discount rate. The results printed by the computer use the same format which are labeled internal rate of return. For example:

```
INTERNAL RATE OF RETURN  1.1680
```

The actual rate of return is .1680 or 16.8 percent. The results also show how close to zero the present value is. If no limit were imposed on the number of places the computer could extend the discount rate, the present value would be zero. In this example, the present value was computed to be 16.426 which indicates that 16.8 percent is a close estimate. This value is shown on the printout as:

```
EARNING DIFFERENTIAL 16.426
```

If many assumptions are made, the computations for human capital investments can be somewhat cumbersome. Each time the status of the student or the assumptions about the variables change, new data must be added through the editor. In the SBCC study, about three days of time at the terminal were necessary to complete the human capital calculations.

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07/31/78 SBCC ECONOMIC IMPACT MODEL

COMMUNITY COLLEGE OF BALTIMORE ECONOMIC IMPACT ANALYSIS

NUM	DESCRIPTION OF VARIABLE	NAME	VALUE	ORIGIN
1	TOTAL COLLEGE IMPACT ON LOCAL BUSINESSES	BM		CALCULATED
2	COLLEGE-RELATED LOCAL BUSINESS VOLUME	BVCR		CALCULATED
3	COLLEGE-RELATED LOCAL EXPENDITURES	ELCR		CALCULATED
4	LOCAL EXPENDITURES BY THE COLLEGE	LC		CALCULATED
5	PROPORTION OF TOTAL COLLEGE OUTSIDE EXPENDITURES THAT ARE LOCAL	ELC		INPUT
6	TOTAL COLLEGE EXPENDITURES	EC		INPUT
7	GROSS COMPENSATION TO FACULTY AND STAFF	WF		INPUT
8	TAXES AND OTHER PAYMENTS TO GOVERNMENTS	RC		INPUT
9	LOCAL EXPENDITURES BY FACULTY AND STAFF	ELF		CALCULATED
10	FACULTY AND STAFF EXPENDITURES FOR LOCAL RENTAL HOUSING	EHF		CALCULATED
11	PROPORTION OF FACULTY AND STAFF RESIDING LOCALLY	FL		INPUT
12	PROPORTION OF LOCAL FACULTY AND STAFF WHO RENT HOUSING	FH		INPUT
13	TOTAL DISPOSABLE INCOME OF FACULTY AND STAFF	DIF		INPUT
14	PROPORTION OF TENANT EXPENDITURES SPENT FOR RENTAL HOUSING	EH		INPUT
15	LOCAL NONHOUSING EXPENDITURES BY LOCAL FACULTY AND STAFF	ENHF		CALCULATED
16	PROPORTION OF NONHOUSING EXPENDITURES MADE LOCALLY	EL		INPUT
17	PROPORTION OF EXPENDITURES SPENT ON NONHOUSING ITEMS	NHF		INPUT
18	LOCAL EXPENDITURES BY NONLOCAL FACULTY AND STAFF	ELNLF		CALCULATED
19	TOTAL NUMBER OF FACULTY AND STAFF	F		INPUT
20	AVERAGE LOCAL EXPENDITURE BY EACH NONLOCAL FACULTY AND STAFF	EIF		INPUT
21	LOCAL EXPENDITURES BY STUDENTS	ELS		CALCULATED
22	PROPORTION OF STUDENTS ATTENDING COLLEGE FULLTIME	SF		INPUT
23	LOCAL MISCELLANEOUS EXPENDITURES BY STUDENTS LIVING W PARENTS	EMS		CALCULATED
24	EXPENDITURES BY STUDENTS FOR LOCAL RENTAL HOUSING	EHS		CALCULATED
25	LOCAL NONHOUSING EXPENDITURES BY STUDENTS WHO RENT LOCAL HOUSING	ENHS		CALCULATED
26	NUMBER OF STUDENTS LIVING WITH PARENTS	SL		INPUT
27	AVE MISCELLANEOUS EXPENDITURES PER STUDENT LIVING WITH PARENTS	EMES		INPUT
28	NUMBER OF STUDENTS RENTING LOCAL HOUSING	SH		INPUT
29	AVERAGE RENTAL HOUSING EXPENDITURES PER STUDENT	HS		INPUT
30	AVERAGE NONHOUSING EXPENDITURES PER STUDENT	NHS		INPUT
31	MULTIPLIER EFFECT	M		INPUT
32	VALUE OF COLLEGE RELATED LOCAL BUSINESS PROPERTY	PRBCR		CALCULATED
33	VALUE OF COLLEGE RELATED LOCAL BUSINESS REAL PROPERTY	RPBCR		CALCULATED
34	LOCAL BUSINESS VOLUME	BVL		INPUT
35	ASSESSED VALUATION OF LOCAL BUSINESS REAL PROPERTY	VB		INPUT
36	LOCAL RATIO OF ASSESSED VALUE TO MARKET VALUE OF TAXABLE PROPERTY	AMV		INPUT
37	VALUE OF COLLEGE RELATED LOCAL BUSINESS INVENTORY	IBCR		CALCULATED
38	INVENTORY TO BUSINESS VOLUME RATIO	IBV		INPUT

APPENDIX A
COMPUTER PRINTOUT SAMPLE

NUM	DESCRIPTION OF VARIABLE	NAME	VALUE	ORIGIN
39	EXPANSION OF LOCAL BANK CREDIT BASE FROM COLLEGE RELATED DEPOSIT	CB		CALCULATED
40	LOCAL TIME DEPOSIT RESERVE REQUIREMENT	T		INPUT
41	AVERAGE TIME DEPOSIT OF THE COLLEGE	TDC		INPUT
42	AVERAGE TIME DEPOSIT OF EACH FACULTY AND STAFF PERSON	TDF		INPUT
43	LOCAL DEMAND DEPOSIT RESERVE REQUIREMENT	D		INPUT
44	AVERAGE DEMAND DEPOSIT OF THE COLLEGE	DDC		INPUT
45	AVERAGE DEMAND DEPOSIT OF EACH FACULTY AND STAFF PERSON	DDF		INPUT
46	CASH TO BUSINESS VOLUME RATIO	CBV		INPUT
47	LOCAL BUSINESES VOLUME UNREALIZED BECAUSE OF COLLEGE	BVUC		INPUT
48	GOVERNMENT-RELATED IMPACTS	GM		CALCULATED
49	COLLEGE-RELATED REVENUES RECEIVED BY LOCAL GOVERNMENTS	RCR		CALCULATED
50	COLLEGE-RELATED REAL ESTATE TAXES PAID TO LOCAL GOVERNMENTS	RRECR		CALCULATED
51	REAL ESTATE TAXES PAID TO LOCAL GOVERNMENT BY THE COLLEGE	RREC		INPUT
52	REAL ESTATE TAXES PAID TO LOCAL GOVT BY LOCAL FACULTY AND STAFF	RREF		CALCULATED
53	NUMBER OF FACULTY AND STAFF RESIDING LOCALLY	LF		INPUT
54	LOCAL PROPERTY TAX RATE	PT		INPUT
55	TOTAL ASSESSED VALUATION OF ALL LOCAL PRIVATE RESIDENCES	VPR		INPUT
56	TOTAL NUMBER OF LOCAL PRIVATE RESIDENCES	NPR		INPUT
57	REAL ESTATE TAXES PAID BY BUSINESS FOR COLLEGE-RELATED PROPERTY	RREBCR		CALCULATED
58	OTHER COLLEGE-RELATED PROPERTY TAXES PAID TO LOCAL GOVERNMENTS	RNRECR		CALCULATED
59	NONREAL PROPERTY TAXES PAID BY LOCAL FACULTY AND STAFF	RNREF		CALCULATED
60	PROPERTY TAXES FOR OTHER THAN REAL ESTATE OR INVENTORY PAID	ROP		INPUT
61	TOTAL NUMBER OF LOCAL HOUSEHOLDS	TC		INPUT
62	INVENTORY TAXES PAID BY BUSINESSES FOR COLLEGE-RELATED BUSINESS	RNREBC		CALCULATED
63	LOCAL INVENTORY TAX RATE	IT		INPUT
64	****NEW VARIABLE USED ONLY IN STATE MODEL****	STLG		CALCULATED
65	TOTAL SALES TAX COLLECTED LOCALLY	ST		INPUT
66	STATE AID TO LOCAL GOVERNMENTS ALLOCABLE TO PRESENCE OF COLLEGE	RACR		CALCULATED
67	STATE SCHOOL AID ALLOCABLE TO CHILDREN OF COLLEGE-RELATED FAM	RACH		CALCULATED
68	TOTAL STATE AID TO LOCAL PUBLIC SCHOOLS	APS		INPUT
69	NUMBER OF FACULTY-STAFF CHILDREN ATTENDING LOCAL PUBLIC SCHOOLS	CHPSF		INPUT
70	TOTAL NUMBER OF CHILDREN ATTENDING LOCAL PUBLIC SCHOOLS	CHPS		INPUT
71	COLLEGE-RELATED INCOME TAX COLLECTED BY LOCAL GOVERNMENTS	RICR		CALCULATED
72	PROPORTION OF TOTAL INCOME SPENT FOR LOCAL INCOME TAX	IL		INPUT
73	PROPORTION OF TOTAL INCOME SPENT FOR STATE INCOME TAX	IS		INPUT
74	VARIABLE NOT USED IN EQUATIONS	RAPC		CALCULATED
75	TOTAL NUMBER OF PERSONS IN LOCAL FACULTY AND STAFF HOUSEHOLDS	FHL		INPUT
76	FED AID TO LOCAL GOVT ALLOCABLE TO PRESENCE OF COLLEGE	RFCR		CALCULATED
77	FED AID RECEIVED BY LOCAL GOVERNMENT ON PER CAPITA BASIS	RF		INPUT
78	COLLEGE-RELATED GOVT COSTS OF MUNICIPAL AND SCHOOL SERVICES	OCMPSC		CALCULATED

NUM	DESCRIPTION OF VARIABLE	NAME	VALUE	ORIGIN
79	COLLEGE-RELATED COSTS OF MUNICIPAL SERVICES	OCMCR		CALCULATED
80	TOTAL LOCAL DAYTIME POPULATION	POPLD		INPUT
81	TOTAL LOCAL RESIDENT POPULATION	POPLR		INPUT
82	LOCAL GOVERNMENT OPERATING BUDGET EXCEPT PUBLIC SCHOOLS	BMS		INPUT
83	COLLEGE-RELATED COST OF OPERATING PUBLIC SCHOOLS	OCPSCR		CALCULATED
84	LOCAL GOVERNMENT OPERATING BUDGET FOR PUBLIC SCHOOLS	BPS		INPUT
85	VALUE OF COLLEGE-RELATED LOCAL GOVERNMENT PROPERTY	GPCR		CALCULATED
86	VALUE OF ALL LOCAL GOVERNMENT PROPERTY EXCEPT PUBLIC SCHOOLS	GPM		INPUT
87	VALUE OF LOCAL GOVERNMENT PROPERTY ASSOCIATED WITH PUBLIC SCHOOL	GPPS		INPUT
88	REAL ESTATE TAXES FOREGONE THROUGH TAX-EXEMPT STATUS OF COLLEGE	RFREC		CALCULATED
89	TOTAL REAL ESTATE TAXES COLLECTED BY LOCAL GOVERNMENTS	RRE		INPUT
90	GEOGRAPHICAL AREA OF THE COLLEGE	GC		INPUT
91	GEOGRAPHICAL AREA OF SUBDIVISION EXCLUSIVE OF COLLEGE	GL		INPUT
92	VALUE OF MUNICIPAL-TYPE SERVICES SELF-PROVIDED BY COLLEGE	OCMSC		INPUT
93	NUMBER OF JOBS ATTRIBUTED TO PRESENCE OF COLLEGE	JM		CALCULATED
94	EMPLOYMENT MULTIPLIER EFFECT	J		INPUT

APPENDIX B

SAMPLE SURVEY
FOR FACULTY, STAFF AND STUDENTS

1. What is your college status?
   (Check the category representing your primary status at the college.)

   [ ] Faculty or administration
   [ ] Support staff
   [ ] Student

2. What is your marital status?
   (Check one)

   [ ] Single, widowed, divorced, separated
   [ ] Married

3. How many persons are there in your household? _____

   a) How many children? _____

   b) How many of those children attend public schools? _____

4. Where do you live?
   (Check one)

   [ ] In _____* County (or Baltimore City)

   [ ] Out-of-county (or outside Baltimore City)

5. In what type of housing do you reside?

   [ ] Rent
   [ ] Own home
   [ ] With parents

6. Please estimate your average monthly expenditures in the following categories:

   Housing expense _____

   Food expense _____

   All other expenses _____

7. What is the total annual income of all persons in your household

   before payroll deductions? _____

   after payroll deductions? _____

8. What is your approximate monthly expenditure in business establishments in county, exclusive of the college facilities? _____

9. What are your average balances in the following categories?

   Local bank checking account? _____

   Local bank savings account? _____

   Local credit union savings? _____

   Local savings and loan institution savings account? _____

* Insert the actual community or communities being studied.